Behavioral Risk Profiling Across Five Countries: Loss Aversion, Risk Aversion, and the Reflection Effect

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Abstract

Risk profiling typically reduces investors' preferences to a single risk–return trade-off, despite extensive evidence that reference dependence plays a central role in decisions under risk and uncertainty. We show that three elicited indifference values are sufficient to jointly identify loss aversion and domain-specific risk attitudes over gains and losses, thereby measuring the reflection effect as a shift toward greater risk seeking in the loss domain, without imposing functional-form assumptions. Using data from over 25,000 respondents in five European countries, we find that loss aversion and the reflection effect differ markedly in prevalence: loss aversion is far from universal, with the median respondent loss neutral in three of the five countries, whereas the reflection effect is observed for the majority of respondents in every country. We further show that widely used survey-based risk questionnaires primarily capture gain-domain risk attitudes and provide little information about loss aversion or the reflection effect. These findings imply that substantially richer behavioral profiling is feasible without increasing survey complexity. The method provides a tractable tool for researchers interested in measuring these preferences at scale and has practical applications in personalized financial services, such as investor suitability assessments.

Keywords: prospect theory; loss aversion; risk aversion; reflection effect; risk profiling; suitability assessment; cross-country comparison

JEL Classifications: C91; D18; D81; D91

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1 Introduction

Prospect theory is widely regarded as the leading descriptive framework for decisions under risk and uncertainty (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992; Wakker, 2010; Barberis, 2013; Ruggeri et al., 2020). A core component of prospect theory is reference dependence: outcomes are evaluated not in absolute terms but as gains or losses relative to a reference point. Two properties of reference-dependent preferences are particularly important. The first is loss aversion—the tendency to weigh losses more heavily than commensurate gains. Experimental, survey, and field evidence suggests that loss aversion affects a wide range of economic decisions, including portfolio choice, trading behavior, and household asset allocation (Haigh and List, 2005; Dimmock and Kouwenberg, 2010; Abdellaoui et al., 2013; Lee and Veld-Merkoulova, 2016; Bodnaruk and Simonov, 2016; Gajewski and Meunier, 2020; Iqbal et al., 2021). The second is the reflection effect—a systematic shift in risk attitudes across domains, whereby individuals tend to be risk averse over gains but risk seeking over losses (Kahneman and Tversky, 1979; Vieider et al., 2015). This pattern has been documented among financial professionals (Abdellaoui et al., 2013), and risk seeking in the loss domain features prominently in prospect-theory accounts of financial decision-making, including models of the disposition effect and investors' liquidation decisions (Shefrin and Statman, 1985; Kyle et al., 2006; Barberis and Xiong, 2009; Henderson, 2012). Together, these two reference-dependent features imply that a single measure of risk aversion is insufficient to characterize an individual's preferences under risk.

Despite the empirical support for the multidimensional nature of risk preferences implied by prospect theory, practical approaches to risk profiling typically remain one-dimensional. In the United States, the United Kingdom, and the European Union, financial institutions are required to perform suitability assessments when providing clients with investment advice or portfolio management (FINRA Rule 2111; ESMA, 2018; FCA, 2022). These assessments are intended to ensure that investment recommendations are consistent with clients' risk preferences, financial situation, and investment objectives. In practice, however, suitability assessments commonly rely on short survey questionnaires that measure risk preferences coarsely and along a single risk–return dimension (de Palma and Picard, 2010; Linciano and Soccorso, 2012). Financial regulators have recognized these limitations and have called for incorporating behavioral insights into risk profiling. The European Securities and Markets Authority explicitly identifies loss aversion as a relevant concept for suitability assessments (ESMA, 2017, 2018). More recently, the European Commission's Retail Investment Strategy has called for the inclusion of behavioral elements in risk profiling and the development of more dynamic, quantitative assessment methods (European Commission, 2022, 2023*a*). De-

spite this regulatory momentum, the large-scale adoption of behavioral preference measures in financial practice remains limited. A central obstacle is the absence of a measurement method that is both theoretically sound and practically feasible within digital advisory processes (van Dolder and Vandenbroucke, 2024).

This paper implements a theoretically grounded elicitation method for reference-dependent risk preferences (Abdellaoui et al., 2016) in five European countries: France, Italy, the United Kingdom, Spain, and Greece. Using survey data from over 25,000 respondents, we apply a three-step choice-based task that jointly measures loss aversion and risk attitudes for gains and losses. The method has previously been used to measure loss aversion in investor risk profiling (van Dolder and Vandenbroucke, 2024); the present paper extends its application to a broader set of behavioral dimensions and compares the resulting preference measures across countries.

We contribute to the literature in five ways. First, we show that the three indifference values elicited by the method of Abdellaoui et al. (2016)—previously used to measure loss aversion (van Dolder and Vandenbroucke, 2024)—also yield measures of risk attitudes in the gain and loss domains, thereby identifying the reflection effect as a shift in risk attitudes between domains. Loss aversion, gain-domain risk aversion, loss-domain risk aversion, and the reflection effect can therefore all be obtained from a single elicitation task, without imposing assumptions on the shapes of the utility or probability-weighting functions.

Second, we provide large-scale cross-country evidence on the joint distribution of loss aversion, risk aversion in the gain and loss domains, and the reflection effect. Our data reveal substantial heterogeneity both within and across countries. The median respondent is loss averse in the United Kingdom and France but approximately loss neutral in Greece, Italy, and Spain, corroborating the finding of Chapman et al. (2025*b*) that loss aversion is less ubiquitous than commonly assumed. Risk aversion for gains is prevalent in all five countries, whereas median risk aversion for losses is close to zero. In contrast to the cross-country variability in loss aversion, the reflection effect—defined as greater risk seeking, or lower risk aversion, for losses than for gains—is observed for the majority of respondents in every country. Of the two reference-dependent features, the reflection effect therefore emerges as the more robust behavioral pattern across countries.

Third, we examine the respondent-level correlates of all four behavioral measures. We find that age, gender, education, investment amount, and investment experience are associated with loss aversion and risk aversion, with qualitatively similar patterns for risk aversion across the gain and loss domains. The reflection effect stands apart as the measure most weakly related to respondent characteristics: gender, education, and investment amount are all insignificant, and age is only marginally so. The one clear exception is investment experience.

Experienced investors show a less pronounced shift in risk attitudes across gain and loss domains, indicating that market participation may dampen domain-specific differences in risk preferences. These patterns are broadly stable across countries.

Fourth, we show that a conventional survey-based risk-attitude elicitation primarily captures attitudes toward risk in the gain domain. The survey measure correlates strongly with the choice-based measure of risk aversion for gains, whereas its correlations with choice-based measures of risk aversion for losses, loss aversion, and the reflection effect are substantially weaker. This finding suggests that standard risk profiles based on such survey measures may overlook important dimensions of behavioral heterogeneity relevant to investment suitability.

Finally, we provide evidence on respondents' acceptance of the method and their willingness to share the resulting data with their financial institution. A majority of respondents across all five countries rate the elicitation method positively, and in the four countries where data sharing was assessed, between 63 and 72 percent agree that their bank should use their behavioral profile to provide better service. These findings speak directly to the policy debate on financial data access and personalized advisory services. The proposed European framework for Financial Data Access (FIDA; European Commission, 2023*b*) underscores the relevance of data portability across institutions, and related guidance notes that digital choice architecture can shape investor decisions and that firms may tailor information to clients' preferences, risk profiles, and investment objectives (ESMA, 2023). Preference measures that are informative, standardized, and portable therefore contribute to investor protection as retail participation in financial markets continues to grow (European Commission, 2022).

The paper proceeds as follows. Section 2 introduces the theoretical framework and derives the measures of loss aversion, risk aversion, and the reflection effect. Section 3 describes the data collection, elicitation task, and survey measures. Section 4 presents the empirical results. Section 5 discusses use cases and implications for financial regulation and practice. Section 6 concludes.

2 Measuring Behavioral Preferences under Prospect Theory

2.1 Theoretical framework

Consider a decision maker who evaluates risky prospects relative to a reference point r. Outcomes above r are perceived as gains and outcomes below r as losses. We focus on binary prospects of the form $x_p y$, which yield x with probability p and y with probability $1-p$. A prospect is mixed if it involves both a gain and a loss. For mixed prospects, the notation $x_p y$

signifies that x is a gain and y is a loss, so that $x > r > y$. A gain prospect has both outcomes weakly above the reference point, whereas a loss prospect has both outcomes weakly below the reference point. For gain and loss prospects, the notation $x_p y$ signifies that x is the outcome farther from the reference point: for gains, $x \geq y \geq r$, whereas for losses, $x \leq y \leq r$. We use the notation $\succ$ for strict preference, $\succsim$ for weak preference, and $\sim$ for indifference.

Under prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992), a mixed prospect is evaluated as

$$w^+(p)\,U(x) \;+\; w^-(1-p)\,U(y), \tag{1}$$

whereas a gain or loss prospect is evaluated as

$$w^i(p)\,U(x) \;+\; \Big[1 - w^i(p)\Big]\,U(y), \tag{2}$$

where $i = +$ for gains and $i = -$ for losses. The function $U(\cdot)$ is strictly increasing and normalized so that $U(r) = 0$. It is defined as a ratio scale, so the utility of one outcome other than the reference point can be chosen freely. The function $w^i(\cdot)$ is a strictly increasing probability-weighting function satisfying $w^i(0) = 0$ and $w^i(1) = 1$. The weighting functions may therefore differ between gains and losses. For binary prospects, several prominent theories of decision under risk—including rank-dependent expected utility (Quiggin, 1982), prospective reference theory (Viscusi, 1989), and disappointment aversion (Gul, 1991)—are special cases of Equations (1) and (2).[1]

We use the common decomposition of the utility function into a basic utility component $u(\cdot)$, which captures attitudes toward outcomes within each domain, and a loss-aversion coefficient $\lambda > 0$, which captures the relative weighting of losses and gains (Sugden, 2003; Köbberling and Wakker, 2005; Kőszegi and Rabin, 2006). Formally,

$$U(x) = \begin{cases} u(x-r) & \text{if } x \geq r, \\ \lambda\, u(x-r) & \text{if } x < r. \end{cases} \tag{3}$$

If $\lambda > 1$, losses receive more weight than commensurate gains; if $\lambda < 1$, gains receive more weight than losses; and if $\lambda = 1$, gains and losses are treated symmetrically.

[1] Cumulative prospect theory can also be formulated for ambiguous prospects, in which probabilities are unknown (Tversky and Kahneman, 1992). In that case, the probability-weighting function $w^i(\cdot)$ is replaced by an event-weighting function $W^i(\cdot)$, which assigns a decision weight $W^i(E)$ to each event E in the state space S, with $W^i(\emptyset) = 0$, $W^i(S) = 1$, and $W^i(E) \geq W^i(F)$ whenever $E \supseteq F$. As with probability weighting, event weighting may differ between gains and losses and need not be additive. The elicitation method we employ can be applied to both risky and ambiguous prospects; in our implementations, we use risky prospects.

2.2 Measuring loss aversion, risk aversion, and the reflection effect

We employ the elicitation method of Abdellaoui et al. (2016). The method elicits three indifference values that can be used to construct a measure of loss aversion without imposing functional-form assumptions on the utility or probability-weighting functions.[2] van Dolder and Vandenbroucke (2024) previously used this method to measure loss aversion in the context of investor risk profiling. We show that the same three indifference values also yield measures of risk attitudes in the gain and loss domains, allowing the reflection effect to be measured as the shift in risk attitudes between domains. Loss aversion, gain-domain risk aversion, loss-domain risk aversion, and the reflection effect can therefore all be obtained from a single elicitation task. Below, we describe the three elicitation steps and derive each measure.

The procedure requires a reference point r, a gain amount $G > r$, and a probability $p \in (0, 1)$.[3] The elicitation proceeds in three steps: a gain prospect, a mixed prospect, and a loss prospect.

Step 1 (gain prospect). We elicit the certainty equivalent x^+ such that $x^+ \sim G_p\, r$. Under prospect theory, this indifference implies

$$U(x^+) = w^+(p)\, U(G). \tag{4}$$

Step 2 (mixed prospect). We elicit the loss L such that $G_p\, L \sim r$. This indifference implies

$$w^+(p)\, U(G) + w^-(1-p)\, U(L) = U(r) = 0. \tag{5}$$

Step 3 (loss prospect). We elicit the certainty equivalent x^- such that $x^- \sim L_{1-p}\, r$. This indifference implies

$$U(x^-) = w^-(1-p)\, U(L). \tag{6}$$

Combining Equations (4) to (6) yields

$$U(x^+) = -U(x^-). \tag{7}$$

[2]The full method introduced by Abdellaoui et al. (2016) consists of three stages. The three elicitation steps we use constitute their first stage. In their second and third stages, they employ the trade-off method of Wakker and Deneffe (1996) to elicit additional points on the utility function for both gains and losses.

[3]The procedure can also start from a fixed loss $L < r$ rather than a fixed gain $G > r$; what matters is that one monetary amount is fixed ex ante. With L fixed instead of G, the mixed-prospect step should precede the gain-prospect step.

Thus, the three elicitations identify a gain x^+ and a loss x^- with equal absolute utility, regardless of the shapes of the utility function $U(\cdot)$ and the probability-weighting functions $w^+(\cdot)$ and $w^-(\cdot)$.

In our implementation, outcomes are expressed as changes relative to the respondent's current position. We therefore set the reference point to zero: gains are positive amounts and losses are negative amounts. We set $p = 0.5$ throughout. This choice is not required for the loss-aversion derivation below, but it is convenient for the risk-attitude indices: it places the risk-neutral certainty equivalent at the midpoint of the prospect's possible outcomes, leaving symmetric scope for deviations toward risk aversion or risk seeking. The value of G depends on the respondent's stated investment amount; we describe this calibration in Section 3.

With these choices in place, we now derive the four behavioral measures from the indifference values x^+, L, and x^-.

Loss aversion. Following Köbberling and Wakker (2005), we define loss aversion as the ratio of the left to the right derivative of $U(\cdot)$ at the reference point. Empirically, these derivatives are approximated by $U(x^-)/x^-$ and $U(x^+)/x^+$, respectively. Given Equation (7), the ratio of these two approximations simplifies to

$$\hat{\lambda} = \frac{x^+}{-x^-}. \tag{8}$$

Risk aversion for gains. Step 1 provides a behavioral measure of the respondent's attitude toward risk in the gain domain. Given that $p = 0.5$, a risk-neutral decision maker has a certainty equivalent of $x^+ = 0.5G$.[4] We define the risk-aversion index for gains as

$$\mathrm{RA}_{\mathrm{gain}} = \frac{0.5G - x^+}{0.5G}. \tag{9}$$

This index equals zero if the respondent is risk neutral, is positive under risk aversion, and is negative under risk seeking.

Risk aversion for losses. Analogously, Step 3 provides a behavioral measure of the respondent's attitude toward risk in the loss domain. Given that $1 - p = 0.5$, a risk-neutral decision maker has a certainty equivalent of $x^- = 0.5L$. We define the risk-aversion index

[4]We use risk aversion in the behavioral sense of preferring a sure amount to a lottery with the same expected value (Yaari, 1969, 1986). This definition does not presuppose any specific decision theory. Under prospect theory, risk aversion for gains—and thus our index—is jointly determined by the curvature of the value function and probability weighting, rather than by utility curvature alone as under expected utility. The same holds for risk aversion for losses.

for losses as

$$\mathrm{RA}_{\mathrm{loss}} = \frac{x^{-} - 0.5L}{0.5L}. \tag{10}$$

As for gains, this index equals zero under risk neutrality, is positive under risk aversion, and is negative under risk seeking.

The reflection effect. Under the reflection effect (Kahneman and Tversky, 1979), respondents who are risk averse for gains tend to be risk seeking for losses. Comparing $\mathrm{RA}_{\mathrm{gain}}$ and $\mathrm{RA}_{\mathrm{loss}}$ reveals whether an individual's risk attitude differs across domains. We define the reflection index as

$$\mathrm{Reflection} = \mathrm{RA}_{\mathrm{gain}} - \mathrm{RA}_{\mathrm{loss}}. \tag{11}$$

A positive value indicates a shift in line with the reflection effect—greater risk seeking, or lower risk aversion, for losses than for gains. A value of zero indicates identical risk attitudes in both domains, and a negative value indicates greater risk aversion for losses than for gains.

3 Implementation

We collected survey data in five European countries: France, Italy, the United Kingdom, Spain, and Greece. Each country sample comprises approximately 5,000 respondents, yielding a combined sample of 25,741.

3.1 Data collection

Respondents were recruited by an international research agency through digital invitations sent to individuals registered in its local panels. Invitations included a link to a secure survey website that hosted the survey and elicitation task. Both the invitations and the website were presented in the country's official language. Participation was voluntary and incentivized through the agency's broader engagement program, in which members accumulate points by contributing to research initiatives throughout the year. The incentive structure was not contingent on respondents' answers.

To ensure respondent anonymity, we had no access to personally identifiable information, while the agency had no access to individual survey responses. The agency stopped distributing invitations once an encrypted signal confirmed that 5,000 complete sessions had been recorded. A session was counted as complete if the respondent reached the final screen, which required answering all obligatory components. Within a complete session, voluntary fields such as education level could still be left blank.

3.2 Survey components

Respondents completed all survey components, including the choice-based preference elicitation, without human assistance. The survey was fully digital and designed to render on mobile, tablet, and desktop devices. Table 1 lists the components in the order presented to respondents and indicates which components were included in each country. In France, the order of the choice-based and survey-based components was randomized; in all other countries, respondents completed the components in the fixed order shown.[5]

The first component administered in all five countries asked respondents to select a representative investment amount. The available amounts were 5K, 10K, 15K, 20K, 25K, 50K, 100K, 500K, and 1,000K, denominated in the local currency. The middle option, 25K, was preselected as the default. Allowing respondents to choose the investment amount was intended to increase engagement and anchor the elicitation in their financial situation.

Respondents then completed the three-step elicitation described in Section 2.2, with $p = 0.5$ and G equal to 20 percent of the respondent's selected investment amount. The 20 percent proportion balances two considerations: the stake should be large enough to feel consequential relative to the respondent's financial situation, yet small enough that the linear approximation underlying our loss-aversion estimate in Equation (8) remains reasonable.

We elicited each indifference value using an adaptive bisection procedure. Within each step, respondents faced a sequence of binary choices, each presented on a separate screen; respondents had to select their preferred option before proceeding. The first iteration presented the sure outcome and the prospect at values that equalized their expected monetary outcomes. Each subsequent iteration adjusted the elicited parameter—the sure outcome in Steps 1 and 3, and the loss amount in Step 2—in the direction implied by the respondent's previous choice, progressively narrowing the interval containing the indifference value.[6] A step terminated once the respondent had switched sides twice, thereby identifying respondent-specific lower and upper bounds on the indifference value; the value was then estimated as the midpoint of these bounds.[7] Amounts shown to respondents were rounded up to multiples

[5]We verified that the distributions of the four behavioral measures and their correlations with the survey-based measures were not meaningfully different across the two orderings in France. We therefore pool both orderings throughout the paper.

[6]In Steps 1 and 3, the first iteration presents a sure outcome of $G/2$ or $L/2$, respectively, against the corresponding 50/50 prospect, and each subsequent iteration halves the remaining interval. In Step 2, the loss amount has no natural finite lower bound. We start from $L = -G$. In the first iteration, if the respondent prefers the status quo, L is adjusted toward zero by $0.75|L|$; if the respondent prefers the prospect, L is multiplied by 1.75. From the second iteration onward, if the respondent has chosen the status quo at least once, both bounds are defined, and standard bisection applies. If the respondent has always preferred the prospect, the lower bound remains undefined; the algorithm then continues to increase $|L|$ by the same step that bisection would use to decrease it, preserving symmetry in step sizes across directions.

[7]If the respondent did not switch sides within seven consecutive choices, the step was terminated, and

Table 1: Survey components

	Component	Description	FR	IT	UK	ES	GR
1	Financial-services attitudes	Views on financial services; FCA Consumer Duty questions			✓		
2	Investment amount selection	Set {5K, . . . , 1,000K} in local currency; 25K default	✓	✓	✓	✓	✓
3	Risk and loss elicitation	$G = 20\%$ of investment amount; $p = 0.5$; bisection (three steps)	✓	✓	✓	✓	✓
4	Graphical choice-based risk-preference elicitation	Visual portfolio comparison as in van Dolder and Vandenbroucke (2024)	✓				
5	Investment objective	Regulatory question with four alternatives		✓	✓	✓	✓
6	Choice-based profile feedback	Behavioral risk profile based on elicited preferences	✓	✓	✓	✓	✓
7	Method evaluation	Three five-point Likert items; FR and UK included an additional item	✓	✓	✓	✓	✓
8	Data-sharing willingness	Two-layered question on data usage and storage		✓	✓	✓	✓
9	Respondent characteristics	Demographics; education levels: FR 10, IT 6, UK/ES/GR 4 categories	†	✓	✓	✓	✓
10	Survey-based risk attitude	Four response options from "Stability, low return" to "Highest return, more risk"	✓	✓	✓	✓	✓
11	Survey-based loss attitude	Four response options from "Sell immediately" to "Consider buying more"	✓	✓	✓	✓	✓
12	Survey-based profile feedback and method comparison	Profile based on survey responses; preference for choice-based or survey-based method	✓				

Notes: The table lists all survey components in the order presented to respondents. For respondent characteristics, † indicates that the information was provided by the research agency rather than collected as a survey component. FR = France, IT = Italy, UK = United Kingdom, ES = Spain, GR = Greece.

of 10, or 5 for small magnitudes; the final estimate was rounded to the nearest multiple of 5.[8] Table A1 in the appendix provides an example for each step.

After completing the choice-based elicitation, respondents received a plain-language description of their investor profile. The profile was based on a 4×4 categorization of risk and loss attitudes, yielding 16 possible outcomes. Respondents were then invited to evaluate

the respondent proceeded to the next step. The number of iterations within each step was thus respondent-specific.

[8]The exact rule is as follows. Let A denote the absolute value of the displayed amount and B the absolute value of the adjustment that the current iteration makes to the displayed amount. The displayed amount is rounded up to a multiple of 10 whenever both $A > 50$ and $B > 30$, and to a multiple of 5 otherwise. The final indifference-value estimate is always rounded to the nearest multiple of 5.

the method using three statements—"I like this method, it made me think," "I think it was worth the effort," and "The method was easy to understand"—each rated on a five-point Likert scale.

The survey also collected demographic information, including gender, age, education, investment experience, and risk-profiling experience. Education categories were country-specific, reflecting local educational systems: France used 10 levels, Italy 6, and the United Kingdom, Spain, and Greece 4 each. In France, demographic data were provided directly by the local research agency, so education information was available for all respondents; in the other four countries, education was a voluntary survey item.[9]

Finally, respondents completed two survey-based questions that served as benchmarks for comparison with the choice-based measures. The first asked respondents to indicate their attitude toward risk by selecting one of four response options: "Stability, low return," "Limited risk, safe investing," "Return, more risk," or "Highest return, more risk." The second asked how they would react to a hypothetical investment-loss scenario, again with four response options: "Sell immediately," "Consult a financial expert," "Do nothing because I invest for the long term," or "Consider buying more."

Beyond these common components, the French survey included a graphical choice-based risk-preference elicitation (van Dolder and Vandenbroucke, 2024) and, at the end, a survey-based profile followed by a method-preference question in which respondents indicated whether they preferred the choice-based or the survey-based method.[10] The UK survey included questions on financial services and the Financial Conduct Authority's Consumer Duty. The Italian, UK, Spanish, and Greek surveys each included a regulatory-inspired investment-objective question and a two-layered question on respondents' willingness to share their behavioral profile data with their bank.

3.3 Sample description

Table 2 summarizes the key characteristics of each country sample. The French survey was conducted in November 2022, the Italian survey in June 2023, the UK survey in October

[9]The response rate for education was 85 percent in Greece, 71 percent in the United Kingdom, 65 percent in Italy, and 55 percent in Spain.

[10]Because the choice-based arm included the graphical risk-preference elicitation, it was longer and more demanding than the three-step task alone. In addition, the order of the choice-based and survey-based components was randomized in France. Responses exhibited a strong primacy effect: respondents tended to prefer whichever method they encountered first. Among those shown the choice-based method first, 57.9 percent preferred it, whereas among those shown the survey-based method first, only 39.5 percent did. Because stated preferences largely reflect presentation order, and because the comparison also involved a more demanding graphical risk-preference elicitation that is not part of the current paper, we do not consider this item further.

Table 2: Sample overview

	France	Italy	UK	Spain	Greece
Survey period	Nov 2022	Jun 2023	Oct 2023	May 2025	Jun 2025
Respondents (N)	5,100	5,121	5,022	5,191	5,307
Female (%)	51.1	48.4	51.1	61.9	47.7
Investor experience (%)	48.1	41.0	42.0	40.2	46.3
Profiling experience (%)	32.6	40.6	17.3	24.0	27.4
Median age [IQR]	45 [35–61]	47 [36–61]	52 [39–64]	45 [35–55]	42 [31–51]

Notes: The table reports key sample characteristics for each country. Investor experience and profiling experience indicate the percentage of respondents who reported having investment experience and prior risk-profiling experience, respectively. Education is excluded from this overview because categories are country-specific and education information is missing for part of the sample in several countries. Table A2 in the Appendix reports the full distribution of education levels for each country and the high/low education classification used in the regression analyses.

2023, and the Spanish and Greek surveys in May and June 2025, respectively. Each dataset was collected in less than two weeks. The final number of respondents slightly exceeds the target of 5,000 per country because additional invitations had already been distributed by the time the quota of completed responses was reached.

Across countries, the demographic composition of respondents is broadly similar, with near-balanced gender distributions and a majority of individuals without prior investment experience.[11] Spain has the highest share of female respondents, at 61.9 percent. Respondents in the United Kingdom have the highest median age (52), whereas respondents in Greece have the lowest median age (42). Investment experience ranges from 40.2 percent in Spain to 48.1 percent in France. Prior risk-profiling experience is less common, ranging from 17.3 percent in the United Kingdom to 40.6 percent in Italy. The fact that most respondents lack investment experience is relevant for our setting, because a practical risk-preference elicitation tool should be usable by individuals with limited financial-market experience.

[11] In the regression analyses, we collapse the country-specific education variables into a binary indicator, Education (high), which captures higher education according to each country's education system and is comparable across countries. Table A2 in the Appendix provides further detail on this binary categorization. Among respondents with non-missing education information, the share classified as high education is 49 percent in France, 60 percent in Greece, 43 percent in the United Kingdom, 39 percent in Italy, and 54 percent in Spain.

4 Results

4.1 Loss aversion

Figure 1 shows the distribution of the loss-aversion coefficient by country, and Table 3, Panel A, reports the corresponding summary statistics.[12] The median respondent in the United Kingdom and France is loss averse, with median coefficients of 1.63 and 1.49, respectively. In Greece, Italy, and Spain, the median coefficient is at or close to 1.00, indicating that the median respondent in these countries is approximately loss neutral.

Our findings are broadly consistent with the existing literature on loss aversion. The median coefficients in the United Kingdom (1.63) and France (1.49) fall within the range of previous estimates. Using the same elicitation method, Abdellaoui et al. (2016) report a median of 1.88 in a laboratory experiment with student subjects, while van Dolder and Vandenbroucke (2024) report medians of 1.20 for Belgian bank clients, 1.59 for Belgian bank employees, and 1.88 for Irish investment clients. The meta-analysis by Brown et al. (2022) estimates a median loss-aversion coefficient of approximately 1.5 across studies, but documents substantial heterogeneity across elicitation methods, subject pools, and countries.

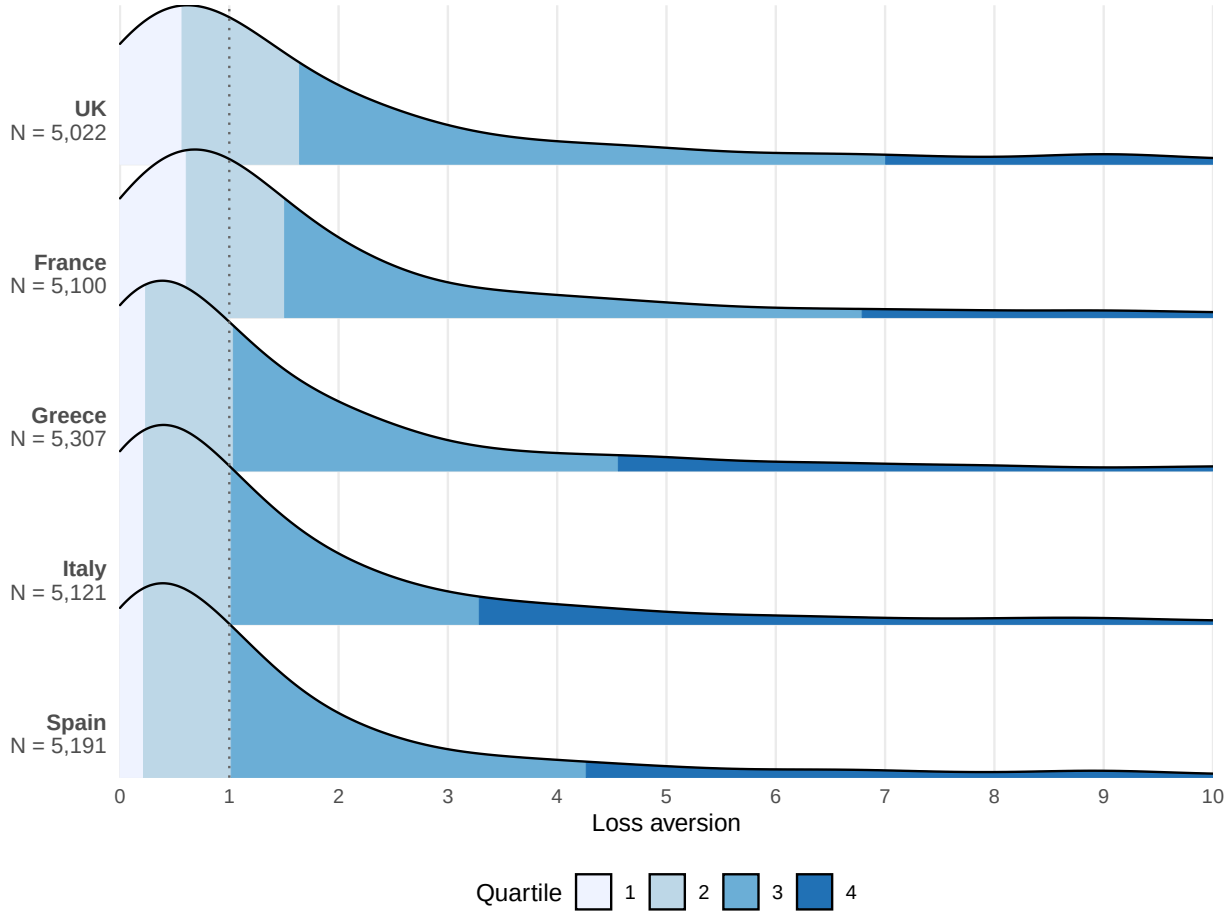
The results for Greece, Italy, and Spain align with recent evidence that loss aversion is less prevalent than commonly assumed. Chapman et al. (2025*a*,*b*) find substantial heterogeneity in loss attitudes in large-scale, incentivized, representative surveys of the US population, with the median respondent approximately loss neutral and a substantial fraction gain seeking. Cross-country comparisons further suggest that loss aversion varies considerably across cultures (l'Haridon and Vieider, 2019; Vieider et al., 2015). Our results extend this evidence by documenting a loss-neutral median in samples from three southern European countries. The wide interquartile ranges in every country, however, indicate considerable individual-level heterogeneity, consistent with the finding of Chapman et al. (2025*b*) that a neutral or gain-seeking median can coexist with a substantial loss-averse subpopulation.

4.2 Risk aversion for gains

Figure 2 shows the distribution of risk aversion for gains by country, and Table 3, Panel B, reports the corresponding summary statistics. A large majority of respondents are risk averse for gains in all five countries, with the share ranging from 74 percent in France to 81 percent in the United Kingdom and Italy. The median risk-aversion coefficient ranges from 0.50 in France to 0.69 in Italy, Spain, and Greece, indicating a marked preference for certainty over a

[12] Throughout the paper, countries are ordered by the median loss-aversion coefficient, from the United Kingdom (highest) to Spain (lowest). This ordering is preserved across all figures and tables to facilitate visual comparison.

Figure 1: Distribution of loss aversion by country



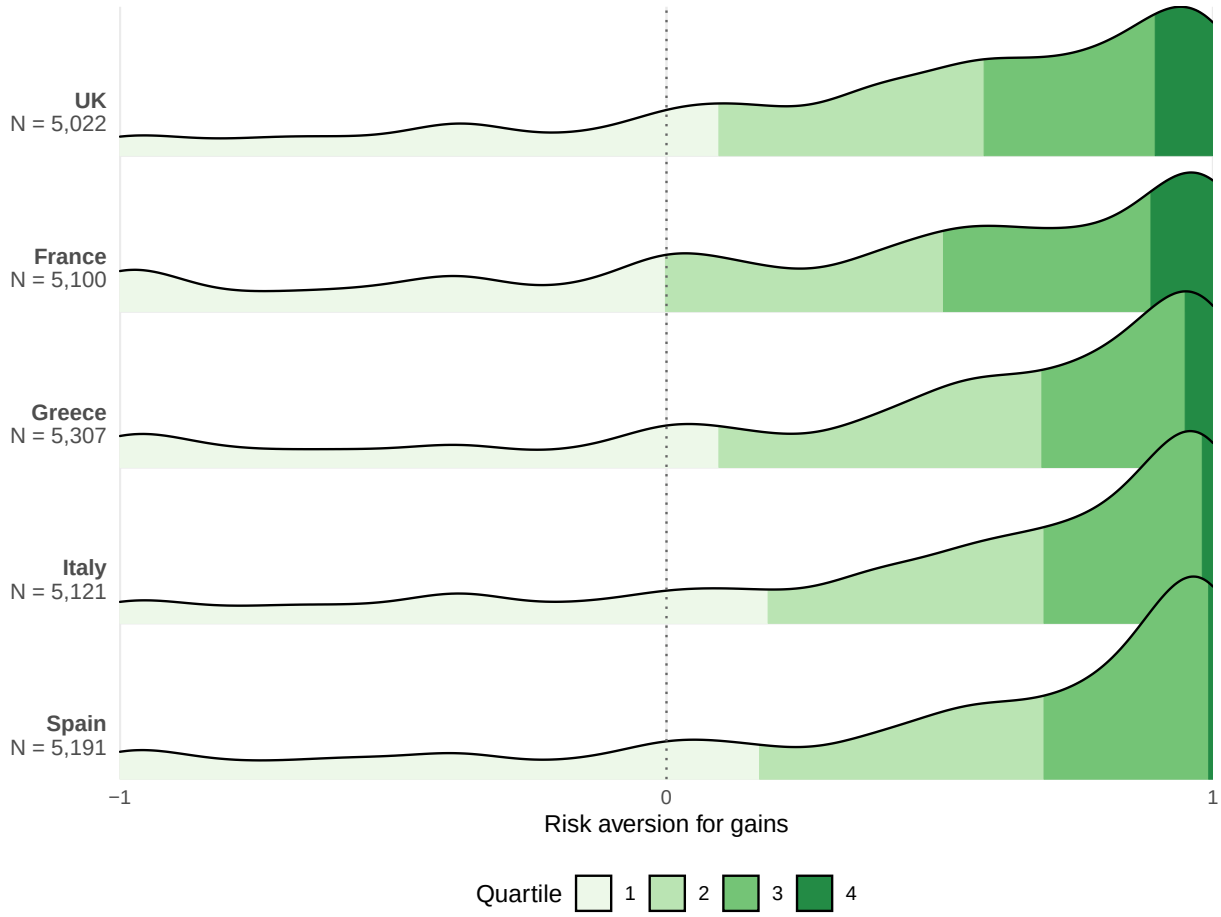
Notes: The figure shows ridge plots of the distribution of the loss-aversion coefficient by country. Loss aversion is defined as $-x^+/x^-$, where x^+ and x^- are the certainty equivalents for the gain and loss prospects, respectively. Values greater than one indicate loss aversion; values less than one indicate gain seeking, meaning that gains receive greater weight than commensurate losses. Countries are ordered by the median loss-aversion coefficient, from the United Kingdom (highest) to Spain (lowest); this ordering is preserved throughout the paper.

Table 3: Summary statistics for behavioral measures by country

Country	N	Median [IQR]	% Averse	% Seeking	% Neutral
Panel A: Loss aversion					
UK	5,022	1.63 [0.56—7.00]	61	33	6
France	5,100	1.49 [0.60—6.78]	59	34	6
Greece	5,307	1.02 [0.23—4.54]	50	45	5
Italy	5,121	1.00 [0.21—3.29]	47	47	5
Spain	5,191	1.00 [0.20—4.26]	47	45	8
Panel B: Risk aversion for gains					
UK	5,022	0.58 [0.09—0.89]	81	19	0
France	5,100	0.50 [0.00—0.88]	74	26	0
Greece	5,307	0.69 [0.09—0.95]	80	20	0
Italy	5,121	0.69 [0.18—0.98]	81	19	0
Spain	5,191	0.69 [0.17—0.99]	80	20	0
Panel C: Risk aversion for losses					
UK	5,022	0.00 [−0.50—0.51]	50	46	4
France	5,100	0.00 [−0.59—0.55]	47	47	6
Greece	5,307	0.00 [−0.73—0.55]	47	50	3
Italy	5,121	0.00 [−0.50—0.51]	50	46	3
Spain	5,191	0.01 [−0.54—0.76]	52	44	4
Panel D: Reflection effect					
UK	5,022	0.36 [−0.01—0.91]	33	67	0
France	5,100	0.26 [−0.14—0.96]	38	62	0
Greece	5,307	0.42 [−0.01—1.04]	29	71	0
Italy	5,121	0.42 [0.00—0.99]	28	71	0
Spain	5,191	0.33 [−0.01—0.99]	34	66	0

Notes: The table reports summary statistics for four behavioral measures by country. N is the number of respondents. Median and interquartile range [IQR] are reported. The columns Averse, Seeking, and Neutral report the percentage of respondents in each category. In Panel A, these correspond to loss averse (> 1), gain seeking (< 1), and neutral ($= 1$). In Panels B and C, the categories correspond to risk averse (> 0), risk seeking (< 0), and risk neutral ($= 0$). In Panel D, Averse denotes respondents who are more risk averse for losses than for gains, Seeking denotes respondents who are more risk seeking for losses than for gains, and Neutral denotes respondents with no shift in risk attitudes across domains.

Figure 2: Distribution of risk aversion for gains by country

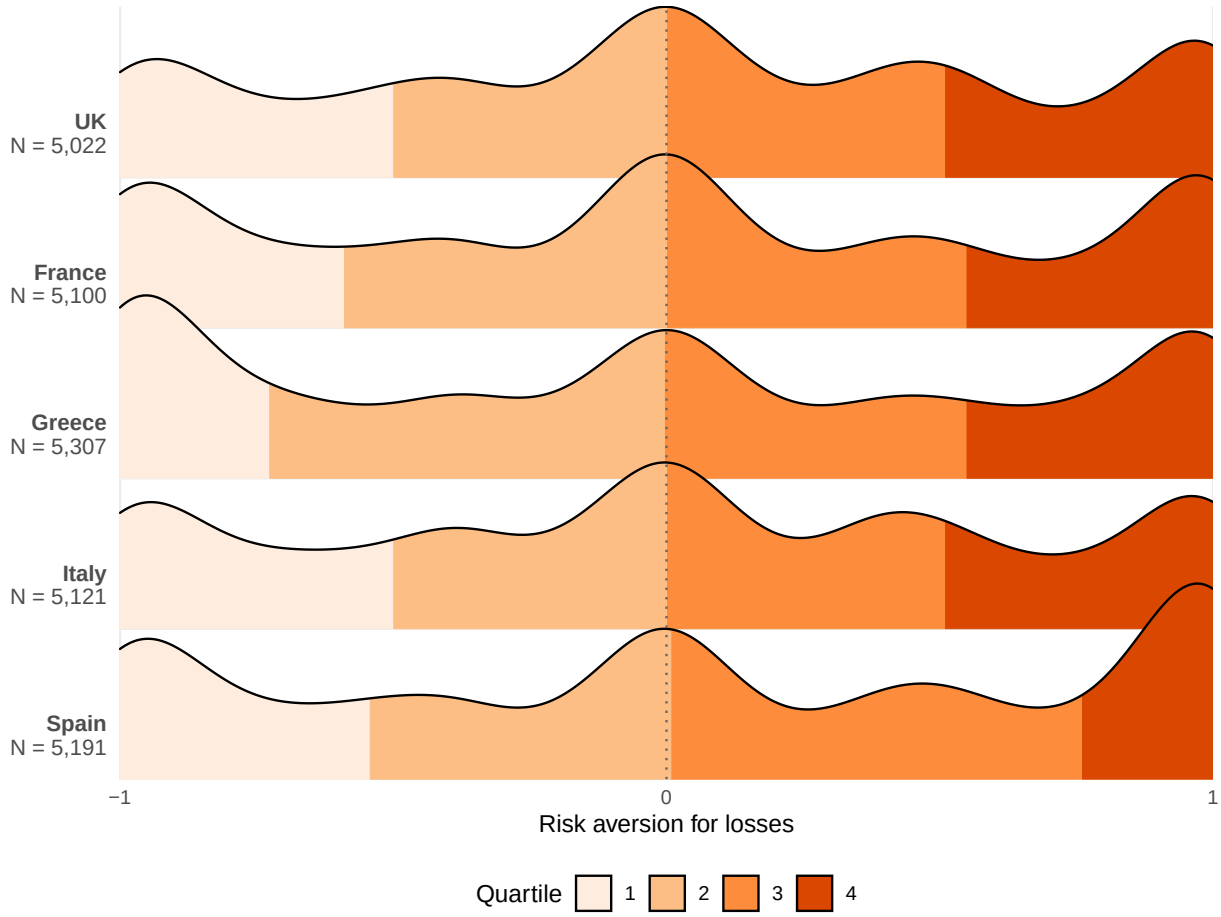


Notes: The figure shows ridge plots of the distribution of risk aversion for gains by country. Risk aversion for gains is defined as $1 - 2(x^+/G)$, where x^+ is the certainty equivalent and G is the gain stake. The index equals zero under risk neutrality, is positive under risk aversion, and is negative under risk seeking.

fair prospect in the gain domain; the wide interquartile ranges nevertheless reflect substantial heterogeneity in the strength of this preference.

These findings are consistent with the existing literature. Risk aversion for gains has been documented in canonical incentivized designs (Holt and Laury, 2002; Andersen et al., 2008) and across diverse cross-country samples (Vieider et al., 2015). Within prospect theory, two well-documented features both predict $x^+ < 0.5G$: concavity of the value function over gains and probability weighting that underweights moderate probabilities, with $w^+(0.5)$ typically estimated below 0.5 (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992; Wu and Gonzalez, 1996; Prelec, 1998; Gonzalez and Wu, 1999; Imai et al., 2026). Our index captures the overall tendency to value a prospect below its expected value; it does not separate these two channels.

Figure 3: Distribution of risk aversion for losses by country



Notes: The figure shows ridge plots of the distribution of risk aversion for losses by country. Risk aversion for losses is defined as $2(x^{-}/L) - 1$, where x^{-} is the certainty equivalent and L is the loss stake. The index equals zero under risk neutrality, is positive under risk aversion, and is negative under risk seeking.

4.3 Risk aversion for losses

Figure 3 shows the distribution of risk aversion for losses by country, and Table 3, Panel C, reports the corresponding summary statistics. In contrast to the gain domain, the median respondent is approximately risk neutral for losses in all five countries, with median coefficients at or close to zero. Respondents are roughly evenly split between risk aversion and risk seeking, with the share classified as risk averse ranging from 47 percent in France and Greece to 52 percent in Spain. The interquartile ranges are wide and span both positive and negative values in every country, indicating that the near-zero medians mask considerable individual-level heterogeneity.

Our finding of approximate risk neutrality in the loss domain is consistent with evidence

that utility over losses is closer to linear than strongly convex (Bouchouicha and Vieider, 2017; Abdellaoui et al., 2013), and with meta-analytic estimates suggesting approximately neutral probability weighting at $p = 0.5$ in the loss domain (Imai et al., 2026). As for gains, our index captures the overall certainty equivalent relative to the prospect's expected value; it does not separate utility curvature from probability weighting.

4.4 The reflection effect

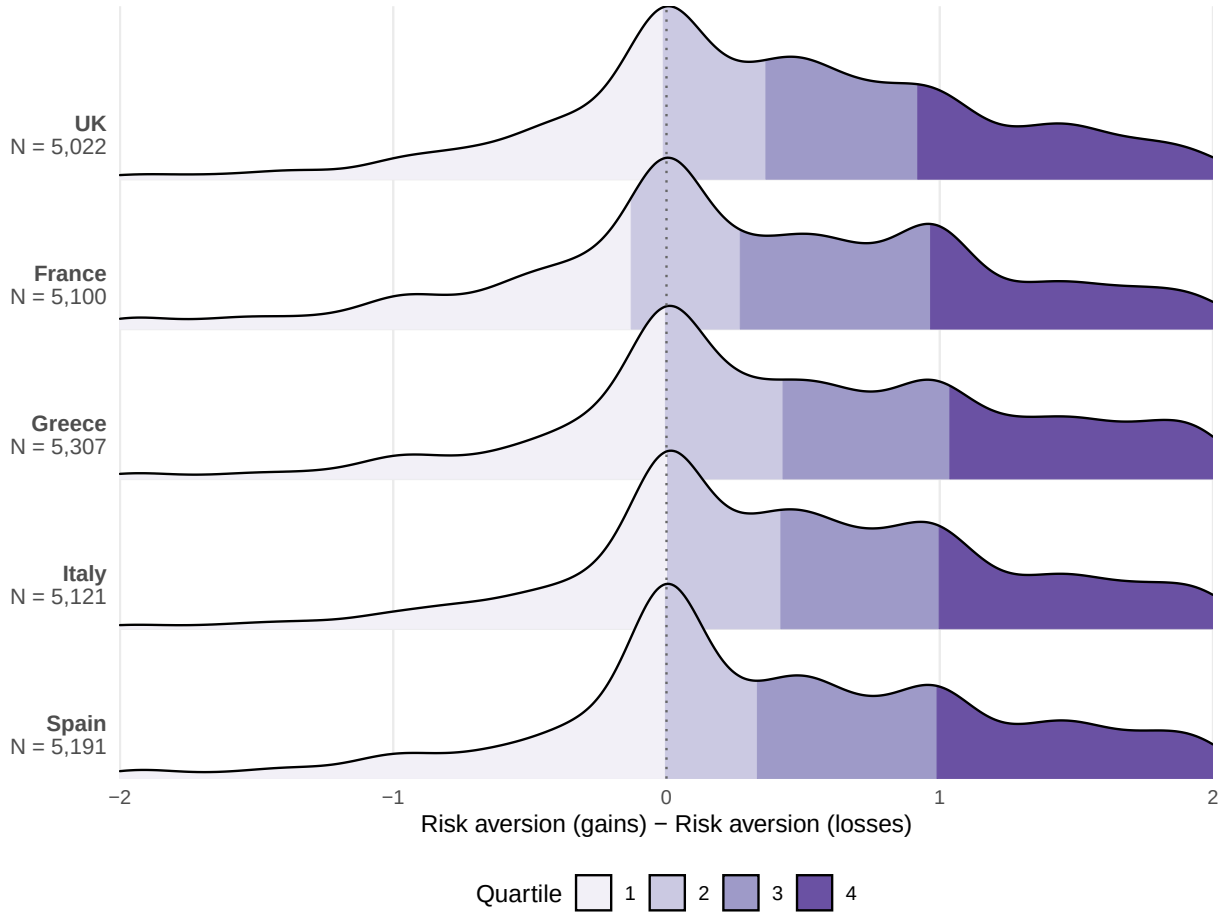
Figure 4 shows the distribution of the reflection index by country and Table 3, Panel D, provides the corresponding summary statistics. The median reflection index is positive in all five countries, ranging from 0.26 in France to 0.42 in Greece and Italy, indicating that the typical respondent is more risk averse for gains than for losses, consistent with the reflection effect described by Kahneman and Tversky (1979). Between 62 and 71 percent of respondents exhibit this pattern. The wide interquartile ranges indicate, however, that a substantial minority displays the opposite pattern.

The positive median reflection index in all five countries confirms the classic aggregate pattern (Kahneman and Tversky, 1979), which has been shown to replicate across many paradigms and populations (e.g., Vieider et al., 2015). Table 4 cross-tabulates risk attitudes for gains and losses and shows, however, that the within-person reflection pattern is far from dominant (cf. Schneider and Lopes, 1986; Schoemaker, 1990). Two patterns account for approximately three quarters of the sample in each country: risk aversion in *both* domains (36 to 43 percent), and risk aversion for gains combined with risk seeking for losses—the pattern predicted by the reflection effect (32 to 38 percent). The remaining respondents are either risk seeking in both domains (11 to 15 percent) or risk seeking for gains combined with risk aversion for losses (7 to 11 percent).

Figure 5 plots risk aversion for gains against risk aversion for losses and reveals a weak but positive correlation between the two measures in all countries: respondents who are more risk averse for gains tend to be somewhat more risk averse for losses as well. This coexistence of an aggregate-level shift consistent with the reflection effect and a positive individual-level correlation has been documented in prior work (Abdellaoui, 2000; Abdellaoui et al., 2008; Tymula et al., 2013; Vieider et al., 2015).[13] The correlation is modest, however, with OLS slope coefficients between 0.15 and 0.20 across countries. At the same time, the concentration of respondents in the upper-left region of each panel—highly risk averse for gains yet highly risk seeking for losses—indicates that a minority does exhibit the classic

[13]The direction of the individual-level correlation is not universal. Schoemaker (1990) reports correlations of -0.22 to -0.38 between risk aversion for gains and losses, and Shen and Zhong (2025) find no significant correlation in a large-scale Chinese sample.

Figure 4: Distribution of the reflection index by country



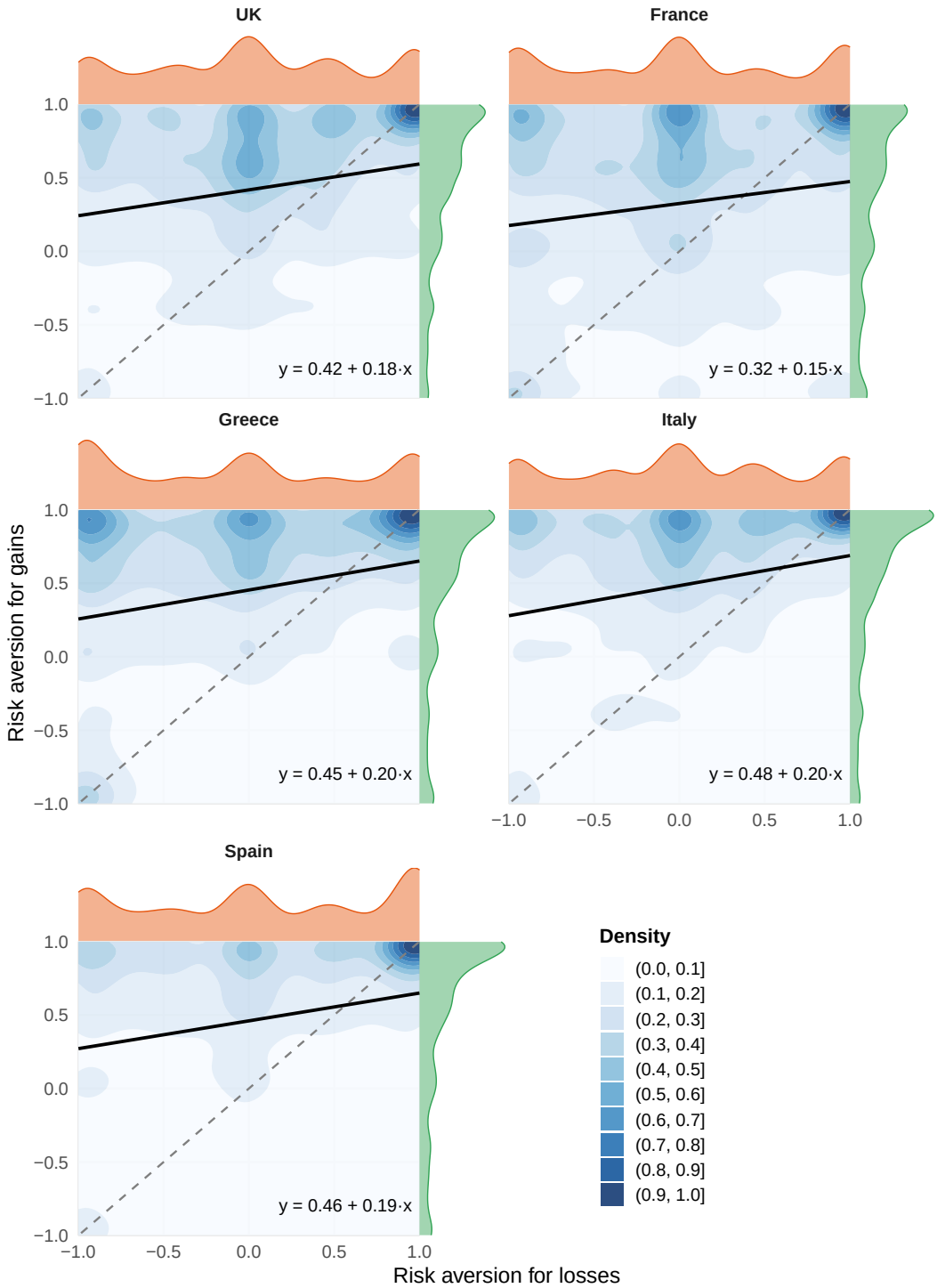
Notes: The figure shows ridge plots of the distribution of the reflection index by country. The reflection index is defined as the difference between risk aversion for gains and risk aversion for losses. Positive values indicate that a respondent is more risk seeking, or less risk averse, for losses than for gains—the standard reflection effect.

Table 4: Cross-tabulation of risk attitudes for gains and losses

	Losses			
Gains	Risk averse	Risk seeking	Risk neutral	Total
Panel A: UK				
Risk averse	2,147 (43%)	1,727 (34%)	174 (3%)	4,048 (81%)
Risk seeking	376 (7%)	569 (11%)	29 (1%)	974 (19%)
Risk neutral	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	2,523 (50%)	2,296 (46%)	203 (4%)	5,022 (100%)
Panel B: France				
Risk averse	1,846 (36%)	1,656 (32%)	260 (5%)	3,762 (74%)
Risk seeking	569 (11%)	744 (15%)	25 (0%)	1,338 (26%)
Risk neutral	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	2,415 (47%)	2,400 (47%)	285 (6%)	5,100 (100%)
Panel C: Greece				
Risk averse	2,113 (40%)	1,994 (38%)	127 (2%)	4,234 (80%)
Risk seeking	377 (7%)	685 (13%)	11 (0%)	1,073 (20%)
Risk neutral	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	2,490 (47%)	2,679 (50%)	138 (3%)	5,307 (100%)
Panel D: Italy				
Risk averse	2,215 (43%)	1,766 (34%)	152 (3%)	4,133 (81%)
Risk seeking	362 (7%)	606 (12%)	20 (0%)	988 (19%)
Risk neutral	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	2,577 (50%)	2,372 (46%)	172 (3%)	5,121 (100%)
Panel E: Spain				
Risk averse	2,251 (43%)	1,698 (33%)	187 (4%)	4,136 (80%)
Risk seeking	446 (9%)	587 (11%)	22 (0%)	1,055 (20%)
Risk neutral	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	2,697 (52%)	2,285 (44%)	209 (4%)	5,191 (100%)

Notes: The table cross-tabulates risk attitudes for gains (rows) and losses (columns) for each country separately. Cell entries show the count and percentage of respondents. Panels A through E correspond to the UK, France, Greece, Italy, and Spain, respectively.

Figure 5: Risk aversion for gains versus losses by country



Notes: The figure shows filled 2D kernel density plots of risk aversion for gains (y-axis) against risk aversion for losses (x-axis), with marginal density plots, for each country separately. Darker shading indicates higher density. The solid line is an OLS fit; the dashed line is the 45-degree line. Marginal densities are shown in green (gains) and orange (losses).

within-person reversal of risk attitudes.

Taken together, the aggregate reflection pattern emerges primarily from a distributional shift rather than from individuals systematically reversing their risk attitudes across domains, although a non-negligible minority does display a full reversal.

4.5 Correlates of behavioral preferences

We now examine how the median of each behavioral measure relates to respondent characteristics.[14] Table 5 reports the pooled median quantile regression results, and Figure 6 provides a visual overview of the estimated coefficients and their 90 percent confidence intervals from the pooled specification and the country-specific regressions (full results appear in Table A5 in the Appendix).

The investment amount is significantly related to all four measures. Because it is self-selected, however, these associations should be interpreted with caution: respondents who are less risk averse, for example, may report a higher amount, which in turn determines the stakes used in the elicitation. This endogenous selection of stakes can plausibly account for the negative association between investment amount and risk aversion for gains and losses. It is less likely, however, to explain the positive association with loss aversion, which is consistent with independent evidence that loss aversion is more pronounced at larger stakes (Harinck et al., 2007; Mukherjee et al., 2017; van Dolder and Vandenbroucke, 2024).

Risk aversion for both gains and losses increases with age, in line with a growing literature documenting rising risk aversion over the adult life course (Tymula et al., 2013; Josef et al., 2016; Mata et al., 2016; Dohmen et al., 2017). Loss aversion and the reflection effect are weakly and negatively related to age, though only at the ten percent significance level. The weak relationship between age and loss aversion is consistent with Chapman et al. (2025*b*) and van Dolder and Vandenbroucke (2024), neither of whom reports robust age effects.[15]

Gender is systematically related to three of the four measures. Women are significantly less loss averse and more risk averse for both gains and losses. These risk-aversion differences accord with the well-documented finding that women tend to be more risk averse (Byrnes et al., 1999; Croson and Gneezy, 2009; Charness and Gneezy, 2012; Vieider et al., 2015),

[14] Summary statistics for all variables used in the regressions and Kendall's τ rank correlation matrices are reported in Tables A3 and A4 in the Appendix.

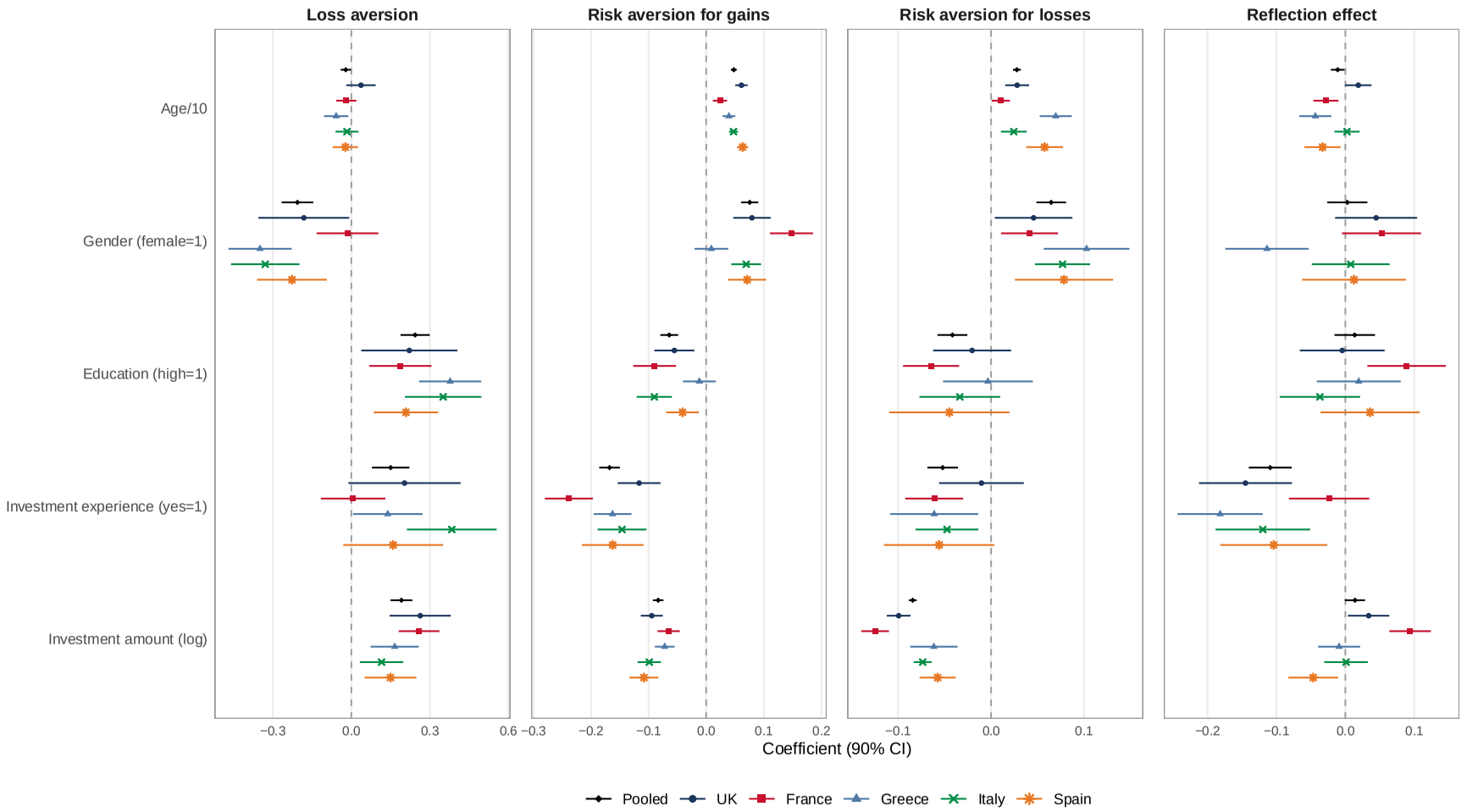
[15] We also consider quadratic age effects; the results are reported in Table A6 in the Appendix. Including the quadratic term does not alter the substantive conclusions, although it makes the age effects less straightforward to interpret. Wald tests indicate that the quadratic term is not statistically significant for loss aversion or the reflection effect ($F = 0.52$, $p = 0.471$; $F = 0.20$, $p = 0.652$). For risk aversion for gains and losses, it is statistically significant ($F = 10.34$, $p = 0.001$; $F = 5.19$, $p = 0.023$). However, because the implied turning points lie outside the observed age range in all specifications, the in-sample relationships remain effectively monotone.

Table 5: Pooled quantile regression results

	LA	RA_{gain}	RA_{loss}	Reflection
Age/10	-0.021*	0.048***	0.028***	-0.011*
	(0.012)	(0.003)	(0.003)	(0.006)
Gender (female=1)	-0.206***	0.076***	0.065***	0.003
	(0.037)	(0.009)	(0.010)	(0.018)
Education (high=1)	0.244***	-0.064***	-0.042***	0.014
	(0.034)	(0.009)	(0.010)	(0.018)
Investment experience (yes=1)	0.150***	-0.168***	-0.052***	-0.109***
	(0.044)	(0.011)	(0.010)	(0.019)
Investment amount (log)	0.191***	-0.083***	-0.084***	0.014
	(0.025)	(0.006)	(0.003)	(0.009)
France	-0.156**	-0.014	0.006	-0.090***
	(0.064)	(0.015)	(0.012)	(0.027)
Greece	-0.415***	0.102***	-0.060***	0.086***
	(0.061)	(0.014)	(0.017)	(0.026)
Italy	-0.542***	0.122***	0.009	0.069***
	(0.064)	(0.013)	(0.017)	(0.025)
Spain	-0.399***	0.113***	0.036*	-0.001
	(0.060)	(0.015)	(0.020)	(0.030)
Constant	-0.194	1.193***	0.712***	0.305***
	(0.242)	(0.055)	(0.028)	(0.091)
Observations	19,287	19,287	19,287	19,287

Notes: The table reports coefficients from median quantile regressions estimated on the pooled sample from all five countries. Each column corresponds to a different dependent variable: loss aversion (LA), risk aversion for gains (RA_{gain}), risk aversion for losses (RA_{loss}), and the reflection effect (Reflection). The United Kingdom serves as the reference category for the country indicators. Age is measured in years and divided by 10 for scaling. Gender is a dummy variable equal to one for female respondents. Education is a dummy variable equal to one for respondents with a university degree or higher. Investment experience is a dummy variable equal to one for respondents who report prior investment experience. Investment amount is the natural logarithm of the reported amount available for investment. Standard errors are in parentheses. Asterisks denote significance at the one ***, five **, and ten * percent levels, respectively.

Figure 6: Coefficient estimates by outcome and country



Notes: The figure shows coefficient estimates and 90 percent confidence intervals from median quantile regressions. Each panel corresponds to a different dependent variable. Black diamonds show pooled estimates with country fixed effects (the United Kingdom is the reference category); colored markers show country-specific estimates. All variables are defined as in Table 5.

whereas prior evidence on gender differences in loss aversion is mixed (Bouchouicha et al., 2019). Gender is not significantly associated with the reflection effect.

Education is positively associated with loss aversion and negatively associated with risk aversion for both gains and losses, but is not significantly related to the reflection effect. The negative education–risk-aversion relationship is in line with evidence that higher cognitive ability and education are associated with greater risk tolerance (Dohmen et al., 2010, 2011). The positive education–loss-aversion relationship is consistent with Chapman et al. (2025*a*,*b*), who document a positive association between loss aversion and cognitive ability, and with van Dolder and Vandenbroucke (2024), who reports higher loss aversion among more educated respondents.

Investment experience is significantly associated with all four measures. Experienced investors are more loss averse, less risk averse for both gains and losses, and display a weaker reflection effect. As with the investment amount, the direction of causality is ambiguous: less risk-averse individuals are more likely to enter financial markets, so investment experience may partly reflect pre-existing preferences. For loss aversion, however, the selection argument is less straightforward: if anything, more loss-averse individuals might be expected to avoid risky markets, yet experienced investors in our data are more loss averse. This finding is consistent with Haigh and List (2005), who find that professional traders display greater myopic loss aversion than students. Investment experience is also the only respondent characteristic that significantly predicts the reflection effect: experienced investors shift their risk attitudes less between the gain and loss domains than inexperienced respondents do. Because the regressions control for the self-selected investment amount, this association does not simply reflect experienced investors choosing different stakes. Moreover, the absence of a comparable effect for education suggests that the association is not merely capturing broader differences in cognitive ability. Taken together, these patterns suggest that market experience may attenuate the domain dependence of risk attitudes.

The country indicators point to significant cross-country differences. Relative to the United Kingdom, respondents in all four other countries are significantly less loss averse, with Italy showing the largest difference. Risk aversion for gains is significantly higher in Greece, Italy, and Spain than in the United Kingdom, whereas France does not differ significantly from the UK. Risk aversion for losses varies less across countries, although Greek respondents are significantly less risk averse for losses. The reflection effect also varies across countries: relative to the United Kingdom, it is significantly weaker in France, significantly stronger in Greece and Italy, and not significantly different in Spain.

Taken together, the results show that the four behavioral measures have distinct empirical profiles. Loss aversion is higher among respondents who report larger investment amounts,

have a university degree, and have prior investment experience, but lower among women. Risk aversion for gains and losses is instead higher among women and older respondents, and lower among more educated individuals and more experienced investors. The reflection effect is less strongly related to respondent characteristics than the other measures, though it is weakly lower among older respondents and significantly lower among experienced investors, suggesting that market participation is associated with weaker domain-specific shifts in risk preferences. The country-specific regressions in Figure 6 and Table A5 confirm these pooled patterns while revealing some heterogeneity in the strength and significance of individual predictors.

4.6 Comparison with Survey-Based Measures

The survey included two questionnaire items as benchmarks for the choice-based measures (Section 3.2). Both items are representative of question formats widely used in investor risk-profiling questionnaires.

The first item measured risk attitude. Respondents were asked "Which scenario do you prefer?" and selected one of four options: (1) "Stability, low return—Stability is paramount, and return is secondary. I can live with low returns"; (2) "Limited risk, safe investing—I am willing to take some risk to increase my returns, but I prefer safe investments for the bulk of my assets"; (3) "Return, more risk—Return and limiting risk are both essential for me. But I realize if I want more return, I'll have to take some risk"; or (4) "Highest return, more risk—I go for the highest return in the long term and am willing to take more risk. I can live with value fluctuations of my investments." This preference-scenario format is a standard feature of suitability questionnaires. We reverse-code the item so that higher values indicate greater risk aversion.

The second item measured loss attitude. Respondents were presented with a hypothetical investment loss: "Two years ago, you invested 5,000 [local currency]. You hoped that after two years your investment would amount to 5,250—a net gain of 5%. But now it appears that your investment is only worth 4,250—a downturn of 15%. How would you react?" Response options were: (1) "I am quickly selling and maybe searching for a safer investment"; (2) "I am feeling unsure and want to consult with my financial expert"; (3) "I am doing nothing because I invest for the long term"; or (4) "I am considering buying more." Reaction-to-loss scenarios of this kind are used in financial practice to gauge loss sensitivity. We reverse-code the item so that higher values indicate greater loss aversion.

Table 6 reports Kendall's τ rank correlations between the two survey measures and the four choice-based measures, for each country separately and for the pooled sample. The survey risk-attitude measure is most strongly correlated with the choice-based measure of risk

Table 6: Kendall's τ correlations between survey and choice-based measures

	LA	RA_{gain}	RA_{loss}	Reflection
Panel A: Survey-based risk attitude				
UK	$-.125^{***}$	$.359^{***}$	$.141^{***}$	$.113^{***}$
France	$-.034^{***}$	$.295^{***}$	$.142^{***}$	$.087^{***}$
Greece	$-.140^{***}$	$.292^{***}$	$.115^{***}$	$.100^{***}$
Italy	$-.151^{***}$	$.370^{***}$	$.133^{***}$	$.138^{***}$
Spain	$-.147^{***}$	$.348^{***}$	$.174^{***}$	$.081^{***}$
Pooled	$-.125^{***}$	$.334^{***}$	$.140^{***}$	$.106^{***}$
Panel B: Survey-based loss attitude				
UK	$-.063^{***}$	$.080^{***}$	$.043^{***}$	$.030^{***}$
France	$-.033^{***}$	$.139^{***}$	$.084^{***}$	$.027^{**}$
Greece	$-.060^{***}$	$.058^{***}$	.011	$.021^{**}$
Italy	$-.082^{***}$	$.048^{***}$	$.043^{***}$	.008
Spain	$-.089^{***}$	$.065^{***}$	$.039^{***}$	.017
Pooled	$-.066^{***}$	$.079^{***}$	$.044^{***}$	$.021^{***}$

Notes: The table reports Kendall's τ rank correlation coefficients between the two survey-based measures and the four choice-based behavioral measures. Panel A reports correlations with the survey-based risk-attitude measure, reverse-coded so that higher values indicate greater risk aversion. Panel B reports correlations with the survey-based loss-attitude measure, reverse-coded so that higher values indicate greater loss aversion. Asterisks denote significance at the one ***, five **, and ten * percent levels, respectively.

aversion for gains (Table 6, Panel A). The pooled correlation is $\tau = .334$, with country-specific values ranging from .292 in Greece to .370 in Italy—substantially larger than those between the survey measure and any other behavioral measure. Correlations with risk aversion for losses are roughly half as large (pooled $\tau = .140$), those with the reflection effect are weaker still ($\tau = .106$), and those with loss aversion are negative (pooled $\tau = -.125$).

The survey loss-attitude measure shows a markedly weaker and more uniform pattern (Table 6, Panel B). Its strongest association is with risk aversion for gains ($\tau = .079$), followed by loss aversion ($\tau = -.066$) and risk aversion for losses ($\tau = .044$). The correlation with the reflection effect is close to zero and often statistically insignificant within individual countries. The negative sign on loss aversion, although small, is noteworthy: respondents who report greater sensitivity to losses in the survey tend to exhibit *lower* choice-based loss aversion.

Together, these results indicate that conventional survey instruments primarily capture attitudes toward risk in the gain domain. They provide only limited information about behavioral loss aversion, are weakly related to risk attitudes in the loss domain, and are essentially uninformative about the reflection effect. The richer set of behavioral measures obtained through the choice-based elicitation thus captures dimensions of risk preferences that standard questionnaire items miss. These findings are consistent with recent evidence that qualitative self-assessments of economic preferences do not always map cleanly onto choice-based preference measures and may correlate more strongly with related but distinct constructs than with the constructs they are designed to measure (Chapman et al., 2024).

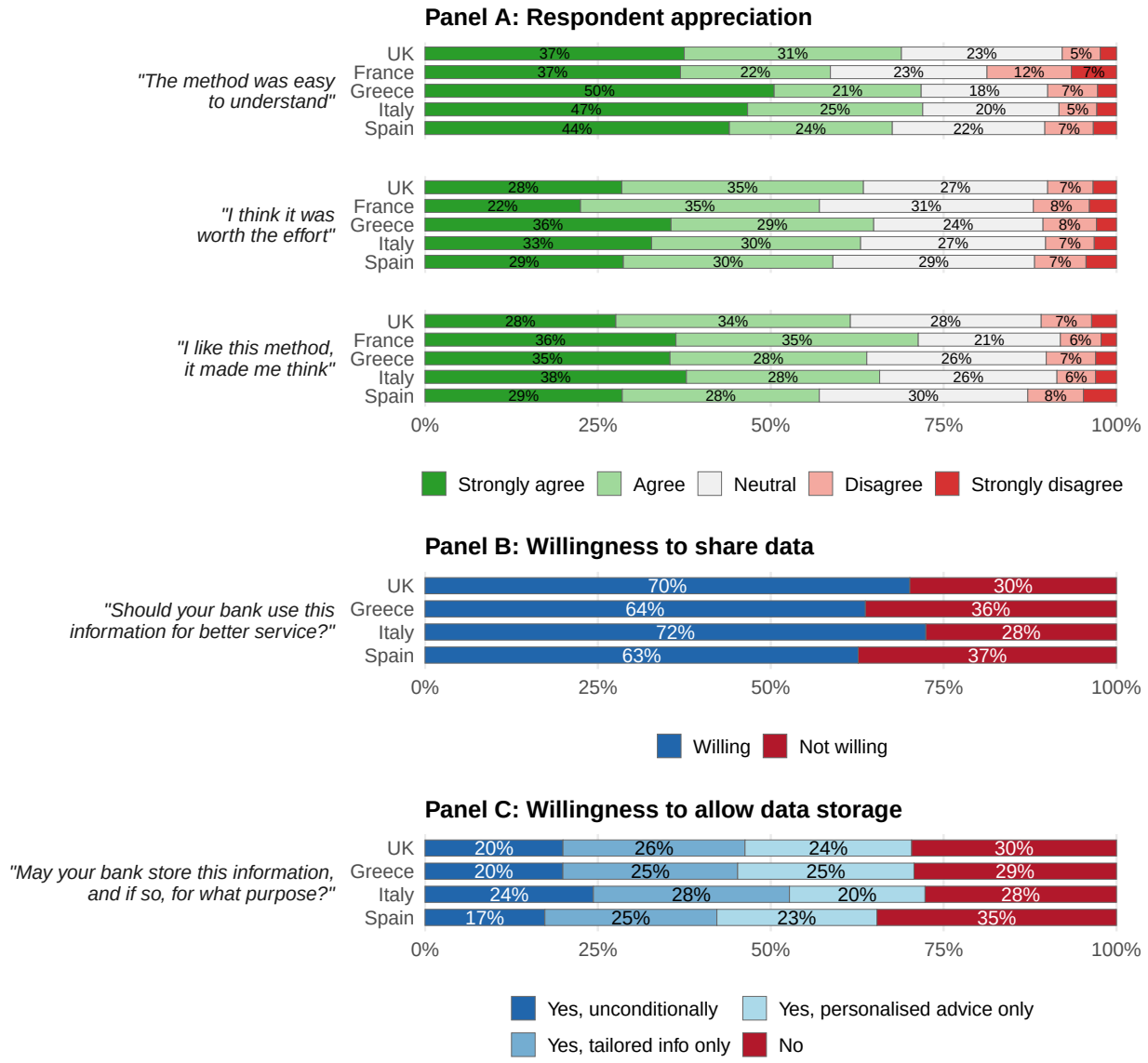
4.7 Additional Survey Measures

Beyond the main preference measures, the surveys included several questions about respondents' experience with the elicitation. These measures help assess whether the choice-based task is understandable and engaging, which is relevant both for research applications and for practical use in financial advice. In four countries, we also asked respondents whether they would allow their bank to use or store the resulting information, providing evidence on the feasibility of integrating behavioral profiling into advisory services.

Respondent appreciation. After completing the elicitation method, respondents rated the elicitation method on three five-point Likert items (Figure 7, top three panels). Across all five countries, responses were generally positive. The item "The method was easy to understand" received the most favorable ratings, with agreement rates ranging from 59 percent in France to 72 percent in Greece and Italy. The items "I like this method, it made me think" and "I think it was worth the effort" received similar levels of approval, with agreement rates between 57 and 71 percent across countries. The share of respondents who disagreed or strongly disagreed never exceeded 19 percent for any item in any country. These results suggest that respondents found the choice-based elicitation accessible and engaging.

Willingness to share data. In Italy, the United Kingdom, Spain, and Greece, respondents were asked two questions about data sharing (Figure 7, Panels B and C). First, they were asked whether a bank should use the elicited information to provide them with better service. A majority in every country agreed, with agreement rates ranging from 63 percent in Spain to 72 percent in Italy. Second, respondents were asked whether they would allow their bank to store these data, and, if so, under what conditions. They could choose one of four options: (i) yes, unconditionally; (ii) yes, but only to send tailored product information; (iii) yes, but only to provide personalized advice; or (iv) no. Across the four countries, 20 percent of

Figure 7: Respondent appreciation and willingness to share and store data



Notes: Panel A shows the distribution of responses to three five-point Likert items (1 = strongly agree, 5 = strongly disagree) across all five countries. Panel B shows the percentage of respondents who agreed that their bank should use the elicited information to provide better service. Panel C shows respondents' stated willingness to allow their bank to store the data, broken down by four conditions: unconditionally, for tailored product information only, for personalised advice only, or not at all. Panels B and C are based on the Italian, UK, Spanish, and Greek surveys only; France did not include these questions.

respondents chose the unconditional option, 26 percent would allow data storage for tailored product information only, 23 percent for personalized advice only, and 30 percent declined. The pattern is broadly similar across countries, although Italy has the highest unconditional willingness to share (24 percent) and Spain has the highest refusal rate (35 percent). These findings suggest that respondents view the behavioral profiling output as practically useful and that most are open to its use in advisory services, though often subject to restrictions on how the data may be used. Probit regressions reported in Table A7 and Figure A1 in the Appendix show that prior investment experience is the strongest predictor of willingness to share data. An ordered probit for the storage question—collapsing the four options into no consent, conditional consent, and unconditional consent—shows that the same holds for the data storage question and is reported in Table A8 and Figure A2 in the Appendix.

5 Implications for risk profiling and decision support

The measurement approach considered in this paper is, in the first instance, a research instrument. It recovers key aspects of reference-dependent risk preferences from a short choice-based task, imposes no functional-form assumptions, and can be administered at scale to non-specialist populations. These features make it suitable for studying the distribution, correlates, and—with longitudinal data—the stability of loss aversion and domain-specific risk attitudes in large and diverse samples.

The empirical results also have implications for settings in which institutions need to measure risk and loss preferences at scale and translate them into classification or decision support. We focus on financial advice, where the regulatory mandate is most concrete, and discuss implications for investor risk profiling, client segmentation, and the portability of preference data across institutions. The positive evaluations reported in Section 4.7 suggest that respondents generally found the task understandable and engaging.

The most direct implication concerns investor risk profiling. In the European Union, the United Kingdom, and the United States, firms that provide investment advice or portfolio management must assess suitability. Although the regulatory frameworks differ, practical implementation often relies on short questionnaires that summarize risk preferences along a single risk–return dimension and assign clients to a small number of categorical risk profiles (Linciano and Soccorso, 2012; de Palma and Picard, 2010). Our comparison with such instruments (Section 4.6) shows that the survey-based risk measure primarily tracks risk aversion in the gain domain. Its correlations with choice-based loss aversion, loss-domain risk aversion, and the reflection effect are substantially weaker, and in some cases negative. Investors who receive the same questionnaire-based profile may therefore differ substantially

in behaviorally relevant dimensions once choice-based measures are considered.

Separating loss aversion from risk aversion is useful because these preferences have different implications for advice. A client who is generally unwilling to bear risk differs from one who tolerates risk but reacts strongly to potential losses. An important question is how to act on a client's measured loss aversion. One view treats loss aversion as a valid preference to be accommodated: a more loss-averse client may benefit from a portfolio that limits downside exposure, consistent with models in which optimal allocation depends on loss aversion (Berkelaar et al., 2004; Vandenbroucke, 2019; van Bilsen et al., 2020). A complementary view treats loss aversion, at least in part, as a behavioral tendency that can work against long-term investment goals (Bleichrodt et al., 2001). Under this view, advisory communication may help clients maintain a long-term perspective and avoid evaluating their portfolio too frequently—responses that the literature on myopic loss aversion shows can substantially attenuate the effect of loss aversion on investment behavior (Benartzi and Thaler, 1995; Thaler et al., 1997; Haigh and List, 2005). In practice, these perspectives are not mutually exclusive: sound advice may both respect a client's sensitivity to losses in the portfolio design and help prevent short-term reactions from undermining long-term goals. Because the three-step elicitation yields loss aversion and domain-specific risk attitudes from the same task, this richer profile can be obtained without substantially lengthening the assessment. This speaks to the European Commission's call to "simplify, improve, automate and standardise" the assessment of investor profiles (European Commission, 2022), and to the European Securities and Markets Authority's identification of loss aversion as a behavioral concept relevant for suitability assessments (ESMA, 2017, 2018).

A related implication concerns client segmentation. Policy initiatives such as the UK's targeted support framework (Financial Conduct Authority, 2025) seek to close the advice gap by allowing firms to direct structured support to groups of consumers with similar needs. The choice-based measures could support such segmentation because they are continuous, comparable across respondents, and derived directly from choices, allowing groups to be identified through data-driven methods such as cluster analysis rather than imposed through predefined questionnaire categories.

A further implication concerns the portability of preference data across institutions. The proposed framework for Financial Data Access (European Commission, 2023*b*) and the Commission's consultation on suitability assessment (European Commission, 2022) both identify the transferability of risk-preference data as a policy objective. A standardized, theory-based behavioral profile is a more natural object to share than the idiosyncratic output of a proprietary questionnaire, because its components have a common interpretation across institutions. Our data speak to the demand side: in the four countries where data-sharing questions

were asked, between 63 and 72 percent of respondents were willing to let their bank store their behavioral profile, albeit often subject to restrictions on use (Figure 7). Willingness to share is most strongly associated with prior investment experience (Table A7), suggesting that experienced investors are the group most receptive to such arrangements. If adopted at scale, such an infrastructure would also generate the longitudinal preference data needed to study the stability and predictive validity of these measures—a research agenda we outline in Section 6.

6 Conclusion

Prospect theory implies that risk preferences are multidimensional: individuals may differ not only in their general willingness to bear risk, but also in their sensitivity to losses and in the degree to which their risk attitudes shift between gain and loss domains. Standard risk-profiling methods, however, typically measure risk preferences as a single risk–return trade-off. This paper has shown that one choice-based task eliciting three indifference values can jointly measure loss aversion and risk aversion separately for gains and losses, thereby also identifying the reflection effect as the shift in risk attitudes between domains, without imposing functional-form assumptions on the utility or probability weighting functions. Using data from over 25,000 respondents in five European countries, we documented the joint distribution of these measures, their respondent-level correlates, and their relationship to conventional survey-based instruments.

Two findings stand out. First, the two reference-dependent features of prospect theory differ sharply in robustness. The reflection effect is widespread: in every country, a majority of respondents are more risk seeking for losses than for gains. This aggregate pattern, however, primarily reflects a distributional shift rather than a systematic within-person reversal of risk attitudes. Loss aversion, by contrast, is far from universal. The median respondent is loss averse in the United Kingdom and France but approximately loss neutral in Greece, Italy, and Spain, even as a substantial fraction remains loss averse in every country. Of the two features, the reflection effect is therefore the more robust across countries. Second, the measures have distinct empirical profiles. Risk aversion over gains and losses is systematically related to age, gender, education, investment experience, and the investment amount. Loss aversion is related to several of the same characteristics but often in different directions. The shift in risk attitudes between domains is largely unrelated to observables, with prior investment experience the one notable predictor: experienced investors display more similar risk attitudes across gains and losses. These patterns are consistent with the view that the measures capture distinct dimensions of preferences.

The comparison with survey-based instruments shows that a conventional risk-profiling question primarily captures attitudes toward risk in the gain domain. Its correlations with choice-based loss aversion and risk attitudes in the loss domain are substantially weaker. Standard suitability questionnaires may therefore overlook behavioral heterogeneity, particularly in loss sensitivity and domain dependence, that the choice-based method recovers.

Several limitations qualify these conclusions. The elicitation relies on hypothetical choices rather than financially incentivized decisions. Although this is common in large-scale survey research and difficult to avoid in a study of this scope, the absence of real incentives may affect the precision of the estimates. The data cannot be linked to respondents' actual portfolio choices, trading behavior, or subsequent investment outcomes, and the cross-sectional design does not allow us to assess the temporal stability of the measures or to interpret the associations with respondent characteristics causally. These limitations point to natural extensions: linking the measures to administrative or transaction-level data to test whether richer profiles improve suitability, examining their stability over time, and using the joint distribution to identify behaviorally meaningful investor segments.

Taken together, the results show that behavioral risk preferences cannot be adequately summarized by a single risk-aversion measure. Loss aversion and domain-specific risk attitudes have distinct empirical profiles and distinct relationships with conventional survey questions, yet can be measured jointly through a short, theory-based task. Doing so provides a more informative account of how individuals evaluate gains, losses, and risky prospects—of value both to behavioral research and to the design of financial advice.

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Appendix

Table A1: Illustrative bisection procedure for a hypothetical respondent

Iteration	Certain option	Risky option	Choice	Bounds after
Step 1: gain prospect, eliciting x^+				
1	2,500	(5,000, 0)	Certain	$0 < x^+ < 2{,}500$
2	1,250	(5,000, 0)	Risky	$1{,}250 < x^+ < 2{,}500$
3	1,880	(5,000, 0)	Certain	$1{,}250 < x^+ < 1{,}880$
				Estimated $\hat{x}^+ = 1{,}565$
Step 2: mixed prospect, eliciting L				
1	0	(5,000, −5,000)	Risky	$L < -5{,}000$
2	0	(5,000, −8,750)	Certain	$-8{,}750 < L < -5{,}000$
3	0	(5,000, −6,870)	Certain	$-6{,}870 < L < -5{,}000$
4	0	(5,000, −5,930)	Risky	$-6{,}870 < L < -5{,}930$
				Estimated $\hat{L} = -6{,}400$
Step 3: loss prospect, eliciting x^-				
1	−3,200	(−6,400, 0)	Risky	$-3{,}200 < x^- < 0$
2	−1,600	(−6,400, 0)	Risky	$-1{,}600 < x^- < 0$
3	−800	(−6,400, 0)	Certain	$-1{,}600 < x^- < -800$
4	−1,200	(−6,400, 0)	Certain	$-1{,}600 < x^- < -1{,}200$
5	−1,400	(−6,400, 0)	Risky	$-1{,}400 < x^- < -1{,}200$
				Estimated $\hat{x}^- = -1{,}300$

Notes: The table illustrates the bisection procedure for a hypothetical respondent who selected an investment amount of 25,000 (in local currency), so that $G = 5{,}000$. The risky option is the prospect, with each outcome occurring with probability 0.5. Each step terminates after two switches. The choices shown correspond to a respondent who is risk averse for gains ($\widehat{RA}_{gain} \approx 0.37$), risk seeking for losses ($\widehat{RA}_{loss} \approx -0.59$), and slightly loss averse ($\hat{\lambda} \approx 1.20$)—thus displaying a reflection effect (reflection index ≈ 0.97).

Table A2: Education level distribution by country

Code	Description	*N*	%	Group
Panel A: France				
1	Aucun diplôme (no qualification)	60	1.2	Low
2	Certificat d'études primaires (CEP)	88	1.7	Low
3	Brevet des collèges / BEPC	481	9.4	Low
4	CAP / BEP (vocational certificate)	611	12.0	Low
5	Baccalauréat	1,353	26.5	Low
6	Bac+2: BTS / DUT	701	13.7	High
7	Bac+3: Licence	456	8.9	High
8	Bac+4: Maîtrise	1,031	20.2	High
9	Bac+5: Master / Grande École	126	2.5	High
10	Bac+6 or more (Doctorat)	193	3.8	High
	Low education	2,593	50.8	
	High education	2,507	49.2	
Panel B: Italy				
1	No qualification / primary school	45	1.3	Low
2	Lower secondary (licenza media)	237	7.1	Low
3	Upper secondary diploma (maturità)	1,767	53.0	Low
4	Bachelor's degree (laurea triennale)	492	14.7	High
5	Master's degree or higher	796	23.9	High
	Missing / not stated	1,784	34.8†	—
	Low education	2,049	61.4	
	High education	1,288	38.6	
Panel C: UK				
1	No formal qualifications	50	1.4	Low
2	GCSEs or equivalent	1,042	29.3	Low
3	A-levels or vocational qualifications	940	26.4	Low
4	University degree or higher	1,523	42.8	High
	Missing / not stated	1,467	29.2†	—
	Low education	2,032	57.2	
	High education	1,523	42.8	

Continued on next page

Table A2 (continued)

Code	Description	*N*	%	Group
Panel D: Spain				
1	Primary education or below	257	9.0	Low
2	Lower secondary (ESO)	578	20.2	Low
3	Upper secondary / vocational (Bachillerato / FP)	483	16.9	Low
4	University degree or higher	1,546	54.0	High
	Missing / not stated	2,327	44.8†	—
	Low education	1,318	46.0	
	High education	1,546	54.0	
Panel E: Greece				
1	Primary school	115	2.5	Low
2	Lower secondary (gymnasium)	970	21.4	Low
3	Upper secondary / vocational (lykeio)	721	15.9	Low
4	Higher education (university or TEI)	2,719	60.1	High
	Missing / not stated	782	14.7†	—
	Low education	1,806	39.9	
	High education	2,719	60.1	

Notes: The table reports the distribution of education levels by country, using the country-specific scale from the survey instrument. France uses a 10-point scale; Italy uses a 5-point scale; the UK, Spain, and Greece each use a 4-point scale. Level descriptions are approximate English-language equivalents based on the respective national education systems; the original survey items were administered in the national language. Percentages for individual education levels are calculated as a share of valid (non-missing) responses. † Percentages for missing observations are calculated as a share of the full country sample. The high education indicator used in the regression analyses equals one for respondents classified as high education in the *Group* column — those at the university level or above — and zero for those classified as low education: level 4 in the UK, Spain, and Greece; levels 4–5 in Italy; and levels 6–10 in France. Low/high subtotals are based on respondents who provided a valid education response.

Table A3: Summary statistics

Variable	N	Mean	SD	Min	Q1	Median	Q3	Max
Panel A: United Kingdom								
Loss aversion	5,022	36.50	386.48	0.00	0.56	1.63	7.00	19924.00
RA_{gain}	5,022	0.42	0.55	−1.00	0.09	0.58	0.89	1.00
RA_{loss}	5,022	0.03	0.64	−1.00	−0.50	0.00	0.51	1.00
Reflection	5,022	0.39	0.75	−2.00	−0.01	0.36	0.91	2.00
Age	5,022	51.24	15.77	18.00	39.00	52.00	64.00	93.00
Female	5,022	0.51	0.50	0	0	1	1	1
Education (high)	3,555	0.43	0.49	0	0	0	1	1
Investment experience	5,022	0.42	0.49	0	0	0	1	1
Investment amount (log)	5,022	9.68	1.11	8.52	8.52	9.62	10.13	13.82
Panel B: France								
Loss aversion	5,100	47.04	352.66	0.00	0.60	1.49	6.78	17506.00
RA_{gain}	5,100	0.33	0.63	−1.00	0.00	0.50	0.88	1.00
RA_{loss}	5,100	0.00	0.67	−1.00	−0.59	0.00	0.55	1.00
Reflection	5,100	0.32	0.84	−2.00	−0.14	0.26	0.96	2.00
Age	5,100	47.38	15.48	18.00	35.00	45.00	61.00	85.00
Female	5,100	0.51	0.50	0	0	1	1	1
Education (high)	5,100	0.49	0.50	0	0	0	1	1
Investment experience	5,100	0.48	0.50	0	0	0	1	1
Investment amount (log)	5,100	9.96	1.04	8.52	9.21	10.13	10.13	13.82
Panel C: Greece								
Loss aversion	5,307	20.24	91.07	0.00	0.23	1.02	4.54	3940.00
RA_{gain}	5,307	0.44	0.60	−1.00	0.09	0.69	0.95	1.00
RA_{loss}	5,307	-0.05	0.69	−1.00	−0.73	0.00	0.55	1.00
Reflection	5,307	0.49	0.81	−2.00	−0.01	0.42	1.04	1.99
Age	5,307	41.53	12.58	18.00	31.00	42.00	51.00	89.00
Female	5,245	0.48	0.50	0	0	0	1	1
Education (high)	4,525	0.60	0.49	0	0	1	1	1
Investment experience	5,307	0.46	0.50	0	0	0	1	1
Investment amount (log)	5,307	9.44	0.98	8.52	8.52	9.21	10.13	13.82

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Table A3 (continued)

Variable	N	Mean	SD	Min	Q1	Median	Q3	Max
Panel D: Italy								
Loss aversion	5,121	35.12	561.01	0.00	0.21	1.00	3.29	19924.00
RA_{gain}	5,121	0.49	0.57	−1.00	0.18	0.69	0.98	1.00
RA_{loss}	5,121	0.02	0.64	−1.00	−0.50	0.00	0.51	1.00
Reflection	5,121	0.47	0.76	−2.00	0.00	0.42	0.99	2.00
Age	5,121	48.24	15.36	18.00	36.00	47.00	61.00	93.00
Female	5,121	0.48	0.50	0	0	0	1	1
Education (high)	3,337	0.39	0.49	0	0	0	1	1
Investment experience	5,118	0.41	0.49	0	0	0	1	1
Investment amount (log)	5,121	9.79	1.05	8.52	8.52	9.90	10.13	13.82
Panel E: Spain								
Loss aversion	5,191	28.05	147.79	0.00	0.20	1.00	4.26	3988.00
RA_{gain}	5,191	0.47	0.60	−1.00	0.17	0.69	0.99	1.00
RA_{loss}	5,191	0.07	0.70	−1.00	−0.54	0.01	0.76	1.00
Reflection	5,191	0.41	0.82	−2.00	−0.01	0.33	0.99	2.00
Age	5,136	45.40	13.54	19.00	35.00	45.00	55.00	92.00
Female	5,136	0.62	0.49	0	0	1	1	1
Education (high)	2,864	0.54	0.50	0	0	1	1	1
Investment experience	5,191	0.40	0.49	0	0	0	1	1
Investment amount (log)	5,191	9.51	0.99	8.52	8.52	9.62	10.13	13.82

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Table A3 (continued)

Variable	N	Mean	SD	Min	Q1	Median	Q3	Max
Panel F: Pooled								
Loss aversion	25,741	33.26	350.10	0.00	0.33	1.15	4.93	19924.00
RA_{gain}	25,741	0.43	0.59	−1.00	0.06	0.59	0.95	1.00
RA_{loss}	25,741	0.01	0.67	−1.00	−0.57	0.00	0.56	1.00
Reflection	25,741	0.42	0.80	−2.00	−0.01	0.37	0.99	2.00
Age	25,686	46.70	14.93	18.00	35.00	46.00	58.00	93.00
Female	25,624	0.52	0.50	0	0	1	1	1
Education (high)	19,381	0.49	0.50	0	0	0	1	1
Investment experience	25,738	0.44	0.50	0	0	0	1	1
Investment amount (log)	25,741	9.67	1.05	8.52	8.52	9.90	10.13	13.82
France	25,741	0.20	0.40	0	0	0	1	1
Greece	25,741	0.21	0.40	0	0	0	1	1
Italy	25,741	0.20	0.40	0	0	0	1	1
Spain	25,741	0.20	0.40	0	0	0	1	1

Notes: The table reports summary statistics for all variables used in the quantile regressions (Table 5). Panels A through E report statistics for each country separately; Panel F reports statistics for the pooled sample, including country indicator variables. Each variable reports the number of observations for which that variable is non-missing. Loss aversion is defined as $x^+/(-x^-)$; RA_{gain} and RA_{loss} are the risk aversion indices for gains and losses; Reflection is $\text{RA}_{\text{gain}} - \text{RA}_{\text{loss}}$. Female, Education (high), and Investment experience are indicator variables. Investment amount (log) is the natural logarithm of the reported amount available for investment. In the regressions, Age and Investment amount (log) are standardized to have mean zero and unit variance.

Table A4: Kendall's τ correlation matrices by country

	LA	RA_{gain}	RA_{loss}	Refl.	$Risk_s$	$Loss_s$	Age	Female	Educ.	Inv. exp.	Inv. amt.
Panel A: United Kingdom											
LA	1.000										
RA_{gain}	$-.292^{***}$	1.000									
RA_{loss}	$-.285^{***}$	$.155^{***}$	1.000								
Refl.	$.042^{***}$	$.331^{***}$	$-.522^{***}$	1.000							
$Risk_s$	$-.125^{***}$	$.359^{***}$	$.141^{***}$	$.113^{***}$	1.000						
$Loss_s$	$-.063^{***}$	$.080^{***}$	$.043^{***}$	$.030^{***}$	$.174^{***}$	1.000					
Age	.002	$.106^{***}$	$.051^{***}$	$.020^{**}$	$.084^{***}$	$-.062^{***}$	1.000				
Female	$-.067^{***}$	$.098^{***}$	$.059^{***}$	$.023^{**}$	$.112^{***}$	$.069^{***}$	$-.130^{***}$	1.000			
Educ.	$.045^{***}$	$-.091^{***}$	$-.038^{***}$	$-.019$	$-.129^{***}$	$-.041^{***}$	$-.124^{***}$	$-.028^{*}$	1.000		
Inv. exp.	$.074^{***}$	$-.161^{***}$	$-.066^{***}$	$-.049^{***}$	$-.283^{***}$	$-.142^{***}$	$.069^{***}$	$-.186^{***}$	$.184^{***}$	1.000	
Inv. amt.	$.076^{***}$	$-.139^{***}$	$-.121^{***}$	.009	$-.252^{***}$	$-.100^{***}$	$.028^{***}$	$-.146^{***}$	$.155^{***}$	$.395^{***}$	1.000
Panel B: France											
LA	1.000										
RA_{gain}	$-.290^{***}$	1.000									
RA_{loss}	$-.322^{***}$	$.124^{***}$	1.000								
Refl.	$.049^{***}$	$.387^{***}$	$-.496^{***}$	1.000							
$Risk_s$	$-.034^{***}$	$.295^{***}$	$.142^{***}$	$.087^{***}$	1.000						
$Loss_s$	$-.033^{***}$	$.139^{***}$	$.084^{***}$	$.027^{**}$	$.223^{***}$	1.000					
Age	$-.006$	.011	.006	$-.014$	$-.000$	$-.098^{***}$	1.000				
Female	$-.011$	$.102^{***}$	$.054^{***}$	$.025^{**}$	$.163^{***}$	$.091^{***}$	$-.080^{***}$	1.000			
Educ.	$.029^{**}$	$-.071^{***}$	$-.061^{***}$	.015	$-.111^{***}$	$-.090^{***}$	$-.009$	$.035^{**}$	1.000		
Inv. exp.	$.028^{**}$	$-.155^{***}$	$-.096^{***}$	$-.022^{*}$	$-.254^{***}$	$-.204^{***}$	$.121^{***}$	$-.130^{***}$	$.183^{***}$	1.000	
Inv. amt.	$.050^{***}$	$-.082^{***}$	$-.137^{***}$	$.055^{***}$	$-.154^{***}$	$-.048^{***}$	$.026^{**}$	$-.098^{***}$	$.069^{***}$	$.169^{***}$	1.000
Panel C: Greece											
LA	1.000										
RA_{gain}	$-.390^{***}$	1.000									
RA_{loss}	$-.424^{***}$	$.161^{***}$	1.000								
Refl.	$.095^{***}$	$.320^{***}$	$-.526^{***}$	1.000							
$Risk_s$	$-.140^{***}$	$.292^{***}$	$.115^{***}$	$.100^{***}$	1.000						
$Loss_s$	$-.060^{***}$	$.058^{***}$	.011	$.021^{**}$	$.077^{***}$	1.000					
Age	$-.037^{***}$	$.067^{***}$	$.055^{***}$	$-.014$	$.067^{***}$	$-.067^{***}$	1.000				
Female	$-.069^{***}$	$.051^{***}$	$.057^{***}$	$-.021^{*}$	$.085^{***}$	$.088^{***}$	$-.048^{***}$	1.000			
Educ.	$.064^{***}$	$-.035^{***}$	.001	$-.011$	$-.057^{***}$	$-.053^{***}$	$-.005$	$.043^{***}$	1.000		
Inv. exp.	$.069^{***}$	$-.150^{***}$	$-.053^{***}$	$-.064^{***}$	$-.214^{***}$	$-.078^{***}$	$-.020^{*}$	$-.241^{***}$	$.112^{***}$	1.000	
Inv. amt.	$.062^{***}$	$-.111^{***}$	$-.067^{***}$	$-.029^{***}$	$-.185^{***}$	$.019^{*}$	$-.025^{**}$	$-.067^{***}$	$.052^{***}$	$.225^{***}$	1.000
Panel D: Italy											
LA	1.000										
RA_{gain}	$-.400^{***}$	1.000									
RA_{loss}	$-.354^{***}$	$.176^{***}$	1.000								
Refl.	$.038^{***}$	$.315^{***}$	$-.517^{***}$	1.000							
$Risk_s$	$-.151^{***}$	$.370^{***}$	$.133^{***}$	$.138^{***}$	1.000						
$Loss_s$	$-.082^{***}$	$.048^{***}$	$.043^{***}$	.008	$.074^{***}$	1.000					
Age	$-.035^{***}$	$.113^{***}$	$.027^{***}$	$.030^{***}$	$.090^{***}$	$-.072^{***}$	1.000				
Female	$-.107^{***}$	$.126^{***}$	$.080^{***}$	$.025^{**}$	$.138^{***}$	$.068^{***}$	$-.010$	1.000			
Educ.	$.092^{***}$	$-.133^{***}$	$-.063^{***}$	$-.036^{***}$	$-.126^{***}$	.021	$-.148^{***}$	.016	1.000		
Inv. exp.	$.128^{***}$	$-.194^{***}$	$-.097^{***}$	$-.061^{***}$	$-.235^{***}$	$-.079^{***}$	$.057^{***}$	$-.186^{***}$	$.134^{***}$	1.000	
Inv. amt.	$.105^{***}$	$-.149^{***}$	$-.116^{***}$	$-.018^{*}$	$-.233^{***}$	$-.001$	$.072^{***}$	$-.116^{***}$	$.150^{***}$	$.390^{***}$	1.000

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Table A4 (continued)

	LA	RA_{gain}	RA_{loss}	Refl.	$Risk_s$	$Loss_s$	Age	Female	Educ.	Inv. exp.	Inv. amt.
Panel E: Spain											
LA	1.000										
RA_{gain}	−.399***	1.000									
RA_{loss}	−.369***	.179***	1.000								
Refl.	.065***	.301***	−.531***	1.000							
$Risk_s$	−.147***	.348***	.174***	.081***	1.000						
$Loss_s$	−.089***	.065***	.039***	.017	.112***	1.000					
Age	−.036***	.082***	.064***	−.018*	.055***	−.093***	1.000				
Female	−.057***	.086***	.032***	.038***	.120***	.068***	−.201***	1.000			
Educ.	.071***	−.096***	−.053***	−.005	−.097***	−.040**	−.125***	.017	1.000		
Inv. exp.	.095***	−.178***	−.075***	−.069***	−.278***	−.139***	.056***	−.203***	.168***	1.000	
Inv. amt.	.092***	−.133***	−.106***	−.025**	−.230***	−.057***	.038***	−.132***	.129***	.365***	1.000
Panel F: Pooled											
LA	1.000										
RA_{gain}	−.360***	1.000									
RA_{loss}	−.349***	.159***	1.000								
Refl.	.053***	.331***	−.517***	1.000							
$Risk_s$	−.125***	.334***	.140***	.106***	1.000						
$Loss_s$	−.066***	.079***	.044***	.021***	.130***	1.000					
Age	−.009**	.067***	.042***	−.004	.050***	−.077***	1.000				
Female	−.063***	.094***	.060***	.015***	.123***	.079***	−.091***	1.000			
Educ.	.054***	−.080***	−.044***	−.006	−.096***	−.045***	−.089***	.020***	1.000		
Inv. exp.	.082***	−.172***	−.078***	−.054***	−.252***	−.129***	.052***	−.191***	.161***	1.000	
Inv. amt.	.084***	−.129***	−.106***	−.008*	−.215***	−.044***	.043***	−.113***	.084***	.307***	1.000
UK	.067***	−.031***	.013**	−.015***	−.016***	.031***	.117***	−.010	−.063***	−.015**	−.008
France	.069***	−.068***	−.007	−.042***	−.051***	−.044***	.014***	−.009	−.003	.046***	.130***
Greece	−.031***	.009*	−.037***	.036***	.028***	.012**	−.139***	−.044***	.117***	.029***	−.107***
Italy	−.061***	.044***	.000	.028***	.011*	−.022***	.039***	−.036***	−.099***	−.026***	.054***
Spain	−.043***	.045***	.032***	−.007	.027***	.023***	−.028***	.099***	.038***	−.034***	−.067***

Notes: The table reports Kendall's τ rank correlation coefficients. Panels A through E show country-specific matrices; Panel F shows the pooled sample. LA is loss aversion; RA_{gain} and RA_{loss} are risk aversion for gains and losses; Refl. is the reflection effect; $Risk_s$ is the survey-based risk attitude measure (reverse-coded so that higher values indicate greater risk aversion); $Loss_s$ is the survey-based loss attitude measure (reverse-coded so that higher values indicate greater loss aversion); Age is respondent age in years; Female is a dummy variable equal to one for female respondents; Educ. is the high education indicator; Inv. exp. is investment experience; and Inv. amt. is the log investment amount. In Panel F, five country-dummy rows are added below the main matrix (UK, France, Greece, Italy, and Spain): each entry gives the correlation between that country dummy and the column variable. Asterisks denote significance at the one ***, five **, and ten * percent levels, respectively.

Table A5: Country-specific quantile regression results with investment experience

	UK	France	Greece	Italy	Spain
Panel A: Loss aversion					
Age/10	0.037	-0.019	-0.058**	-0.017	-0.023
	(0.034)	(0.023)	(0.028)	(0.027)	(0.029)
Gender (female=1)	-0.181*	-0.015	-0.349***	-0.329***	-0.227***
	(0.105)	(0.072)	(0.073)	(0.080)	(0.081)
Education (high=1)	0.221**	0.188***	0.378***	0.351***	0.209***
	(0.112)	(0.072)	(0.072)	(0.089)	(0.075)
Investment experience (yes=1)	0.203	0.007	0.139*	0.384***	0.160
	(0.130)	(0.075)	(0.081)	(0.104)	(0.116)
Investment amount (log)	0.263***	0.259***	0.166***	0.116**	0.150**
	(0.071)	(0.047)	(0.056)	(0.050)	(0.060)
Constant	-1.180*	-1.070**	-0.249	-0.079	-0.175
	(0.670)	(0.449)	(0.513)	(0.469)	(0.556)
Observations	3,555	5,100	4,474	3,337	2,821
Panel B: Risk aversion for gains					
Age/10	0.061***	0.024***	0.039***	0.047***	0.063***
	(0.007)	(0.007)	(0.007)	(0.005)	(0.006)
Gender (female=1)	0.080***	0.148***	0.009	0.069***	0.071***
	(0.020)	(0.023)	(0.018)	(0.016)	(0.020)
Education (high=1)	-0.055***	-0.089***	-0.012	-0.090***	-0.041**
	(0.021)	(0.023)	(0.017)	(0.019)	(0.017)
Investment experience (yes=1)	-0.116***	-0.238***	-0.163***	-0.146***	-0.162***
	(0.023)	(0.025)	(0.020)	(0.026)	(0.033)
Investment amount (log)	-0.094***	-0.065***	-0.072***	-0.099***	-0.108***
	(0.012)	(0.012)	(0.010)	(0.012)	(0.015)
Constant	1.200***	1.116***	1.225***	1.465***	1.450***
	(0.114)	(0.121)	(0.101)	(0.114)	(0.147)
Observations	3,555	5,100	4,474	3,337	2,821
Panel C: Risk aversion for losses					
Age/10	0.028***	0.010*	0.069***	0.024***	0.057***

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Table A5 (continued)

	UK	France	Greece	Italy	Spain
	(0.008)	(0.006)	(0.010)	(0.008)	(0.012)
Gender (female=1)	0.046*	0.041**	0.103***	0.077***	0.078**
	(0.025)	(0.019)	(0.028)	(0.018)	(0.032)
Education (high=1)	-0.020	-0.065***	-0.003	-0.034	-0.045
	(0.026)	(0.018)	(0.029)	(0.026)	(0.039)
Investment experience (yes=1)	-0.010	-0.061***	-0.061**	-0.047**	-0.056
	(0.028)	(0.019)	(0.029)	(0.021)	(0.036)
Investment amount (log)	-0.099***	-0.125***	-0.062***	-0.074***	-0.057***
	(0.008)	(0.009)	(0.015)	(0.006)	(0.012)
Constant	0.836***	1.236***	0.224	0.616***	0.361***
	(0.092)	(0.094)	(0.152)	(0.072)	(0.133)
Observations	3,555	5,100	4,474	3,337	2,821
Panel D: Reflection effect					
Age/10	0.019	-0.028**	-0.044***	0.002	-0.033**
	(0.012)	(0.011)	(0.014)	(0.011)	(0.016)
Gender (female=1)	0.045	0.052	-0.114***	0.008	0.013
	(0.036)	(0.035)	(0.037)	(0.034)	(0.046)
Education (high=1)	-0.005	0.089**	0.019	-0.037	0.036
	(0.037)	(0.035)	(0.037)	(0.035)	(0.044)
Investment experience (yes=1)	-0.145***	-0.024	-0.182***	-0.120***	-0.104**
	(0.041)	(0.035)	(0.038)	(0.042)	(0.047)
Investment amount (log)	0.034*	0.094***	-0.009	0.001	-0.047**
	(0.018)	(0.018)	(0.019)	(0.019)	(0.022)
Constant	-0.028	-0.604***	0.813***	0.460**	0.951***
	(0.182)	(0.186)	(0.185)	(0.187)	(0.222)
Observations	3,555	5,100	4,474	3,337	2,821

Notes: The table reports coefficients of median quantile regressions estimated separately for each country. The dependent variable in each panel is indicated in the panel header. Age and Investment amount (log) are standardized to have mean zero and unit variance. Standard errors (in parentheses) are computed using the Bose–Chernozhukov–Hong sandwich estimator. Asterisks denote significance at the one ***, five **, and ten * percent levels, respectively.

Table A6: Pooled quantile regression results: quadratic age specification

	LA	RA_{gain}	RA_{loss}	Reflection
Age/10	0.024	0.106***	0.072***	0.005
	(0.064)	(0.019)	(0.019)	(0.035)
$Age^2/100$	-0.005	-0.006***	-0.005**	-0.002
	(0.007)	(0.002)	(0.002)	(0.004)
Gender (female=1)	-0.207***	0.079***	0.064***	0.004
	(0.036)	(0.009)	(0.009)	(0.018)
Education (high=1)	0.244***	-0.066***	-0.040***	0.013
	(0.034)	(0.009)	(0.010)	(0.018)
Investment experience (yes=1)	0.145***	-0.172***	-0.049***	-0.109***
	(0.043)	(0.011)	(0.010)	(0.019)
Investment amount (log)	0.193***	-0.081***	-0.084***	0.015*
	(0.025)	(0.005)	(0.003)	(0.009)
France	-0.165***	-0.013	0.008	-0.090***
	(0.064)	(0.015)	(0.011)	(0.027)
Greece	-0.414***	0.104***	-0.062***	0.083***
	(0.061)	(0.014)	(0.016)	(0.027)
Italy	-0.543***	0.125***	0.005	0.067***
	(0.064)	(0.013)	(0.016)	(0.025)
Spain	-0.407***	0.116***	0.035*	-0.006
	(0.060)	(0.014)	(0.020)	(0.031)
Constant	-0.302	1.047***	0.609***	0.264**
	(0.277)	(0.069)	(0.053)	(0.118)
Joint test: Age	2.00	116.53***	42.05***	1.72
	[0.135]	[<0.001]	[<0.001]	[0.179]
Observations	19,287	19,287	19,287	19,287

Notes: The table reports coefficients from median quantile regressions estimated on the pooled sample from all five countries. Each column corresponds to a different dependent variable: loss aversion (LA), risk aversion for gains (RA_{gain}), risk aversion for losses (RA_{loss}), and the reflection effect (Reflection). Age enters as Age/10 and $Age^2/100$. The Joint test row reports the Wald F-statistic and p-value, in brackets, for the null hypothesis that both age coefficients are jointly equal to zero. The United Kingdom serves as the reference category for the country indicators. All other variables are defined as in Table 5. Standard errors are in parentheses. Asterisks denote significance at the one ***, five **, and ten * percent levels, respectively.

Table A7: Determinants of willingness to share data by country

	Pooled	UK	Greece	Italy	Spain
Loss aversion	-0.009**	-0.032	-0.018	-0.006*	-0.014
	(0.004)	(0.022)	(0.027)	(0.004)	(0.024)
RA_{gain}	0.016**	0.012	0.014	0.010	0.027
	(0.007)	(0.015)	(0.013)	(0.015)	(0.016)
RA_{loss}	-0.018***	-0.031**	-0.021**	-0.033***	0.012
	(0.006)	(0.012)	(0.011)	(0.012)	(0.013)
Age/10	-0.003	-0.016***	-0.006	0.015***	-0.003
	(0.003)	(0.005)	(0.006)	(0.005)	(0.007)
Gender (female=1)	-0.006	-0.006	0.013	-0.013	-0.042**
	(0.008)	(0.016)	(0.015)	(0.016)	(0.019)
Education (high=1)	-0.009	0.008	-0.017	-0.015	-0.004
	(0.008)	(0.016)	(0.014)	(0.016)	(0.018)
Investment experience (yes=1)	0.165***	0.183***	0.183***	0.163***	0.120***
	(0.009)	(0.017)	(0.015)	(0.017)	(0.020)
Investment amount (log)	0.026***	-0.001	0.035***	0.023***	0.056***
	(0.004)	(0.008)	(0.008)	(0.009)	(0.010)
Greece	-0.073***				
	(0.011)				
Italy	0.017				
	(0.011)				
Spain	-0.056***				
	(0.012)				
Observations	14,186	3,555	4,473	3,337	2,821
Log-likelihood	-8641.5	-2091.3	-2832.9	-1902.0	-1784.2

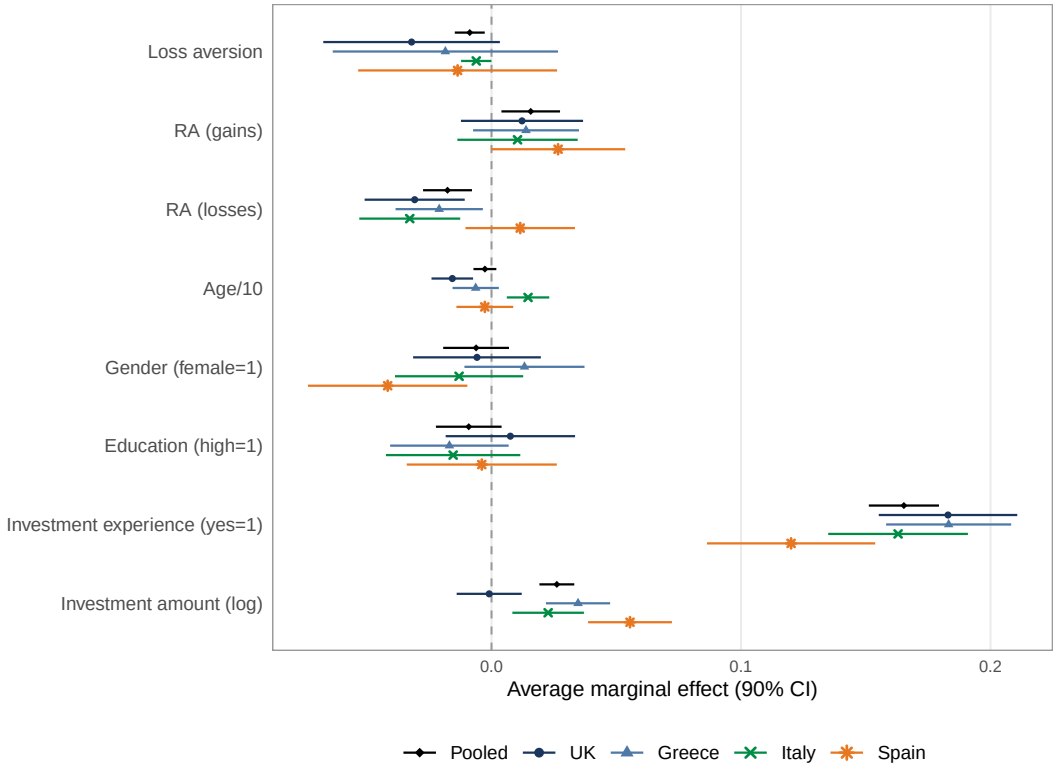
Notes: The table reports average marginal effects from probit regressions. The dependent variable is willingness to share behavioral profiling data with the bank (1 = willing, 0 = not willing). This question was included in the Italian, UK, Spanish, and Greek surveys only. The first column reports pooled estimates with country fixed effects (the United Kingdom is the reference category); subsequent columns show separate estimates for each of the four countries (without country dummies). All models include the behavioral preference measures and demographic controls. Loss aversion is standardized to have mean zero and unit variance. Reflection is omitted because it is a linear function of RA_{gain} and RA_{loss}. Delta-method standard errors are in parentheses. Asterisks denote significance at the one ***, five **, and ten * percent levels, respectively.

Table A8: Determinants of data storage willingness by country (ordered probit)

	Pooled	UK	Greece	Italy	Spain
Loss aversion	-0.037***	-0.109**	-0.077	-0.031***	-0.059
	(0.011)	(0.055)	(0.066)	(0.012)	(0.057)
RA_{gain}	-0.009	-0.023	-0.025	-0.029	0.068*
	(0.017)	(0.037)	(0.031)	(0.037)	(0.039)
RA_{loss}	-0.034**	-0.082***	-0.050*	-0.054*	0.043
	(0.015)	(0.031)	(0.026)	(0.032)	(0.032)
Age/10	-0.046***	-0.081***	-0.030**	-0.019	-0.052***
	(0.007)	(0.013)	(0.013)	(0.013)	(0.017)
Gender (female=1)	-0.142***	-0.139***	-0.043	-0.182***	-0.278***
	(0.020)	(0.039)	(0.035)	(0.040)	(0.047)
Education (high=1)	-0.002	0.005	-0.002	0.024	-0.045
	(0.020)	(0.039)	(0.035)	(0.042)	(0.044)
Investment experience (yes=1)	0.359***	0.288***	0.421***	0.392***	0.336***
	(0.021)	(0.044)	(0.037)	(0.045)	(0.049)
Investment amount (log)	0.127***	0.058***	0.138***	0.167***	0.181***
	(0.010)	(0.019)	(0.018)	(0.022)	(0.024)
Greece	-0.058**				
	(0.026)				
Italy	0.060**				
	(0.027)				
Spain	-0.108***				
	(0.029)				
α_1	0.501***	-0.368*	0.775***	0.976***	1.004***
	(0.104)	(0.196)	(0.184)	(0.215)	(0.241)
α_2	1.925***	1.030***	2.255***	2.349***	2.469***
	(0.105)	(0.196)	(0.186)	(0.217)	(0.244)
Observations	14,186	3,555	4,473	3,337	2,821
Log-likelihood	-14134.2	-3587.3	-4400.3	-3348.5	-2744.1

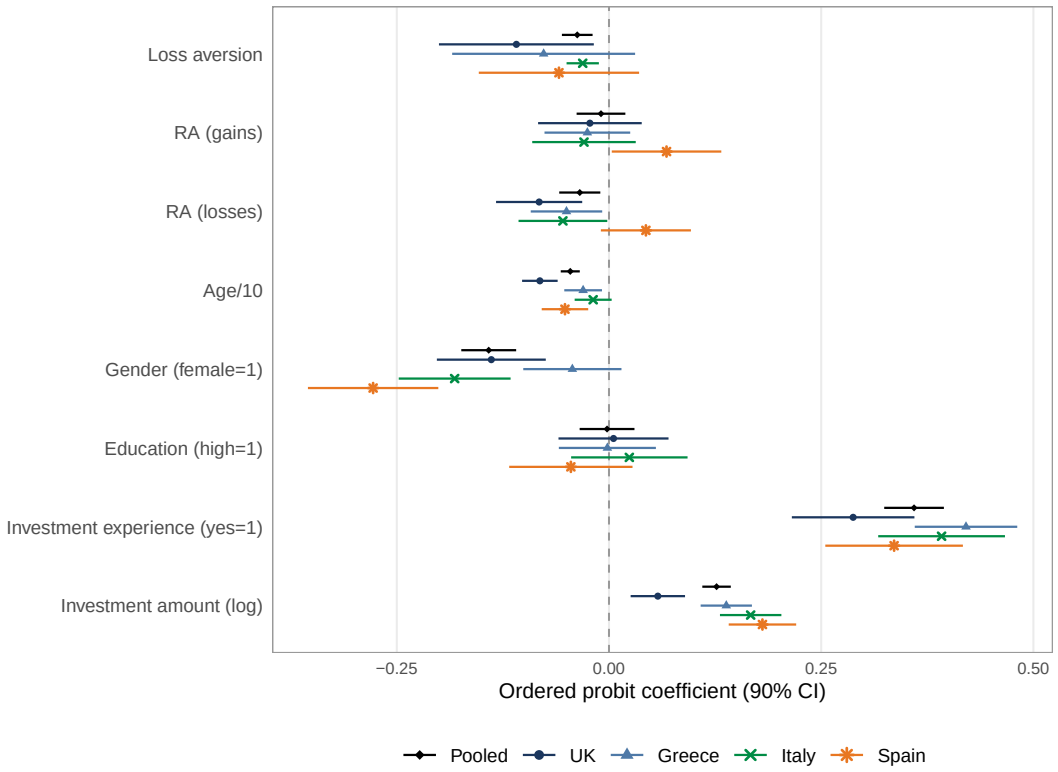
Notes: The table reports ordered probit coefficients. The dependent variable is a three-category ordered outcome derived from the data storage question: 0 = no consent, 1 = yes with conditions (tailored information or personalised advice only), 2 = yes unconditionally. This question was included in the Italian, UK, Spanish, and Greek surveys only. The first column reports pooled estimates with country fixed effects (United Kingdom is the reference category); subsequent columns report country-specific estimates without country dummies. All models include behavioral preference measures, demographic controls, and investment amount. Loss aversion is standardized to have mean zero and unit variance. The reflection effect is omitted because it is a linear function of RA_{gain} and RA_{loss}. α_1 and α_2 are the estimated threshold parameters. Standard errors are in parentheses. Asterisks denote significance at the one ***, five **, and ten * percent levels, respectively.

Figure A1: Average marginal effects on willingness to share data by country



Notes: The figure shows average marginal effects and 90 percent confidence intervals from probit regressions of willingness to share behavioral profiling data with the bank on the behavioral preference measures and demographic controls. Black diamonds show pooled estimates with country fixed effects; colored markers show country-specific estimates. Loss aversion is standardized to have mean zero and unit variance. Delta-method standard errors are used for confidence intervals. All other variable definitions are as in Table A7.

Figure A2: Ordered probit coefficients for data storage willingness by country



Notes: The figure shows ordered probit coefficients and 90 percent confidence intervals for the data storage willingness outcome. Black diamonds show pooled estimates with country fixed effects; colored markers show country-specific estimates. Positive coefficients indicate higher probability of unconditional consent and lower probability of refusal. All variable definitions are as in **??**.