University of St.Gallen s:fi VU

Climate Transition Beliefs

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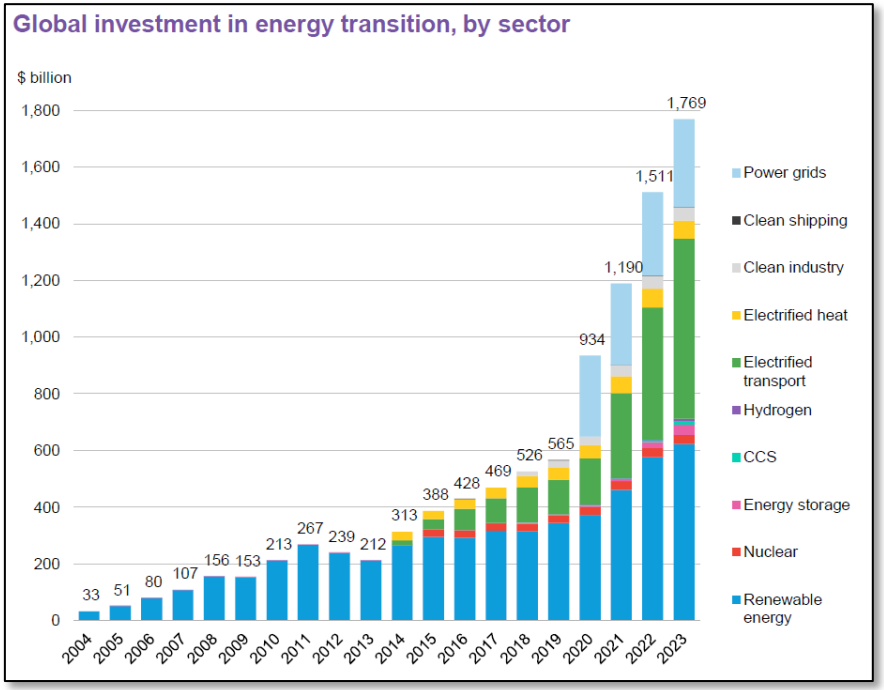
Expectations Surveys, Central Banks and the Economy conference

October 1, 2024

Motivation



Energy Transition Investment Trends 2024, Bloomberg.

- Global investments in the energy transition are increasing.
- But much more is needed!
- The energy transition requires scaling up clean energy investments to USD 4 trillion annually until 2030 (IEA, 2023).


CNBC

A green transition will require trillions of dollars. It'll be a 'tall order' to find the cash, but there's hope

PUBLISHED TUE, APR 4 2023•1:15 AM EDT

KEY POINTS

- According to the International Energy Agency, clean energy investment will need to hit over $4 trillion a year by 2030 in its Net Zero Emissions by 2050 Scenario.

What drives green investments?

So far, the literature looks at green investments mainly through the lens of their non-pecuniary or risk-hedging benefits (cost of capital).

→ In equilibrium, green investments have lower expected returns than conventional ones (Pàstor et al., 2021, Bolton and Kacperczyk, 2021).

Prevailing theories generally assume investors agree about the probability distributions of future cash flows. But:

- Large belief dispersion in financial markets (Giglio et al., 2021).
- Complete agreement assumption is unrealistic (Fama and French, 2007), especially on the energy transition.

Different narratives about the energy transition

"*The transition to clean energy is happening worldwide and it's unstoppable*", IEA World Energy Outlook (October 2023).

The New York Times

Energy Agency Sees Peaks in Global Oil, Coal and Gas Demand by 2030

The prediction, which has stirred controversy among oil producers, is a sign of a sweeping transformation in the global energy landscape.

Oct. 24, 2023

"*We should abandon the fantasy of phasing out oil and gas*", Amin Nasser, Saudi Aramco's CEO (March 2024).

The New York Times

Oil Executives, Meeting in Texas, Cast Doubts on 'Fantasy' Energy Transition

The comments by a Saudi executive raised questions regarding whose predictions about the future of oil and gas are more likely to be true.

Summary

How do investors' expectations about the trajectory of the energy transition ("climate transition beliefs") influence their investment behavior?

1. Survey evidence
   I. Considerable heterogeneity in climate transition beliefs.
   II. Positive correlation between transition optimism, green performance expectations, and green investment preferences.
   III. Beliefs more important for those without strong pro-environmental preferences.

2. Experimental evidence
   I. Different narratives meaningfully shift climate transition beliefs.
   II. Causal evidence on the role of transition beliefs in forming heterogenous return expectations and investment decisions.

Survey evidence

Surveys run in collaboration with YouGov in November 2023.

- N=1,007 U.S. retail investors.
- 15 questions in 3 blocks, median completion time of ~12 minutes.
- Also information about the respondents' demographics, including income, wealth, ZIP code, and also political affiliation.

1. Climate concerns and environmental preferences

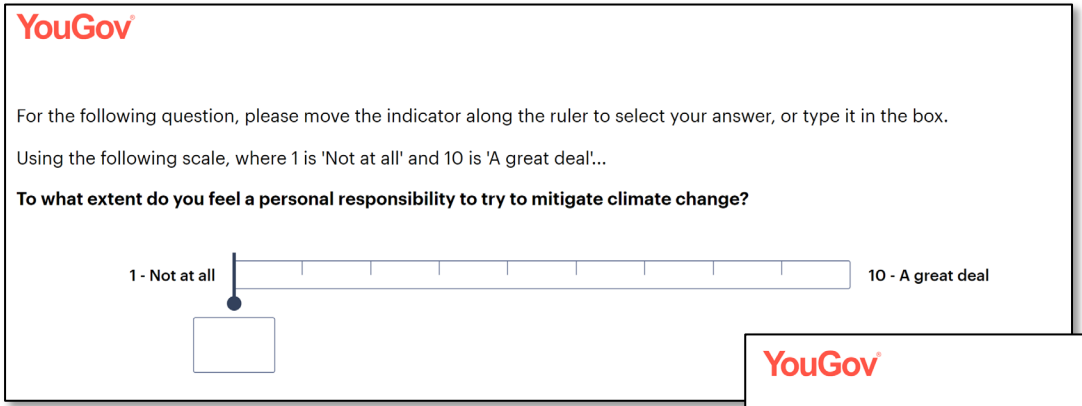
2. Climate transition beliefs

3. Green investment expectations

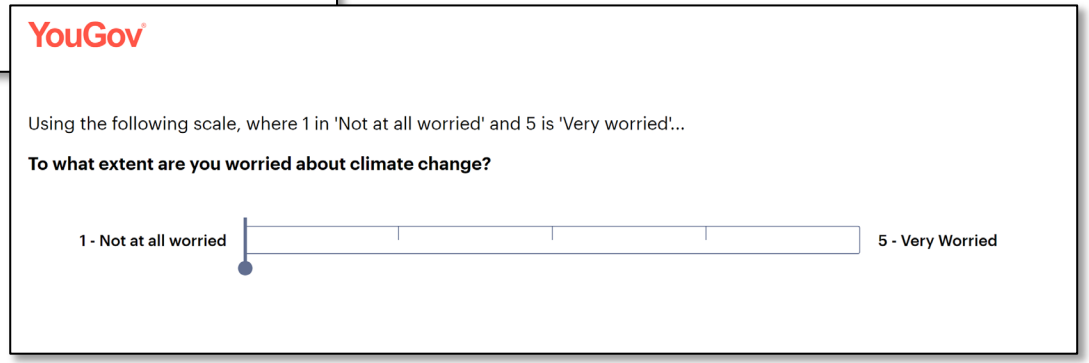
Question block 1. Environmental preferences

Questions similar to other climate-related surveys (e.g., Yale PCCC survey):

Pro-environmental preferences



Climate change worry



Question block 2. Climate Transition Beliefs

Next, we ask about long-term expectations about the energy transition. How to proxy for it?

Subjective expectations on a specific dimension: The share of U.S. electricity generated using renewable energy sources (solar, wind, and hydroelectric power).

Motivation:

1) RELEVANCE: Expanding renewables in electricity is the single most critical driver of emission reduction (e.g., IEA, 2023).

2) SIMPLICITY: Allows us to capture expectations about a very complex phenomenon through concrete questions.

Question block 2. Climate Transition Beliefs

YouGov

According to official statistics, in 2022, the share of U.S. electricity generated using renewable sources (such as solar, wind, and hydroelectric power) was around 22%, up from 10% in 2010

How much do you expect the share of U.S. electricity generation from renewable sources to be in **2030?**

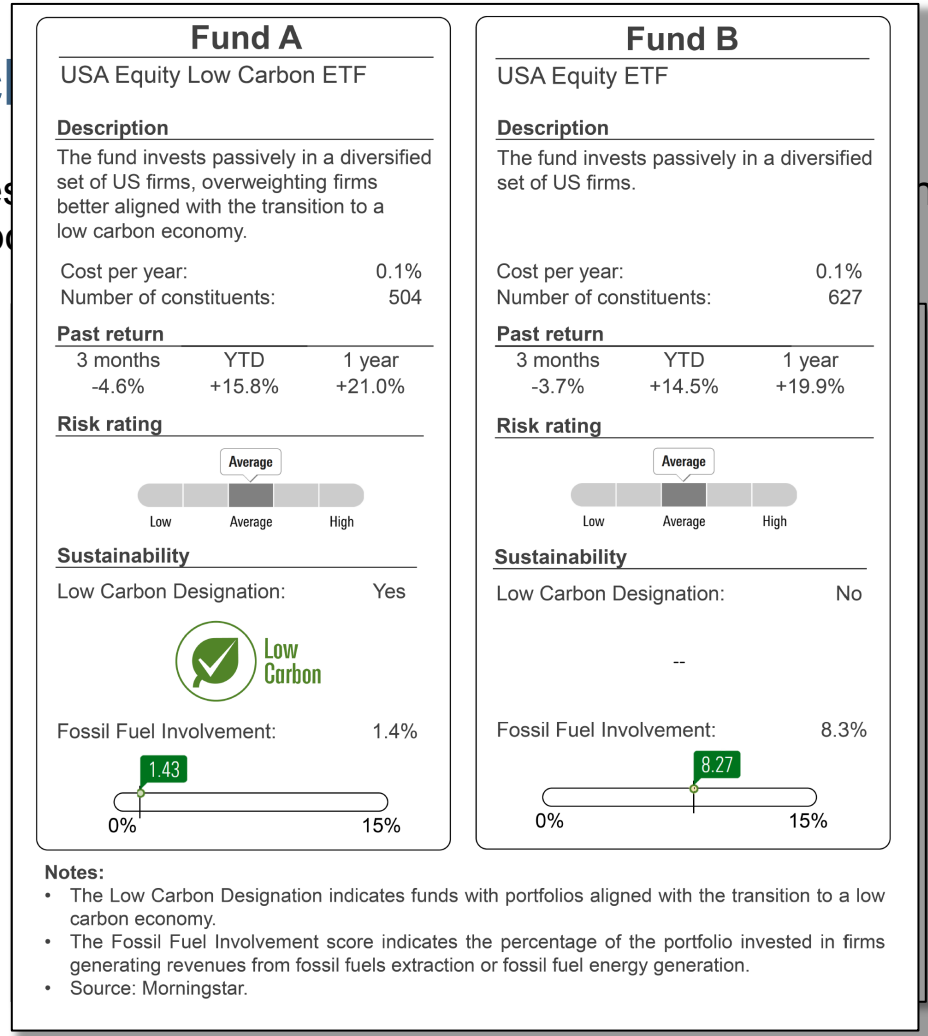
How much do you expect the share of U.S. electricity generation from renewable sources to be in **2040?**

How much do you expect the share of U.S. electricity generation from renewable sources to be in **2050?**

Question bloc

Next, we present res
fund and a low-carb

ntional U.S. equity



Fund A

USA Equity Low Carbon ETF

Description

The fund invests passively in a diversified set of US firms, overweighting firms better aligned with the transition to a low carbon economy.

Cost per year:	0.1%
Number of constituents:	504

Past return

3 months	YTD	1 year
-4.6%	+15.8%	+21.0%

Risk rating

Average

Low Average High

Sustainability

Low Carbon Designation: Yes

Low Carbon

Fossil Fuel Involvement: 1.4%

1.43

0% 15%

Fund B

USA Equity ETF

Description

The fund invests passively in a diversified set of US firms.

Cost per year:	0.1%
Number of constituents:	627

Past return

3 months	YTD	1 year
-3.7%	+14.5%	+19.9%

Risk rating

Average

Low Average High

Sustainability

Low Carbon Designation: No

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Fossil Fuel Involvement: 8.3%

8.27

0% 15%

Notes:

- The Low Carbon Designation indicates funds with portfolios aligned with the transition to a low carbon economy.
- The Fossil Fuel Involvement score indicates the percentage of the portfolio invested in firms generating revenues from fossil fuels extraction or fossil fuel energy generation.
- Source: Morningstar.

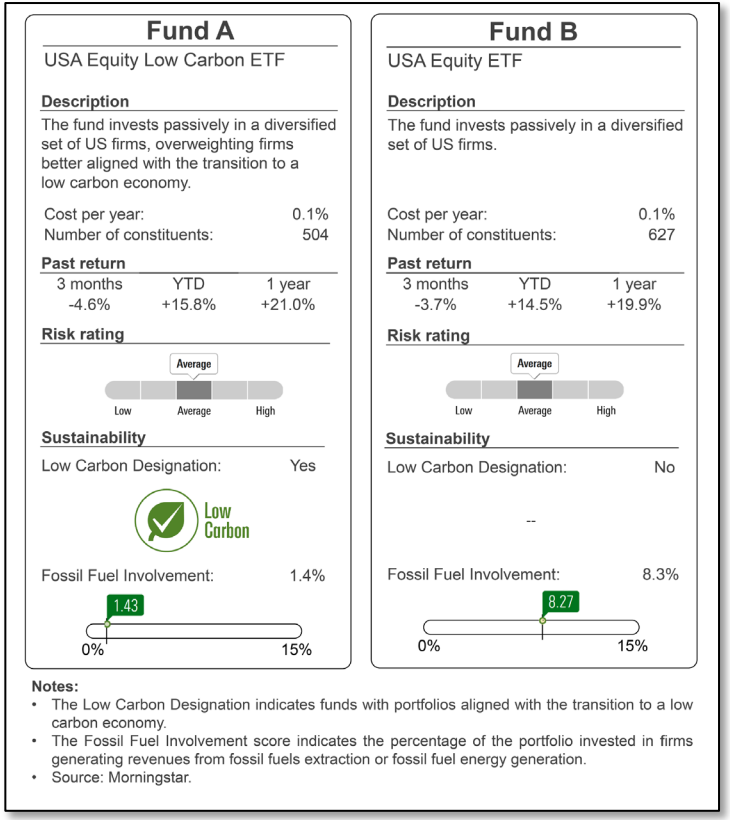
- We show Morningstar's Low Carbon label because Ceccarelli et al. (2024) show it moves flows.
- We randomize the low carbon fund as Fund A or Fund B.

Question block 3. Investments

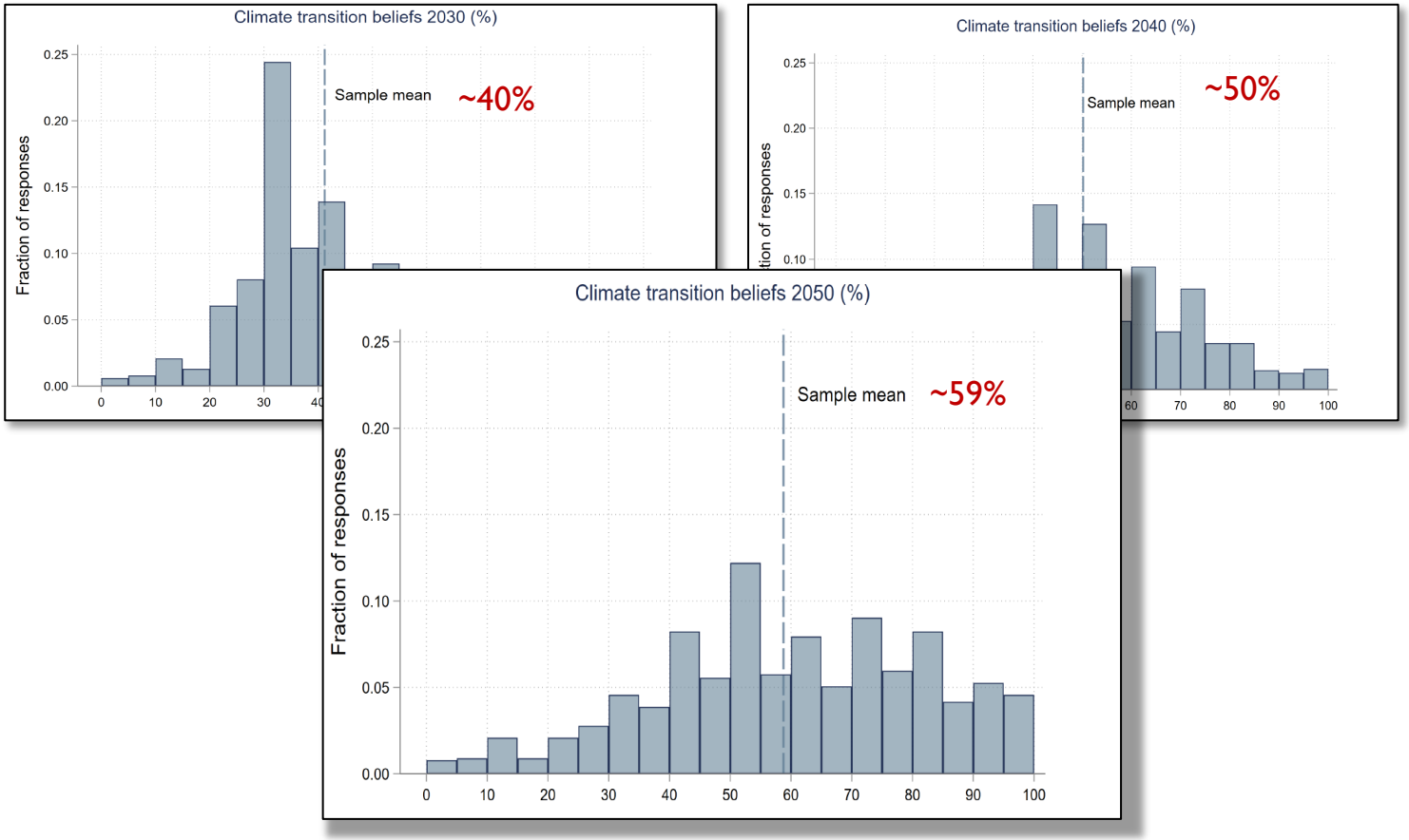
Expected green return:
“How do you expect the return of Fund A and Fund B to be over the next 10 years?” From 1 to 5.

Expected green risk:
“How do you expect the risk of Fund A and Fund B to be over the next 10 years?” From 1 to 5.

Green investment:
“Please imagine you have to invest 10,000 USD for a period of 10 years. You have two investment options: Fund A or Fund B. In which fund would you invest?”

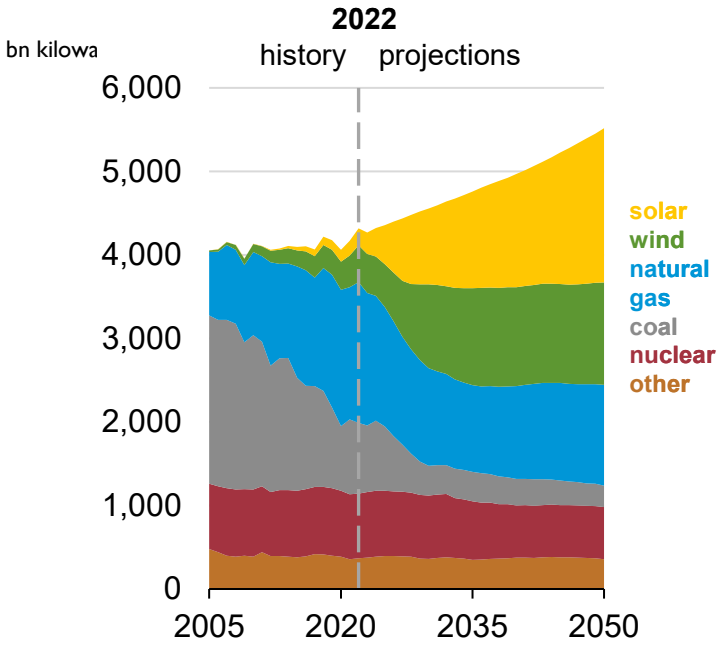


Distributions of climate transition beliefs



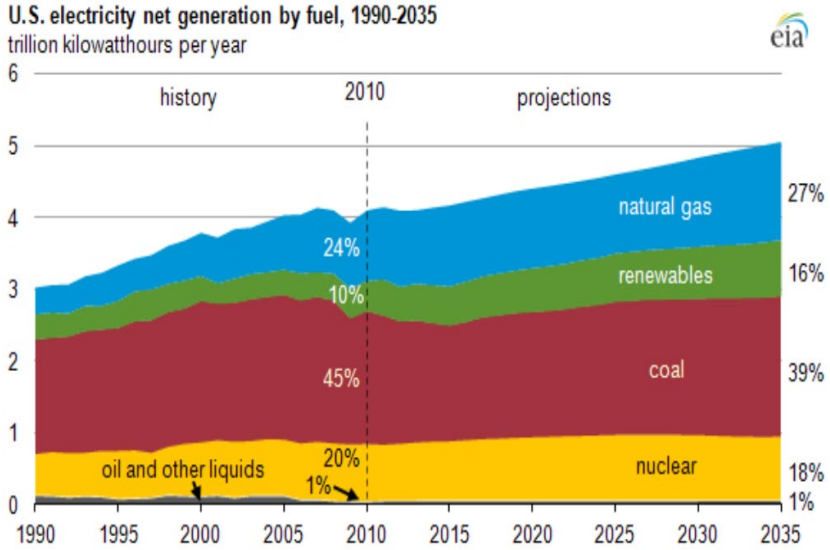
Distributions of transition beliefs

Official 2023 forecasts: ~53.5% of electricity generation capacity from renewables by 2050.



Data: U.S. Energy Information Administration, *Annual Energy Outlook 2023.*

Official 2012 forecasts: 16% of electricity generation capacity from renewables by 2035, a level reached already in 2016!

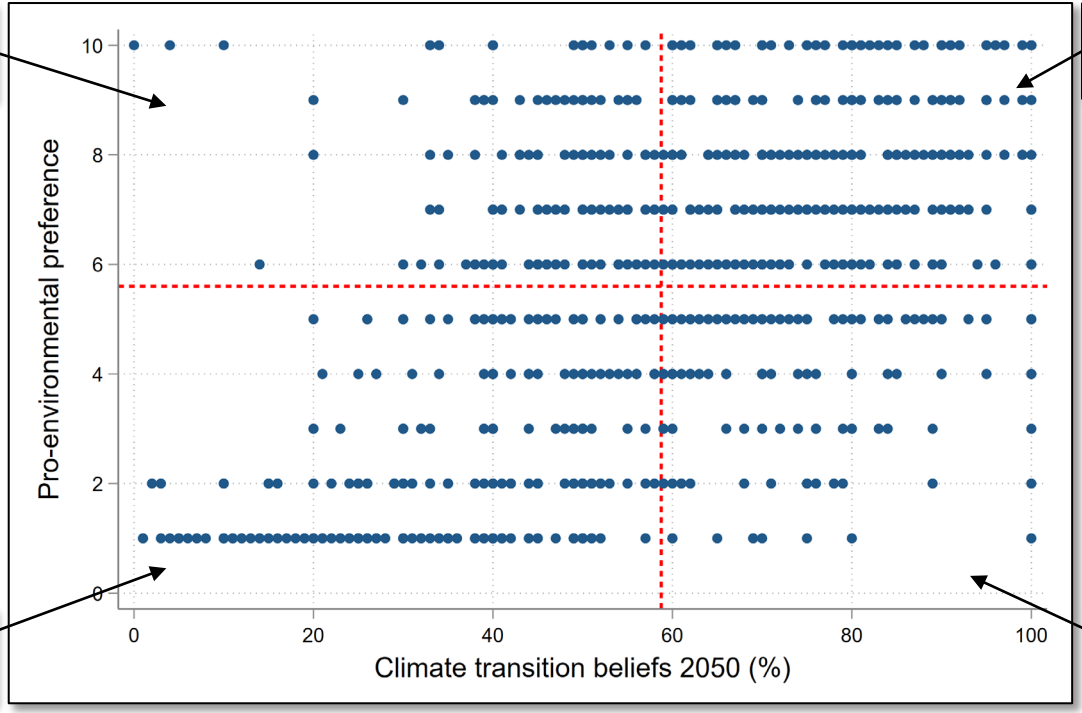


Data: U.S. Energy Information Administration, *Annual Energy Outlook 2012.*

Transition beliefs ≠ environmental preferences

Transition pessimism & High env. preferences

Transition optimism & High env. preferences



Transition pessimism & Low env. preferences

Transition optimism & Low env. preferences

Individual characteristics and climate transition beliefs

Who is more transition optimist?

- Younger people
- Women
- Higher-income
- Left-wing
- People living in areas with more renewables

Individual characteristics explain only a small fraction (16%) of the heterogeneity in climate transition beliefs.

Dep. variable:	Climate transition beliefs 2050						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Age	-0.05***						-0.04***
	(-8.16)						(-5.75)
Female		0.03*					0.03**
		(1.79)					(1.97)
Income			0.01***				0.01***
			(4.30)				(3.17)
Wealth			-0.01***				-0.00
			(-3.32)				(-0.10)
No income info.			0.07**				0.06**
			(2.41)				(2.31)
No wealth info.			-0.14***				-0.03
			(-4.18)				(-0.87)
Graduate education				0.02			0.01
				(0.69)			(0.57)
Democrat					0.14***		0.11***
					(8.75)		(7.16)
Republican					-0.03		-0.04**
					(-1.37)		(-2.03)
CO2 electricity (ZIP code)						-0.12**	-0.07
						(-2.22)	(-1.36)
Constant	0.78***	0.58***	0.62***	0.57***	0.54***	0.63***	0.66***
	(32.54)	(59.72)	(22.09)	(27.17)	(41.09)	(29.29)	(15.90)
Observations	1,007	1,007	1,007	1,007	1,007	1,004	1,004
R-squared	0.05	0.00	0.03	0.00	0.11	0.00	0.16

Climate transition beliefs and green performance expectations

Dep. variable:	Green expected return				
	(1)	(2)	(3)	(4)	(5)
Climate transition beliefs 2050	1.55***	1.40***	0.90***	0.71***	0.57***
	(9.85)	(8.25)	(4.71)	(3.79)	(2.85)
Pro-environmental preferences			0.09***	0.02	0.06***
			(5.55)	(1.06)	(3.55)
Climate change worry				0.24***	
				(5.57)	
Second-order CC worry 2050					0.65***
					(4.20)
Observations	1,007	1,007	1,007	1,007	1,007
R-squared	0.10	0.12	0.15	0.18	0.17
Controls	No	Yes	Yes	Yes	Yes

- Climate transition optimism is associated with higher green return expectations.
- A one standard deviation higher *Climate transition belief 2050* (0.22) → 1/3 of a one standard deviation higher green expected returns.
- Climate transition optimists also expect green investments to have lower *risk.*

Climate transition beliefs and green investment preferences

Dep. variable:	Green investment				
	(1)	(2)	(3)	(4)	(5)
Climate transition beliefs 2050	0.69***	0.51***	0.29***	0.32***	0.17**
	(10.79)	(7.52)	(4.28)	(4.67)	(2.46)
Green expected return			0.16***		0.14***
			(11.98)		(10.46)
Green expected risk				-0.14***	-0.11***
				(-9.86)	(-8.19)
Observations	1,007	1,007	1,007	1,007	1,007
R-squared	0.10	0.18	0.30	0.26	0.35
Controls	No	Yes	Yes	Yes	Yes

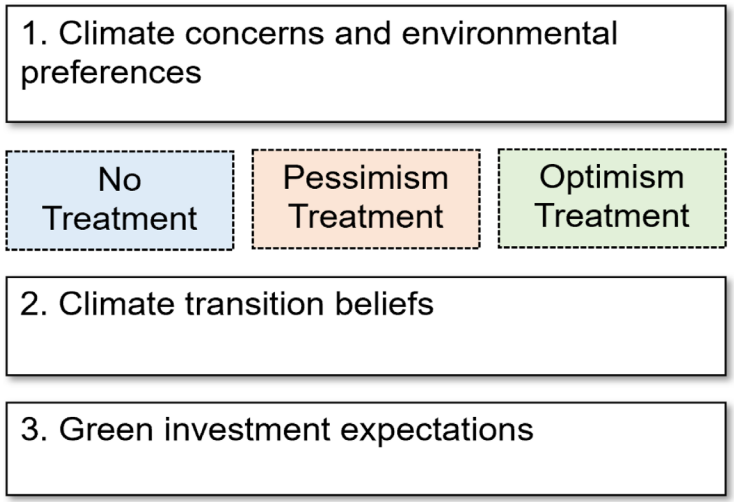
- One standard deviation higher climate transition beliefs → 15.51 percentage points increase in the likelihood of choosing the green fund.
- This is about ¼ of the unconditional probability of investing in the green fund (61%).
- Effect of climate transition beliefs largely mediated by risk and return expectations

Experimental evidence

To test the causal role of transition beliefs on return expectations, information provision experiments to create an **exogenous variation in climate transition beliefs**.

Strategy similar to the one employed in many papers studying the effects of beliefs on various aspects of individual behavior (reviewed in Haaland et al., 2023, and Stantcheva, 2023).

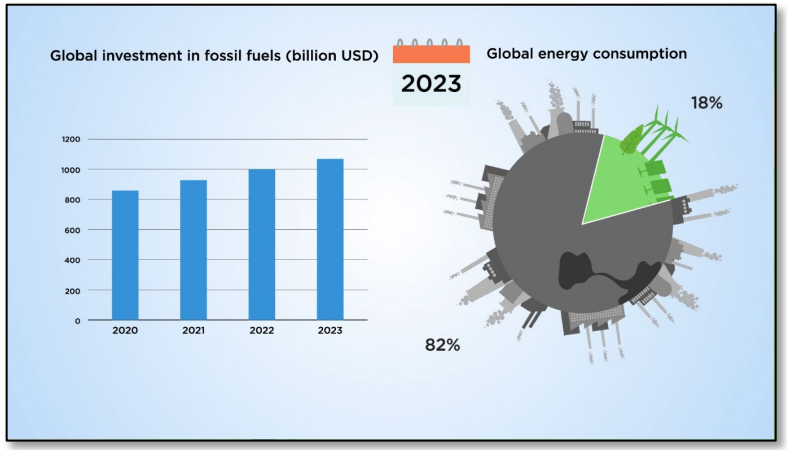
- Run in January and August 2024.
- Same questions as in the baseline survey.
- N=3,003 + 1,001 (new subjects).
- Pre-registered at: https://aspredicted.org/blind.php?x=DDD_KTF



Information treatments

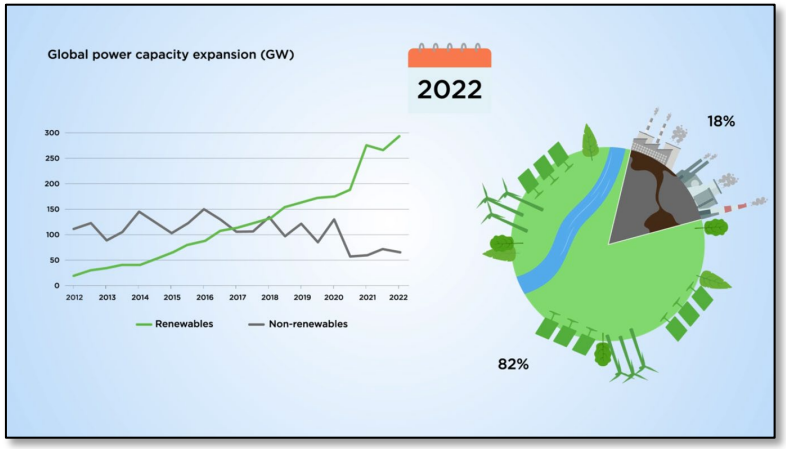
We randomize two short animated videos offering truthful but opposing perspectives on the recent evolution of the energy transition.

Pessimism Treatment



https://www.youtube.com/watch?v=zmAWD9uagmc

Optimism Treatment

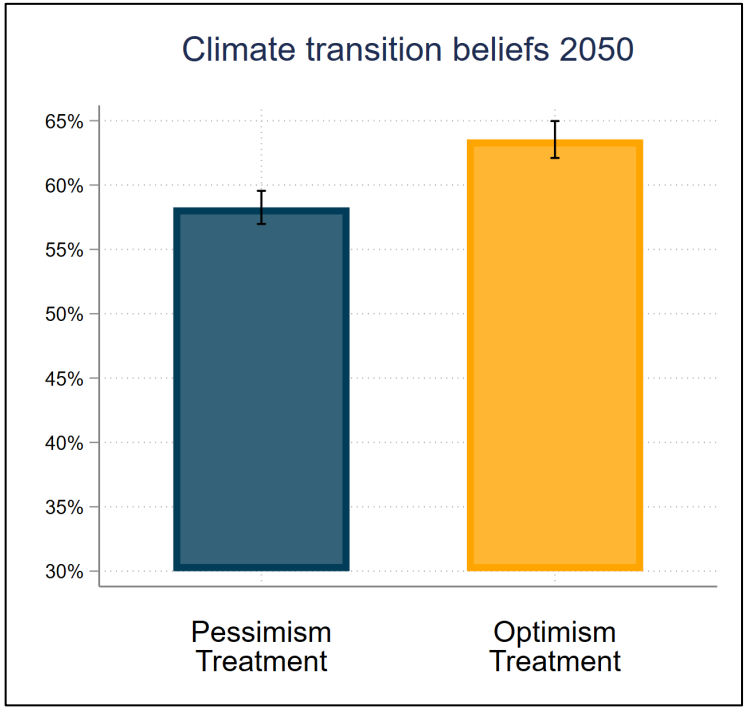


https://www.youtube.com/watch?v=ye4kI4Se1ZE

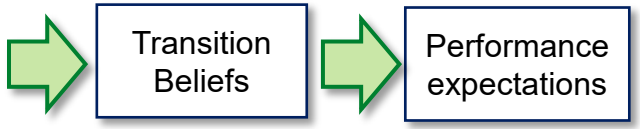
1st stage treatment effect

Transition Beliefs

- In the Optimism Treatment, significantly higher climate transition beliefs than in the Pessimism Treatment group.
- 5 percentage point difference: (63.54% vs 58.26%, two-sided t-test: $p < 0.001$).
- Success of our treatments in exogenously influencing beliefs in the desired directions.



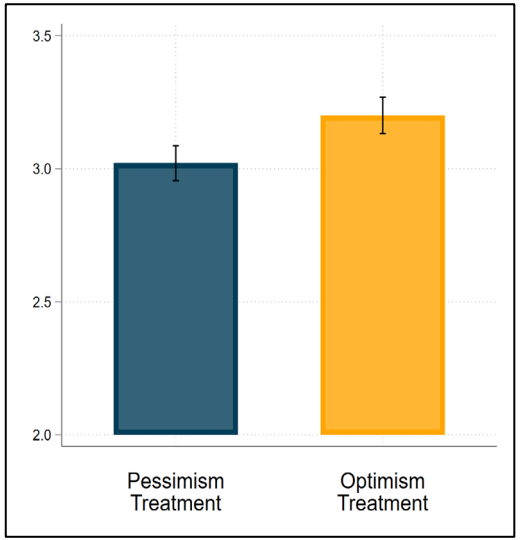
2nd stage treatment effect



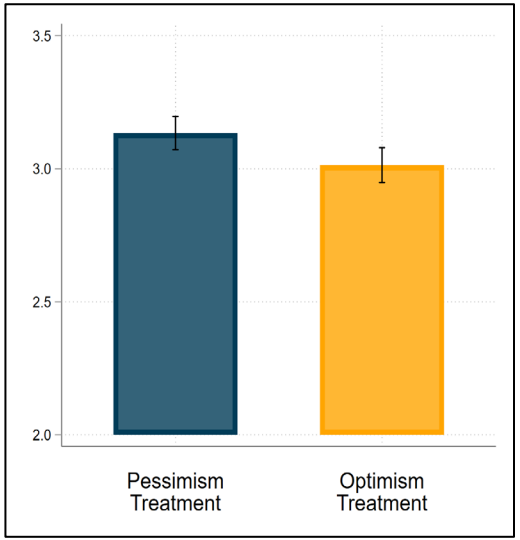
In the Optimism Treatment vs. Pessimism Treatment, respondents expect the green fund to:

- Deliver a **higher return** (3.20/5 vs. 3.02/5, two-sided t-test: $p<0.001$) and
- Have a **lower risk** (3.01/5 vs. 3.13/5, two-sided t-test: $p<0.01$)

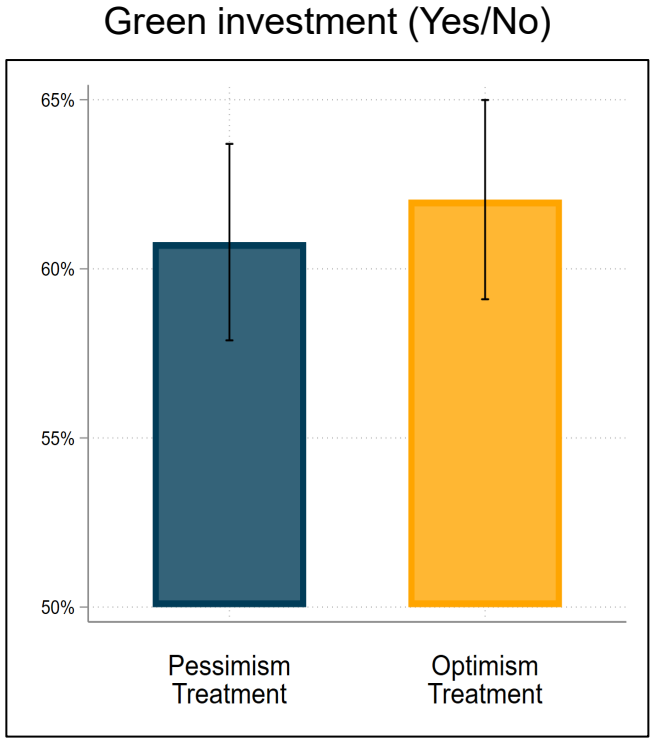
Green expected return



Green expected risk

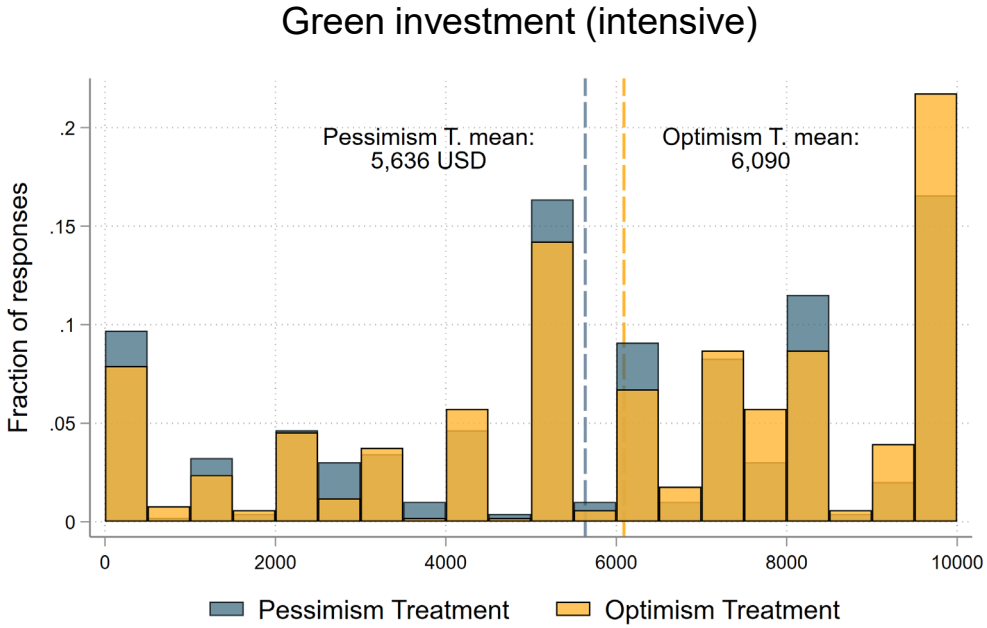


3rd stage treatment effect



- Respondents in the Optimism Treatment are 1.61 percentage points more likely to chose the green fund (62.04% vs 60.79).
- But this measure only reflects a binary choice.
- We run a new identical pre-registered experiment (N=1,001) in August 2024 asking to allocate 10,000 USD between a green and conventional funds.
- (We successfully replicate the 1st and 2nd stage treatment effects.)

3rd stage treatment effect



- In the Optimism Treatment, 8% more green investments (two-sided t-test, *p = 0.02).*
- Behavioral elasticity (transition beliefs → green investments) of 0.5.

Key takeaways

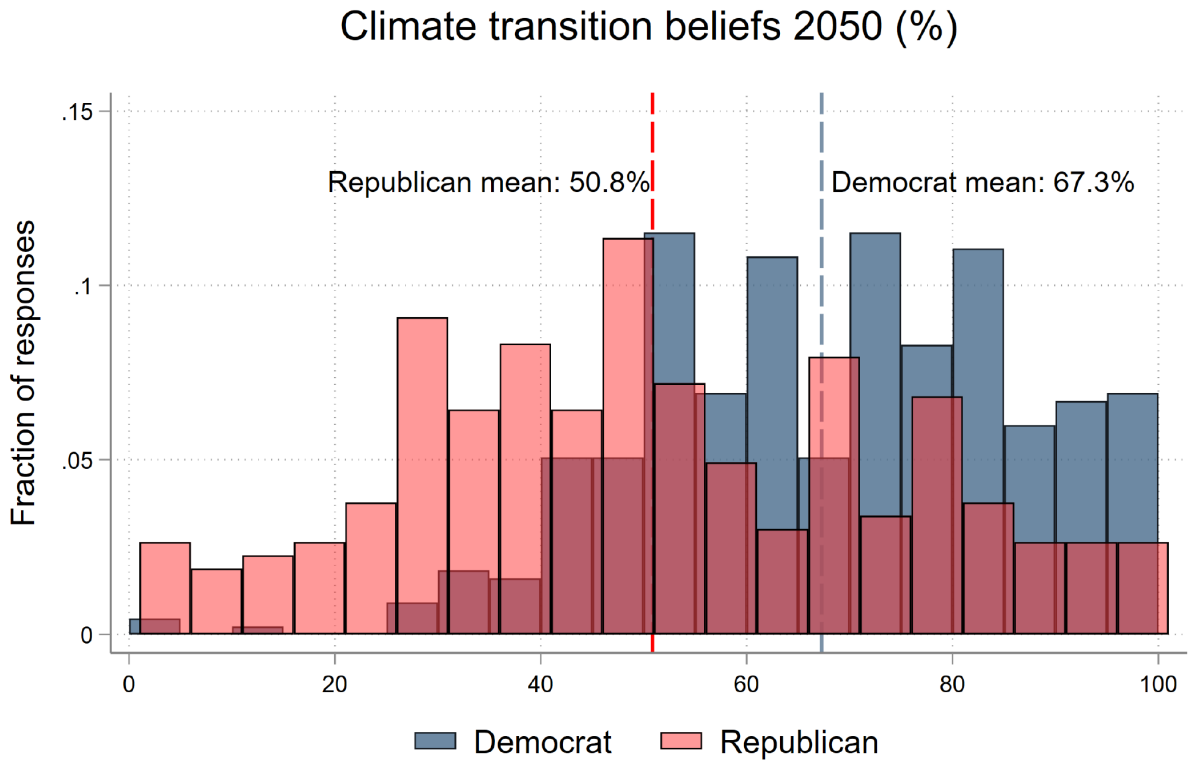
- *Which* long-term equilibrium do investors envision, and how does their expected future influence investment decisions?

- Significant heterogeneity in investors' transition beliefs, with important effects on expected returns and green investment decisions. Who will be proven right ex-post? Who knows, the future will tell.

- But "*who will be proven right ex-post*" also depends on green investment decisions today.

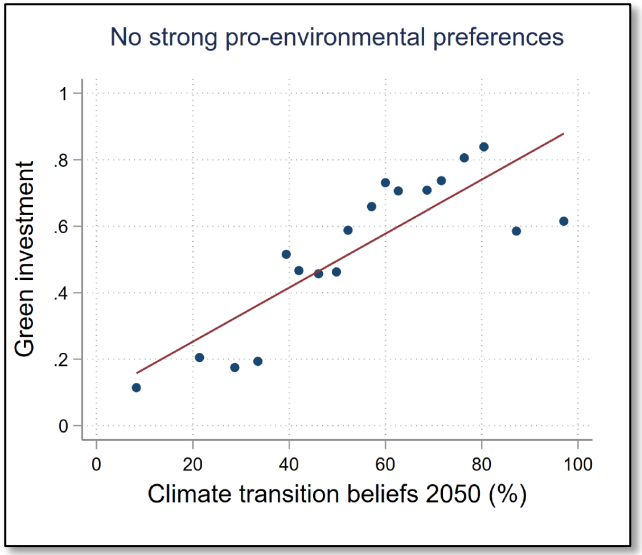
It is important to track climate transition beliefs.

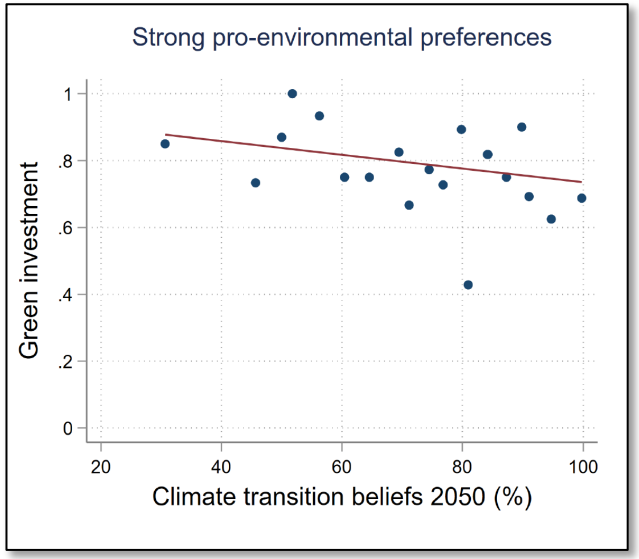
Political divide and climate transition beliefs



Cross-sectional heterogeneity

How do climate transition beliefs interact with pro-environmental preferences in investment decisions? (“Value” and “Values” considerations, Starks, 2023.)





Transition Beliefs strongly correlate with green investments especially for investors without strong pro-environmental preferences.