Believe it or not: Psychological Bias, ESG, and Investor Preferences

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Abstract

The transition to a low-carbon energy future requires the mobilisation of private finance to accelerate the shift away from fossil fuels. While investment in green energy has surged, fossil fuel financing remains persistent, underscoring the need to understand the factors shaping investment decisions. Existing research has primarily examined retail investors' preferences for sustainable investments but has paid limited attention to professional investors' attitudes toward fossil fuel investments. This study addresses this gap by investigating the determinants influencing professional investors' decisions in the energy sector. Using a Multiple Discrete-Continuous Extreme Value (MDCEV) model—a method not previously applied in sustainable finance—the analysis reveals that professional investors continue to exhibit a preference for brown firms. However, key factors such as professional roles, experience, and cognitive biases significantly impact their willingness to divest from fossil fuels. These findings highlight the complexities of sustainable investment decisions and underscore the need for targeted policies to steer capital toward green energy solutions.

Keywords: Green Finance; Multiple Discrete-Continuous Choice Experiment (MDCEV); Resistance to Change Bias; Fossil Fuels; Professional Investors

1 Introduction

For the first time in 2020, global investments in green energy surpassed those in the fossil fuel industry. In recent years, the pace of renewable energy investment has accelerated significantly, with annual spending on clean energy projects nearing USD 2 trillion—almost double the total expenditure on new oil, gas, and coal supply (IEA 2024). However, despite this positive trend, global energy demand continues to rise, with fossil fuels still meeting two-thirds of the additional demand in 2023. The transition to renewable energy remains highly uneven across regions, largely driven by key players such as China. In Europe, recent estimates suggest that annual investments in green energy must increase by 2.7% to 3.7% of EU GDP until 2030 to meet climate targets (ECB 2025). While progress towards a low-carbon energy system is evident, it remains fragile. Climate objectives are still far from being achieved, and decision-making by governments, consumers, and investors continues to favour the existing energy system. This creates a paradox: while there is broad support for a cleaner energy transition, actions often reinforce the status quo, slowing the shift away from fossil fuels.

Achieving this transition requires substantial financial mobilisation, with private capital playing a critical role alongside public funding. Redirecting investment towards green energy is essential to reducing reliance on fossil fuels and driving a sustainable energy transition. Since Mark Carney's landmark speech (Bank of England 2015), financial actors have increasingly recognised the concept of double materiality, acknowledging that climate change poses systemic risks to the financial sector while financial decisions, in turn, shape climate outcomes. To align with the 2°C global warming limit, a significant share of fossil fuel reserves must remain unexploited. Although financial literature acknowledges that investors perceive climate change as a risk (P. Krueger, Sautner, and Starks 2020) and despite recommendations—such as those from the International Energy Agency (IEA)—to halt new fossil fuel investments, capital continues to flow into the industry.

This persistent investment in fossil fuels is particularly striking given the growing prominence of green finance in recent years, accompanied by increasing efforts to develop financial methodologies that align portfolios with climate objectives. Over the past decade, net-zero alliances, such as the Net-Zero Asset Management Initiative and the UN Principles for Responsible Investment, have expanded, with a growing number of financial institutions committing to climate-aligned investment strategies. In Europe, these efforts have been reinforced by climate reporting directives under the EU Green Deal, which aim to harmonise sustainability practices and establish a structured framework for defining green investments. The rise of green finance is also reflected in academic research, where interest in Environmental, Social, and Governance (ESG) criteria has surged. However, most studies assessing sustainable investment preferences rely on multi-sectoral analyses using ESG scores. While these scores provide a broad measure of sustainability, they fail to capture the specific decarbonisation efforts of high-emission industries such as fossil fuels. Given the stakes involved, understanding investor motivations beyond ESG metrics is crucial to explaining why financial flows into the fossil fuel industry are not declining at the necessary pace.

The financial performance of the fossil fuel industry is likely a key factor. Between 2011 and 2016, the oil and gas sector underperformed relative to the broader market (Trinks et al. 2018), enabling investors to divest without significant financial drawbacks (Halcoussis and Lowenberg 2019). However, since 2022, shifting geopolitical and economic conditions have driven substantial gains in the sector. Consequently, investors who had publicly committed to fossil fuel divestment have underperformed compared to those who maintained exposure, renewing interest in these companies.

Given this context, investors are divided between those who have publicly committed to divesting from fossil fuels and those who argue that achieving a low-carbon transition requires continued engagement with fossil fuel companies. The latter group asserts that some firms are transitioning towards sustainability and, therefore, merit investor support. However, this argument creates ambiguity, making it difficult to distinguish

genuinely green investors from those financing fossil fuels without clear climate commitments. While no fossil fuel company can yet be considered fully green, some have implemented climate transition plans. This raises a key question: for investors prioritising climate objectives, what information guides their decision-making in this industry?

The development of tools to assess the climate impact of portfolios and firms has expanded rapidly, yet methodologies remain highly divergent among financial actors. The European Green Taxonomy provides a structured approach to evaluating the climate impact of economic activities, distinguishing between green and non-green operations based on turnover, capital expenditures (CapEx), and operational expenditures (OpEx). Currently, only a limited number of firms qualify as green, and a successful transition requires enabling businesses to shift from carbon-intensive to sustainable activities. While many companies still generate most of their revenues from non-green activities, those committed to decarbonisation should demonstrate an increasing share of green CapEx over time.

This research seeks to determine whether investors consider the indicators provided by the EU taxonomy when assessing a firm's willingness to transition to a low-carbon business model. Using a theoretical framework, this study evaluates investor preferences through a choice experiment. While previous research has examined sustainable investment preferences, few studies have specifically focused on the energy sector, which is central to the green transition. Additionally, much of the existing literature has concentrated on retail investors, whereas the role of professional investors—who build mutual funds and make strategic asset allocation decisions—remains underexplored. This paper addresses this gap by directly surveying professional investors using an innovative methodological approach: the Multiple Discrete-Continuous Extreme Value (MDCEV) model developed by (Bhat 2008). Furthermore, this study contributes to the literature on behavioural finance by investigating the presence of resistance-to-change bias within the financial community, which may help explain the inertia in shifting capital away from fossil fuels.

The findings reveal the presence of a small subset of investors with strong preferences for green firms who systematically avoid fossil fuel-related investments. However, the results also indicate that, overall, brown firms remain favoured and generate greater investor satisfaction. Notably, there is no evidence that investors consider low-carbon CapEx when allocating capital in the energy sector, suggesting that the assessment of transitioning firms remains inadequate. This aligns with the hypothesis that some investors remain 'blind to carbon risk' (Monasterolo and De Angelis 2020). Moreover, investment behaviours exhibit significant heterogeneity, with factors such as experience, openness to change, and investment horizon playing a crucial role in divestment decisions from the fossil fuel industry.

The paper is organised as follows. Part two is divided into two subcategories: the literature review and the presentation of research questions. The third section details the experimental design used in this study. The fourth section presents the estimation results. The fifth section discusses these results, and finally, the sixth section concludes the paper.

2 Literature Review and Research Questions

2.1 Literature Review

The field of sustainable finance has sought to understand investors' motivations behind sustainable investing. To investigate these preferences, several studies have used experimental settings or qualitative methods (Bachmann, Meyer, and Krauss 2024; Löfgren and Nordblom 2024; Bauer et al. 2024). Among these methods, discrete choice experiments (DCE) have become a widely accepted tool for studying investment behaviour, particularly in assessing how individuals value environmental attributes. This approach, initially applied in

environmental economics—most notably by Adamowicz, Louviere, and Swait (1998) in his study on Canadian rivers—has been increasingly used in sustainable finance (see, e.g., Bassen et al. 2019; Kuzmanovic, Makajic-Nikolic, and Nikolic 2019; Barber, Morse, and Yasuda 2021; Gottlieb and Edenbrandt 2024; Harasheh, Bouteska, and Manita 2024; Rozkov and Idema 2023; Lagerkvist et al. 2020; Saravade, Weber, and Vitalis 2025; Muñoz-Muñoz et al. 2025; Holzheu and Wekhof 2025; Fraile et al. 2023).

While DCE assumes that goods are perfectly substitutable and mutually exclusive, this assumption may not fully align with investment decision-making. According to portfolio diversification theory (Markowitz 1952), investors seek to allocate their capital across a range of assets to minimise risk and maximise returns. As a result, investment decisions are not necessarily discrete but involve budget allocation across multiple options. To address this limitation, some studies have incorporated experimental surveys requiring participants to distribute a fixed budget across different mutual funds with and without sustainability attributes (Gutsche, Wetzel, and Ziegler 2023; Seifert et al. 2024; Filippini, Leippold, and Wekhof 2024; Meyer 2024). However, these studies typically employed a single choice card, potentially constraining the depth and consistency of their findings. Repeating the choice task across multiple scenarios allows for a more consistent assessment of investor preferences.

Given these methodological considerations, this paper adopts a multiple discrete-continuous choice experiment—a method originally developed in transportation economics by Bhat (2008) but not yet applied in sustainable finance. This approach better captures investment allocation decisions by allowing respondents to distribute their capital across multiple firms rather than choosing between discrete alternatives.

A critical gap in the existing literature is its predominant focus on retail investors. While past studies have provided insights into retail investors' preferences for sustainable mutual funds, they have not examined how professional investors construct these funds by selecting individual firms. This paper addresses this gap by shifting the focus to professional investors, specifically asset managers, who play a key role in allocating capital across sectors. Understanding their decision-making process is crucial, as they manage investments on behalf of institutional clients, including pension funds, insurance companies, banks, and investment firms (Ahmad, Ibrahim, and Tuyon 2017; Suto and Toshino 2005).

Moreover, previous studies have largely adopted a multi-sectoral approach, analysing sustainable investment preferences without focusing on a particular industry. This paper recognises that investment strategies may vary significantly by sector, particularly in industries with high climate-related risks. The energy sector is particularly relevant, given its central role in achieving European climate objectives. Across Europe, debates around fossil fuel divestment have intensified, with increasing pressure from policymakers and NGOs to redirect financial flows towards low-carbon solutions (*The 2024 Global Oil & Gas Exit List: More Loss and Damage Ahead* 2024). France, for instance, has introduced stringent criteria under its SRI label, excluding firms generating more than 5% of their turnover from fossil fuels or those engaged in developing new fossil fuel infrastructure (*ISR Label Guidelines* 2024).

Given the central role of the energy sector in the low-carbon transition and the growing calls for divestment, academic research presents mixed findings on the financial impact of such strategies. Some studies suggest that divesting from fossil fuels does not harm financial performance (Plantinga and Scholtens 2021; Trinks et al. 2018; Halcoussis and Lowenberg 2019), while others indicate potential underperformance (Cornell 2018). In France, among the 18 largest asset management companies—representing 60% of assets under management—16 have adopted coal divestment policies. However, similar policies for oil and gas remain rare and tend to target only unconventional sources. This hesitancy suggests that the energy sector poses unique transition risks, making it essential to examine how investors evaluate firms within this industry. Previous research indicates that investors tend to avoid strict exclusion policies, as these reduce diversification opportunities (Amel-Zadeh and Serafeim 2018).

Given these insights and the persistent reluctance to divest from the fossil fuel industry, questions arise regarding the potential role of cognitive biases in shaping investment decisions. Behavioural finance research has established that investors' choices are influenced not only by financial considerations but also by psychological factors, including emotions, values, and biases (Eber 2020; Tadjeddine 2013; Kahneman and Tversky 1979; Simon 2000). In the context of sustainable investing, studies have shown that altruism, environmental values, and moral preferences can significantly impact decision-making (Seifert et al. 2024; Gutsche, Wetzel, and Ziegler 2023; Saravade, Weber, and Vitalis 2025; Heeb et al. 2023; Bauer et al. 2024; Hartzmark and Sussman 2019; Matallín-Sáez et al. 2022). While research has primarily focused on retail investors (Aren, Aydemir, and Şehitoğlu 2016), evidence suggests that professional investors are equally susceptible to behavioural biases (Kudryavtsev, Cohen, and Hon-Snir 2013; Aren, Aydemir, and Şehitoğlu 2016; Ahmad, Ibrahim, and Tuyon 2017; Viale et al. 2018).

To capture these biases, previous studies have incorporated psychometric scales into surveys. For instance, Muñoz-Muñoz et al. (2025) applied the Big Five Personality Scale (McCrae and Costa 1987), while Gutsche, Wetzel, and Ziegler (2023) employed the Ten Item Personality Inventory (TIPI) (Gosling, Rentfrow, and Swann Jr 2003) and the New Environmental Paradigm Scale (Dunlap et al. 2000). Other research has drawn on the Value-Belief-Norm Theory (Stern et al. 1999) or the Biospheric and Altruistic Value Orientation Scale (De Groot and Steg 2007).

Building on this literature, the present study investigates whether a resistance-to-change bias, as conceptualized by Oreg (2003), plays a role in investment decisions within the energy sector. This bias, which has yet to be explored in the sustainable finance literature, could offer new insights into the reluctance to divest from fossil fuels.

H. Simon's concept of bounded rationality suggests that individuals rely on heuristics to navigate complex decisions. In sustainable finance, ESG ratings have often played this role, offering simplified assessments of firms' non-financial performance. However, ESG ratings lack standardisation and vary significantly across providers (Berg, Koelbel, and Rigobon 2022), leading to concerns about their reliability. This divergence is particularly evident in the energy sector, where best-in-class methodologies allow high-emission firms to obtain strong ESG ratings despite their environmental impact.

To address these limitations, the European Green Taxonomy was introduced as a common classification framework for green investments (Claringbould, Koch, and Owen 2019; Alessi, Battiston, Melo, and Roncoroni 2020; Gangi et al. 2022). Unlike ESG ratings, which are subject to methodological discrepancies, the Taxonomy is based on predefined criteria, potentially serving as a more consistent reference point for investors (Beerbaum and Puaschunder 2018). Academic research highlights its role in reducing information asymmetry and guiding capital toward sustainable investments (Pacces 2021; Alessi, Battiston, and Melo 2021; Schütze et al. 2020).

Despite this, its adoption in investment decision-making remains limited. Interviews with fund managers suggest that the Taxonomy is primarily regarded as a reporting tool rather than an aid for portfolio construction. Empirical evidence supports this perception: for instance, De Angelis and Monasterolo (2024) found a greenium in the EURO STOXX 600 based on ESG classifications but not when using the EU Taxonomy. This raises the question of whether investors truly integrate the Taxonomy into their decision-making.

This paper contributes to the literature by incorporating EU Taxonomy indicators—specifically, revenue and CAPEX breakdowns—into an experimental setting to assess their influence on investment decisions. Unlike previous studies, which have focused on ESG ratings, this approach offers new insights into how standardized sustainability metrics shape financial choices.

2.2 Research questions

Building on insights from the existing literature, this paper investigates the following pre-registered hypotheses (AsPredicted #170063):

1. The presence of investors with green preferences, who refrain from investing in fossil fuels, is marginal compared to those investing in fossil fuels.
2. Investors who continue to invest in firms with substantial exposure to fossil fuels exhibit a higher resistance to change, according to the scale.
3. Firms exhibiting both high financial performance and a strong ESG (Environmental, Social, and Governance) score are preferred over others.
4. The indicator provided by the European Green Taxonomy, specifically the low-carbon CAPEX, is insignificant in influencing investors' investment choices.

This study makes several novel contributions to sustainable finance literature. First, it shifts the focus from retail to professional investors, examining how asset managers build energy portfolios and the role of cognitive biases, particularly resistance to change.

Second, while most research relies on ESG ratings, this study incorporates the EU Taxonomy, a standardized framework that may better inform investment decisions but remains underexplored.

Finally, it is the first to apply a multiple discrete-continuous choice experiment in sustainable finance, capturing portfolio allocation behaviour more realistically than traditional methods.

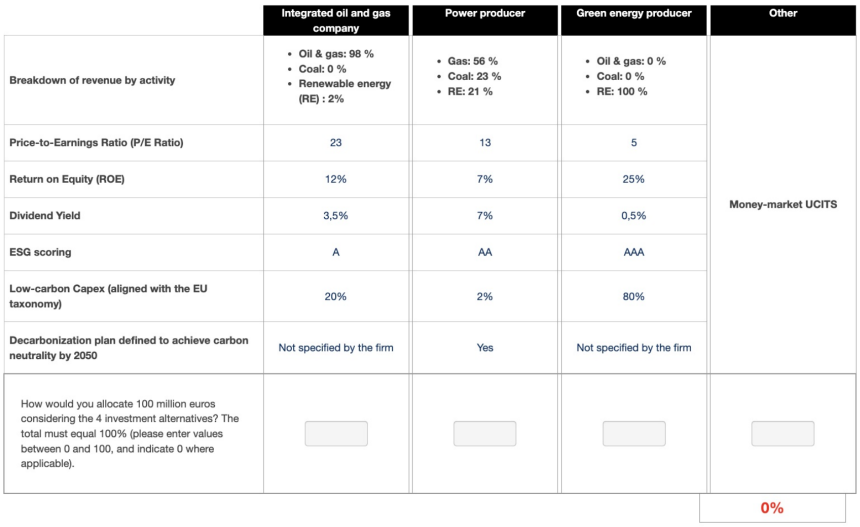
By addressing these gaps, this study advances understanding of professional investors' decision-making and the impact of sustainability metrics on capital allocation.

3 The survey

The survey was validated by the Paris Dauphine University Ethics Board. Each respondent consented to their responses being used within an academic context, and were assured of anonymity. No direct incentives were given to the respondents; however, for each participation, a donation of 5€ was made to an organization that trains and provides medical assistance dogs at no cost to people with disabilities. Furthermore, each respondent pledged to provide honest answers (Jacquemet et al. 2019).

Experimental design

The first part of the survey included a discrete-continuous choice experiment with an efficient design generated using NGENE software. Respondents were presented with six choice cards and asked to allocate a €100 million budget among three energy firms from the STOXX 600. A fourth option, representing investment in a monetary fund, was also available as an opt-out choice.



	Integrated oil and gas company	Power producer	Green energy producer	Other
Breakdown of revenue by activity	• Oil & gas: 98 % • Coal: 0 % • Renewable energy (RE) : 2%	• Gas: 56 % • Coal: 23 % • RE: 21 %	• Oil & gas: 0 % • Coal: 0 % • RE: 100 %	Money-market UCITS
Price-to-Earnings Ratio (P/E Ratio)	23	13	5	
Return on Equity (ROE)	12%	7%	25%	
Dividend Yield	3,5%	7%	0,5%	
ESG scoring	A	AA	AAA	
Low-carbon Capex (aligned with the EU taxonomy)	20%	2%	80%	
Decarbonization plan defined to achieve carbon neutrality by 2050	Not specified by the firm	Yes	Not specified by the firm	
How would you allocate 100 million euros considering the 4 investment alternatives? The total must equal 100% (please enter values between 0 and 100, and indicate 0 where applicable).				

0%

Figure 1: Example of one choice card

Each option was described by its energy mix related to revenue breakdown by activity. This breakdown was fixed during the experiment. The following table describes attributes and levels used for the experiment.

The table below simplifies the names of the firms used in the survey. In the experiment, the three alternatives presented in the choice experiment are as follows:

- Integrated Oil and Gas Company (Brown).
- Electricity Producer (Grey).
- Green Energy Producer (Green).

Table 1 details the six attributes assigned to each option. Three financial attributes were included: the Price Earnings Ratio (PER), Return on Equity (ROE), and dividend yield. The PER is widely used in listed markets, while ROE serves as a standard corporate finance indicator applicable to both listed and unlisted markets. Fund managers employ various indicators as part of their active management strategies, which differ among individuals. These key indicators were identified through semi-structured interviews with fund managers.

The levels of the financial attributes were determined using actual data from firms in the Euro STOXX 600 across the following industries: electric utilities, integrated oil & gas, oil & gas exploration and production, multi-utilities, and renewable electricity. The financial data was sourced from Refinitiv.

The final attribute is a binary variable indicating whether a firm has implemented a low-carbon transition plan. This topic has gained increasing attention in recent years. In the 2018 and 2019 CDP questionnaires, energy firms were specifically asked about the existence of such plans. Although this question was omitted in the 2020 and 2021 editions, it was reintroduced in 2022 across all sectors, now requiring more detailed disclosures than in previous iterations.

The survey also incorporated the 17-item psychometric scale developed by Oreg (2003) to measure resistance to change (RC) bias. This scale assesses RC across four latent factors: routine seeking, emotional reaction, short-term focus, and cognitive rigidity. It has been validated across 17 nations by Oreg et al. (2008). For the French version of this survey, the validated French adaptation by Angel and Steiner (2013) was used.

Participants rated their agreement with the 17 statements on a 6-point Likert scale. The full list of scale items is provided in the Appendix.

Participants

The survey was designed using EngineSurvey and distributed via email to professional investors between April and October 2024. A total of 157 responses were collected, yielding a response rate of 2.5% based on the number of link clicks. However, this rate drops to 1.46% when considering the highest number of opened emails and to 0.81% relative to the total sample size (i.e., all sent emails). After data cleaning, the final dataset comprises 149 responses.

The contact database was partially compiled with the assistance of Hexagone, a Paris-based financial consultancy, and through LinkedIn. Additional contacts were sourced using Apollo.io, a sales intelligence and engagement platform.

Despite institutional support, engaging financial professionals proved challenging. The French journal Funds Magazine featured the survey in its newsletter for several weeks, generating only one response. Similarly, the Paris House of Finance and CFA Society France distributed the survey to their members, yet obtained just one and zero responses, respectively. Some additional responses were collected via LinkedIn.

There is a geographic bias in the responses, as part of the dataset was sourced through the network of Hexagone, a company operating exclusively in France. However, France is a key player in the European asset management sector, accounting for 24% of total assets under management across Europe (AFG 2022).

The following tables indicate that the majority of respondents work either in asset management (AM) companies or in investment funds. 78% of respondents are male, which is representative of the financial industry (Kaddouri 2024). The age distribution is evenly spread, with the age groups 'between 25 and 35' and 'between 45 and 55' having the highest number of respondents. A substantial portion of the respondents, 71.2%, are directly involved in management teams, including 56% who are fund managers or investment directors. A minority of respondents work on very short-term projects, while the majority focus on long-term objectives. Additionally, 10% of respondents consider themselves experts in the energy sector. The financial institutions (FIs) where respondents are employed vary significantly in size: responses were gathered from employees at large, medium, and small institutions alike. Lastly, 50% of the respondents are employed by FIs registered in France, with the remainder primarily working for FIs registered elsewhere in Europe.

Table 2: Sample Presentation

Distribution of Respondents by FIs	**Percentage**
Asset management company	74.5
Investment funds	13.42
Bank	5.37
Asset owner	3.36
Other	3.36
Gender Distribution	
Man	80.54
Woman	16.79
Prefer not answer	2.69
Age Range of Respondents	
Over 65 years old	2.69
Between 55 and 65 years old	12.75
Between 45 and 55 years old	27.52
Between 35 and 45 years old	20.81
Between 25 and 35 years old	30.87
Under 25 years old	4.70
Prefer not answer	0.67

Table 3: Summary of Respondent Professional Characteristics

Function of Respondents	**Percentage**
Fund Manager	38.26
Investment / Risk / Financial Analyst	16.11
Investment and/or Management Director	12.75
Financial and ESG Analyst	6.04
Member of the SRI Team	6.04
Other	5.37
Responsible Investment Director	3.36
CEO	4.O2
Other Director	2.68
Active Investment Horizon of Respondents	
More than 5 years	45.64
Between 3 and 5 years	36.91
Between 1 and 3 years	11.41
Less or equal to a year	6.04
Energy Expertise	
The respondent is specialised in the energy sector	10.90
Size of the FIs Where Respondents are Working	
Greater than 100 billion euros	21.48
Between 50 and 100 billion euros	4.70
Between 15 and 50 billion euros	15.44
Between 5 and 15 billion euros	16.78
Between 3 and 5 billion euros	3.36
Between 1 and 3 billion euros	7.38
Between 500 million and 1 billion euros	12.08
Less than 500 million euros	16.11
Prefer not to answer	2.68
Registration Country of the FIs Where Respondents are Working	
France	50.33
Eurozone (excluding France, Ireland, and Luxembourg)	16.78
UK	10.74
Switzerland	6.72
Luxembourg	6.04
North America	4.70
Europe	2.01
Ireland	1.34
Other	1.34

4 Estimation results

4.1 The MDCEV Model

Using the MDCEV model developed by Bhat (2008), preferences of professional investors regarding investments in the energy sector were estimated. The MDCEV model is an extension of the Discrete Choice Experiment (DCE).

In the DCE, the utility function is assumed to be linear, and the final utility is calculated as the sum of the utilities derived from each selected good. DCE operates under the assumption that marginal utility is constant, thus ignoring the effects of satiation that can occur from consuming a good. In contrast, the novelty of the Multiple Discrete Continuous Extreme Value (MDCEV) model lies in its non-linear utility functions, which incorporate the concept of satiation. The MDCEV model integrates the concept of diminishing marginal utility through two specific indicators, thereby providing a more nuanced understanding of consumer choices and consumption patterns.

The Multiple Discrete-Continuous Extreme Value (MDCEV) model introduces a nuanced approach to modelling consumer behaviour, distinct from traditional Discrete Choice Experiments (DCE). A key difference is the MDCEV model's incorporation of the satiation effect, which acknowledges that the marginal utility of goods decreases as more is consumed. This contrasts with the DCE model, where marginal utility is assumed to increase with consumption. A key feature of the MDCEV is that if an individual consumes only one good, the model reverts to a DCE. For more details on the model, see Appendix A.
The first tests of the MDCEV model realised demonstrated high heterogeneity among respondents. In order to cope with this heterogeneity, a mixed-MDCEV model was therefore used, similar to a mixed multinomial logit (MNL) used in the discrete choice experiment literature. To further explore this heterogeneity—unexpected in the initial hypotheses—an exploratory cluster analysis was conducted to identify distinct investor groups.

4.2 Three types of investors

4.2.1 Defining Clusters

One of the primary objectives of this survey is to understand the preferences of investors by taking into account the possible presence of resistance to change bias. To measure the latter, the scale used was tested and validated in the literature. However, when applied to the studied sample of investors, the overall score of the scale was very low—1.8 out of 5—indicating either that respondents are highly open to change or that the scale as a whole is a poor explanation of the resistance to change bias. Finally, statistical tests revealed that overall, the theoretical foundation of the scale used was poorly adapted to the sample. See Appendix B for details.

Although the overall scale showed a poor fit, certain items proved useful for the analysis. Specifically, the allocated amounts and items associated with the fourth latent factor—labelled Cognitive Rigidity—were valuable in the principal component analysis (PCA), which was subsequently used to identify clusters. A three-cluster solution was chosen using the K-means algorithm, with the number of clusters determined via the elbow method. Further details on the clustering methodology are provided in Appendix C.

Cluster	Investment Brown	Investment Grey	Investment Green	Investment Outside	% of sample
0	24.51	23.25	36.41	15.84	26.8
1	4.24	4.11	81.37	10.28	35.5
2	27.98	25.77	30.84	15.41	37.7

Table 4: Mean Investment Allocations by Firm Type and Cluster

The previous table shows that three distinct clusters emerged based on the amounts allocated to different types of firms. Cluster 1 clearly represents a group of investors with strong green preferences. Across all clusters, the average amount allocated to green firms is higher than that allocated to other firm types. These findings are supported by the descriptive results of the choice experiment, presented in the table below.

	Brown	**Grey**	**Green**	**Outside**
Times Available	894.00	894.00	894.00	894.00
Number of Times Chosen (discrete choice)	545.00	514.00	837.00	578.00
Average Investment When Chosen (continuous choice)	30.67	30.71	53.29	21.27

Table 5: Descriptive Statistics of Choice

It is observable that the Outside options is as much as selected as the Brown and Grey firms but amount allocated to it is lower on average than for the other firms, which confirms its role as an opt-out option.

Cluster	**Item 14**	**Item 15**	**Item 16**	**Item 17**
0	2.03	1.53	1.39	1.94
1	3.14	2.35	2.63	3.06
2	3.42	3.01	2.99	3.28

Table 6: Average Resistance to Change Items Per Cluster

The previous table gives average score (out of 5) of the four items from the scale that were used to defined cluster. There is a clear distinction between Cluster 0 that is more open to change and with the other two clusters. The four items are the following:

14. I often change my mind *(item originally reverse-coded as a cognitive check; reversed back for consistency in analysis)*.
15. I don't change my mind easily.
16. Once I've come to a conclusion, I'm not likely to change my mind.
17. My views are very consistent over time.

These results particularly highlight how confident individuals are in their investment decisions. Previous literature has shown that investors often display overconfidence, so these findings are consistent with existing research. This confidence may also reflect strong conviction—whether among green investors, who are more represented in Cluster 1, or among those with browner preferences, more prevalent in Cluster 2.

Clusters 0 and 2 show similarities in that their investment allocations across the four alternatives are relatively balanced, in line with principles of portfolio diversification. However, one of these clusters appears more resistant to change—i.e., more confident on average—than the other.

Cluster	**France**	**Eurozone**	**Europe**
0	32	31	27
1	66	19	9
2	48	22	26

Table 7: Geographical Distribution Per Cluster

Cluster 2 is mainly composed of individuals working in French financial institutions, while Cluster 0 shows a more balanced geographical distribution. Similar to Cluster 1, nearly half of the individuals in Cluster 2 are employed in French financial institutions.

Cluster	Very Large FIs	Large FIs	Medium Large FIs	Small FIs	Other
0	29	33	22	13	3
1	27	28	19	22	4
2	22	34	28	14	3

Table 8: Organisation Size Distribution by Cluster

The three clusters are characterised by a relatively balanced distribution of individuals working in financial institutions of different sizes. However, Cluster 1 includes a higher proportion of individuals employed in small financial institutions compared to the other two clusters.

Cluster	Less 5 years	5 to 10 years	10 to 15 years	15 to 20 years	More 20 years	
0	18	42	9	4	27	1
1	21	19	6	6	44	
2	18	26	10	10	35	

Table 9: Years of Experience by Cluster

Finally, Cluster 1 includes a higher proportion of individuals with extensive experience (more than 20 years), whereas Cluster 0 is more strongly represented by individuals with 5 to 10 years of experience. Cluster 2 also has a notable share of highly experienced individuals, though to a lesser extent than Cluster 1, and presents a more even distribution across experience levels overall.

4.2.2 A deeper look into green investors

The table below examines investors with strong green preferences—specifically, those who did not invest at all during the experiment in either the Brown firm (i.e., exploiting oil and gas), the Grey firm (i.e., involved in gas, coal, and renewable energy), or in both types of firms. It shows that over 20% of participants never selected the Brown firm. This proportion is lower for the Grey firm, with 12.5% of respondents avoiding it entirely. The exclusion of the Grey firm by some investors might be related its share of revenue coming from coal being higher (i.e 20%) than threshold defined by the NGO Urgewald (i.e 10%), which advocates divestment from firms having coal activities [1].

Group	Green	Outside	Brown	Grey	% of sample	% of which are SRI
No Investment in Brown	61.43	22.86	0.00	15.71	20.39	0.00
No Investment in Grey	57.89	17.37	24.74	0.00	12.50	21.05
No Investment in Brown & Grey	82.71	17.29	0.00	0.00	15.79	20.83

Table 10: Firm Exclusion - Descriptive Statistics

Finally, 15% of participants never invested in either the Brown or Grey firm, meaning they exclusively allocated funds to the Green firm and the Outside Option. The presence of people working in Socially Responsible Investment teams, which are inherently more focus on sustainable investment strategy, only

[1] https://www.coalexit.org/

explain 20 of the respondents that chose not to invest in the Grey and/or Brown firms. These results reveals the presence of green investor, which initial findings suggest. More information regarding firm exclusion per type of professional roles is available in the Appendix D.

Group	Cluster 0	Cluster 1	Cluster 2
No Investment in Oil and Gas	0.00	8.93	3.51
No Investment in Utilities	12.82	17.86	7.02
No Investment in Fossil Fuels	2.56	37.50	3.51

Table 11: Firm Exclusion - Share of Each Cluster Per Exclusion

The previous table reinforces the finding that green investors are primarily concentrated in Cluster 1, where approximately 65% of individuals did not invest in the Brown firm, the Grey firm, or either. Cluster 0 is characterised by a stronger reluctance to invest in the Grey firm compared to cluster 2, while the latter includes only a small proportion of green investors.

4.3 The MDCEV Model

The model was estimated using the Apollo R package for mixed Multiple Discrete-Continuous Extreme Value (MDCEV) models with an outside good, developed by Hess and Palma (2019).

In the MDCEV model, the constant in each utility function represents the baseline utility of an investment option, i.e., the utility derived when no investment is allocated to that option. The outside option serves as a reference point, with its baseline utility fixed at zero. Since a gamma-profile was estimated, all α parameters were set to zero, making the γ parameters the sole representation of satiation effects. Additionally, following standard modelling practice, the γ parameter for the outside option was fixed at zero. The final model was selected based on the lowest Bayesian Information Criterion (BIC) and Akaike Information Criterion (AIC).

Following the recommendations of Hess and Palma (2019), the scale parameter of the Gumbel distribution was fixed at 1 due to the absence of price variation.

Table 12: Econometric Results of the MDCEV Model with a Gamma Profile

Parameter	**Estimate**	**s.e.**	**t.rat.(0)**
Baseline utility Brown	-0.245351	0.590940	-0.4152
Baseline utility Grey	-2.688238****	0.267423	-10.0524
Baseline utility Green	2.042979****	0.268664	7.6042
σ_{Brown}	-1.926760****	0.226363	-8.5118
σ_{Grey}	2.465409****	0.181918	13.5523
γ_{Brown}	1.851749****	0.110835	16.7073
γ_{Grey}	1.769673****	0.119036	14.8667
γ_{Green}	1.374481****	0.146845	9.3601
ROE	-0.003986	0.004902	-0.8133
σ_{roe}	0.032023***	0.005298	6.0448
Low Carbon CAPEX	-7.1114e-04	0.002194	-0.3241
σ_{capex}	0.020048****	0.001329	15.0902
Cluster 0 * Brown	1.750927***	0.352068	4.9733
Cluster 0 * Grey	1.727570***	0.311634	5.5436
Cluster 0 * Green	-1.385490***	0.243407	-5.6921
Cluster 2 * Brown	1.710150***	0.252455	6.7741
Cluster 2 * Grey	1.530951***	0.259144	5.9077
Cluster 2 * Green	-1.556809***	0.195196	-7.9756
sig	1 (fixed)		
α_{Brown}	0 (fixed)		
α_{Grey}	0 (fixed)		
α_{Green}	0 (fixed)		
γ_{Outside}	0 (fixed)		
Baseline utility Outside	0 (fixed)		
LL(final)	-8127.01		
AIC	16292.02		
BIC	16383.52		

Note: $p\_value = 0$: ****, $p\_value < 0.01$: ***, $p\_value < 0.05$: **, $p\_value < 0.1$: *

Baseline Utility In the MDCEV model, baseline utilities represent the constants in each utility function, reflecting inherent preferences for each alternative when no investments are made. The estimation results show that, compared to the outside good (neutral option), the green firm is naturally preferred. In contrast, the grey firm is significantly less preferred. The coefficient for the brown firm is negative but not statistically significant.

These results suggest that, at the zero-investment point, the green firm holds the highest baseline utility. However, the σ parameters, which capture preference heterogeneity, are all statistically significant. This indicates that inherent preferences vary substantially across investors.

Satiation Parameters γ The MDCEV model allows for the estimation of satiation parameters, which capture the rate at which marginal utility decreases as investment increases. Higher values of the γ parameters indicate slower marginal utility decrease, meaning that larger γ values reflect stronger inherent preferences for a given alternative.

The estimation results show that the Brown firm has the highest γ, followed by the Grey firm, and lastly the Green firm. This suggests that, while investors do allocate to the Green firm, their marginal utility from doing so diminishes more quickly, leading to smaller amounts being allocated after initial investments.

Overall, investors allocate to all energy firms, but tend to invest larger amounts in the Brown and Grey firms. This pattern is consistent with portfolio diversification theory, whereby investors aim to spread risk across different segments while still demonstrating a clear preference for Brown firms. These results support the pre-registered hypothesis that, on average, investors continue to exhibit brown preferences, and that green-oriented investors remain a minority.

Low Carbon CAPEX and ROE Tests in the regression showed that none of the attributes used to define the choice experiment were statistically significant. However, the heterogeneity parameters σ for Return on Equity (ROE) and Low-Carbon CAPEX were significant, indicating that these attributes may have influenced individual choices, even though no consistent main effect could be identified.

These findings support the pre-registered hypothesis that Low-Carbon CAPEX does not directly influence investors' choices in the energy sector, despite conveying relevant information about a firm's willingness to transition away from fossil fuels.

The role of clusters Each cluster was included in the regression analysis. As Cluster 1 is primarily composed of individuals who consistently selected the Green firm, the correlation between Cluster 1 membership and the amount allocated to the Green firm was high. For this reason, Cluster 1 was excluded from the regression to avoid multicollinearity issues.

The results show that individuals in Clusters 0 and 2 are more likely to invest in the Brown and Grey firms, and less likely to invest in the Green firm. The estimate for investment in the Green firm is even lower for Cluster 2 than for Cluster 0, suggesting a stronger disinterest in green options among members of Cluster 2.

This implies that, compared to the outside good, the utility derived from investing in the Green firm decreases for individuals in Clusters 0 and 2, while their utility increases when choosing to invest in the Brown or Grey firms.

The pre-registered hypothesis that stipulates that investors more resistant to change tend to more invest in brown firms has to be discussed. Indeed, comparing both Cluster 0 and 2, the latter tend the even less invest in Green firm compared to Cluster 0, but both cluster invest in the Brown and Grey firms independently of

the low-carbon CAPEX, but Cluster 0 is more open to change than Cluster 2. While, Cluster 1 tends also to be more resistant to change and invest almost all its budget into the green firms. This mean that resistance to change bias do explain some behaviours and distinguished individuals between them. The items in the resistance to change scale that were significant tend to measure more confidence of individuals. This show, that high confidence in oneself - and to some extent the resistance to change as high confidence - can explain investment of individuals with strong convictions do invest in green energy. Another fact, is that individuals in this exercise comply with their initial beliefs, as none of the attribues were significant, meaning that did not very influence choices which translate the presence of a resistance to change with the idea of sticking with its perceived view. While, some indicators such as the Low-carbon CAPEX could be relevant to look into, especially for browner energy mix, was totally neglected showing that this indicator does not convey a strong signal enough.

5 Discussion

The pre-registered hypothesis suggesting that investors more resistant to change are more likely to invest in brown firms requires further discussion. When comparing Clusters 0 and 2, the latter invests even less in the Green firm than Cluster 0. However, both clusters allocate investment to the Brown and Grey firms, regardless of the level of Low-Carbon CAPEX. Importantly, Cluster 0 appears more open to change than Cluster 2.

At the same time, Cluster 1 also demonstrates a higher level of resistance to change, yet allocates nearly its entire budget to the Green firm. This suggests that resistance to change may play a role in shaping investment behaviour, distinguishing groups of individuals according to their convictions. Among the significant items in the resistance to change scale, they appear to capture self-confidence. This supports the idea that high self-confidence—or resistance to change expressed as conviction—can explain strong and consistent green investment preferences.

Furthermore, the results suggest that individuals in this experiment largely act in line with their initial beliefs. None of the firm-level attributes were statistically significant, implying that these features did not substantially influence choices. This may reflect a form of resistance to change, with individuals remaining anchored to their prior views. Notably, indicators such as Low-Carbon CAPEX—while potentially informative, especially in the context of browner energy mixes—were largely disregarded. This suggests that such indicators do not yet send a strong enough signal to shift investment behaviour. Consequently, responsible investment policies should increasingly emphasize CAPEX as a fundamental metric, moving beyond ESG ratings, which often fail to capture the depth of a firm's transition strategy.

Findings also highlights significant heterogeneity among respondents. In line with previous literature on ESG-driven investment motivations, they confirm that investors exhibit diverse preferences and decision-making processes (Giglio et al. 2025). To account for this heterogeneity, the sample was segmented into three clusters, which allowed for a more nuanced understanding of variations in investment behaviour.

While the study confirms the presence of green investors, the results also reveal that the majority of respondents continue to favour browner firms. The model suggests that investing in companies linked to fossil fuel activities generates higher satisfaction compared to investing in renewable energy firms. These findings align with previous research indicating that although investors recognise green firms as viable investment opportunities, they do not yet perceive brown firms as particularly risky (Masini and Menichetti 2013; Monasterolo and De Angelis 2020). This persistence in investing in fossil fuel-related firms suggests that, for a significant portion of investors, perceived financial returns and low exposure perception to climate-related risks continue to outweigh sustainability considerations.

The results also indicate that individuals working in Socially Responsible Investment (SRI) teams are, for the most part, more strongly driven by green investment preferences. The divergence in preferences between SRI teams and other professional investor profiles underscores the need for greater integration and collaboration between these groups in order to facilitate the redirection of financial flows towards greener solutions within the energy sector. Beyond professional roles, investment experience also appears to be positively associated with a greater willingness to invest in green energy, in line with previous findings by Masini and Menichetti (2013). Additionally, the combination of experience and employment at a French financial institution (FI) appears to influence green investment decisions. Prior studies have demonstrated the impact of cultural and institutional factors on decision-making (Claudio and Gallo 2025), a pattern that is also observed in the present research. In particular, Masini and Menichetti (2013) highlighted the role of institutional pressures in shaping preferences for renewable energy investments. In France, financial market authorities such as the AMF and ACPR actively encourage banks and financial institutions to reduce their exposure to the fossil fuel sector, monitoring their progress on an annual basis. This regulatory oversight likely contributes to shaping investment behaviours and underscores the role of policy interventions in fostering sustainable finance.

Given the prevailing preference for brown firms, policymakers should consider these insights when designing regulatory frameworks. The findings suggest that mandatory extra-financial reporting alone may be insufficient to redirect capital flows toward greener firms, except among investors with strong environmental convictions—who remain a minority. As a potential policy response, mandating a minimum exposure to transitioning firms within mutual funds could be an effective mechanism. The ongoing revision of the European Sustainable Finance Disclosure Regulation (SFDR) is considering such an approach. The revised directive proposes classifying sustainable funds based on their objectives—such as sustainability, social impact, and transition—each requiring a minimum capital expenditure (CAPEX) threshold aligned with the EU taxonomy (European Commission - Platform on Sustainable Finance 2024). If implemented, this regulation could act as a behavioural nudge, encouraging investors to align their portfolios with sustainable investment policies and ensuring a more systematic allocation of capital toward firms actively engaged in the low-carbon transition.

6 Conclusion

This study demonstrates that professional investors continue to exhibit a preference for brown energy firms, highlighting the persistence of fossil fuel investments despite the increasing prominence of sustainability considerations. The research aimed to identify the investor characteristics associated with a willingness to divest from fossil fuels. Key factors such as investment experience, professional roles within financial institutions (FIs), location, and prior beliefs and convictions were found to influence green investment decisions. Additionally, resistance to change bias may play a role in shaping investment behaviours towards both green and brown energy, albeit in different ways.

While previous research on green investment preferences has primarily focused on retail investors, this study sought to bridge the gap by examining professional investors, particularly those operating in the energy sector—a crucial domain for the low-carbon transition. By employing the Multiple Discrete-Continuous Extreme Value (MDCEV) model, this study provided a more comprehensive understanding of investor decision-making when faced with multiple investment options. The inclusion of satiation parameters in the MDCEV model was particularly valuable, as it enabled a more precise measurement of investor satisfaction derived from different investment choices. By capturing diminishing marginal utility, these parameters offered deeper insights into how investors allocate capital across various firms, revealing the trade-offs and underlying preferences that shape energy investment decisions.

Despite its contributions, this study is not without limitations. Engaging with professional investors proved challenging, and the relatively small sample size (n=157) remains the primary constraint. Future research should seek to replicate this experiment with a larger sample of professional investors, ideally leveraging institutional support to improve response rates. Expanding the sample would allow for a more robust analysis of additional determinants influencing investment preferences in the energy sector. Furthermore, the survey included an incentive mechanism in the form of a charitable donation, which may have introduced a selection bias favouring individuals with stronger altruistic tendencies. Future studies should consider alternative incentive structures to mitigate potential biases while maintaining respondent engagement.

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A Presentation of the MDCEV model

Utility and Likelihood Functions: The model's utility and likelihood functions are expressed as follows:

$$U(x) = \sum_{k=1}^{K} \psi_k \frac{v_k}{\alpha_k} \left(\left(\frac{x_k + 1}{\gamma_k} \right)^{\alpha_k} - 1 \right)$$

$$LKH = \frac{1}{\sigma^{M-1}} \times \left(\prod_{i=1}^{M} c_i \right) \times \left[\sum_{i=1}^{M} \frac{1}{c_i} \times \left(\prod_{j=1}^{M} \frac{v_{j_k}}{e^{\frac{v_k}{\sigma}}} \right) \Big/ \left(\sum_{k=1}^{K} e^{\frac{v_k}{\sigma}} \right) \right] \times (M-1)!$$

where $\psi_k = e^{v_k + \varepsilon_k}$,

$c_i = \dfrac{(1-\alpha_i)}{e+\gamma_i}$,

$v_k = \beta_k z_k + (\alpha_k - 1) \ln \left(\dfrac{e_k + 1}{\gamma_k} \right)$,

β_k, z_k are vectors of estimators and attributes,

γ_k and α_k are satiation parameters

Implications of the MDCEV Model: Incorporating an error term that captures uncertainty and individual variations in satisfaction assessments, the MDCEV model reflects the complex nature of decision-making. This random component follows an extreme value distribution, allowing for significant variations in individual preferences. Unlike the DCE model, which typically focuses on discrete choice among mutually exclusive alternatives, the MDCEV model extends the error structure to accommodate the selection and quantity of multiple items, providing a richer framework for analysing consumer behaviour patterns.

The utility function $U(x)$ is concave, increasing, and continuously differentiable, showing how consumption quantity affects satisfaction. The parameters γ_k and α_k control the utility's shape, influencing consumption behaviour significantly. While γ_k allows for non-consumption scenarios (i.e, corner solutions), α_k adjusts the rate at which satisfaction from consumption diminishes.

ψ_k represents the base utility of good k, where $k = 1, \ldots, K$. A higher ψ_k indicates a stronger inherent preference for good k. If α_k is close to 1, there is no satiation effect, and the individual is likely to allocate a larger portion of their budget to good k as the marginal utility remains constant, not decreasing with consumption. Conversely, a lower α_k suggests a rapid onset of satiation; hence, the individual will consume less of good k as utility decreases more quickly with increased consumption.

Practical Application: Empirically, the parameters γ_k and α_k are difficult to estimate simultaneously due to their intertwined effects on utility. Typically, one parameter is fixed while the other is estimated to discern their distinct impacts. The flexibility and detailed insight provided by the MDCEV model make it extremely valuable for academic research in consumer behaviour, particularly in fields requiring a nuanced understanding of the trade-offs consumers make among multiple goods.

B The psychometric scale

B.1 Presentation of the scale

Psychometrics is a field that encompasses theories and techniques aimed at measuring personal characteristics and their impact on behaviours. Personality traits, being latent constructs, cannot be directly observed. To address this, psychometrics employs methods such as scales that gather self-reported data from individuals to quantify specific variables. Each scale is composed of multiple items, which respondents complete using a Likert scale. These responses are scored and interpreted based on established psychological theories and research. This rigorous methodology ensures that scales accurately provide quantitative evaluations of abstract traits and psychological states, including intelligence, personality, attitudes, and emotional states (Robins, Fraley, and R. F. Krueger 2009).

Presentation of items of the RC scale developed by Oreg (2003):

Latent Factor 1: Routine Seeking

1. I generally consider changes to be a negative thing.
2. I'll take a routine day over a day full of unexpected events any time.
3. I like to do the same old things rather than try new and different ones.
4. Whenever my life forms a stable routine, I look for ways to change it.
5. I'd rather be bored than surprised.

Latent Factor 2: Emotional Reactions

1. If I were to be informed that there's going to be a significant change regarding the way things are done at school, I would probably feel stressed.
2. When I am informed of a change of plans, I tense up a bit.
3. When things don't go according to plans, it stresses me out.
4. If one of my professors changed the grading criteria, it would probably make me feel uncomfortable even if I thought I'd do just as well without having to do any extra work.

Latent Factor 3: Short-term focus

1. Changing plans seems like a real hassle to me.

2. Often, I feel a bit uncomfortable even about changes that may potentially improve my life.
3. When someone pressures me to change something, I tend to resist it even if I think the change may ultimately benefit me.
4. I sometimes find myself avoiding changes that I know will be good for me.

Latent factor 4: Cognitive Rigidity

1. I often change my mind.
2. I don't change my mind easily.
3. Once I've come to a conclusion, I'm not likely to change my mind.
4. My views are very consistent over time.

B.2 Statistical description of the scale

Table 13: Means of each scale items

Item 1.1	**Item 1.2**	**Item 1.3**	**Item 1.4**	**Item 1.5**
1.1476510	1.9395973	1.4496644	2.9328859	0.9395973
Item 2.1	**Item 2.2**	**Item 2.3**	**Item 2.4**	
1.9395973	1.9127517	2.2483221	1.7315436	
Item 3.1	**Item 3.2**	**Item 3.3**	**Item 3.4**	
1.4496644	1.1677852	1.4630872	1.3087248	
Item 4.1	**Item 4.2**	**Item 4.3**	**Item 4.4**	
2.9328859	2.3959732	2.4563758	2.8389262	

B.3 Statistical fits

To measure resistance to change bias, respondents' answers were averaged based on a six-item Likert scale (from 0 to 5), with higher scores indicating a greater resistance to change. To ensure the validity and reliability of the scale, several statistical tests were conducted. Since the psychometric scale used in this research has been previously validated in the literature, only a confirmatory factor analysis (CFA) was performed. Given that kurtosis and skewness revealed that the data were not normally distributed, the Weighted Least Squares Mean and Variance adjusted (WLSMV) estimator was employed for the CFA.

Table 14: Statistical Tests of the Psychometric Scale

Chisq	**SRMR**	**RMSEA**	**CFI**	**TLI**	**Raw Alpha**
1213.22	0.075	0.1044	0.9644	0.9571	0.82
Chisq scaled	**SRMR scaled**	**RMSEA scaled**	**CFI scaled**	**TLI scaled**	
1199.843	0.075	0.1044	0.899	0.916	

The internal consistency of the scale was assessed using Cronbach's alpha, which exceeded 0.8, indicating good reliability.

The Chi-square test was used to assess how well the empirical data fit the theoretical model. The test rejected the null hypothesis, suggesting a poor model fit. While Chi-square is known to be sensitive to sample size, in this case—where the sample consists of only 150 respondents—such a high Chi-square value reinforces the indication of poor fit.

The Root Mean Square Error of Approximation (RMSEA), which is not affected by sample size and evaluates model fit in the population, was found to be 0.1044. As this exceeds the commonly accepted threshold of 0.08, it suggests a poor fit between the data and the model.

Another absolute fit index, the Standardized Root Mean Square Residual (SRMR), was examined and found to be 0.078, which is close to 0.08 and thus suggests a reasonable fit. Additionally, two comparative fit indices, the Tucker-Lewis Index (TLI) and the Comparative Fit Index (CFI), were used to assess the reliability of the scale relative to a model without predefined structures. The TLI value of 0.957 and the CFI value of 0.9644 exceed the recommended threshold of 0.95, suggesting a strong fit. However, when considering the scaled CFI and TLI—adjusted for non-normality and small sample sizes—these values fell below the acceptable threshold, reinforcing the evidence of poor model fit.

Based on these statistical tests, the scale as a whole was not considered a valid standalone measure of resistance to change. However, as will be demonstrated in the following results, some individual items from the scale were included in the econometric analysis. Additionally, the average score on the scale was 1.82 out of 5, which is below the midpoint of 2.5.

C Clustering methodology

C.1 Realising the PCA

In order to realise the principal component analysis in two dimensions, at first all variables available were used: investment decisions, socio-demographic information regarding respondents and finally items from the resistance to change scale. Finally, only the following variables were found usefull to define the two principal components:

- Investment in the brown firm (oil&gas).
- Investment in the grey firm (electric utility).
- Investment in the green firm.
- Items 14, 15, 16 and 17 from the resistance to change scale.

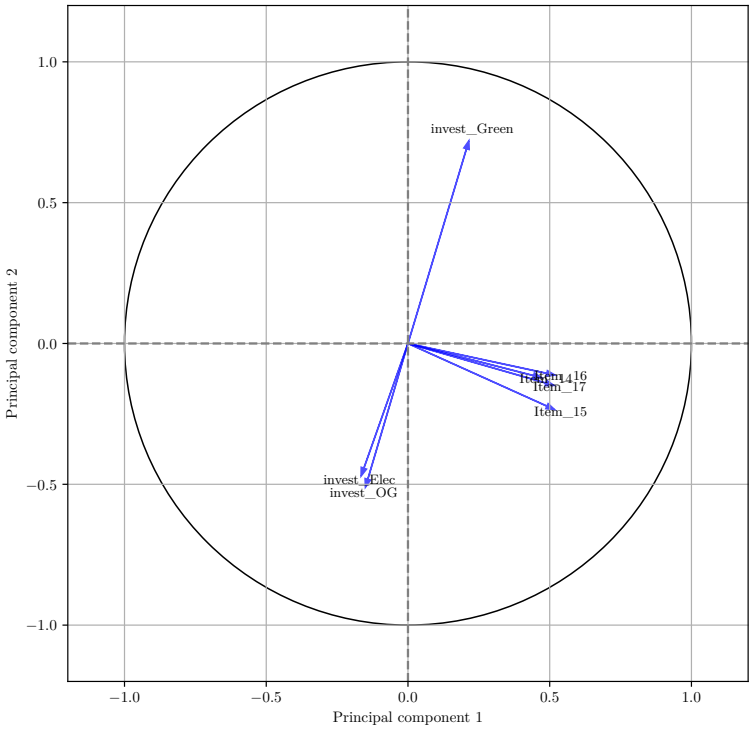

Figure 2: Correlations Circle (CPA)

C.2 Determining clusters

Then, once the two dimensions of the PCA were defined, they were used to defined clusters. Using the elbow method to define the number of clusters, 3 clusters seem to be the adequate number.

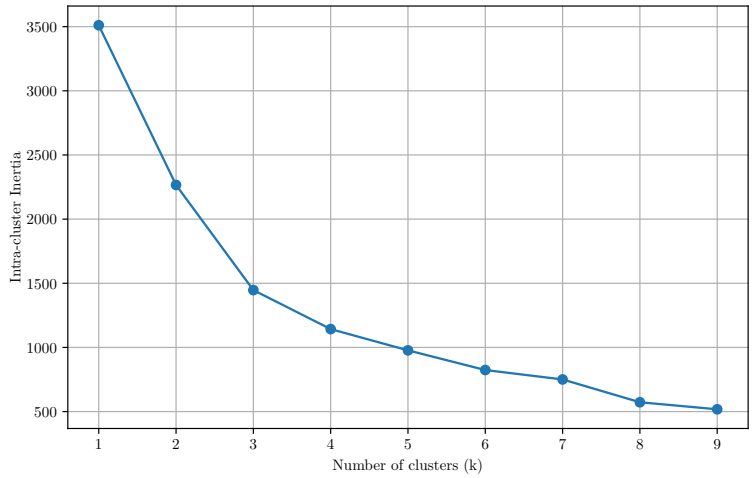

Figure 3: Elbow method to determine optimal k

Graphically, three clusters are observable for the studied sample.

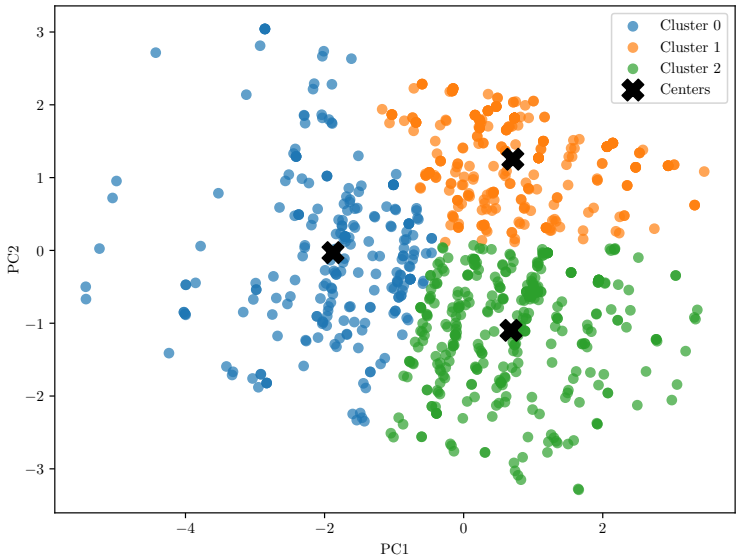

Figure 4: Clustering (k=3) on the CPA space

D Firm Exclusion per Professional Roles

Group	Energy Expert	Fund Manager	Analyst	SRI	Financial & ESG Analyst	Other
No Investment in Brown	12.5	4.71	8.33	0.00	11.11	0.00
No Investment in Grey	0.0	11.76	4.17	26.67	0.00	21.05
No Investment in Brown & Grey	25.0	14.12	12.50	33.33	33.33	5.26

Table 15: Firms Exclusion - Share of Each Professional Role Per Exclusion

E Other materials on the survey

E.1 Cognitive fatigue and Pilot

The survey was structured into three parts: the first involved a discrete-continuous choice experiment; the second section gathered sociodemographic and job-related information; and the third section employed an 17-item psychometric scale to measure resistance to change cognitive bias. This sequence was strategically chosen to minimize cognitive fatigue between the experiment and the psychometric assessment. If interested by the results of the survey, respondents had the possibility to register to receive the final results.

Coefficients from a pilot study of 27 Master's students in Asset Management at University Paris-Dauphine PSL served as priors.

E.2 Additional information of the survey communication

Qualtrics was used for the email distributions. On average, Apollo.io enabled contact with over 17,000 investment specialists across Europe.

The first communication campaign was launch in April 2024. In addition to the initial email, three follow-up emails were sent. The number of emails opened for each dispatch is as follows:

- First email in April: 599
- Second email in May: 518
- Third email in June: 784
- Fourth email in July: 425

A second communication campaign was executed using a commercial tool, Apollo.io, a comprehensive sales intelligence and engagement platform. This tool facilitated the efficient sourcing and management of professional contact details from a diverse array of industry specialists. On average, Apollo.io enabled contact with over 17,000 investment specialists across Europe. It was ensured that individuals contacted in the first campaign were not included in this second campaign. During the second campaign, the follow-up emails were sent at shorter intervals. The number of emails opened for each dispatch:

- First email on August 22: 10,146
- Second email on September 3: 10,024
- Third email on September 10: 5,742
- Fourth email on September 18: 7,386
- Fifth email on October 8: 5,614

Regarding RGDP compliance, all email addresses were deleted once the survey was concluded.

For comparison, the French Public Bank for Investments (BPI France), a well-established and renowned institution within the financial community, conducted a survey in 2024 on the adaptation of SME and intermediate-sized enterprise executives to climate change. They received 300 responses from a pool of 65,000, equating to a response rate of 0.6%, which they reported as unusually low (*L'adaptation des PME et ETI au changement climatique* 2024). This highlights the current challenges associated with conducting such surveys.

Table 1: Levels and attributes of the choice experiment

Breakdown of revenue by activity	**Brown Firm**	**Grey Firm**	**Green Firm**
Oil and Gas	98%	-	-
Gas (alone)	-	56%	-
Coal	-	23%	-
Renewable Energy	2%	21%	100%
Attributes			
Price-to-Earnings Ratio (PER)		5% 13% 23%	
Return on Equity (ROE)		7% 12% 25%	
Dividend yields		0.5% 3.5% 7%	
ESG Score		AAA AA A	
Low Carbon CAPEX	2% 20% 60%		80%
Decarbonisation Plan Defined	Yes Not specified by the firm		