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Abstract

We assess the impact of environmental externalities on portfolio decisions in a lab-in-the-field experiment on finance professionals and students. Subjects show pro-environmental preferences, with a strong asymmetry because of the sign of the externality. They are prone to accept lower return for positive environmental impact, but not to bear increased risk. Finance professionals are more pro-environmental than students, particularly regarding negative externalities, and less influenced by a ranking signal about environmental performance. Additional control tasks show that pro-social and pro-environmental preferences have much less influence on portfolio composition than market practices for finance professionals, but they are significant predictors for students.

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de gustibus et coloribus non disputandum

(There is no accounting for taste and colors)

1 Introduction

Green is the new black of the finance industry. According to the 2019 Global Landscape of Climate Finance (Buchner et al., 2019), climate-related investments were more than $500 billion in 2017 and 2018, with more than 56% from private initiatives. Yet on the opposite side of the environmental spectrum, institutional actors and regulators (TCFD, 2017; EU-TEG-SF, 2020) are modestly silent about remaining investments in carbon-intensive activities and related divestment efforts in brown[1] assets. Those still represent an important share of global investment, despite repeated calls for fossil fuel divestment (Carney, 2015; Ritchie et al., 2015). Green investment and brown divestment must co-exist in the transition toward a greener economy, and in financial practices as well (Battiston et al., 2021). They participate to the same intent undertaken by a growing fringe of investors, but at different stages of maturity. Investors may engage in both actions, but do their investment behaviors differ and if so, how and why?

Abundant literature has explored the motives for holding socially responsible investments (SRI) (Benabou and Tirole, 2010; Jansson and Biel, 2011; Riedl and Smeets, 2017). On one hand, there is the hunt for the (disputable) green premium, and on the other hand, there are investors' preferences, including extra-financial concerns. The former discusses private benefits generated by SRI (Renneboog et al., 2008; Larcker and Watts, 2020), while the latter has multiple underlying motivations (Fama and French, 2007; Benabou and Tirole, 2010). These may have an important psychological component, as illustrated by the extensive literature on "doing-well-by-doing-good" (Dowell et al., 2000; Renneboog et al., 2008; Edmans, 2011; Deng et al., 2013; Dimson et al., 2015). Overall, it is generally acknowledged that the social preferences of individual investors play a key role in holding SRI funds, but they are not the only motivation (Riedl and Smeets, 2017).

The literature about investment in carbon-intensive activities, however, is much more about risk than opportunity. Bolton and Kacperczyk (2021) show that the carbon premium is widely required from investors as compensation for carbon emissions, even though Trinks et al. (2018) argue against the existence of out-performances of such investments. Ilhan et al. (2021) show the existence of carbon risk pricing on options markets, proving that risk has

[1] EU-TEG-SF (2020) says (p.51) that The Technical Expert Group "considers that a different word to 'brown' is needed to describe activities that are significantly harmful to environmental objectives." Therefore, we keep it there for convenience, but we will of course detail what it means in this study.

found a way to be priced on markets. In any case, the environmental standpoint lies more in the reasons for not investing, in contrast with SRI.

From the subjective point of view, the difference with environmentally virtuous investments may lie in very different psychological and cognitive motives, in a fashion similar to gain-loss asymmetry (Kahneman and Tversky, 1979; Tversky and Kahneman, 1991). Drawing from this example, the aversion for brown assets may be stronger than the attraction of green ones. Like sin assets (Hong and Kacperczyk, 2009; Blitz and Fabozzi, 2017; Colonnello et al., 2019), brown assets may bear heavier social norms and comparison: Kirchler et al. (2016) and Sutter et al. (2020) show that negative externalities generate interference between moral considerations and market activities. To the best of our knowledge, no research has explored the similarities and differences of green and brown investment in terms of individual behaviors. So, we ask, in echo to Riedl and Smeets (2017): why would finance professionals divest from brown assets?

The present paper seeks to answer the question by using an experimental approach. Just like censoring, avoided investment and its related divestment, are difficult phenomena to observe. An experiment allows us to compare green and brown investments—whatever they mean at this point—on the same basis by involving the same investors. Assets differ in many other dimensions that might affect investors' decisions. By providing full symmetric information on all asset characteristics, we can investigate how and why investors are willing to trade them off, and if, e.g., they exhibit a tendency to avoid brown assets. We built on the assumption that investors are willing to trade off risk and return for holding greener assets. For both green and brown assets, such trade-offs can be observed in a controlled experimental environment.

We designed an experiment in which characteristics of brown assets are matched with those of green assets, facing a common so-called "neutral" asset. Assets vary in expected return, standard deviation, and color. The preference for a specific color may arise because that asset either bears a positive environmental externality, a negative externality, or no externality. The externality is expressed as a donation from us, the experimenters, either to a pro-environmental NGO[2] for green assets or to a fossil-fuel producers' association[3] for brown ones. Delegated philanthropy (Baron, 2007; Benabou and Tirole, 2010) is a standard experimental tool to simulate SRI or charitable giving (Bonnefon et al., 2011; Koppel and Regner, 2011; Eckel et al., 2017; Brodback et al., 2020). Subjects are offered the chance to make a donation to a charity (e.g., Red Cross or WWF). In our experiment, delegated philanthropy is implemented by a donation to an environmentally virtuous association. Subjects can buy self-esteem or

[2] An international company that plants trees all over the world.
[3] An international association of producers of oil and gas.

warm glow by investing in low-return green assets that generate a positive externality on society. Taking a symmetrical stand for negative externalities is one of the challenges and contributions of this paper.

In contrast to delegated philanthropy, which is based on the willingness to sacrifice material payoff to achieve social goals, we need a compensation mechanism that eases the moral cost of delegated misanthropy. We do this by introducing a "brown premium" on the returns of brown assets. Delegated misanthropy is implemented by a donation to the fossil energy industry.

In the main part of the experiment, subjects had to make a portfolio allocation between two assets: a colored asset and a neutral asset which did not entail any donation. The allocation task was repeated 35 times by varying the risk and return characteristics of the assets. Our analysis mainly focuses on the color dimension, i.e., portfolio decisions involving either a green asset or a brown asset, i.e., a positive or a negative environmental externality. Comparing the externality situations helps to identify shared and distinct patterns. Besides the core design which is our baseline, the experiment includes four inputs that are introduced as tentative explanatory blocks.

First, the baseline setting is altered by two treatments. Exploring these directions is essential, not only to public policy conception but also to assess the robustness of our experimental design in evaluating the role of structures and incentives in portfolio decisions. That is why our treatments are halfway between virtual and current mechanisms. The first treatment introduces a private moral comparison through ranking information on the environmental performance of a portfolio. According to social comparison theory, individuals compare themselves to others, upwardly and downwardly (Festinger, 1954). Upward social comparisons improve individuals' abilities, and they provide self-enhancement with new targets (List, 2006; Kirchler et al., 2018). The second treatment introduces non-linear monetary incentives in tax treatment. The tax is endogenously computed, and it penalizes the expected return of the asset with the worst environmental externality in proportion to the holding of that asset. This lets us test subjects' sensitivity to differences in yield based on environmental considerations.

Second, the experiment is duplicated on two subject pools, finance professionals (hereafter the PRO sample) and students (hereafter the STUD sample). We follow the widespread literature that compares student subjects and professionals (Haigh and List, 2005; Gajewski et al., 2020; Kirchler et al., 2018; Weitzel et al., 2020; Bottasso et al., 2020; Holmen et al., 2021). The PRO sample comprises 190 finance professionals who took part in a lab-in-the-field setting closely related to their work environment. We replicated as closely as possible the experiment in the laboratory with 279 student participants from various disciplines. Like the

opposition between green and brown, we aim to study differences between finance professionals and students.

Third, we control our analyses by relating the results to various behavioral traits, opinions, and socio-demographic data. Following the core experimental task, subjects took part in several control tasks and answered questionnaires. These tasks are taken from the mainstream literature to elicit five individual traits: risk preference (Noussair et al., 2014), cognitive ability (CRT, Frederick, 2005), strategic skill (the 11-20 game of Alaoui and Penta, 2016), pro-sociability (SVO, Murphy et al., 2011), and pro-environmental opinion (the NEP scale of Dunlap et al., 2000). While these tasks are mainly used as control variables to account for a likely heterogeneity between finance professionals and students, we are also specifically interested in their pro-social and pro-environmental preferences. We predict that these two dimensions affect subjects' portfolio decisions, as already shown by Riedl and Smeets (2017).

Last, within the PRO sample, there is some specific heterogeneity related to jobs and investment strategies. For instance, analysts are more strongly long-term oriented than market traders who focus on short-term information. Such differences in their planning horizons and in the information they use for decision-making may affect their investment decisions. For instance, analysts might put more emphasis on color than on return, while traders might have the opposite emphasis. Since our PRO sample gathers professionals from investment banks and asset management companies, but who occupy different jobs, we asked them about their profession and investment strategy, besides other finance-related questions. We collected a unique data set that allows us to relate investment strategies revealed in the experiment to jobs and out-of-the-lab investment strategies.

Our main contribution is to show that both students and finance professionals reveal pro-environmental preferences in their portfolio decisions. Participants invest larger shares of their endowments in low-return green assets and smaller shares in high-return brown assets when a neutral benchmark asset is available. These findings confirm earlier results from Riedl and Smeets (2017) and Brodback et al. (2020). In the same line, subjects are more sensitive to yield variations for green assets than for neutral ones, and more for neutral assets than for brown ones. Such a conclusion does not extend to the risk dimension. In risky situations, or for asset-generating portfolio risk, the environmental dimension does not offset the pursuit of a return to compensate for risk-taking. This echoes Brodback et al. (2020), who emphasize that bad outcomes generate less willingness to pay for SRI, and Bansal et al. (2021), who suggest that investors have a wealth-dependent preference for social responsibility, and this leads to a decreased demand for SRI during bad times. The connection between bad outcomes and lower SRI desirability extends to risky outcomes.

Our second contribution is to highlight a fundamental investment asymmetry between green and brown assets. Green and brown assets are not comparable to each other, but to a neutral asset with no externality. In this way, we can observe that subjects treat green and brown assets differently in terms of both return and risk, as mentioned above. Finance professionals are more inclined to avoid a brown asset than to seek out green ones, but students show the opposite. This result contributes to the literature on moral tradeoffs, in investors (Riedl and Smeets, 2017) and students (Bartling et al., 2015; Kirchler et al., 2016; Sutter et al., 2020). It also confirms the gain-loss asymmetry analogy suggested earlier (Kahneman and Tversky, 1979) and the suitability of the experimental protocol to test it.

Our third contribution is to implement a novel negative externality protocol in a lab and in lab-in-the-field experiments. Previous implementations of negative externalities in experimental settings (Bartling et al., 2015; Kirchler et al., 2016; Bartling et al., 2019; Sutter et al., 2020) provided evidence about monetary trade-offs of avoiding negative externalities. It is difficult to model negative environmental externalities in an individual decision setting. This holds true for pro-environmental preferences in general (Lange and Dewitte, 2019). To our knowledge, Lange et al. (2018) are the first to propose generating actual emissions of greenhouse gasses (GHG) from subjects' choices. Our choice is to adopt a delegated misanthropy scheme to qualify a brown asset, i.e., a mirror image of the delegated philanthropy scheme usually adopted to qualify virtuous assets. We do this by targeting the beneficiary of the negative externality as an association that explicitly promotes the use of fossil fuels. This approach is based on simplicity as much as the desire to compare brown situations to green ones and to make them as symmetrical as possible. Previous results have shown that such a mechanism induces the expected effect.

We make our fourth contribution to the research about the external validity of laboratory experiments run with standard student subjects by considering a sample of finance professionals in a lab-in-the-field setting. We found differences between finance professionals and students besides those already documented in an important strand of literature aiming at comparing the two populations (Haigh and List, 2005; Kirchler et al., 2018; Gajewski et al., 2020; Weitzel et al., 2020; Bottasso et al., 2020; Holmen et al., 2021). Finance professionals show stronger pro-environmental preferences, and they are less influenced by ranking information or tax cuts on profits. Their results also cannot be explained from social and environmental preferences, which are strong predictors of students' behaviors.

If students' social and environmental preferences influence their investment strategies, finance professionals tend to be influenced by their jobs and real investment practices. This is our result. We show that jobs and investment style have a first-order influence on the

environmental dimension of subjects' portfolios. The categories we employ in the analysis can be seen as similar to the fundamentalist vs chartist opposition. It, therefore, appears that finance professionals who are used to consider extra-financial information and have longer horizons in decision making tend to show stronger pro-environmental considerations in their investments. Perhaps more than personal traits specific to finance professionals (Holmen et al., 2021), positions in the industry and daily practices are crucial determinants of behaviors in experiments. This may be because some jobs and strategies (i) attract specific profiles (selection process Lagarde and Blaauw, 2014), and (ii) reinforce particular learning processes (Cohn et al., 2014).

The rest of the paper is structured as follows. Section 2 introduces the baseline investment task, with its two added treatments and the data specifications. It then analyses the econometric patterns in the investment task in terms of colors (green vs brown), samples (PRO vs STUD), and the effect of treatments. Section 3 details the control tasks and the demographic data. Redoing the analysis with that information provides the individual predictors of investment choices.

2 Portfolio Choices with Environmental Externalities

In this section, we exclusively introduce and study the portfolio choice task, the core experiment, including ranking and tax treatments. We emphasize the discrepancies between green and brown contexts on one hand, as defined below, and differences between finance professionals and students on the other hand.

2.1 The Baseline Portfolio Choice Task

The portfolio choice task follows investment games that elicit risk preferences, from the work of Gneezy and Potters (1997) to more recent researchers, such as Kirchler et al. (2018). They consist in allocating a fixed budget of 100 experimental currency units (ECUs) between two competing assets, by choosing the percentage invested in one of them.[4] The task was repeated over 35 explicitly independent situations by varying the characteristics of the assets, i.e., the expected return μ, the standard deviation σ, the correlation ρ (when applicable), and the "color" (i.e., the environmental impact). Situations were provided in a non-random order, and only one of them was randomly selected to be paid out for real, to incite independent decisions among trials (Cubitt et al., 1998). Asset characteristics, for each situation, are displayed in Table 1 in the chronological order in which they were presented.

[4] Two assets were displayed on the same screen. Subjects had to enter the proportion of the first asset.

Table 1: Asset characteristics in the portfolio choice task

	Situation 1		Situation 2		Situation 3		
Screen	$C(\mu_1, \sigma_1)$	$C(\mu_2, \sigma_2)$	$C(\mu_1, \sigma_1)$	$C(\mu_2, \sigma_2)$	$C(\mu_1, \sigma_1)$	$C(\mu_2, \sigma_2)$	correl.
1	N(15,0)	G(10,0)					
2	N(15,0)	B(20,0)					
3	N(15,0)	N(20,25)	N(15,0)	N(30,25)	N(15,0)	N(30,50)	
4	N(15,0)	G(10,25)	N(15,0)	G(20,25)	N(15,0)	G(20,50)	
5	N(15,0)	B(30,25)	N(15,0)	B(40,25)	N(15,0)	B(40,50)	
6	N(20,25)	G(10,0)	N(30,25)	G(10,0)	N(30,50)	G(10,0)	
7	N(20,25)	B(20,0)	N(20,25)	B(20,0)	N(20,25)	B(20,0)	
8	N(20,25)	G(10,25)	N(30,25)	G(20,25)	N(30,50)	G(20,50)	-1
9	N(20,25)	G(10,25)	N(30,25)	G(20,25)	N(30,50)	G(20,50)	0
10	N(20,25)	G(10,25)	N(30,25)	G(20,25)	N(30,50)	G(20,50)	1
11	N(20,25)	B(30,25)	N(30,25)	B(40,25)	N(30,50)	B(40,50)	-1
12	N(20,25)	B(30,25)	N(30,25)	B(40,25)	N(30,50)	B(40,50)	0
13	N(20,25)	B(30,25)	N(30,25)	B(40,25)	N(30,50)	B(40,50)	1

Description: Up to threee situations were displayed simultaneously in 13 successive screens, requiring a single portfolio decision for each situation. Notation $C(\mu_i, \sigma_i)$ refers to asset i $(1, 2)$ with color C (N=neutral, G=green, B=brown), expected return μ_i (in percent) and standard deviation σ_i (in percent). Correlation between the two assets is provided if $\min(\sigma_1, \sigma_2) > 0$.

Risky assets, i.e., assets involving a positive standard deviation σ, were modeled with a fair Bernoulli lottery: their return outcomes are $\mu + \sigma$ or $\mu - \sigma$ with 50% probability. For the situations that proposed two risky assets, the correlation ρ between them also is provided. Three correlation regimes were tested: $\rho \in \{-1, 0, 1\}$. Thus, any portfolio composition led toward two outcomes, except in the case $\rho = 0$, where four outcomes are possible. As subjects input a portfolio composition, the corresponding expected return and standard deviation of the portfolio were immediately computed and displayed. Table 1 reminds us that the target asset was always the neutral asset in each of the tasks.

This basis allows us to test preliminary if subjects behave according to standard portfolio theory (Kroll et al., 1984; Markowitz, 2010). This translates into the first two hypotheses to test:

Hypothesis 1 (return attraction)**.** *A higher expected return of the target asset has a positive impact on its holding and a negative impact on the holding of the complementary asset.*

Hypothesis 2 (risk avoidance)**.** *A higher standard deviation of the target asset has a negative impact on its holding and a positive impact on the holding of the complementary asset.*

Besides the standard framework, subjects faced three distinct contexts relative to the portfolio's environmental impact. While the first asset was always neutral, the second asset was colored (neutral, green, or brown) according to the following definition. A green (brown)

asset leads to a positive (negative) environmental externality, while a neutral asset does not lead to any externality. In the experiment, the externality was constructed as follows: in the case of a positive (negative) externality, the experimenter committed to donating half of the percentage of the portfolio invested in the green asset (brown asset) to a pro-environmental association[5] (an anti-environmental association, i.e., a fossil fuel association[6]). For example, investing 60% of the budget in the green asset leads to a donation of 30 ECUs[7] to the pro-environmental association. The color of the assets and the description of the recipients of potential donations were provided at all times to the subjects. Once the subject input his portfolio composition, the amount the experimenter engaged in donating was provided in real time. The actual donation was conditioned on the situation selected for real payment. Notice that the amount is fixed and independent of the colored asset's random outcome, in contrast to Brodback et al. (2020).

This novel framework allows us to test our key hypothesis that subjects exhibit pro-environmental preferences.

Hypothesis 3 (green preference)**.** *Subjects reveal a preference for green assets over neutral assets, and a preference for neutral assets over brown assets,* ceteris paribus*.*

Our core analysis relies on the choice of portfolio composition. We are particularly interested in the comparison of opposite environmental situations. A situation is a green context if the second asset is green and a brown context if the second asset is brown. For each kind of context, there is a greener asset (the green asset in a green context or the neutral asset in a brown context) and a browner asset (the neutral asset in a green context or the led brown asset in a brown context). Given these characteristics of the situations, it is convenient to define λ as the proportion of the greener asset held in the portfolio. This allows us to carry all subsequent analyses in terms of λ (in accordance with Hypothesis 3, stating the existence of a preference for the greener asset) in either a green or a brown context.

Testing Hypothesis 3 is not straightforward, since the assets composing a portfolio always differ in return or standard deviation because of the delegated charity design. The average level of λ does not provide an appropriate measure of the preference for the greener asset because risk and return considerations also are involved. Hypothesis 3 is thus tested by comparing situations satisfying the *ceteris paribus* condition, but not only that condition.

[5]This association is a worldwide social enterprise enabling sustainable reforestation across the globe through crowdfunding. Their goal is to protect, rehabilitate, and develop forests around the world. More information is available upon request (name, weblink of the association, and amount transferred).

[6]An international association of producers of oil and gas, which is a consortium promoting the use of fossil fuels, such as gas from shale. More information is available upon request (name, weblink of the association, and amount transferred).

[7]Participants knew that the ECUs would be converted into euros at the end of the experiment, and they knew the conversation rate.

Hypothesis 3 can be framed differently. For example, if hypotheses 1 and 2 hold, it may be possible that subjects exhibit less profit-seeking or more risk tolerance for greener assets. It is a necessary condition that, in a world where asset characteristics boil down to return distribution, the intervention of extra-financial considerations must be at the expense of existing financial criteria. If that is the case, subjects should either tolerate a lower (require a higher) return for a greener (browner) asset or accept a higher (require a lower) standard deviation for a greener (browner) asset, or both effects. Those predictions are rather new, as they would show through which dimension (risk or return), when taken simultaneously, environmental friendliness intervenes in subjects' appreciation and decision. This provides Hypotheses 4 and 5:

Hypothesis 4 (return asymmetry)**.** *An increase in expected return has a stronger effect (in absolute value) on the greener asset than on the browner asset.*

Hypothesis 5 (risk asymmetry)**.** *An increase of the standard deviation has a weaker effect (in absolute value) on the greener asset than on the browner asset.*

The next step of the analysis focuses on asymmetry. As explained above, green and brown assets are connected to a donation from the experimenter to an association. This refers to the mechanism of delegated philanthropy (Benabou and Tirole, 2010) in similar experimental protocols (Bonnefon et al., 2011; Koppel and Regner, 2011; Eckel et al., 2017; Brodback et al., 2020). This poses a challenge in brown contexts, but not in green ones. The principle underlying the mechanism of delegated philanthropy is that the donor is compensated for his donation (i.e., a material loss) by an altruistic reward, such as a warm glow (Andreoni, 1990). However, from a practical point of view, there are actually three outcomes: a loss for the donor, revenue for the association, and a potential benefit for society if the revenue is invested. The counterpart for a brown asset, which generates a negative externality, is to provide material compensation to the donor to relieve his moral cost of guilt[8] in inflicting a potential loss onto society. That is, by designing the brown asset as a symmetric asset to the green, we also create three potential outcomes: material compensation for the donor (a higher expected return), revenue for the association, and a loss for the potential victims of the recipient's activity if the revenue is invested.[9] There is no reason, *a priori*, to conjecture that the altruistic reward of investing in a green asset is of the same magnitude as that of the

[8] Battigalli and Dufwenberg (2007) develop a model of guilt aversion in games.

[9] The level of donation, fixed to half of the proportion invested in the colored asset, is motivated by the decoupling of the material loss or compensation from the association revenue. This decoupling is required to meet the logic of delegated misanthropy, but it is sometimes absent in delegated philanthropy schemes (Bonnefon et al., 2011; Koppel and Regner, 2011; Eckel et al., 2017), with loss oof monetary gain equal to the philanthropic donation.

moral cost of guilt in investing in a brown asset, all other things equal. As a new protocol for negative externalities, our mechanism raises some challenges: subjects' choices may reveal asymmetry in terms of contexts because of fundamental differences in how they perceive the externality and how they trade off their (unobservable) moral cost for return. Eventually, the donation mechanism is associated with losses in return in green contexts and surplus in brown ones, and this by itself generates asymmetry because of loss aversion (Kahneman and Tversky, 1979; Tversky and Kahneman, 1991).

This being said, what behavior is expected from subjects on that matter? We take the point of view that symmetry is the null hypothesis, and we call this context-independence. Hence we have Hypothesis 6:

Hypothesis 6 (context-independence)**.** *On average, subjects invest the same proportion in the greener asset in a green context as in the equivalent brown context,* ceteris paribus*.*

Hypothesis 6 states that portfolio choices are context free. The color of the context is irrelevant for trading off assets' characteristics. This expresses the symmetry of green and brown contexts. In addition, this symmetry decomposes in the two tested dimensions of Hypotheses 1 and 2—return attraction and risk avoidance—in a fashion like the green preference hypothesis and its two variants. We refrain from making any conjectures here and let the analysis speak for itself.

2.2 Samples

Our experiment applies to two samples: the PRO sample, comprising 190 finance professionals from major financial institutions, and the STUD sample, which involved 279 student subjects from the University of Montpellier (France). The experiment with the PRO sample was carried out in October 2019, in banks and asset management companies, using a mobile laboratory with tablets. Student subjects participated in sessions organized in 2020 at the Laboratory for Experimental Economics of Montpellier (LEEM).[10] All the lab sessions were conducted in compliance with the ethical code of conduct and the rules of the LEEM, and the field sessions complied with the ethical rules of the employers of the PRO sample subjects.[11]

In the PRO sample, only one participant out of 10 was randomly selected to be paid out for real, generating high incentives to finance professionals, with a conversion rate of 1 ECU = 1 euro. In the STUD sample, all participants were paid, with a conversion rate of 1 ECU = 0.04 euros. Among PRO subjects, 20 were selected for payment with an average

[10] Information about the setting is available at http://leem.umontpellier.fr.

[11] For reasons of confidentiality, no further information can be provided publicly. Additional information is available upon request.

payment of 216.81 euros, while STUD subjects were paid 13.45 euros on average (including the gratuity for participating). Additional information can be found in Appendix B. Let us quickly mention that PRO subjects' average level of payments was constructed according to the level of magnitude of the industry's salary levels. It aligns with payments made in previous experiments involving professionals, such as Cohn et al. (2015) and Kirchler et al. (2018).[12]

The literature is particularly interested in the singularities of finance professionals compared to lay people (Haigh and List, 2005; Frechette, 2015; Weitzel et al., 2020; Bottasso et al., 2020; Holmen et al., 2021). Our data allow us to address the external validity issue of experimental finance: can results in the laboratory be generalized to actual market conditions and non-student subjects? Thus, we have Hypothesis 7:

Hypothesis 7 (sample-independence)**.** *Students and finance professionals show similar patterns in investment decisions.*

Experimental evidence about sample independence is mixed. Several papers disprove, at least partly, the sample-independence hypothesis (Haigh and List, 2005; Bottasso et al., 2020; Holmen et al., 2021), while others find similar patterns in student and finance professional samples (Weitzel et al., 2020). Our experiment, therefore, provides further evidence in favor or against sample independence.

In our setting, all predictions that are built on the baseline experiment are tested on each population separately, as well as on the aggregate. This also holds for the following treatments.

2.3 Treatments

The baseline setting of Subsection 2.1 is altered to provide two treatments: a ranking treatment and a tax treatment. In the PRO sample, 66 subjects faced the baseline treatment, 63 the ranking treatment, and 61 the tax treatment. In the STUD sample, 103 faced the baseline treatment, 84 the ranking treatment, and 92 the tax treatment.

The treatments are sufficiently complex to deserve a dedicated analysis. They are likely to generate non-monotonous or non-linear effects that will not appear in the econometric analysis. In the present study, they are used as control variables on the baseline framework. The treatments do not affect situations and their order, asset characteristics, environmental externalities (context), or the donation mechanism. In this paper, we aim to assess the impact of those invariant characteristics on subjects' decisions, which is challenged by including treatments as dummy variables. This basic analysis still yields some predictions. Differences of effect between samples and between green and brown contexts also can be tested. Eventually,

[12] As a comparison, Kirchler et al. (2018) paid 1 participant out of 5 with an average payment of 52 euros for a 45-minutes experiment, which is approximately the average time spent during our experiment.

the analysis of treatment effects opens the door for more elaborated studies of policy-oriented tools in nudging portfolio management in its environmental dimension.

2.3.1 Ranking treatment

Social comparison and social norms ground a long-standing component of decision theory (Festinger, 1954). Recent developments in social trading (Kirchler et al., 2018; Liu and Ma, 2020) show that performance rankings play a key role among financial traders, in particular by affecting risk-taking (Bault et al., 2008) by enhancing competition. Grades, indices, and rankings also apply in SRI. We expected that ranking information would act as an incentive for self-enhancement, in the environmental dimension, by stimulating competition. Thus, we have Hypothesis 8:

Hypothesis 8 (ranking sensitivity)**.** *Subjects invest a larger share of their endowment in the greener asset in the ranking treatment than in the baseline treatment.*

In each situation, the ranking treatment provides private information about the environmental performance of a subject's portfolio. Environmental performance is approximated by a rank function of λ, the held proportion of the greener asset[13], compared to a database of 50 pre-recorded values of λ, collected on subjects from the same sample (PRO or STUD), and for the same situation, in the baseline treatment. In each situation, once his/her portfolio is composed, the subject is given his/her environmental rank, between 1 and 51, in real time. Subjects could then adjust their position according to this information. This treatment is compatible with our individual decision setting, since it is based on past recorded data and does not need current matching. The ranking is provided in real time and not *a posteriori*, as in Kirchler et al. (2018). This gives it direct influence on all decisions, which are supposed to be taken independently.

2.3.2 Tax treatment

Taxation is one of the straightest instruments to curb economic behavior. Environmental taxes are prevalent in fostering the ecological transition (Nordhaus, 1992; Bovenberg and De Mooij, 1994; Goulder, 2013). Provided that the return attraction hypothesis holds, degrading an asset's return, depending on its color, will affect the results from the baseline treatment.

However, a flat tax on expected returns of browner assets would simply create several additional situations, i.e., it is just a matter of parametric setting of the experiment, which is

[13]Rank is not provided in situations of screen 3 in Table 1. In fact, this screen is not included in the whole econometric analysis. Instead, it serves a specific testing purpose (see Figure 1).

of very limited interest. The treatment we propose circumvents this limit.

We introduce a taxation formula that affects a portfolio's expected return in real time, depending on its composition. Let λ be the proportion of the greener asset, and let $\Delta\mu = \mu_b - \mu_g$ be the spread of the expected return between the browner asset (μ_b) and the greener asset (μ_g). In the baseline treatment, the expected return of the portfolio (μ_p) can be written as: $\mu_p = \mu_g + (1-\lambda)\Delta\mu$. In the tax treatment, subjects are informed that portfolios incur a loss on the expected returns on the browner assets, and this depends linearly on their weight in the portfolio. More precisely, the portfolio's expected return in the tax treatment is:

$$\mu_p = \lambda\mu_g + (1-\lambda)(\mu_b - (1-\lambda)\Delta\mu) = \mu_g + (1-\lambda)\Delta\mu - (1-\lambda)^2\Delta\mu. \tag{1}$$

Subjects are provided in real time with the gross and net expected return and then with outcomes for each situation. One notices that investing all one's endowment in the greener asset bears no tax, while putting it all in the browner asset cancels all the return premium generated by investing in that asset, which is more profitable than the greener asset. Then, Hypothesis 9 should hold if the return attraction hypothesis holds.

Hypothesis 9 (tax sensitivity)**.** *Subjects invest a larger share of their endowment in the greener asset in the tax treatment than in the baseline treatment.*

The non-linear design of the tax cut may prevent us from observing a significant effect, especially if the average position in the greener asset is intentionally high before tax. Assuming that the hypothesis on tax sensitivity holds, the proportion λ is expected to be endogenous to the effect, so that it is not observable by looking solely at the tax treatment. This puzzle may be solved in part in the econometric analysis by decomposing the analysis in samples and contexts (see Section 2.4). The average share invested in the greener asset λ in the baseline treatment can serve as a proxy for the intentional level of λ in the tax treatment before the tax cut, to be compared with the dummy variable for the tax treatment. We predict that the lower the baseline λ, the stronger the impact of the tax on the tax treatment.

2.4 Analysis

Our main analysis is grounded on econometric modeling of the share *lambda* of the endowment invested in the greener asset by testing the effect of the characteristics of financial situations that are common to all treatments. The treatments described in Section 2.3 are included as categorical variables. Since the share invested in an asset varies between 0% and 100%, subjects' decisions are censored from below and above. In fact, 24% of all observed portfolios contained a single asset. This suggests that, if short-selling and leveraging would

have been available, both "negative" and holdings above 100% would have been possible. To account for censuring, we rely on a Tobit model for panel data.[14] We chose to report average marginal effects (AME) in the core paper (see Table 2), rather than coefficient estimates (reported in Appendix C.3), because marginal effects can easily be interpreted and compared to each other.

Table 2 summarizes the results, by reporting the estimates from seven identical regressions on the whole sample and on subsamples, where λ is the dependent variable. Columns (1) to (3) contain the coefficients for the pooled samples PRO and STUD and for all treatments. Columns (4) and (5) contain the coefficients for the PRO sample only, and columns (6) and (7) for the STUD sample only. Column (1) provides estimates for 32 portfolio decisions[15], while columns (2), (4), and (6) (resp. columns (3), (5), and (7)) provide estimates only in green contexts (resp. in brown contexts).

2.4.1 Return, risk, and color

In any column of Table 2, the impact of the expected return and the standard deviation is significantly non-zero at the 1% level, with signs as predicted by standard portfolio theory. Hypotheses 1 and 2 are immediately validated: subjects reveal attraction for return and aversion for standard deviation.

Result 1 (return attraction)**.** *An increase in the expected return of an asset increases the proportion of its holding and decreases the proportion of the holding of the opposite asset.*

Result 2 (risk avoidance)**.** *An increase in the standard deviation of an asset decreases the proportion of its holding and increases the proportion of the holding of the opposite asset.*

Next, we turn to the hypothesis on green preference (Hypothesis 3). We put forth three pieces of evidence in favor of the latter.

First, in the first two non-risky situations (screens 1 and 2 in Table 1), a vast majority of subjects holds a strictly positive quantity the greener asset. This suggests that they accept a fixed monetary loss as compensation for a higher positive (or lower negative) environmental externality. The overall average λ for those situations is 42.85% in the green context and 60.74% in the brown one. However, a subject who wants to maximize return without pro-environmental preferences would choose $\lambda = 0$. A similar observation can be made for screens 8 and 11, where both assets are risky, fully correlated (non-diversifiable), and have the same standard deviation; they differ only in color and explicitly show a trade-off between environmental externality and monetary gains.

[14] See Appendix C.3 for details.
[15] see footnote 13.

Table 2: Impact of assets and sample characteristics on λ

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	ALL	ALL	ALL	PRO	PRO	STUD	STUD
Context	All	Green	Brown	Green	Brown	Green	Brown
N	15,008	7,504	7,504	3,040	3,040	4,464	4,464
Asset characteristics							
Expected return of greener asset	1.06***	0.81***	1.30***	0.64***	0.90***	0.92***	1.59***
	(0.08)	(0.09)	(0.11)	(0.14)	(0.13)	(0.12)	(0.17)
Expected return of browner asset	-0.73***	-0.61***	-0.92***	-0.53***	-0.55***	-0.67***	-1.19***
	(0.08)	(0.09)	(0.10)	(0.13)	(0.11)	(0.13)	(0.16)
Standard deviation of greener asset	-0.45***	-0.32***	-0.63***	-0.37***	-0.57***	-0.28***	-0.67***
	(0.04)	(0.03)	(0.05)	(0.05)	(0.06)	(0.05)	(0.07)
Standard deviation of browner asset	0.45***	0.47***	0.47***	0.48***	0.41***	0.46***	0.53***
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.07)
Correlation $\rho = 1$	-8.93***	-13.56***	-3.56**	-7.47***	-0.75	-17.73***	-5.85***
	(1.10)	(1.37)	(1.48)	(1.98)	(1.77)	(1.85)	(2.25)
Correlation $\rho = 0$	-7.75***	-13.21***	-1.52	-8.23***	2.25	-16.63***	-4.56**
	(1.09)	(1.30)	(1.47)	(1.73)	(1.70)	(1.84)	(2.25)
Correlation $\rho = -1$	-3.59***	-7.08***	0.30	-4.88***	3.75	-8.52***	-2.38
	(1.01)	(1.26)	(1.46)	(1.83)	(1.81)	(1.71)	(2.17)
Sample characteristics							
Ranking treatment	6.52***	8.62***	3.57	4.35	2.45	11.07***	4.51
	(2.13)	(2.21)	(3.47)	(3.11)	(4.63)	(3.07)	(4.92)
Tax treatment	14.41***	16.61***	11.58***	6.34**	-1.09	22.65***	21.40***
	(1.88)	(2.17)	(3.39)	(2.78)	(4.19)	(3.04)	(5.07)
Student	-5.31***	-6.99***	-2.42				
	(1.80)	(1.82)	(2.68)				
Green	-9.40***						
	(1.43)						

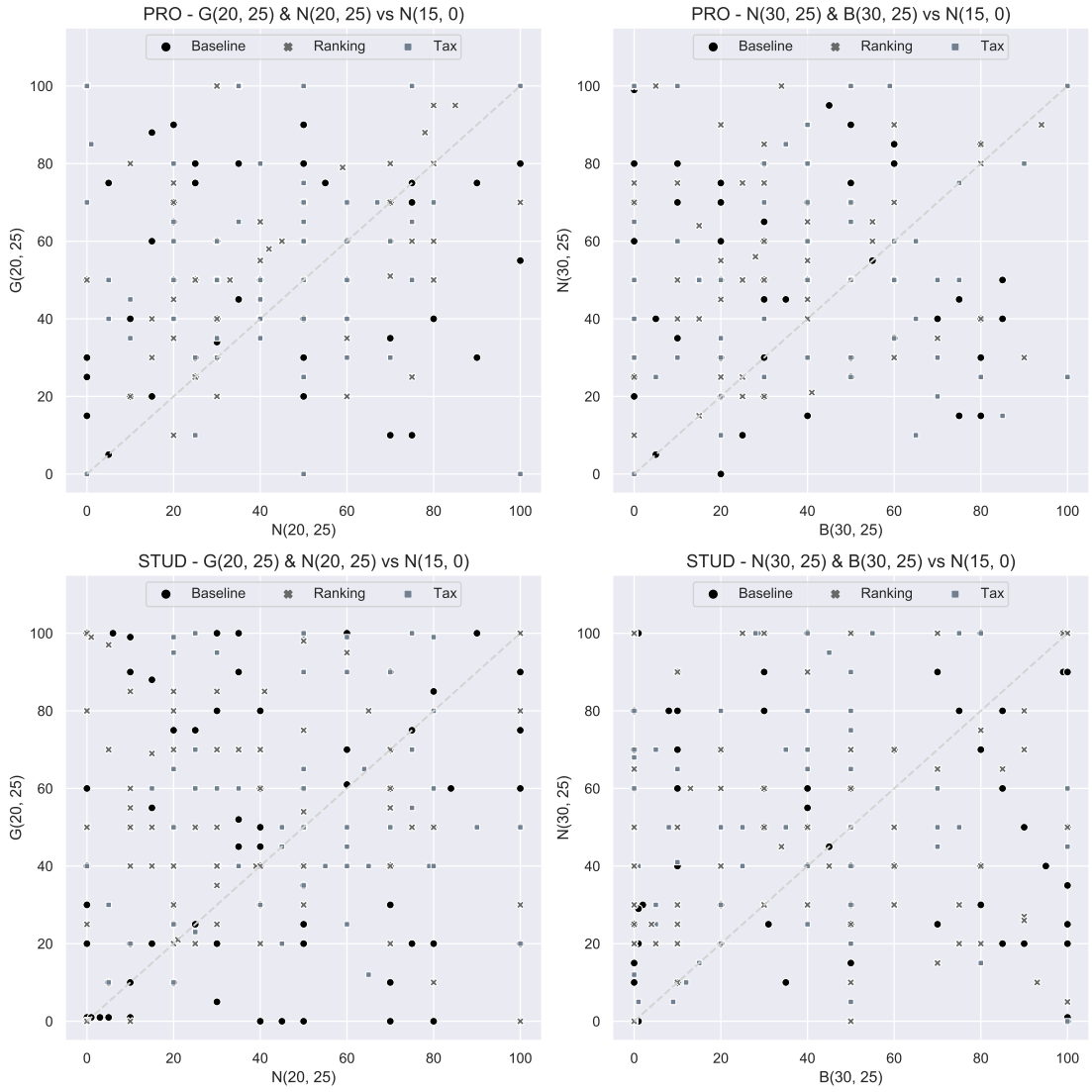
** , *** account for 5% and 1% significance levels respectively.

Description: average marginal effect (AME) (standard deviation in parenthesis) in a random-effect Tobit panel regression with robust cluster standard error at the subject level. The explained variable is the proportion λ put in the greener asset. Contexts denote those used for estimation: *Green* contexts denote screens 1, 4, 6, 8, 9 and 10 of Table 1; *Brown* contexts denote screens 2, 5, 7, 11, 12 and 13. *All* adds *Green* and *Brown* (screen 3 is excluded from analysis). N is the number of related observations (samples and situations in the context). The *Green* dummy variable controls for the subsets of screens (=1 for Green screens and 0 for Brown). *Student* dummy variable controls for the type of sample (=0 if subject belongs to PRO, =1 if subject belongs to STUD). *Correlation* $\rho = 1$ *(resp* $\rho = 0$ *and* $\rho = -1$*)* controls for the correlation between the two assets (=0 for screens 1 to 7, =1 for screens 10 and 13; *resp =1 for screens 9 and 12, =1 for screens 8 and 11*). Control variables tested but not included in the table: *risk*, *prudence*, *temperance*, *SVO*, *NEP*, *k-level* and *CRT* (for details, see Section 3).

The second piece of evidence is illustrated by figure 1. Each point represents the level of λ in two situations that differ only with respect to the greener asset (green and neutral on the left, neutral and brown on the right). The second asset that participants face in this figure is always

the riskless neutral asset (N(15,0)). A point above the diagonal corresponds to a preference for the greener asset, *ceteris paribus*. Given the large aggregate frequencies of observations above the diagonal in all diagrams, we reject the null hypothesis ($p < 0.01$ in a Wilcoxon test for each panel of figure 1). However, a non-negligible proportion of points are below the diagonal, especially in the STUD sample. This may be due to revealed anti-environmental preferences, which would invalidate green preference hypothesis 3 at the individual level. At the aggregate level however, figure 1 constitutes strong evidence in favor of hypothesis 3.

Figure 1: Within-group comparison of specific portfolio choices



Description: each point corresponds to the share invested in two risky assets by the same subject in a given treatment. The two assets differ only by their color (neutral versus green on the left, brown versus neutral on the right). Their expected returns and standard deviations are identical in each diagram. In each corresponding situation, the risky asset is matched with the riskless neutral asset N(15,0). The situations we refer to are 1st of screen 3 versus 2nd of screen 4, and 2nd of screen 3 versus 1st of screen 5.

Result 3 (green preference)**.** *Subjects reveal a preference for the greener asset over the browner asset,* ceteris paribus.

An additional piece of evidence comes with the study of the hypothesis of return asymmetry (Hypothesis 4). We want to assess if colors change return perception. We test whether the AME for the expected return of the greener asset is larger than the AME for the expected return of the browner asset (in absolute value). According to Result 1, an increase in the expected return of any asset increases its proportion in the portfolio. But if both assets in the portfolio undergo a similar increase in the expected return, effects compensate unless coefficients significantly differ. A larger AME for the expected return of the greener asset than for the browner induces a shift toward a greater λ in the latter case. Accordingly, subjects are more sensitive to return when considering a greener asset than a browner one.[16]

Tests reports are positive. Column-wise, AME are significantly different from each other ($p < .01$, Wald test) except in column (4) ($p = .24$, Wald test), which shows the expected order.[17] We conclude that most of our subjects invest a larger share in the greener asset than they would if they were indifferent to color. But more precisely, the return from a greener asset is more attractive than that of a browner asset by having a greater positive effect for each yield point.

Result 4 (return asymmetry)**.** *An increase in expected return has a stronger effect (in absolute value) for the greener asset than for the browner asset, except for finance professionals in green context.*

For its part, the risk asymmetry hypothesis is much less obvious. Standard deviation coefficients must be analyzed together with the correlation dummy variable.[18] Analyzing standard deviation and correlation coefficients simultaneously show three effects: (i) the riskiness of an asset inhibits its environmental attractiveness, (ii) correlation does not create strong incentives for diversification and (iii) those effects appear differently in green and brown contexts.

Let us start with brown contexts. As Table 2 reads, for each correlation regime, the AME is closer to zero in brown contexts than in green ones. They are not even significant for PRO subjects in brown contexts, and they are not significant for STUD subjects in the brown context for the regime $\rho = 1$. Since correlation induces a weak and indefinite effect, the

[16] Formally, estimated coefficients and AME read precisely as relative effects but, since the expected return variable is always positive, its coefficients can also be interpreted in the regression as absolute, i.e., so that *ceteris paribus*, they indicate a preference for the greener asset over the browner asset.

[17] All tests are displayed in Appendix C.3.2.

[18] A majority of situations with risky assets involve correlation (18 out of 30). The latter is treated with a categorical variable, which then identifies with a categorical variable for individual screens 8 to 13 when we separate green and brown contexts (e.g., columns (2) and (3) of Table 2). Therefore, they capture to a great extent effects specific to the comparison of risky assets.

standard deviation can be interpreted alone. In brown contexts, and for each subsample, the standard deviation coefficient of the greener asset is greater in absolute value than that of the browner asset ($p \leq .01$). Subjects are thus more sensitive to risk for the neutral asset than for the brown one.[19] In situations of screens 11 to 13, involving two risky assets, an increase in the level of standard deviation for both assets increases the share invested in the brown asset. In addition, for those situations, the average λ is very close to 50% in each correlation regime. This portfolio composition is the minimal variance allocation when $\rho \in \{0, -1\}$. Thus, the effect of diversification incentives is not observable.

To summarize, in brown contexts, participants react more strongly and negatively to an increase in the standard deviation of the greener asset (neutral), than the browner one. Consequently, participants divest from the greener asset, when both risky assets increase their risk to the same magnitude.

In green contexts, the correlation dummy coefficient takes very high negative values. This shows that subjects, especially students, invest much less in the green asset when they are confronted with two risky assets compared to other situations. This is confirmed by sample statistics (see Appendix C.1) and the lower panel of Figure 2. The effect is greater in amplitude than that of the standard deviation coefficients.[20] Even if subjects seem more sensitive to the standard deviation of the neutral asset than that of the green one, this does not offset the effect of specific situations captured by the correlation dummies. Similar to brown contexts, subjects put less in the greener asset in the presence of risk. There is a slight effect of correlation upon diversification (when $\rho = -1$) with an increase of λ toward the minimal variance allocation, but this does not compensate for the former observation. The AME for the correlation regime $\rho = -1$ is significantly different from that of other regimes in green contexts. This shows that subjects get closer to the minimal variance allocation when risk can be canceled.

To conclude, green and brown contexts show, although differently, that the risk asymmetry hypothesis is not only invalidated but that the opposite effect appears (see Table 2). Confronted with market risk, subjects strongly temper the pro-environmental preferences they exhibit in their overall portfolio decisions.

Result 5 (risk asymmetry)**.** *An increase in the risk of a portfolio diminishes the attractiveness of the greener asset put forth in Result 3.*

[19] Similar to the reasoning put forth in footnote 16, the standard deviation is a non-negative variable, so that results can also be interpreted as a preference for the standard deviation of the browner asset than for that of the greener asset. Appendix C.3.2 supports this analysis with an analysis of interaction coefficients.

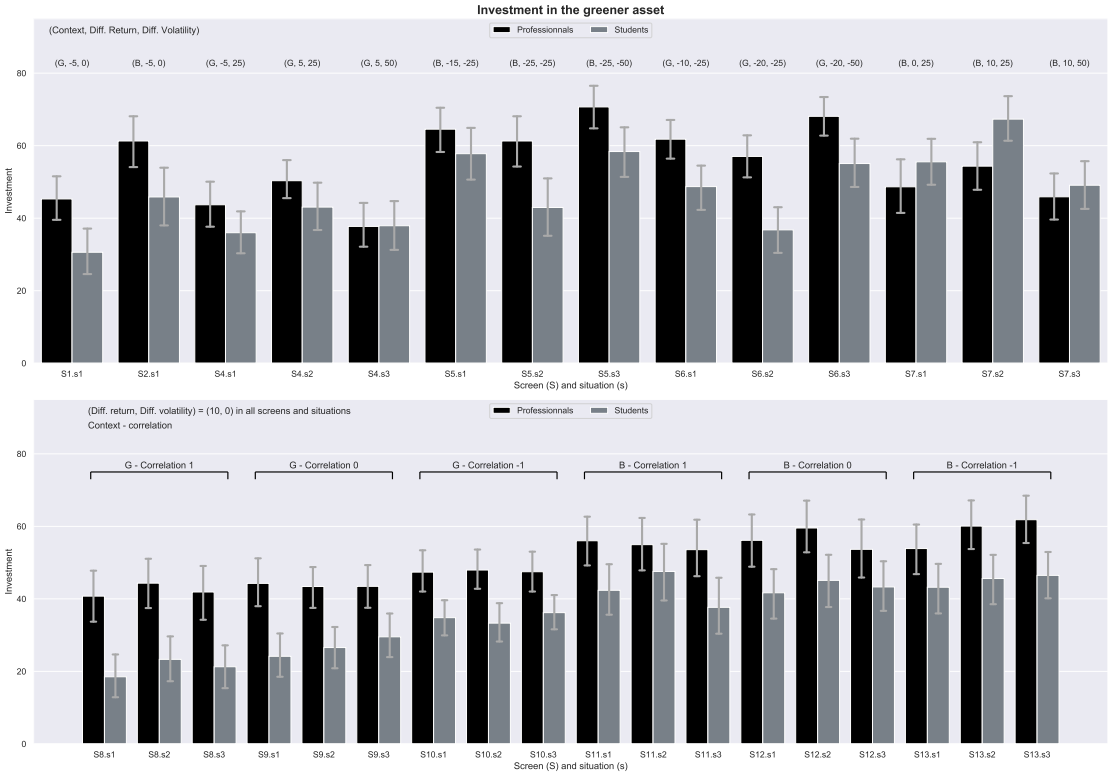
[20] Computing aggregate marginal effects from Table 2, with a standard deviation of 25 or 50 and any level of correlation, leads to negative marginal effects of risk.

2.4.2 Green vs brown asymmetry

In the last paragraph, we underlined a difference between green and brown contexts. Let us gather other pieces of evidence that the hypothesis of context independence does not hold.

The first piece of evidence concerning differences between green and brown contexts lies in the large and significant effect of the green dummy. It shows that subjects put 9.40% less on average in the greener asset in green contexts than in brown ones. This is also confirmed by looking at the student variable in columns (2) and (3) of Table 2. Students invest significantly less than finance professionals in the greener asset in a green context (6.99% less). But the difference between students and finance professionals is not significant in brown contexts. A more detailed look is provided in Figure 2. It compares the value of λ in the baseline treatment for finance professionals and students separately. The figure shows that investments are lower in green contexts than in brown ones, for similar situations in terms of return spread and standard deviation.

Figure 2: Investment in the greener asset, by situation, in the Baseline Treatment



Description of both panels: average λ for PRO and STUD subjects separately in Sxsy where S and s stand for screen x and situation y, in reference to Table 1. Further information: G and B stand for green and brown contexts, followed by the difference in expected return and standard deviation between the greener and the browner assets. Upper panel shows results from screens 1 to 7 and lower panel shows results from screens 8 to 13 involving correlation ρ.

Asymmetry clearly appears in the magnitude of coefficients of expected returns, when

we compare the different subsamples (PRO vs STU) and contexts (Green vs Brown). We already noticed that the AME of the greener asset expected return is greater (in absolute value) than that of the browner asset. But tests also confirm, for ALL and STUD samples but not clearly for PRO subjets, that the AME for the greener asset expected return is greater in brown contexts than in green ones, and that holds for the browner asset expected return as well.[21] This means that the sensitivity to the expected return described in Result 4 is greater in brown contexts than in green ones. In addition, the spread between AMEs (greener asset expected return minus browner asset expected return) seems also greater in the brown context (although not tested). This means that for an increase in returns for the two assets simultaneously, the increase in the proportion of the greener asset's holding is greater in brown contexts than in green ones.

We conclude that, relative to the return dimension, subjects show a stronger attraction for the greener asset in a brown context than in a green context. More precisely, subjects are more sensitive to return in a brown context than in a green one. In other words, subjects' aversion to brown is stronger than their attraction to green.

Result 6 (context-independence)**.** *On average, subjects invest a lower proportion in the greener asset in green contexts than in brown contexts,* ceteris paribus*.*

2.4.3 finance professionals vs students

We have sketched several results that showing discrepancies between finance professionals and students. Figure 1 shows evidence of a weaker holding of the greener asset among students than among finance professionals, while figure 2 also shows the difference of behavior of finance professionals and students in separate contexts with more granularity. In the former figure, we observe a greater proportion of points below the diagonal for students than for finance professionals. As figure 2 shows, the proportion invested in the greener asset is usually the smallest for students in green contexts in the baseline treatment (detailed statistics are available in Appendix C.1). The multiple asymmetries between green and brown situations are stronger among students than finance professionals.

Looking at AMEs, we see that the coefficients for expected return are greater for students than for finance professionals. This concerns the greener asset ($p < .001$) as much as the browner asset ($p < .001$), but in the brown context only. The conclusion is similar to the one for the context-free hypothesis: in the brown context, students' preference for the greener asset

[21] For the ALL sample, $p \leq .001$ when comparing greener assets, $p \leq .037$ when comparing browner assets, in both contexts. For the STUD sample, $p \leq .003$ when comparing greener assets, $p \leq .019$ when comparing browner assets in both contexts. For the PRO sample, $p \geq .13$ when comparing greener assets, $p \geq .95$ when comparing browner assets in both contexts. All tests are displayed in Appendix C.3.2.

is more sensitive to return variations than the preference of finance professionals. Students vary more than finance professionals in their portfolio composition when asset returns change.

As an echo to Subsection 2.4.2, all these results tend to show that there is a rather strong green-vs-brown asymmetry among students. In green contexts, in particular, they invest less in the green asset than do finance professionals, but they invest much more like the finance professionals in brown contexts (as is shown in Figure 2). A detailed look at the average values of λ, for all three treatments[22], shows that there are few situations in which students invest more in the greener asset than finance professionals: 4 out of 32 in the baseline treatment, 2 out of 32 in the ranking treatment, and 24 out of 32 in the tax treatment.

The result for the tax treatment is particularly striking. The difference between students and finance professionals also shows with treatments, to which we turn next. Let us simply mention here that the refutation of the hypothesis of sample independence is robust to the heterogeneity measured by the control tasks we discuss in Section 3, since all traits measured by such tasks were added in the regression.

Result 7 (sample-independence)**.** *In the green context, students invest significantly less in the green asset than do finance professionals, and they show a larger green-versus-brown asymmetry.*

2.4.4 Treatments

Both treatment variables, ranking and tax treatment, have a significantly positive effect on λ for the pooled sample (ALL). However, the result does not hold for the subsamples. The coefficient of the ranking treatment dummy is of the expected sign in each regression, but its significance occurs mostly in situations in the green context in the STUD sample. The standard error of the coefficient is too large in other regressions to conclude with confidence that the hypothesis of rank sensitivity is validated. This result is striking because, as we explained in Section 2.3.1, the ranking is constructed as a comparison with a subsample in the baseline treatment. As we mentioned earlier, students in the baseline treatment invest less in the green asset than finance professionals do, and less than they invest in the neutral asset in brown contexts. Therefore, students in the ranking treatment can rise to a high rank with a lower λ in green contexts than in brown ones, and lower than finance professionals could, too. This gives additional weight to the conclusion that ranking affects only students in a green context. This is another instance of green-vs-brown asymmetry.

Result 8 (ranking sensitivity)**.** *In the green context, students invest more of their endowment in the greener asset in the ranking treatment than in the baseline treatment.*

[22] See Appendix C.1

The tax treatment dummy is of the expected sign in all regressions, except for finance professionals in brown contexts (column (5)), for which it is also non-significant. Therefore, the hypothesis of tax sensitivity seems confirmed in almost all situations. As we suggested in Section 2.3.2, there may be an inverse relationship between the size of the tax variable coefficient and the tax-free intention to invest in the greener asset because of the convexity of the tax. If we look at average λ in the baseline treatment, we obtain $\lambda = 52.54\%$ and $\lambda = 40.80\%$ for finance professionals and students respectively. This comports with the values obtained for the tax variable: the lower the λ in the baseline treatment, the stronger the effect of the tax. As noted above, this effect is particularly strong on students, since they invest a larger share in the greener asset than finance professionals in the tax treatment (24 out of 29 situations). This reversal of positions, which does not appear with the ranking treatment, shows that students are more sensitive to the tax treatment than finance professionals. This provides more weight against the hypothesis of sample independence, but in support of the hypothesis of tax sensitivity—but only for students.

Result 9 (tax sensitivity)**.** *In the green context, students and finance professionals invest more of their endowment in the greener asset in the tax treatment than in the baseline treatment.*

3 Individual characteristics of portfolio choices

In the previous sections, we focused exclusively on the portfolio task by analyzing how various external parameters influence the composition of portfolios. Some clear patterns appeared at the aggregate level for the pooled samples, such as a preference for greener assets, with an acceptance of lower yields. However, we also documented some strong differences between the STUD and the PRO samples. What are the reasons for these patterns in portfolio choices? In the remainder of the paper, our aim is to deepen our understanding of the portfolio preferences exhibited in Section 2 by extending the econometric analysis to include individual data. For that purpose, two sets of variables are added into the basic model: (i) personal skills and traits measured through additional control tasks and surveys, and (ii) socioeconomic and demographic data specific to each sample.

After the portfolio task, all subjects were asked to complete four tasks and two surveys in the following order:

1. a lottery choice task to elicit risk preferences,
2. the Social Value Orientation task (SVO) to measure pro-sociability,
3. a one-shot game to test strategic skills (11–20 game),
4. the cognitive reflection test (CRT) to measure cognitive ability,

5. a survey about environmental opinion based on the New Environmental Paradigm (NEP), and
6. a socio-economic and demographic questionnaire.

Tasks 1-4 were incentivized in that one participant was randomly selected to be paid out for real, in addition to the core investment task. Payment rules for each task are explained in Appendix A.3. The Euro–ECU exchange rate and the probability of being paid for the supplementary task were the same as in the portfolio task for each sample (1 for STUD and 1/10 for the PRO).

In Subsection 3.1 we comment on Items 1 to 5. Subsection 3.2 comments on Items 2 and 5. Finally, in Subsection 3.3 we focus on Item 6.

3.1 Control Tasks

Task 1 was intended to measure risk preferences, following the higher-order risk-preferences methodology of Noussair et al. (2014) (relevant details are provided in Appendix A.3.1). Respondents were given 15 binary choice questions involving compound lotteries to measure their risk aversion, prudence, and temperance. Risk aversion is related to the moment of the second order of the underlying risk distribution, while prudence and temperance relate to the third (skewness) and fourth moment (kurtosis) of the distribution. Skewness and kurtosis are dimensions absent from the portfolio task. But as shown by Bottasso et al. (2020), risk, prudence, and temperance are linked in the choices of finance professionals. Respective measures might then provide significant information regarding the subjects' relation to risk in portfolio decisions. The task provides three round scores between 0 and 5 for the three dimensions.

The second task is the Social Value Orientation introduced by Murphy et al. (2011) and detailed in Appendix A.3.2. It provides a real number between -20 and 60 which relates to behaviors between being competitive and altruistic. We develop this task below.

The third task is the version of the 11–20 game, originally designed by Arad and Rubinstein (2012) and modified by Alaoui and Penta (2016). It is detailed in Appendix A.3.3. It is a one-shot, two-player game to assess each subject's level-k strategic depth of reasoning (Arad and Rubinstein, 2012), in a fashion similar to the beauty contest game (Brañas-Garza et al., 2012).

The fourth task is the cognitive reflection test (CRT, see Frederick (2005); Toplak et al. (2011); Korniotis and Kumar (2010)). It has seven numerical questions to measure cognitive and concentration skills. It provides a round score between 0 and 7. Corgnet et al. (2018) showed that such skills are predictors of investors' performance. The third and fourth tasks

are related to strategic skills and cognition. They are thus valid control variables for subjects' heterogeneous choices.

The last task is a survey of 15 questions of 5 modalities between disagreement and agreement (the NEP scale of Dunlap et al. (2000)). They relate to environmental opinion and provide a round number between 15 and 75 that reflects pro-environmental preferences.

In the previous section, these variables were added as control variables. Regressions that omit those variables provide coefficients that are almost identical to that of Table 2, so that any disparities are not caused by those variables. Our results are therefore robust to individual heterogeneity induced by the control tasks. Still, it can be expected in the same fashion as Holmen et al. (2021), that finance professionals obtain different results, at least partly, for these tasks than other populations (in our case, students).

Two of the tasks are of particular interest in relation to our hypothesis of green preference. Following Riedl and Smeets (2017), we focus on the influence of revealed pro-sociability and expressed pro-environmental preferences on λ.

3.2 Pro-social and pro-environmental preferences

As extensively discussed by Riedl and Smeets (2017), social preferences strongly influence socially responsible investment. Riedl and Smeets (2017) relied on the standard investment game of Berg et al. (1995) to elicit trusting behavior. We follow their track, but we rely on a different task to capture pro-sociability, the Social Value Orientation (SVO) score introduced by Murphy et al. (2011).

The SVO score is based on a distribution task between self and others. Each subject is asked to choose a payoff distribution, within a set of options, between himself and an anonymous counterpart, randomly selected from the participants in the experiment. In the short version of the SVO elicitation task, used in our experiment, the distribution choice was repeated six times with a different set of options in each round. In the PRO sample, pairs were formed at the end of the day, as the number of participants in a session was unknown in advance, whereas in the STUD sample, subjects were randomly paired at the beginning of the corresponding task. Of the six screens presenting the choices, only one screen was randomly selected for payment.

The six choices are averaged and aggregated to determine a score (see Appendix A.3.2). Higher scores are associated with more pro-social individuals. Pro-sociability is likely to have a positive influence on λ because pro-social individuals care more about others' well-being.

Hypothesis 10 (pro-sociability effect)**.** *The SVO score positively affects the share invested in the greener asset.*

Eliciting pro-environmental preferences raises a new challenge, both for researchers and survey designers (Lange et al., 2018). To our knowledge, an experimentally validated task for eliciting pro-environmental preferences is currently unavailable. However, there exists a canonical survey used in thousands of studies for this purpose, the New Environmental Paradigm (NEP scale) of Dunlap et al. (2000).

The NEP scale is based on 15 Likert-type questions related to 5 environmental dimensions (see Appendix A.3.5). The standard treatment quantifies each answer on a scale from 1 to 5. The total score, therefore, ranges from 15 to 75: the higher the score, the stronger the pro-environmental orientation.

Hypothesis 11 (environment sensitivity)**.** *The NEP score positively affects the share invested in the greener asset.*

3.3 Socio-economic and demographic data

The PRO and STUD samples reflect the socio-economic traits of the populations they were drawn from. Each sample had to take a final, but specific survey after the experiment. It is, therefore, possible that the variables that are specific to each sample also have a specific influence on their portfolio choices.

3.3.1 The STUD sample

The STUD sample was drawn from a large subject pool—voluntary registered student participants. Subjects were asked standard questions such as age, gender, years of study, and discipline. We use the A.M. discipline categories of health and the folk-known division of liberal arts (humanities, formal sciences, natural sciences, social sciences). We also distinguish business and management (the reference category) and economics and finance from the latter. This serves as a possible explanatory purpose: those two categories represent an important pool of recruitment in the finance profession (as well as already sizeable categories in our sample). We use only discipline in the analysis and put aside the other variables as controls.

3.3.2 The PRO sample

A particular characteristic of our PRO pool of subjects is that it is mostly drawn from practitioners of financial markets. Therefore, we asked, in a multiple-choice setting, questions about the type of job (traders, risk managers, etc.), the employer (bank, hedge fund, etc.), past experience, and investment strategy. Because of ethical concerns, we were not allowed to collect data about gender and age. The questionnaire is provided in Appendix A.4.

Table 3: Categorization of the PRO sample

New category	includes
Finance Job & Past experience	
Market Trading*	Proprietary trading, market maker, Jobs with trading activities
Commercial trading	Sales trader, sales
Portfolio manager	Asset manager, portfolio manager
Analyst	Strategist, economist, financial analyst (buy/sell side), risk analyst, jobs with analyst skills
Support functions and others	Support and related functions, middle office job, business manager, trade finance, private banker, senior banker, other
Employer	
Bank*	Bank
Other	Asset management company, trading company, broker, hedge fund, work for your own, private equity company, other
Investment strategy	
Pattern following*	Technical analysis, trend following
Value investing	Value investing
Mispricing	Event driven, arbitrageur, scalping
Global macro	Global macro
Market making	Market making
None	None
Others	Merger arbitrage, others, no answer
Asset class	
Money market*	Money market
Forex market	Forex market, currencies
Equity	Equity
Bonds	Bonds, fixed income and related derivatives
Others	Commodities, private equity, real estate, hedge fund, other

Note: * stands for the reference category in the regression.

Like the disciplines in the case of the STUD pool, we categorized a priori our PRO sample according to the participants' jobs. The proposed categorization is reported in table 3. The categories provided in that table are not arbitrary. They obey informal rules relative to the knowledge of the a priori categories. For finance jobs and past experience categorical variables, we used the following logic. Operators of financial markets are collected in market trading activities, whereas commercial trading refers to client-related activities. Portfolio and asset managers are in charge of managing funds of assets (stocks, bonds, derivatives, commodities, and forex) for clients such as individuals, companies, and banks. The "analyst" category pools together all the jobs that mainly require analyzing large sets of financial and economic data to make predictions or to control risky positions, in support of decision making and trading. These jobs mainly rely on analytical skills with multiple dimensions, using some macroeconomic and financial fundamentals. They do not directly intervene in financial markets.

Analysts regroup practitioners that include much more long-term and multidimensional extra-financial (or economic) information than market traders (or commercial traders) usually do. Taking care of such considerations probably leaves more space for environmental concerns. More generally, it is, first, likely that the nature of the job and the finance professionals' exposure to different business cultures shape their preferences (Cohn et al., 2014). Second, reverse causality may of course apply as well, revealing (self-)selection to specific financial jobs and positions (Lagarde and Blaauw, 2014).

In terms of investment strategies, "pattern following" refers to trading strategies focusing on time series configurations of quoted prices, such as following trends or technical analysis, on a time scale that can include intraday trading (a somehow chartist approach). The mispricing category includes strategies based on short-term error-adjustment dynamics in prices and volatility. They can be grounded on financial knowledge other than price dynamics. "Value investing" and "global macro" refer to longer time horizons, and they include more extra-financial information (fundamentalist approaches based on corporate valuation and macroeconomic outlook, respectively).

The interpretation follows the one proposed for jobs. Technical analysis and trend following are the main categories of strategies that rely exclusively on short-term price movements and exclude *a priori* any asset picking based on corporate finance data, macroeconomic analysis, or extra-financial information. Indeed, focusing exclusively on price dynamics, without integrating other parameters, may explain the fact that finance professionals using these strategies do not integrate environmental externalities and focus only on the risk and profitability of the asset.

In brief, the categorization of jobs and investment strategies follows a fashion similar and relatively close to the usual division among practitioners between the fundamentalist and the chartist approaches.

3.4 Analysis

The analysis consists in repeating the econometric analysis of Section 2.4 with the addition of questionnaire data. Table 4 provides the average marginal effects computed from estimates. Appendix C.3 provides the estimates in another table.

The analysis now consists of six regressions: columns (1) to (3) relate to the PRO sample and columns (4) to (6) to the STUD sample, with the respective decomposition of all situations in green ones (2 and 5) and brown ones (3 and 6). For the sake of clarity, we show the coefficients for the SVO and NEP for discussion, but we hide all other variables that were analyzed in Section 2.4.

Table 4: Impact of pro-social/environmental pref. and demographics

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	PRO	PRO	PRO	STUD	STUD	STUD
Context	All	Green	Brown	All	Green	Brown
N	6048	3024	3024	8928	4464	4464
Preferences						
SVO	0.12	0.08	0.17	0.19***	0.35***	-0.01
	(0.08)	(0.07)	(0.11)	(0.07)	(0.08)	(0.13)
NEP	0.05	-0.10	0.26	0.45**	0.24	0.68**
	(0.18)	(0.18)	(0.24)	(0.18)	(0.21)	(0.30)
Finance jobs						
Commercial Trading	-0.35	2.31	-3.29			
	(3.23)	(3.15)	(4.59)			
Portfolio Manager	-6.81	-1.44	-12.54**			
	(4.96)	(5.14)	(6.04)			
Analyst	15.35***	15.09***	16.18**			
	(4.36)	(4.62)	(6.57)			
Support function and others	3.63	7.07	0.15			
	(4.31)	(4.62)	(6.57)			
Investment Strategies						
Value investing	10.85**	6.68	15.58**			
	(4.47)	(4.17)	(6.17)			
Mispricing	18.07***	12.86**	23.34***			
	(4.75)	(5.84)	(5.97)			
Global Macro	10.36**	4.50	17.14***			
	(4.14)	(3.71)	(5.91)			
Market Making	11.10***	5.32	16.95***			
	(3.52)	(3.37)	(5.46)			
None	1.13	-3.56	6.07			
	(4.07)	(4.04)	(5.08)			
Other	10.12**	5.43	16.99**			
	(5.17)	(4.84)	(7.86)			
Disciplines						
Humanities				10.61	-1.92	21.28
				(7.76)	(8.40)	(14.62)
Formal Sciences				6.13	1.47	11.58
				(4.45)	(4.80)	(7.18)
Economics				5.45	1.11	9.99*
				(4.04)	(4.40)	(5.60)
Health				12.58***	6.05	18.35**
				(4.70)	(4.96)	(7.97)
Natural Sciences				8.38	3.49	12.48*
				(5.52)	(5.38)	(7.51)
Social sciences				7.83	4.63	12.85
				(5.39)	(4.60)	(9.37)
Others				14.55**	11.43	18.37
				(6.33)	(7.71)	(12.28)

Method and Analysis are identical to Table 2. All variables included in the specifications of Table 2 are included as control variables. Variables for the PRO sample: *Finance jobs* and *investment strategies* are detailed in Table 3. Additional control variables included but not shown are *employer*, *asset class*, and *market type*, as defined in Table 3. Variables for the STUD sample: Disciplines as defined in Table 3. Control variables included but not shown are *age* (in years), *gender* (=0 for female, =1 for male), and *student level* (in years). One professional did not answer the questionnaire. Therefore, we lost 32 observations for the professional columns between this table and the previous one.

3.4.1 Preferences, Skills and Personality Traits

A look at variables related to preferences shows that measures of pro-social and pro-environmental leanings do not affect the portfolio choices of finance professionals. Interestingly, for students, these variables are highly significant, and they have the expected sign. However, SVO affects the share invested in the greener asset only in a green context, while the NEP is significant only in a brown context. No significant effects were found in the converse situations. A careful look at the NEP questionnaire in Appendix A.3.5 shows that it is particularly oriented to the human origin of environmental degradation, and much less about attenuation or repairing impacts. On the contrary, the SVO task is about sharing a monetary endowment with another subject. This relates strongly to the delegated philanthropy mechanism in the green context where the donation carries a positive moral connotation. What this may show, for students at least, is that the SVO task may not be suited for testing negative social and or environmental externalities, while the experimental literature is still in search of a protocol for measuring environmental preferences.

As we said earlier, control tasks do not substantially modify the results of Table 2. In short, let us just mention that the variables are rarely significant at the 5% level in more than one context and one sample.

Result 10 (pro-sociability effect)**.** *The SVO score positively affects the share invested by students in the green asset. The SVO score is not correlated with the portfolio decisions of finance professionals.*

Result 11 (environment sensitivity)**.** *The NEP score negatively affects the share invested by students in the brown asset. The NEP score is not correlated with the portfolio decisions of finance professionals.*

3.4.2 Activity

Without any *a priori* hypothesis on the impact of questionnaire data on portfolio choices, we refrain from over-interpreting the possible effects of the variables described in Section 3.3. Samples were drawn from very different populations, in different countries, and they must be analyzed separately.

Results are strong. Substantial differences in the level of λ can be found for different jobs and investment strategies. Average marginal effects show, for example, that portfolio and asset managers invest almost 29 percentage points more in the brown asset than market and risk analysts, all things being equal. Indeed, analysts are the only job category that differs significantly from market traders in both green and brown situations; they invest significantly

more in the greener asset (above 15 percentage points in both green and brown contexts).

Looking at investment strategies, subjects who rely on technical analysis and trend following invest significantly more in the browner asset than all other defined types of strategies. However, in the green context, only event-driven, arbitrage and scalping strategies are significantly different from technical analysis and trend following.[23]

Put together, jobs and strategies reflect a very high heterogeneity of investment in the greener asset by finance professionals. Comparing the average marginal effect of these different dummy variables, some reveal the main differences in portfolio positions. Those differences in average λ are greater than the SVO or the NEP scale can allow finance professionals.[24] Accordingly, this result indicates that an experimenter may know much more about environment-related financial decisions by looking at finance professional subjects' positions and practice than by testing the subjects with associated tasks or surveys. This has great consequences for further studies.

Result 12 (job effect)**.** *Analysts invest significantly more in the greener asset, in all contexts, than market traders, sales/commercial traders, and portfolio managers.*

Result 13 (strategy effect)**.** *Technical analysts and trend followers invest significantly more in the browner asset (with a stronger and broader effect in the brown contexts), than finance professionals using other strategies.*

Last, in the same way as for jobs and strategies, students' disciplines show an effect, although narrow in this case, but which could still be the result of (i) the process and content of learning that differ across disciplines, and (ii) student (self-) selection based on the choice of specific disciplines to study. Indeed, health is significantly different from business and management in brown situations exclusively. Besides, the only singular effect, although it is not significant, is that all coefficients are positive, except humanities in a green context. That means that business and management show the highest propensity to hold the brown asset, i.e., the most profitable one. Students' disciplines could have shown a similar heterogeneity between categories if the variance in each of them was not as great as it is, age or gender having no effect on portfolio choices.

This observation provides the last piece of evidence for refuting the hypothesis of sample independence. Students' portfolio choices clearly reflect pro-social and pro-environmental preferences, but they are mostly dissociated from the discipline of study. On the contrary,

[23] Scalping is often referred to as a technical analysis practice. However, it is based on careful stock selection and repeated fast buy–sell orders and order book dynamics to reach profitability. Therefore, it is closely related to arbitrage methods as well.

[24] For example, the SVO score has an amplitude of 80, which corresponds to a maximal average effect of 13.6 for values of λ (in brown contexts) between the worst and the best score.

finance professionals' portfolio choices crucially depend on their positions and practices, and they are dissociated from their revealed pro-social preferences and from their stated pro-environmental sensitivity.

4 Conclusion

In this paper, we investigate the interplay between return, risk, and environmental impact of assets in a virtual portfolio composition experiment. By asking for 32 such compositions from 190 finance professionals and 279 students of many disciplines, and by collecting behavioral and demographic data from additional tasks, we can determine common patterns between finance professionals and students, as well as strong disparities.

Portfolio patterns exhibited in the experiment mix conclusions from standard portfolio theory (attraction for return, aversion for risk) with overall pro-environmental preferences. Finance professionals show better environmental performances in portfolio composition than students. They are less influenced by ranking information or tax penalties on asset returns. Cognitive skills or risk aversion measures, as well as social behavior and environmental opinion assessments, are not significant predictors of the finance professionals' investments' decisions. However, the type of job in relation to financial markets, and the kind of investment strategy, are strong predictors of average portfolio compositions.

The novelty of our design is to model assets with negative environmental externalities, in contrast to most studies that focus on socially responsible investment. The latter consider exclusively the positive impact of assets and products. We assess similarities and asymmetries between green and brown assets, and we show that finance professionals are more reluctant to take on the brown asset than students. It is worth mentioning that the pro-environmental performance of portfolios involves the acceptance of lower expected returns. Risk, however, tends to temper pro-environmental investment intentions. In risky environments, subjects have a rising interest in brown assets and those that have higher expected returns. The finding that risk may have a degrading effect on positive impact investment is a relevant track for future research.

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Appendices

A Experimental tasks

A.1 Portfolio task

A.1.1 Instructions (professional version)

This first part is composed of 13 independent rounds. There is no link between the rounds.

Portfolio composition

At the beginning of each round you will be endowed with €100.00, which you will have to entirely invest in two assets, asset 1 and asset 2, in order to compose a portfolio. To compose your portfolio, enter the amount of your investment in Asset 1. This amount must be an integer between 0 and 100. The amount of your investment in Asset 2 will be calculated automatically (100 - the amount invested in Asset 1). During the first two rounds, you will only have to compose one portfolio. From round 3 onward, you will have three portfolios to compose in each round. This is specified in the instructions that follow.

Types of assets

There are three types of assets: neutral, green and brown. Each of these assets can be either riskless or risky. The expected return and standard deviation of each asset will be given in the asset description.

- A **green asset** A green asset is an environmentally responsible asset. For any amount you invest in a green asset we commit to pay half of the amount to [Green company](*). Example: you invest €50.00 in a green asset, we will pay €25.00 to [Green company]. (*) [Green company] enables individuals and companies to take concrete action in favour of reforestation throughout the world.
- A **brown asset**A brown asset is an environmentally irresponsible asset. For any amount you invest in a brown asset we commit to pay half of the amount to [Brown association](*). Example: you invest €50.00 in a brown asset, we will pay €25.00 to [Brown association]. (*) [Brown association] is an international organisation of oil and gas producers, one of their technical areas of expertise is shale gas.
- A **neutral asset** does not give rise to any action on our part.

Realized return

A riskless asset will have a realized return equal to the expected return. A risky asset will have a realized return that will be equal, with a 50/50 chance, to either the expected return plus its standard deviation or the expected return minus its standard deviation. If we note R the expected return of the asset and E its standard deviation, the realized return is equal to R + E with 50/50 chance or R - E with 50/50 chance. Example: for an asset with an expected return of 40% and a standard deviation of 50%, its realized return will be equal, with 50/50 chance, to 40% + 50% = 90% or 40% - 50% = -10%. Value of the portfolio The initial value of the portfolio is equal to €100.00. The final value of the portfolio is equal to €100.00 plus the proportion of each asset multiplied by its realized return. Example: your portfolio is composed of 35% Asset 1 and 65 % Asset 2. The value of the portfolio is equal to €100.00 + 35% of the realized return of Asset 1 + 65% of the realized return of Asset 2. Your gain for this part At the end of the experiment, if you are selected to be paid (1 chance out of 10), one of the rounds of this part will be drawn at random. If it is round 1 or 2, the value of your portfolio for this round will be your payoff for this part. If it is a round between round 3 and round 13, a second draw will determine the portfolio (1, 2, or 3) that will be used to determine your payoff for the round and therefore your payoff for this part.

Portfolio value

The initial value of the portfolio is 100.00 ECU. The final value of the portfolio is equal to 100.00 ECU plus the proportion of each asset multiplied by its realized return.

Example: Your portfolio is composed of 35% of asset 1 and 65% of asset 2. The portfolio's value is equal to 100.00 ECU + 35% of the realized return of asset 1 + 65% of the realized return of asset 2.

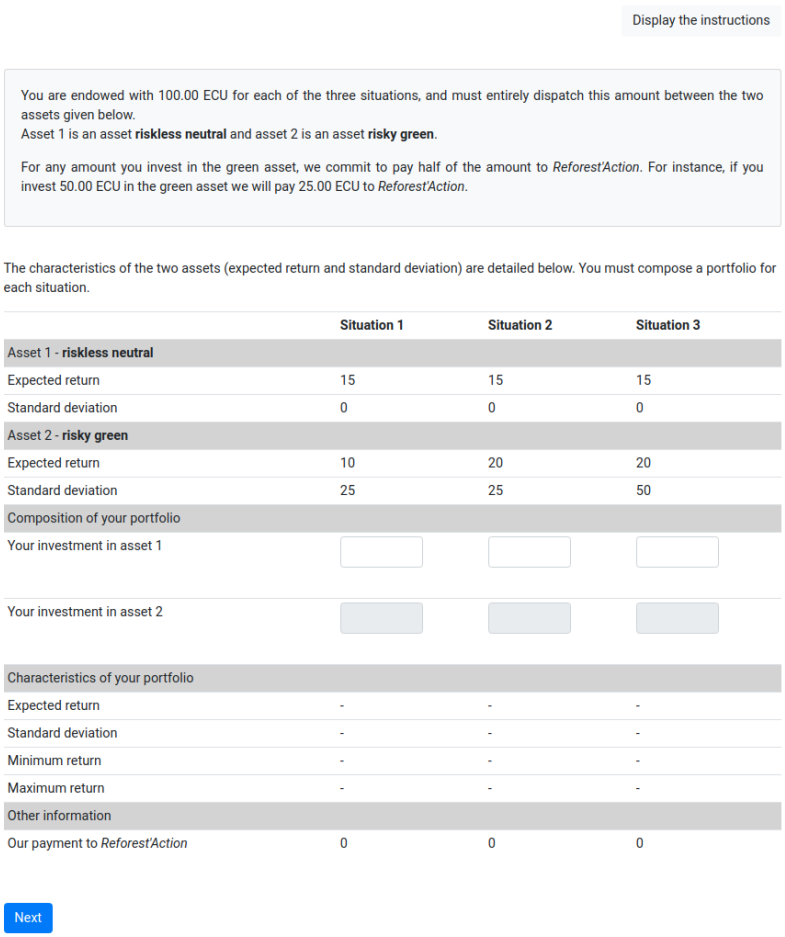
Gain in the game

At the end of the experiment, if you are selected to be paid (1 chance out of 10), one of the rounds of this part will be drawn at random. If it is round 1 or 2, the value of your portfolio for this round will be your payoff for this part. If it is a round between round 3 and round 13, a second draw will determine the portfolio (1, 2, or 3) that will be used to determine your payoff for the round and therefore your payoff for this part.

A.2 Screenshot of a screen from the Portfolio task

The following table provides one screen. All data for 13 screens are provided in Table 1.

Figure 3: Screenshot of a frame in the portfolio task (frame 4)



Display the instructions

You are endowed with 100.00 ECU for each of the three situations, and must entirely dispatch this amount between the two assets given below.
Asset 1 is an asset **riskless neutral** and asset 2 is an asset **risky green**.

For any amount you invest in the green asset, we commit to pay half of the amount to *Reforest'Action*. For instance, if you invest 50.00 ECU in the green asset we will pay 25.00 ECU to *Reforest'Action*.

The characteristics of the two assets (expected return and standard deviation) are detailed below. You must compose a portfolio for each situation.

	Situation 1	**Situation 2**	**Situation 3**
Asset 1 - **riskless neutral**			
Expected return	15	15	15
Standard deviation	0	0	0
Asset 2 - **risky green**			
Expected return	10	20	20
Standard deviation	25	25	50
Composition of your portfolio			
Your investment in asset 1			
Your investment in asset 2			
Characteristics of your portfolio			
Expected return	-	-	-
Standard deviation	-	-	-
Minimum return	-	-	-
Maximum return	-	-	-
Other information			
Our payment to *Reforest'Action*	0	0	0

Next

A.3 Detailed description of the control tasks

A.3.1 Higher order risk preferences

The risk, prudence, and temperance task (RPT task) developed by Noussair et al. (2014), and also used by Bottasso et al. (2020) with financial market professionals, has 15 binary choices to elicit levels of risk aversion, prudence and temperance. Five questions are dedicated to each of the three dimensions.

Table 5 displays the 15 questions. Notation [a_b] indicates an equiprobable lottery in which either a or b is added to the previous total, each with a probability of 0.5 Bottasso et al. (2020).

1. For the elicitation of risk aversion, the choice is between a sure amount and a lottery (Figure 4).
2. The elicitation of prudence relies on two-stage lotteries. Each choice involves the same two sure outcomes (low and high). For one option, a second-stage lottery is attached to the low outcome, and for the other option, the same lottery is attached to the high outcome. A prudent subject chooses the option for which the lottery is attached to the high outcome (Figure 5).
3. Finally, to elicit temperance, two second-stage lotteries are attached to the outcome of the first-stage lottery: they are either attached to the same outcome or spread over the two outcomes. A temperate individual chooses to spread the additional risk according to the second-stage lottery (Figure 6).

The most straightforward treatment of this task is to count the number of choices revealing respectively more risk averse, more prudent, and more tempered preferences. Each of the three scores is thus a round number between 0 and 5.

Table 5: List of choice tasks in the RPT task

Name of task	Left lottery	Right lottery
Riskav 1	20	[65_5]
Riskav 2	25	[65_5]
Riskav 3	30	[65_5]
Riskav 4	35	[65_5]
Riskav 5	40	[65_5]
Prud 1	[(90 + [20_-20])_60]	[90_(60 + [20_-20])]
Prud 2	[(90 + [10_-10])_60]	[90_(60 + [10_-10])]
Prud 3	[(90 + [40_-40])_60]	[90_(60 + [40_-40])]
Prud 4	[(135 + [30_-30])_90]	[135_(90 + [30_-30])]
Prud 5	[(65 + [20_-20])_35]	[65_(35 + [20_-20])]
Temp 1	[(90 + [30_-30])_(90 + [30_-30])]	[90_(90 + [30_-30] + [30_-30])]
Temp 2	[(90 + [30_-30])_(90 + [10_-10])]	[90_(90 + [30_-30] + [10_-10])]
Temp 3	[(90 + [30_-30])_(90 + [50_-50])]	[90_(90 + [30_-30] + [50_-50])]
Temp 4	[(30 + [10_-10])_(30 + [10_-10])]	[30_(30 + [10_-10] + [10_-10])]
Temp 5	[(70 + [30_-30])_(70 + [30_-30])]	[70_(70 + [30_-30] + [30_-30])]

As in Bottasso et al. (2020), [a_b] indicates an equiprobable lottery in which either a or b is received. Choice of the left lottery indicates the more risk averse, prudent and temperate, respectively.

Figure 4: Choices 1 to 5 to elicit risk aversion in the RPT task.

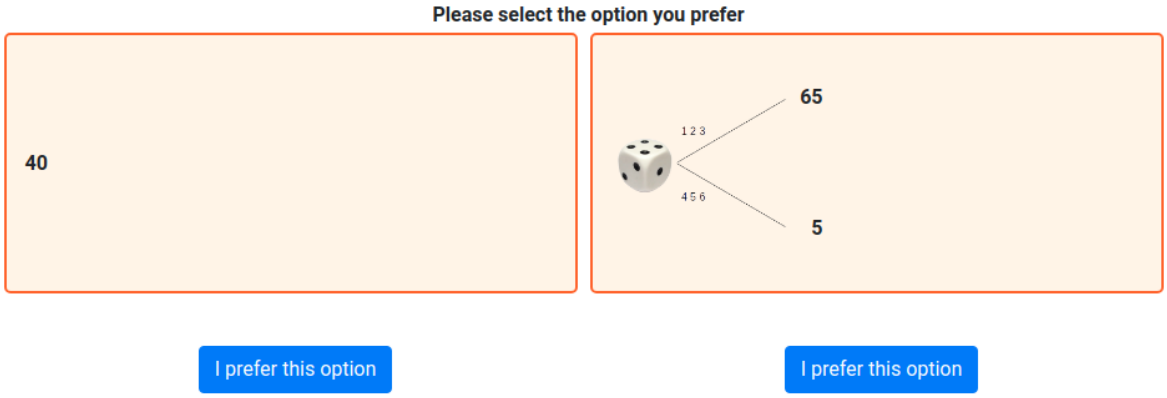


Figure 5: Choices 6 to 10 to elicit prudence in the RPT task.

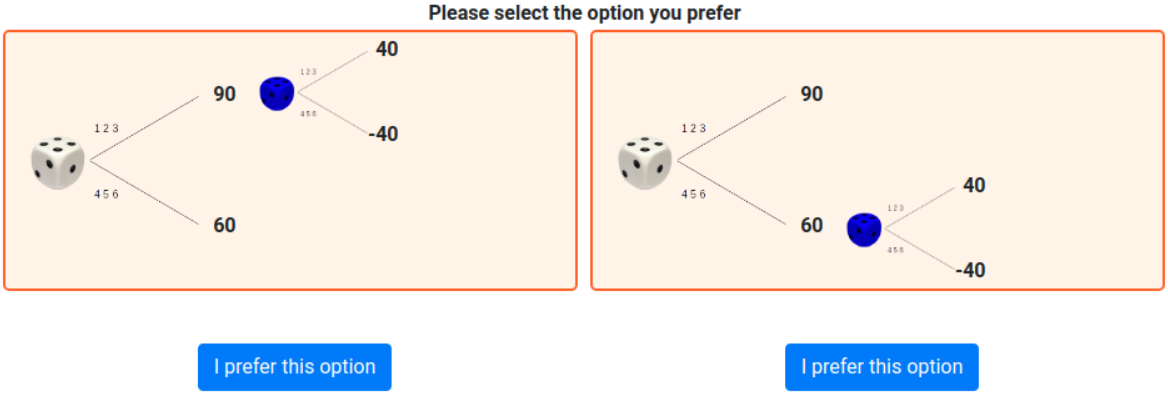
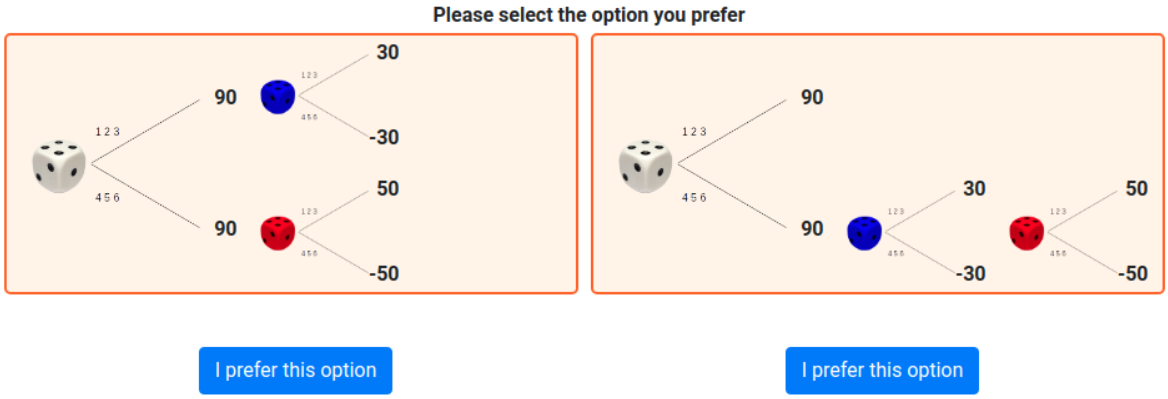


Figure 6: Choices 11 to 15 to elicit temperance in the RPT task.



A.3.2 Prosociability

The Social Value Orientation (SVO) task was introduced by Murphy et al. (2011) to measure pro- and anti-social preferences. The task consists in choosing a payoff distribution between self and an anonymous counterpart from a set of nine possible distributions. We rely on the six-item version of the SVO to provide a specific non-negative aggregate score, which allows us to determine the SVO score. The SVO score is computed as a function of the average self-allocation $\bar{A}_s$ and the average transfer to the counterpart $\bar{A}_o$:

$$\text{SVO} = \arctan\left(\frac{\bar{A}_o - 50}{\bar{A}_s - 50}\right).$$

The result is an angle between $-20°$ and $60°$. Following Murphy et al. (2011), respondents can be categorized as competitive, individualist, pro-social, or altruist, depending on the interval in which the SVO score is located. We use the direct (continuous) score as an explanatory variable, and we check for robustness with the categorization proposed by Murphy et al. (2011). The instructions displayed on the subjects' screen are given below, as well as a screenshot of the decision screen (Figure 7).

> This third part consists of 6 periods. In each period, you have to decide how to divide a sum of money between you and a person participating in this experiment. You can't identify the other person and she can't identify you. There is no right or wrong response, and the data will be treated anonymously. For each of the 6 periods, indicate the allocation you would like to prefer by clicking on the corresponding button. Within each pair, randomly formed by the computer, there will be two successive draws. A first draw will determine the period to be used for remuneration. Then, a second draw will select one of the two in the pair so that her decision will apply to the pair, so either your decision will apply or the other's decision will apply. The amounts on the screens are expressed in ECU.

A.3.3 Strategic thinking

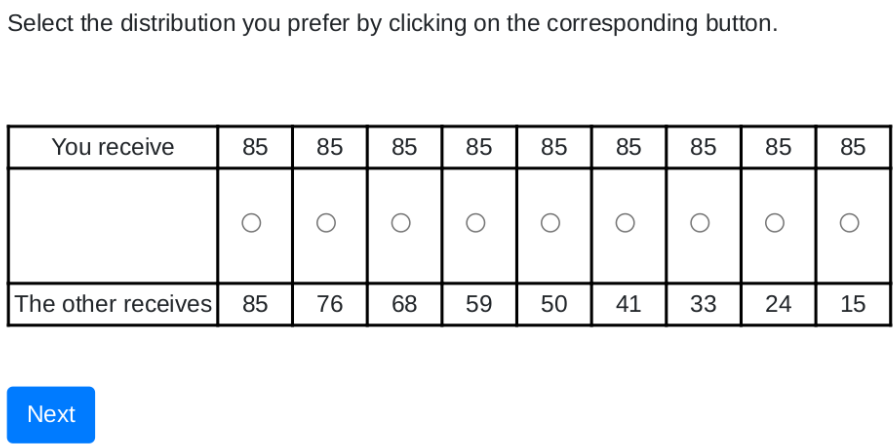
In a third additional task, we measured the depth of reasoning using the 11-20 game from Alaoui and Penta (2016).

The game involves two players, assigned randomly to each other. Each one independently picks an integer number between 11 and 20. Three rules define the nominal reward of the player:

(a) he/she receives the chosen number,

(b) if his/her number is exactly one unit less the opponent's number, he/she receives an extra 20,

Figure 7: Screenshot of the SVO task (first allocation)



(c) if his/her number is exactly his/her opponent's number, he/she receives an extra 10.

The simple game grounded on (a) and (b) has been introduced by Arad and Rubinstein (2012), as a one-shot game designed to assess the depth of strategic thinking. Level-0 (non strategic) optimal choice is given by considering only condition (a), and leads to choice 20. According to condition (b), Level-k reasoning, for $k \geq 1$, follows from the best response to Level-$(k-1)$, and leads to choose the number $20-k$, or number 21 for Level-10. The cycle of best-responses is broken by condition (c). The condition (c) has been introduced by Alaoui and Penta (2016) to change the unique mixed Nash equilibrium of the original game of Arad and Rubinstein (2012) in a pure Nash equilibrium at 11[25]. The instructions of the game, displayed on subjects' screen, are given below.

> There is only one decision in this part. You must choose an integer between 11 and 20. You will receive the amount in euros that you choose. In addition, at the end of the experiment, pairs of participants will be randomly formed, and the selected numbers will be compared.
> If you choose the same number as the other member of your pair, you will receive an additional 10 €.
> If you choose a number that is exactly one less than the other member of your pair, you receive an additional 20 €.
> *Examples*:
>
> - If you choose 17 and the other member of your pair has chosen 19, then you receive 17 € and he receives 19 €.
> - If you choose 12 and the other member of your pair has chosen 13, then you will receive 32 € and he will receive 13 €.
> - If you choose 16 and the other member of your pair has chosen 16, then you will receive 26 € and he will receive 26 €.

[25] In order to study the individual strategic level, a pure Nash equilibrium, that is, an explicit choice of a number, is obviously preferable to a mixed Nash Equilibrium.

A.3.4 Cognitive and Reflection Task

We relied on a standard seven questions cognitive reflection test (Frederick, 2005; Korniotis and Kumar, 2010; Toplak et al., 2011). The answer to each question is either right of wrong. This task provides therefore a score between 0 to 7, which serves as a proxy for abstract reasoning, problem-solving and mathematical formalization. The seven questions are given below. They were displayed on the same screen, one below the other.

1. If it takes 2 nurses 2 minutes to measure the blood pressure of 2 patients, how long would it take 200 nurses to measure the blood pressure of 200 patients? ____minutes. [Correct answer: 2 minutes; intuitive answer: 200 minutes]
2. Soup and salad cost €5.50 in total. The soup costs €5 more than the salad. How much does the salad cost? ____(in cents of €). [Correct answer: €0.25; intuitive answer: €0.5]
3. Sally is making sun tea. Every hour, the concentration of the tea doubles. If it takes 6 hours for the tea to be ready, how long would it take for the tea to reach half of the final concentration? ____hours. [Correct answer: 5 hours; intuitive answer: 3 hours]
4. If John can drink one barrel of water in 6 days, and Mary can drink one barrel of water in 12 days, how long would it take them to drink one barrel of water together? ____days. [correct answer: 4 days; intuitive answer: 9]
5. Jerry received both the 15th highest and the 15th lowest mark in the class. How many students are in the class? ____students. [correct answer: 29 students; intuitive answer: 30]
6. A man buys a pig for €60, sells it for €70, buys it back for €80, and sells it finally for €90. How much has he made? ____€. [correct answer: €20; intuitive answer: €10]
7. Simon decided to invest €8,000 in the stock market one day early in 2008. Six months after he invested, on July 17, the stocks he had purchased were down 50%. Fortunately for Simon, from July 17 to October 17, the stocks he had purchased went up 75%. At this point, Simon: (a) has broken even in the stock market, (b) is ahead of where he began, (c) has lost money. [correct answer: c, because the value at this point is €7,000; intuitive response b].

A.3.5 Pro-environmental opinion

We relied on the New Environmenal Paradigm (NEP) to assess participants' environmental friendliness. The NEP scale (Dunlap et al., 2000) is a very popular 15-question survey to evaluate opinion about environmental issues. Answers to each question vary from "fully disagree" to "fully agree" on a 5-levels Likert scale. The simplest and usual treatment of the data is to quantify answers from 1 to 5, in order to provide a total score on the range from 15 to 75.

1. We are approaching the limit of the number of people the earth can support.
2. Humans have the right to modify the natural environment to suit their needs.
3. When humans interfere with nature it often produces disastrous consequences.
4. Human ingenuity will insure that we do NOT make the earth unlivable.
5. Humans are severely abusing the environment
6. The earth has plenty of natural resources if we just learn how to develop them.
7. Plants and animals have as much right as humans to exist.
8. The balance of nature is strong enough to cope with impacts of modern industrial nations.
9. Despite our special abilities humans are still subject to the laws of nature.
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.
11. The earth is like a spaceship with very limited room and resources.
12. Humans were meant to rule over the rest of nature.
13. The balance of nature is very delicate and easily upset.
14. Humans will eventually learn enough about how nature works to be able to control it.
15. If things continue on their present course, we will soon experience a major ecological catastrophe.

A.4 Financial market professional questionnaire

A dropdown menu was attached to each question, the list of possible answers are given into the brackets.

1. What is your current job? [1: Prop Trader; 2: Sales Trader; 3: Sales; 4: Market Maker; 5: Asset/Portfolio Manager; 6: Strategist/Economist; 7: Financial Analyst (buy side, sell side); 8: Risk analyst; 9: Private equity Manager; 10: Other]
2. What is your employer? [1: Bank; 2: Asset management company; 3: Trading company; 4: Broker; 5: Hedge fund; 6: Work for your own; 7: Private equity company; 8: Other]
3. In which jobs in finance do you have your main experiences? (You can choose various jobs) ? [1: Prop Trader; 2: Sales Trader; 3: Sales; 4: Market Maker; 5: Asset/Portfolio Manager; 6: Strategist/Economist; 7: Financial Analyst (buy side, sell side); 8: Risk analyst; 9: Private equity Manager; 10: Other]
4. What is the main strategy you employ to trade assets? [1: Technical Analysis; 2: Value investing; 3: Trend following; 4: Event Driven; 5: Global Macro; 6: Arbitrageur; 7: Market Making; 8: Scalping; 9: Merger Arbitrage; 10: Other; 11: None]
5. On which asset class are your working on? [1: Money Market; 2: Forex Market; 3: Commodities; 4: Equity; 5: Bonds (Fixed Income); 6: Private Equity: 7: Real estate; 8: Hedge Fund; 9: Other]
6. Do you work on: [1: Spot Market; 2: Market Derivatives; 3: Both; 4: Other]
7. What is the nationality of your company? [answer:]

B Data collection

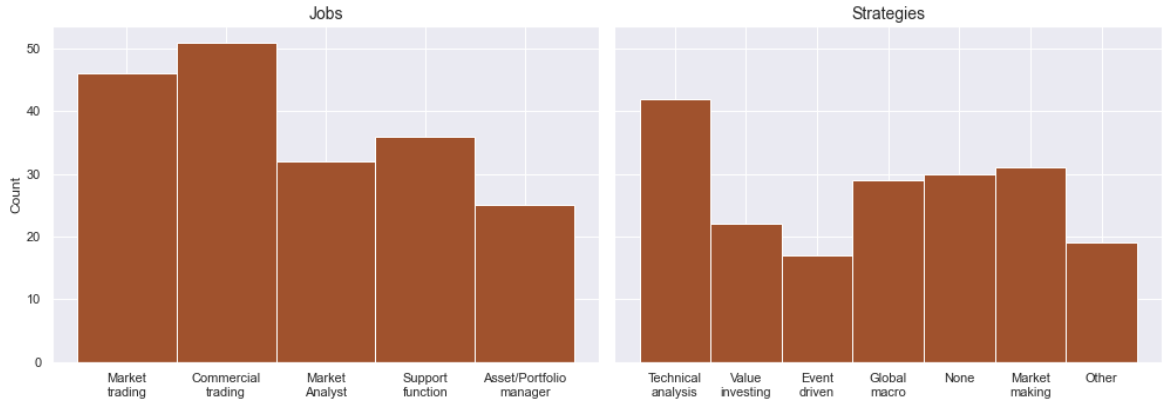
B.1 Samples

The PRO sample We collected the data of the PRO sample in major investment banks in October 2019, using a mobile laboratory with tablets. We conducted experiments in compli-

ance with the ethical rules of the experimental economics laboratory of Montpellier (LEEM) and in accordance with the deontological and compliance rules of the banks.[26] We used oTree software (Chen et al., 2016) to run the experiment. Figure 8 illustrates the typical environment in which the PRO data were collected. A total of 190 financial market professionals participated in the experiment: 66 of them were assigned to the baseline treatment, 63 to the ranking treatment and 61 to the tax treatment. Most of the participants worked in trading activities (proprietary traders, sales traders, asset managers, sales, trading room managers, quantitative engineers, structurers, financial analysts), while others were employed in support functions such as financial management or audit. Figure 9 shows the distribution of the jobs for the entire PRO sample. Finally, many of the members of the bank management board also took part in the experiment.

Figure 8: Meeting rooms used as a laboratory

Figure 9: Financial categories of the professional sample



The STUD sample The STUD sample consists of students from University of Montpellier. The data were collected during 2020, at the Laboratory for Experimental Economics of Montpellier.[27] 279 student participants (45.16% of women, with an average age of 23.86 years)

[26] For reasons of confidentiality, we can not provide any further information publicly, however, we are at the disposition of the reviewers to give them of any additional information they may require.

[27] LEEM, http://leem.umontpellier.fr. The subject pool is managed by the ORSEE platform (Greiner, 2015).

were involved in the experiment: 103 in the baseline treatment, 84 in the ranking treatment and 92 in the tax treatment.

B.2 Practical procedures

The practical procedures for the PRO and the STUD samples differ in two respects. First, they differ with respect to the final questionnaire that followed the control tasks. For the PRO sample, the questions were related to current employment and professional experience in the field of finance, while for the STUD sample, the questions were related to their studies and socio-demographic information.

Second, the two samples differ with respect to how subjects were matched and compensated for the experiment. In the STUD sample, we organized standard sessions with an even number of participants so that we could form pairs of players for the SVO task and the 11–20 task.

In addition, all participants were paid for one (randomly chosen) portfolio choice task and one (randomly selected) control task. For the PRO sample, we could neither anticipate the number of participants in a session nor at what time they would attend the session. We, therefore, needed to rely on the strategy method for the SVO and the 11–20 tasks. Pairs were formed at the end of each session. In addition, only one participant out of 10 was randomly selected to be paid out for real. Selected subjects were paid for one of the portfolio choice task and one control task, both randomly selected. We proceeded that way to provide strong incentives to the finance professional participants. For both samples, we relied on a random selection of the tasks to be paid. This procedure is common among experimentalists as it was demonstrated to be incentive-compatible (Starmer and Sugden, 1991; Charness et al., 2016; Clot et al., 2018). On average, a student earned 8.10 euros, and a (selected to be paid) finance professional 216.81 euros.

C Analysis

C.1 Portfolio task

The following table is used in Section 2.4.

Table 6: Mean (*std*) investment in the greenest asset, by treatment and sample

			Baseline				**Ranking**				**Tax**			
			Professionals		**Students**		**Professionals**		**Students**		**Professionals**		**Students**	
Screen	**Assets**	ρ	**mean**	***std***	**mean**	***std***	**mean**	***std***	**mean**	***std***	**mean**	***std***	**mean**	***std***
1	N (15, 0) vs G (10, 0)		45.30	*24.91*	30.60	*31.89*	48.24	*27.60*	41.31	*31.96*	46.34	*24.78*	50.23	*27.25*
2	N (15, 0) vs B (20, 0)		61.29	*28.67*	45.85	*41.42*	65.70	*28.48*	64.46	*33.85*	61.46	*27.28*	69.77	*25.55*
4	N (15, 0) vs G (10, 25)		43.70	*26.40*	35.99	*31.42*	44.08	*24.21*	40.31	*30.33*	44.20	*23.15*	39.42	*29.96*
	N (15, 0) vs G (20, 25)		50.33	*21.85*	43.06	*33.80*	55.81	*22.48*	52.75	*29.45*	52.70	*25.23*	58.11	*29.04*
	N (15, 0) vs G (20, 50)		37.73	*25.69*	37.91	*36.23*	41.78	*25.74*	50.10	*35.08*	44.11	*31.89*	50.22	*35.71*
5	N (15, 0) vs B (30, 25)		64.55	*25.29*	57.79	*36.68*	67.51	*24.74*	58.06	*36.29*	57.31	*26.82*	69.37	*29.03*
	N (15, 0) vs B (40, 25)		61.29	*29.05*	42.95	*40.53*	60.13	*25.82*	48.45	*38.90*	60.67	*24.31*	69.66	*27.43*
	N (15, 0) vs B (40, 50)		70.68	*25.30*	58.38	*35.56*	71.38	*27.13*	58.89	*33.88*	68.49	*23.97*	72.48	*26.74*
6	N (20, 25) vs G (10, 0)		61.79	*21.76*	48.71	*33.38*	61.89	*25.06*	64.62	*29.80*	63.43	*22.85*	61.14	*27.22*
	N (30, 25) vs G (10, 0)		57.03	*24.22*	36.78	*34.57*	54.84	*23.99*	53.13	*33.90*	61.10	*23.87*	64.78	*24.17*
	N (30, 50) vs G (10, 0)		68.09	*22.82*	55.07	*35.20*	70.35	*22.56*	69.20	*30.52*	70.75	*22.95*	70.61	*27.39*
7	N (20, 25) vs B (20, 0)		48.65	*31.42*	55.54	*32.72*	52.75	*28.75*	48.74	*34.53*	49.43	*29.29*	53.34	*35.58*
	N (30, 25) vs B (20, 0)		54.35	*28.20*	67.32	*33.42*	62.94	*25.92*	62.87	*32.42*	62.20	*29.49*	70.18	*30.72*
	N (30, 50) vs B (20, 0)		45.89	*28.12*	49.09	*34.60*	51.38	*26.54*	47.14	*32.95*	48.03	*32.80*	57.35	*33.62*
8	N (20, 25) vs G (10, 25)		40.76	*29.67*	18.51	*29.74*	49.70	*30.87*	37.00	*34.08*	53.56	*24.17*	51.88	*29.37*
	N (30, 25) vs G (20, 25)	1	44.33	*28.34*	23.32	*30.96*	46.30	*29.17*	41.39	*34.91*	49.10	*24.39*	52.45	*27.96*
	N (30, 50) vs G (20, 50)		41.89	*30.83*	21.28	*31.95*	49.38	*30.51*	36.27	*36.11*	51.84	*25.10*	53.96	*28.80*
9	N (20, 25) vs G (10, 25)		44.27	*27.59*	24.17	*30.63*	45.52	*27.60*	32.67	*29.48*	50.69	*22.60*	50.52	*28.12*
	N (30, 25) vs G (20, 25)	0	43.41	*24.07*	26.57	*31.25*	46.97	*27.33*	35.23	*30.85*	46.48	*24.36*	50.35	*30.39*
	N (30, 50) vs G (20, 50)		43.45	*24.16*	29.53	*33.26*	46.73	*27.04*	37.23	*32.34*	51.59	*23.80*	53.21	*30.15*
10	N (20, 25) vs G (10, 25)		47.38	*25.44*	34.82	*26.17*	48.59	*25.30*	45.60	*27.94*	48.02	*21.51*	51.72	*26.81*
	N (30, 25) vs G (20, 25)	-1	47.95	*23.11*	33.31	*27.04*	50.51	*26.57*	41.60	*31.01*	52.39	*23.92*	51.97	*27.37*
	N (30, 50) vs G (20, 50)		47.48	*22.61*	36.20	*25.18*	53.37	*26.74*	48.77	*27.57*	52.70	*21.61*	56.39	*25.58*
11	N (20, 25) vs B (30, 25)		56.03	*29.75*	42.37	*36.15*	59.25	*24.41*	48.63	*36.98*	53.64	*27.29*	62.88	*29.94*
	N (30, 25) vs B (40, 25)	1	54.95	*30.50*	47.56	*38.52*	62.22	*27.56*	51.70	*38.93*	59.77	*27.40*	60.70	*32.29*
	N (30, 50) vs B (40, 50)		53.58	*32.15*	37.67	*40.33*	57.38	*28.66*	47.14	*38.24*	50.95	*29.01*	62.74	*29.42*
12	N (20, 25) vs B (30, 25)		56.15	*32.05*	41.68	*34.69*	62.17	*27.30*	49.17	*36.53*	58.61	*27.86*	65.85	*29.08*
	N (30, 25) vs B (40, 25)	0	59.55	*30.90*	45.11	*37.14*	62.67	*27.52*	53.35	*37.48*	59.54	*26.52*	63.60	*30.85*
	N (30, 50) vs B (40, 50)		53.67	*33.54*	43.29	*36.13*	58.17	*30.15*	49.26	*37.39*	58.38	*26.05*	60.23	*31.78*
13	N (20, 25) vs B (30, 25)		53.88	*29.50*	43.21	*35.04*	62.57	*26.99*	52.76	*34.31*	57.97	*23.69*	60.76	*28.95*
	N (30, 25) vs B (40, 25)	-1	60.08	*28.23*	45.61	*35.74*	61.75	*26.86*	58.39	*34.20*	63.49	*23.79*	62.96	*30.55*
	N (30, 50) vs B (40, 50)		61.83	*26.56*	46.49	*32.80*	63.84	*25.04*	57.99	*31.00*	59.21	*22.37*	59.86	*29.72*
Overall			52.54	*28.52*	40.80	*35.76*	56.12	*27.75*	49.51	*34.71*	55.25	*26.27*	59.02	*30.23*

C.2 Control tasks

Table 7 reports the mean of the variable of interest for each of the control tasks, for both samples, as well as a column that displays the difference between the two samples and a column that reports the p-value of a two-sided t-test (H0 is the two samples have an equal mean).

Table 7: Summary statistics for the control tasks

	Professionals	Students	Diff.	p-value
Risk aversion	2.537	2.803	-0.266	.065*
Prudence	3.079	3.480	-0.401	.009**
Temperance	2.405	2.642	-0.237	.145
SVO	20.517	18.083	2.434	.080*
CRT	3.516	3.319	0.197	.306
Eleven-twenty (choice)	15.821	16.509	-0.688	.007**
Eleven-twenty (expected payoff)	18.994	19.869	-0.875	.005**
NEP	56.826	56.283	0.543	.417

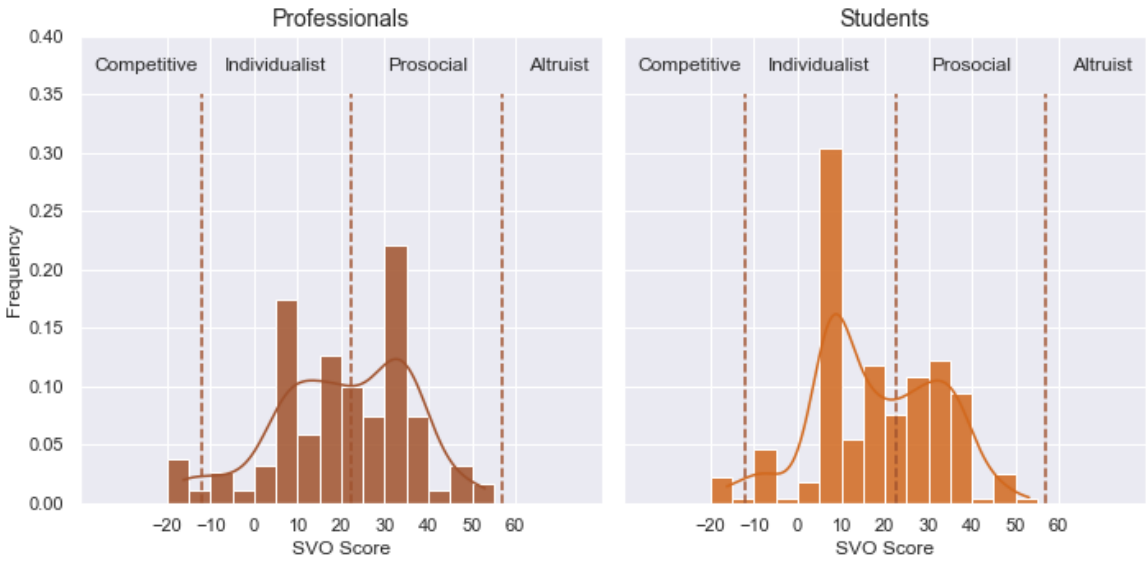
Students seem to be more risk averse and prudent than professionals but there is no difference between the two samples in terms of temperance. A Pearson correlation test shows there is no correlation between risk aversion and prudence ($r = 0.048$, $p = .512$ for professionals and $r = -0.009$, $p = .877$ for students) but a positive correlation between prudence and temperance ($r = 0.280$, $p < .001$ and $r = 0.262$, $p < .001$, respectively).

The average SVO score of professionals is slightly higher compared to the students, the difference is significant at the 10% level. But this score is also used to determine the class of behaviour to which the subject belongs, ranging from competitive, individualistic, pro-social or altruistic (see Murphy et al., 2011, for a detailed explanation). Figure 10 reports the distribution of the scores for the two samples. None of the participants in either sample revealed to be altruistic. On the other end of the spectrum, financial professionals do not appear to be more competitive than students (4.21% of the professionals and 2.15% of the students). Then, professionals are equally divided between individualists (47.37%) and pro-social (48.42%), while 57.35% of students are individualists and 40.50% are pro-social. Overall, based on a Kolmogorov-Smirnov test, we can reject the hypothesis that the two distributions are identical (p=.042).

The average CRT score of professionals is slightly higher than that of students, but is more homogeneous in the latter sample, especially for the highest scores. A Kolmogorov-Smirnov test does not reveal any significant difference, however ($p = .112$).

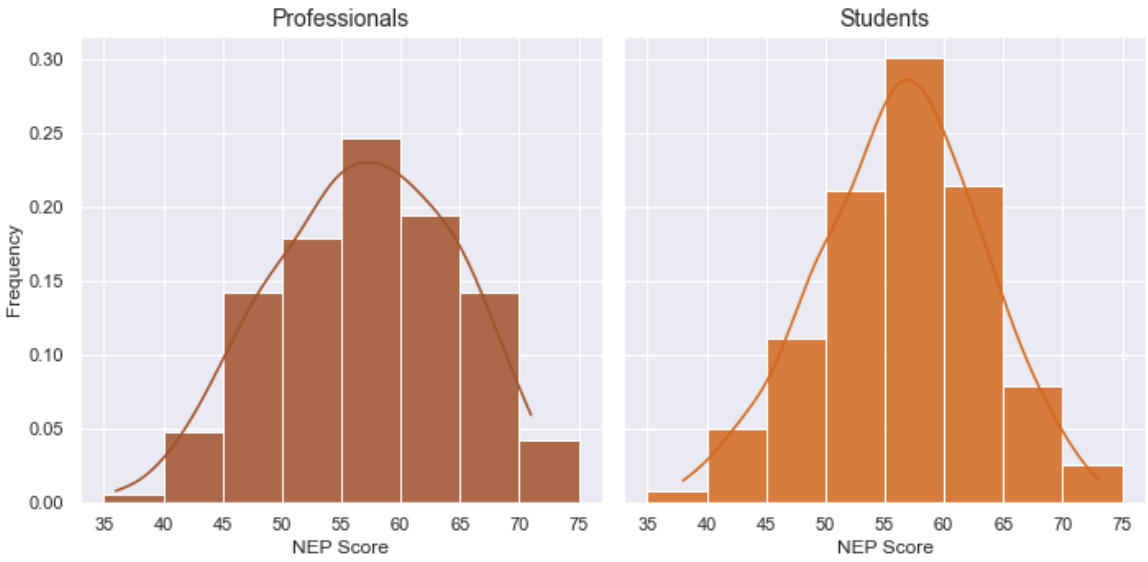
Finally, Figure 11 shows that both populations exhibit a similar distribution for the NEP score, meaning that they have similar concerns about environmental issues (Kolmogorov-

Figure 10: Distribution of the SVO score in both samples



Smirnov test, $p = .431$).

Figure 11: Distribution of the NEP scale score, by sample



To summarize the results from the control tasks, professionals are less risk-averse and less prudent than students. They are more pro-social, and they are less successful at guessing the depth of reasoning of their cohort members. On the other hand, the two samples appear to have a similar profile in terms of temperance, cognitive abilities and environmental concern.

C.3 Econometric analysis

C.3.1 Regression analysis

As noted in Table 2, the regression method is as follows. We compute estimated coefficients in a random-effect (RE) Tobit panel regression with robust clustered standard error at the subject level. This accounts for potential heteroskedasticity and serial correlation of errors (in parenthesis). Estimations were done with StataCorp software (2019) (Stata: Release 16. Statistical Software. College Station, TX: StataCorp LLC. Further information on this class of models is available at https://www.stata.com/manuals/memetobit.pdf.

In presented tables, σ^2*(Intercept)* denotes the standard error at the subject level, while σ^2*(residual)* denotes the residual error variance at the observation level. As usual, *, ** , *** account for 10%, 5% and 1% significance level respectively. The last lines, χ^2 and p-value, stand for the model non-null significance test.

In the analysis, the dependent variable is the proportion invested in the greener asset (λ). Context denote screens used for estimation: *Green* context relates to screens 1,4,6,8,9, and 10; *Brown* context relates to screens 2,5,7,11,12, and 13. *All* combines *Green* and *Brown* (screen 3 is excluded from the analysis). N is the number of related observations (samples and selected screens).

Table 8 refers to the estimation in Section 2, while table 9 refers to the estimation in Section 3.

The *Green* dummy variable refers to the *Green* context (*Green* = 1 for Green context and 0 for Brown context). The *Student* dummy variable controls for the POOL type (*Student* = 1 if the subject belongs to the STUD sample, and 1 if he belongs to the PRO sample). *Correlation* is a categorical variable which equals 0 for screens 1 to 7, 1 for screens 8 and 11, 2 for screens 9 and 12, and 3 for screens 10 and 13.

Variables specific to PRO or STUD sample, such as Finance jobs, Investment strategies or discipline are presented in table 3.

In table 9, all the variables present in table 8 are taken as control variables, except *SVO* and *NEP* which are shown (*cf.* Appendix C.2 for descriptive statistics). In addition, *Employer type* (=0 if "bank", =1 otherwise), *Asset Class* (categories: "Money market", "Forex market", "Equity", "Bonds and FI", "Others"), *Market type* (categories: "spot market", "derivatives", "both", "others")**Age** (in years), *Gender* (=0 for female, =1 for male) and *Student level* (in years) are hidden control variables in table 9.

Table 8: Estimated coefficients of Table 2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	ALL	ALL	ALL	PRO	PRO	STUD	STUD
Screens	All	Green	Brown	Green	Brown	Green	Brown
N	15008	7504	7504	3040	3040	4464	4464
Asset characteristics							
Expected return	1.19***	0.92***	1.43***	0.66***	0.93***	1.13***	1.85***
of greener asset	(0.09)	(0.11)	(0.13)	(0.15)	(0.14)	(0.15)	(0.20)
Expected return	-0.81***	-0.70***	-1.01***	-0.56***	-0.57***	-0.82***	-1.38***
of browner asset	(0.09)	(0.11)	(0.11)	(0.13)	(0.12)	(0.16)	(0.19)
Standard deviation	-0.51***	-0.36***	-0.69***	-0.39***	-0.59***	-0.34***	-0.78***
of greener asset	(0.04)	(0.04)	(0.05)	(0.06)	(0.06)	(0.06)	(0.08)
Standard deviation	0.50***	0.54***	0.52***	0.50***	0.42***	0.57***	0.61***
of browner asset	(0.04)	(0.04)	(0.05)	(0.06)	(0.05)	(0.07)	(0.08)
Green	-10.47***						
	(1.59)						
Sample characteristics							
Ranking treatment	7.41***	10.01***	3.99	4.56	2.53	14.09***	5.39
	(2.41)	(2.57)	(3.87)	(3.26)	(4.78)	(3.91)	(5.87)
Tax treatment	16.04***	18.81***	12.69***	6.62**	-1.13	27.44***	24.46***
	(2.12)	(2.50)	(3.74)	(2.92)	(4.35)	(3.78)	(5.85)
Student	-5.92***	-7.89***	-2.67				
	(2.00)	(2.06)	(2.95)				
Control variables							
Intercept	37.38***	38.24***	25.44*	55.08***	45.59***	16.89	1.93
	(9.45)	(9.20)	(13.56)	(12.53)	(16.97)	(12.63)	(18.57)
Correlation 1	-10.01***	-15.44***	-3.94**	-7.79***	-0.78	-21.82***	-6.80**
	(1.28)	(1.64)	(1.64)	(2.08)	(1.84)	(2.47)	(2.65)
Correlation 0	-8.66***	-15.02***	-1.67	-8.60***	-2.33	-20.36***	-5.28**
	(1.26)	(1.56)	(1.62)	(1.83)	(1.76)	(2.44)	(2.63)
Correlation -1	-3.97***	-7.89***	0.32	-5.07***	3.87**	-10.05***	-2.74
	(1.13)	(1.42)	(1.60)	(1.90)	(1.87)	(2.07)	(2.51)
Risk aversion	-1.16*	-0.15	-2.32***	-0.29	-0.94	0.02	-3.64***
	(0.64)	(0.69)	(1.04)	(0.88)	(1.32)	(1.01)	(1.51)
Prudence	0.44	-0.01	0.69	0.65	-0.49	-0.79	1.06
	(0.64)	(0.62)	(1.01)	(0.87)	(1.29)	(0.86)	(1.49)
Temperance	-0.91	-1.10*	-0.49	-0.81	-1.03	-1.40	0.11
	(0.58)	(0.62)	(0.94)	(0.80)	(1.23)	(0.90)	(1.38)
SVO	0.24***	0.31***	0.17*	0.11	0.24**	0.43***	0.01
	(0.06)	(0.06)	(0.10)	(0.08)	(0.11)	(0.10)	(0.16)
NEP	0.37**	0.17	0.62***	-0.02	0.27	0.33	1.06***
	(0.15)	(0.15)	(0.22)	(0.20)	(0.28)	(0.21)	(0.30)
CRT	-0.25	-1.67***	1.51*	-1.53**	1.88**	1.60**	1.61
	(0.48)	(0.52)	(0.81)	(0.62)	(0.95)	(0.77)	(1.23)
k-level	-0.26	-0.34	-0.99*	0.23	-1.41**	0.61	-0.93
	(0.33)	(0.42)	(0.53)	(0.50)	(0.69)	(0.61)	(0.77)
σ^2(Intercept)	369.73***	431.32***	1004.35***	257.15***	534.59***	560.91***	1411.10***
	(38.76)	(52.34)	(104.97)	(33.26)	(69.68)	(97.65)	(200.70)
σ^2(residual)	1162.16***	843.55***	902.87***	523.00***	509.43***	1125.58***	1266.65***
	(63.55)	(45.70)	(53.69)	(38.29)	(40.72)	(79.38)	(97.26)
χ^2	367.37	326.30	231.49	114.90	136.44	242.66	149.80
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 9: Estimated coefficients of table 4

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	PRO	PRO	PRO	STUD	STUD	STUD
Screens	All	Green	Brown	All	Green	Brown
N	6048	3024	3024	8928	4464	4464
SVO	0.12	0.09	0.17	0.23***	0.43***	-0.01
	(0.08)	(0.08)	(0.11)	(0.09)	(0.10)	(0.15)
NEP	0.05	-0.11	0.26	0.53**	0.29	0.79**
	(0.18)	(0.18)	(0.25)	(0.21)	(0.25)	(0.35)
Finance jobs						
Value investing	-0.36	2.43	-3.41			
	(3.38)	(3.32)	(4.75)			
Asset/ Portfolio Manager	-7.21	-1.53	-13.19**			
	(5.29)	(5.46)	(6.44)			
Market/Risk Analyst	15.75***	15.58***	16.49**			
	(4.47)	(4.89)	(6.54)			
Support functions & others	3.77	7.38	0.15			
	(4.48)	(4.82)	(6.78)			
Investment strategies						
Value Investing	11.37**	6.99	16.30**			
	(4.66)	(4.34)	(6.43)			
Event Driven/Arbitrage/Scalping	18.77***	13.32**	24.20***			
	(4.92)	(6.02)	(6.21)			
Global Macro	10.87**	4.72	17.89***			
	(4.33)	(3.89)	(6.15)			
None	1.20	-3.79	6.44			
	(4.34)	(4.33)	(5.39)			
Market Making	11.63***	5.57	17.70***			
	(3.70)	(3.53)	(5.70)			
Others	10.61**	5.68	17.74**			
	(5.39)	(5.05)	(8.12)			
Disciplines						
Humanities				12.78	-2.43	24.89
				(9.18)	(10.70)	(16.40)
Formal Sciences				7.51	1.83	13.92
				(5.50)	(5.98)	(8.66)
Economics				6.70	1.38	12.07*
				(5.04)	(5.49)	(6.86)
Health				15.06***	7.37	21.62**
				(5.72)	(6.10)	(9.39)
Natural Sciences				10.18	4.29	14.95*
				(6.71)	(6.64)	(9.01)
Social Sciences				9.53	5.67	15.38
				(6.55)	(5.68)	(11.02)
Others				17.31**	13.64	21.64
				(7.42)	(9.04)	(13.99)
Intercept	42.46***	48.51***	27.49	22.52	10.67	25.36
	(12.64)	(12.12)	(17.13)	(20.62)	(23.27)	(33.79)
σ^2(Intercept)	211.83***	200.12***	424.26***	406.77***	546.93***	1373.83***
	(25.67)	(24.97)	(52.79)	(60.42)	(96.64)	(199.74)
σ^2(residual)	636.82***	525.22***	512.31***	1649.37***	1125.48***	1266.40***
	(40.74)	(38.55)	(40.95)	(119.87)	(79.37)	(97.23)
χ^2	213.28	176.14	174.06	276.77	268.98	160.56
p-value	0.00	0.00	0.00	0.00	0.00	0.00

C.3.2 Coefficient analysis

Table 10 describes the tests that are performed on the estimates to test the equality of two parameters in the regression displayed in Table 8. Applied tests are Wald test with H_0 assuming equality of two parameters in the same random-effect Tobit panel regression. The table displays p-values, with bold font when value is below 5%, indicating that the two parameters are significantly different at this level.

Table 10: Tests of parameters of greener vs browner assets in the same regression

	P-values	
Line and column	Expected Return	Standard Deviation
L1C1 vs - L2C1	**0.0000**	
L1C2 vs - L2C2	**0.0010**	
L1C3 vs - L2C3	**0.0000**	
L1C4 vs - L2C4	0.2373	
L1C5 vs - L2C5	**0.0003**	
L1C6 vs - L2C6	**0.0014**	
L1C7 vs - L2C7	**0.0000**	
L3C1 vs - L4C1		0.8419
L3C2 vs - L4C2		**0.0000**
L3C3 vs - L4C3		**0.0000**
L3C4 vs - L4C4		**0.0119**
L3C5 vs - L4C5		**0.0001**
L3C6 vs - L4C6		**0.0000**
L3C7 vs - L4C7		**0.0036**

Description: LxCy stands for the line x and the column y in Table 2. Lines 1 and 2 refers to expected return of the greener asset and browner asset respectively, lines 3 and 4 to the standard deviation of the greener and browner asset respectively. Columns 1 to 7 are described at the beginning of section 2.4.

In table 11, we study differences in specifications between groups. To achieve it, we test if the coefficients (slopes) of the variable under study (e.g., expected return of the greener asset, standard deviation of the browner asset) are significantly different between groups (green versus brown contexts, professional versus student population).

We follow the methodology proposed by Wooldridge (2016), a regression model with qualitative information, by investigating the interaction coefficient between (1) the variable under study and (2) the dummy variable which enables to distinguish the two groups under consideration (Dummy *Group*). By default, we let all the variables and constant differ between groups, by including all the interaction coefficients between the studied groups and the explanatory variables. The general equation is the following:

$$\begin{aligned}\lambda = {} & \beta_0 + \beta_1 ReturnGreener + \beta_2 ReturnBrowner + \beta_3 StandardDevGreener \\ & + \beta_4 StandardDevBrowner + \beta_5 Correlation0 + \beta_6 Correlation1 + \beta_7 Correlationminus1 \\ & + \beta_8 Ranking + \beta_9 Tax + \beta_{10} Risk + \beta_{11} Prudence + \beta_{12} Temperance + \beta_{13} SVO \\ & + \beta_{14} NEP + \beta_{15} CRT + \beta_{16} LevelK + \delta_0 Group + \delta_1 Group.ReturnGreener \\ & + \delta_2 Group.ReturnBrowner + \delta_3 Group.StandardDevGreener \\ & + \delta_4 Group.StandardDevBrowner + \delta_5 Group.Correlation0 + \delta_6 Group.Correlation1 \\ & + \delta_7 Group.Correlationminus1 + \delta_8 Group.Ranking + \delta_9 Group.Tax \\ & + \delta_{10} Group.Risk + \delta_{11} Group.Prudence + \delta_{12} Group.Temperance \\ & + \delta_{13} Group.SVO + \delta_{14} Group.NEP + \delta_{15} Group.CRT + \delta_{16} Group.LevelK \end{aligned} \tag{2}$$

Estimates are computed based on a random effects Tobit regression in a panel data framework, with robust cluster standard error at the subject level, to account for the within-cluster error correlations and the heteroskedasticity, such as displayed in Section C.3.

The null hypothesis (H0) is that the two groups have coefficients (slopes) that do not significantly differ on the variable of interest. The alternative hypothesis (H1) is that the coefficients significantly differ between the two groups on the variable of interest. To perform this test, we observe the interaction coefficients between the dummy variable *Group* and the selected variable under study (for example if *ReturnGreener*, δ_1 in equation 2). If the interaction coefficient is significantly different from 0, then we can conclude that the two coefficients (slopes) differ between groups.

Table 11: Tests of parameters in different regressions

Line and column	Interaction coefficients and p-values (in parentheses)					
	EX RET GR vs BR	SD DEV GR vs BR	Asymmetry neutral	EX RET PRO vs STUD	SD DEV PRO vs STUD	STUD GR vs BR
L1C2 vs L1C3	**-0.45**					
	(0.001)					
L1C4 vs L1C5	-0.25					
	(0.134)					
L1C6 vs L1C7	**-0.63**					
	(0.003)					
L2C2 vs L2C3	**0.27**					
	(0.037)					
L2C4 vs L2C5	0.01					
	(0.953)					
L2C6 vs L2C7	**0.49**					
	(0.019)					
L3C2 vs L3C3		**0.31**				
		(0.000)				
L3C4 vs L3C5		**0.19**				
		(0.006)				
L3C6 vs L3C7		**0.41**				
		(0.000)				
L4C2 vs L4C3		0.04				
		(0.481)				
L4C4 vs L4C5		0.09				
		(0.105)				
L4C6 vs L4C7		-0.01				
		(0.879)				
L4C2 vs -L3C3			**-0.14**			
			(0.005)			
L4C4 vs -L3C5			-0.09			
			(0.145)			
L4C6 vs -L3C7			**-0.18**			
			(0.017)			
L1C4 vs L1C6 (green)				0.39		
				(0.062)		
L1C5 vs L1C7 (brown)				**0.75**		
				(0.001)		
L2C4 vs L2C6 (green)				-0.21		
				(0.312)		
L2C5 vs L2C7 (brown)				**-0.71**		
				(0.001)		
L3C4 vs L3C6 (green)					0.07	
					(0.408)	
L3C5 vs L3C7 (brown)					-0.12	
					(0.227)	
L4C4 vs L4C6 (green)					0.04	
					(0.627)	
L4C5 vs L4C7 (brown)					0.14	
					(0.126)	
L8C2 vs L8C3						-4.40
						(0.118)

Interaction coefficients are displayed, as well as p-values in parentheses.

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