Individual Sustainable Pension and Consumption Decisions

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Olga Balakina, Charlotte Christiansen, Malene Kallestrup-Lamb

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Motivation

Sustainable investing is growing among both retail and institutional investors.

Due to limited individual stock market participation, it is not easy to understand the impact of individual sustainable investment.

We argue that it could be possible if the choice to invest sustainably is linked to individuals' pension saving choices.

- Pension savings ≈ around 40% of total individual wealth (Statistics Denmark, 2023).
- Adjusting pension savings towards sustainability is a major decision and affects individuals long-term.
- Pension funds are major institutional investors, and their sustainable investments have substantial impact on the financial markets (Bauer *et al.*, 2021).

This paper

Unique data set from a Danish pension fund that offered its members a one-off opportunity to substitute their standard variable annuity product with a variable annuity product containing a strong sustainability profile:

- Conditional on switching, which background characteristics correlate with the decision to switch to a strong sustainability profile?
- How is the choice correlated with preferences for sustainability and consumption?
- What are the consequences of being given an opportunity to invest sustainably for consumption?

We find

Background characteristics are correlated with choice of strong sustainability profile:

- Female (+); financial sophistication (−); income (−); manufacturing (−)
- *Sustainable vs conventional* medium risk: financial sophistication (−); income (−); manufacturing (−)

Choice is correlated with preferences for sustainability and consumption

- Sustainable consumption (E-car) correlates positively with sustainable choice overall and also conditional on risk profile

Consequences of being offered an option to invest sustainably?

- An opportunity to invest sustainably increases the sustainable consumption
- The effect is driven by individuals *passing over* the opportunity.

Related literature

Sustainable investment at the individual portfolio level (Riedl & Smeets, 2017; Gutsche & Ziegler, 2019; Barber *et al.*, 2021; Christiansen *et al.*, 2023; Andersen *et al.*, 2024).

We focus on pension savings, constituting a substantial share of individuals' lifetime wealth.

- The compulsory nature of pension savings helps mitigate the limited stock market participation paradox when discussing individual stock portfolios;
- Bauer *et al.* (2021) find that two-thirds of survey participants are willing to expand the pension fund's investment in SRI companies.

Literature on sustainable investments and consumption (Brunen & Laubach, 2022; Famulok *et al.*, 2024)

Data

We combine individual-level data from a pension fund (P+) with the Danish register data.

Pension fund data:

- Information on the campaign: offer, choice, selected plan and timing;
- Pension account information: current plan, total amount of pension savings.

Danish register data:

- Demographic, labor market, and education data.
- Financial data: income, wealth, stock market participation (SMP), loan to value (LTV).
- *Car registry*: cars owned/purchased, owner ID, car characteristics (model, engine, fuel type, fuel consumption, emissions, purchase price).

P+ pension fund

Danish pension fund with around 110,000 members (2023)

- Occupational pension schemes for individuals eligible for membership in 2 trade unions:

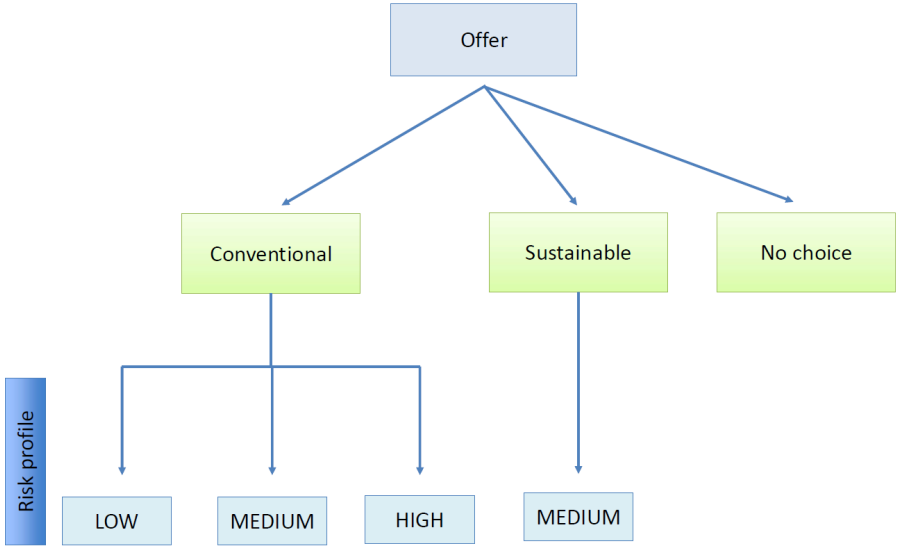
  – **DJØF** (academics within law, economics, social sciences, communication, management) and **DIP** (engineers)

In 2023, most members were offered the option to switch from a variable annuity product (standard sustainability elements and a predetermined risk profile set by the pension fund) to a pure variable annuity product.

- The new product allowed pension holders to align their investments with their risk preferences and/or sustainability preferences.

Descriptive statistics

Choices


Offer
Conventional
Sustainable
No choice
Risk profile
LOW
MEDIUM
HIGH
MEDIUM

Survey

To help individuals make am informed choice, P+ offered a survey to its pension holders (questions in order):

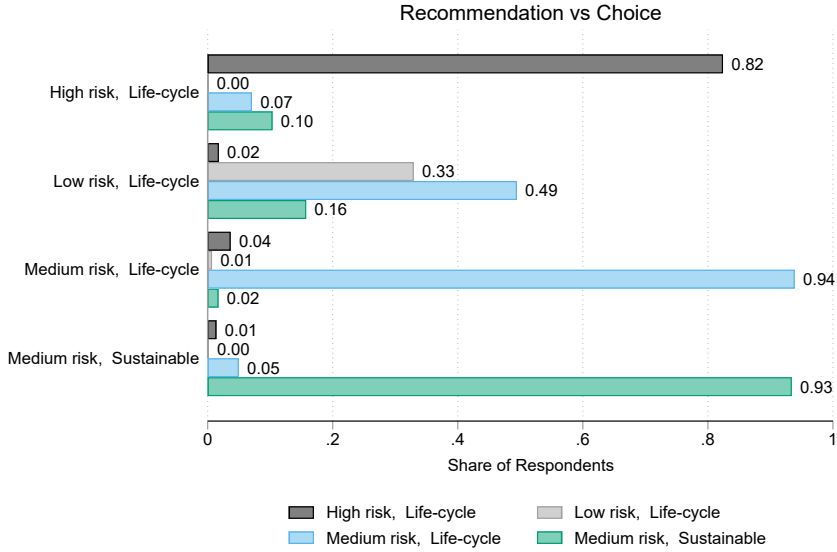
1. Risk and return (afkast og risiko);
2. Attitude towards loss (holdning til tab);
3. Care about environment (bæredygtighed).

The recommendations based on the survey-response was simple:

- If sustainability was important to you (question 3 - YES), P+ recommended the sustainability profile with medium risk plan;
- If not (question 3 - NO) – recommendation is based on your risk profile: low, medium, or high risk conventional plans.

The data allows us to examine the ex-ante preferences versus the ex-post choices.

Preferences and choices



Who chooses sustainable plan?

The linear regression model with fixed effects:

$$p_i = P_L\left[y_i = 1\right] = \alpha + \beta X_i + \gamma Z_i + \epsilon_i,$$

$$\text{where } y_i = \begin{cases} 1 & \text{if } i \text{ chooses a } \textit{Sustainable medium risk} \\ 0 & \text{if } i \text{ chooses conventional } \textit{low, medium, or high Risk} \end{cases}$$

and X_i: vector of explanatory variables of interest, Z_i: fixed effect variables, and ϵ_i: an error term.

- Sustainable medium risk: 1386
- Conventional high risk: 7400
- Conventional medium risk: 3713
- Conventional low risk: 97

Who chooses sustainable plan

Demographic Characteristics:	
Age	0.000274 (0.00400)
AgeSq	0.0000132 (0.0000415)
Married	0.0235*** (0.00790)
Female	0.0264*** (0.00709)
Kids at home	-0.00331 (0.00404)
Education:	
Masters degree	0.00991 (0.00959)
Economist	-0.0460*** (0.00775)
Labor Market:	
Manager	-0.000315 (0.0134)
Manufacturing	-0.389*** (0.151)
Services	-0.0619 (0.0413)
Construction	-0.0750 (0.163)
Financial Characteristics	
Log Income	-0.0742*** (0.0162)
Log Pension Wealth	-0.00811 (0.00867)
LTV	-0.00164 (0.00243)
SMP	-0.0147* (0.00787)
Risky Share	-0.0263** (0.0124)
Consumption: Cars	
Electric Car	0.0319** (0.0126)
Constant	1.230*** (0.195)
Workplace FE	Yes
Constant	No

0.0235*** -Married

0.0264*** - Female

-0.046*** - Economist

-0.389*** - Manufacturing

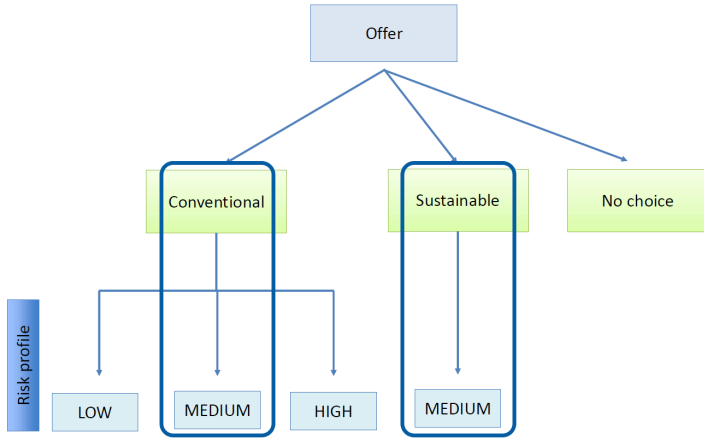
-0.0742*** - Log Income

-0.0263** - Risky Share

0.0319*** - Electric Car

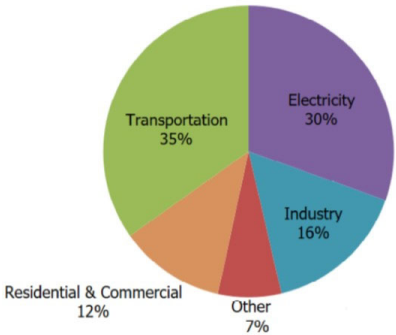
Sustainable vs conventional medium risk

- Married $(+)$;
- Economist $(-)$;
- Manufacturing $(-)$;
- Log-income $(-)$;
- **E-car** $(+)$.



Sustainable consumption: E-car consumption

Passenger cars are a major polluter, accounting for 61% of total CO2 emissions from EU road transport (25% EU's total CO2 emissions in 2019) (European Parlament, 2019).



To cut carbon emissions, individuals can convert to an e-car or get rid of the car.

All choices

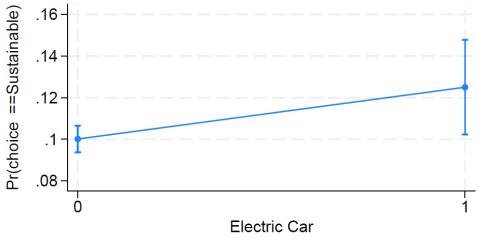
We want to evaluate the relation between sustainable consumption (proxy: E-car ownership) and choice of plan;

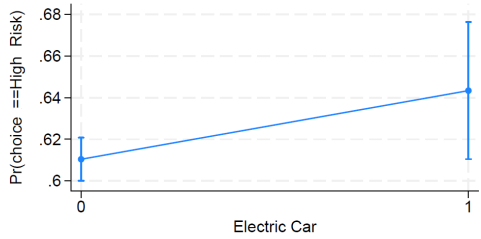
using the *multinomial logit*

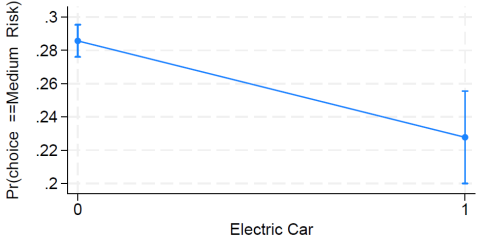
$$p_{ij} = P_{MNL}\left[y_i = j\right] = \frac{e^{x_i'\beta_j}}{\sum_{h=1}^{m} e^{x_i'\beta_h}} = \frac{e^{x_i'\beta_j}}{1 + \sum_{h=2}^{m} e^{x_i'\beta_h}}.$$

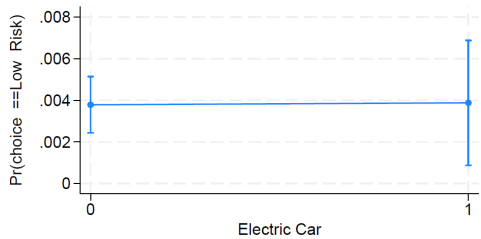
where $y_i = \begin{cases} 1 & \text{if } i \text{ chooses a } \textit{sustainable medium risk} \\ 2 & \text{if } i \text{ chooses a } \textit{conventional high risk} \\ 3 & \text{if } i \text{ chooses a } \textit{conventional medium risk} \\ 4 & \text{if } i \text{ chooses a } \textit{conventional low risk} \end{cases}$

E-car effects









Female | Financial Sophistication

Sustainable consumption and savings:

Compliments or substitutes?

Ex-ante: sustainable consumers are more likely to choose a sustainable pension plan

- Positive correlation between E-car consumption (in 2022) and choice of sustainable plan (in 2023).

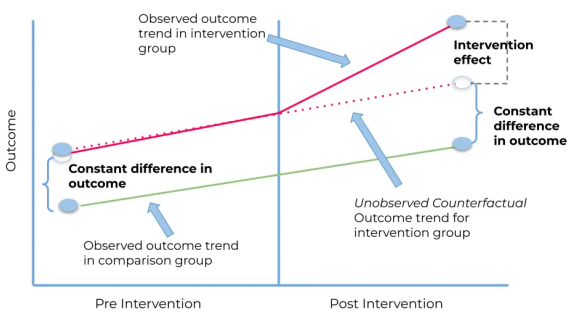
What is the relationship *ex-post*?

- How does offering individuals to invest sustainably affect their consumption (in 2023)?
- Measures: changes in personal car CO^2 emissions and probability of purchasing an E-car (EV, PHEV).

Cars: Descriptive Statistics

P+ members' consumption before and after offer

Methodology: difference-in-difference

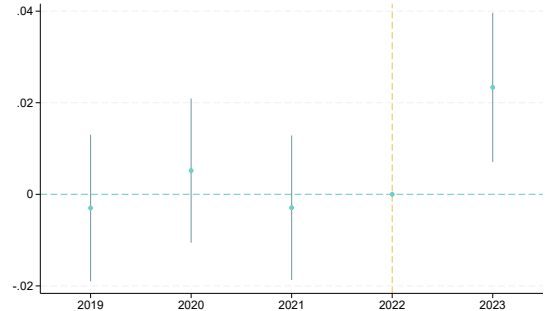


- Sample of car buyers
- *Pre-intervention*: 2019-2022
- *Post-intervention*: 2023;
- Comparison group: matched sample (CEM: age, gender, income, education level, commune);
- Outcome variables:
  - Likelihood of purchasing an E-car;
  - Average car CO^2 emissions[a].

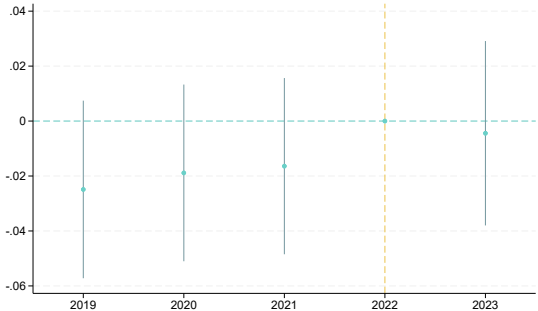
[a] Yearly car tax is based on its CO^2 emission

Buying an E-car: OFFER

OFFER



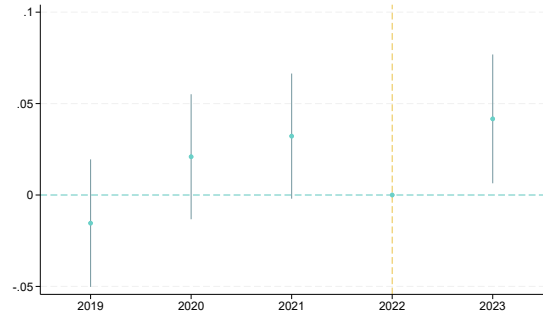
NO OFFER



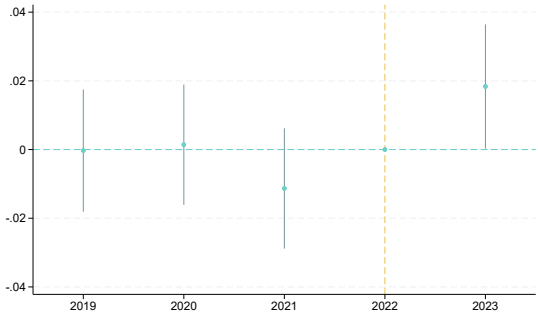
CO2 Emissions

Buying an E-car: CHOICE

CHOICE



NO CHOICE



CO2 Emissions

Conclusion

Individual characteristics matter for sustainable investments:

- Female $(+)$; financial sophistication $(-)$; income $(-)$; manufacturing $(-)$

Strong connection between sustainable investments and consumption behavior:

- Ex-ante E-car ownership correlates with sustainable pension choice;
- Evidence of spillover effects:

  - being offered sustainable investment options influences subsequent consumption decisions.

Implications:

- Pension funds can be an effective channel for promoting sustainable investments;
- Individuals' sustainable investment choices have broader implications for consumption behavior.

Thank You!

Olga Balakina: balakina@safe-frankfurt.de

Charlotte Christiansen: cchristiansen@econ.au.dk

Malene Kallestrup-Lamb: mkallestrup@econ.au.dk

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Descriptive statistics

	All Pplus members	No Offer	Offer	No Choice	Choice	Sustainable	High Risk	Low Risk	Medium Risk
Demographic Characteristics:									
Age	43.39	42.64	43.52	43.78	42.38	42.40	40.12	54.84	46.55
	(10.59)	(10.77)	(10.56)	(10.62)	(10.21)	(10.34)	(9.27)	(10.31)	(10.39)
Married	0.57	0.54	0.57	0.57	0.58	0.62	0.55	0.68	0.63
	(0.50)	(0.50)	(0.49)	(0.50)	(0.49)	(0.49)	(0.50)	(0.47)	(0.48)
Female	0.49	0.44	0.50	0.51	0.42	0.49	0.38	0.28	0.47
	(0.50)	(0.50)	(0.50)	(0.50)	(0.49)	(0.50)	(0.49)	(0.45)	(0.50)
Kids at home	1.09	1.03	1.10	1.10	1.13	1.12	1.17	0.68	1.05
	(1.06)	(1.06)	(1.07)	(1.07)	(1.06)	(1.05)	(1.08)	(0.87)	(1.03)
Education:									
Master's and Higher	0.78	0.75	0.78	0.77	0.81	0.78	0.83	0.67	0.78
	(0.42)	(0.43)	(0.41)	(0.42)	(0.40)	(0.41)	(0.38)	(0.47)	(0.41)
Economist	0.23	0.24	0.23	0.22	0.29	0.16	0.31	0.27	0.29
	(0.42)	(0.42)	(0.42)	(0.41)	(0.45)	(0.37)	(0.46)	(0.45)	(0.45)
Other Degree	0.21	0.24	0.21	0.21	0.17	0.24	0.16	0.21	0.16
	(0.41)	(0.43)	(0.40)	(0.41)	(0.37)	(0.42)	(0.36)	(0.41)	(0.37)
Observations	79503	11851	67652	55055	12597	1386	7400	97	3713

Continue

Descriptive statistics

	All Pplus members	No Offer	Offer	No Choice	Choice	Sustainable	High Risk	Low Risk	Medium Risk
Workplace:									
Manager	0.09	0.09	0.09	0.09	0.10	0.08	0.09	0.08	0.13
	(0.29)	(0.29)	(0.29)	(0.29)	(0.30)	(0.27)	(0.29)	(0.28)	(0.34)
State	0.44	0.30	0.46	0.47	0.44	0.45	0.46	0.39	0.41
	(0.50)	(0.46)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.49)	(0.49)
Private Sector	0.35	0.59	0.31	0.31	0.33	0.31	0.32	0.43	0.35
	(0.48)	(0.49)	(0.46)	(0.46)	(0.47)	(0.46)	(0.47)	(0.50)	(0.48)
Financial Characteristics									
LogValue of income	13.32	13.33	13.32	13.31	13.34	13.26	13.33	13.37	13.40
	(0.38)	(0.48)	(0.37)	(0.36)	(0.37)	(0.35)	(0.37)	(0.38)	(0.35)
Log Pension Wealth	13.79	13.50	13.84	13.84	13.85	13.77	13.65	14.62	14.26
	(1.20)	(1.32)	(1.17)	(1.17)	(1.16)	(1.16)	(1.13)	(0.96)	(1.13)
SMP	0.37	0.38	0.36	0.34	0.46	0.38	0.50	0.38	0.40
	(0.48)	(0.49)	(0.48)	(0.47)	(0.50)	(0.48)	(0.50)	(0.49)	(0.49)
Consumption: Cars									
Electric Car	0.14	0.17	0.13	0.13	0.15	0.20	0.16	0.14	0.12
	(0.34)	(0.37)	(0.34)	(0.33)	(0.36)	(0.40)	(0.37)	(0.35)	(0.33)
Observations	79503	11851	67652	55055	12597	1386	7400	97	3713

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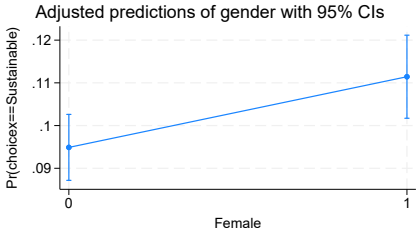
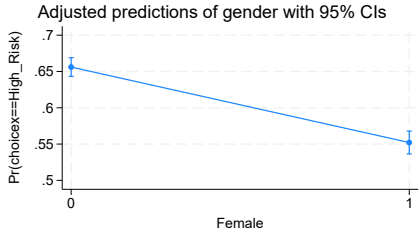
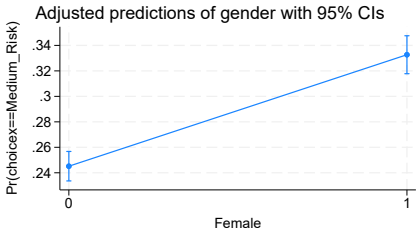
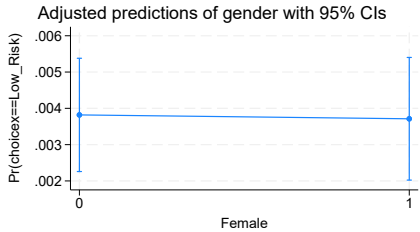
Gender effects - other variables fixed at mean values









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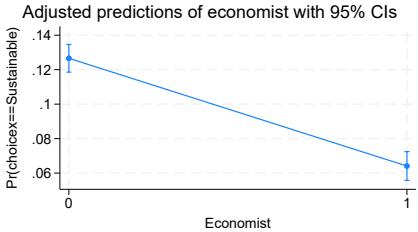
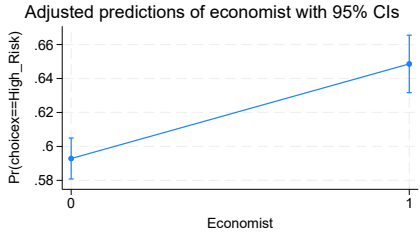
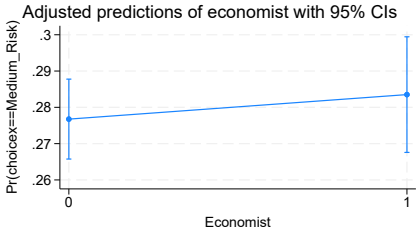
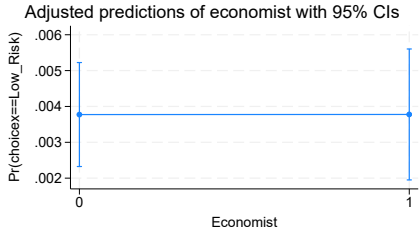
Financial sophistication effects









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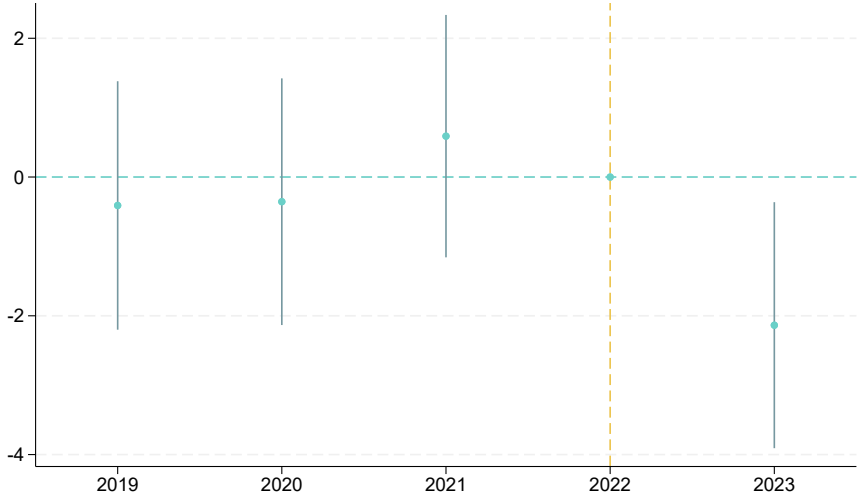
Average CO^2 emissions



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Average CO^2 emissions: OFFER

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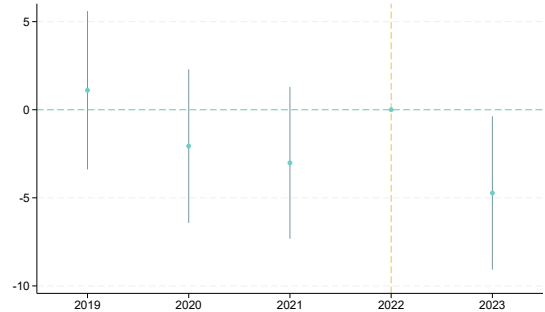
Average CO^2 emissions: CHOICE

CHOICE



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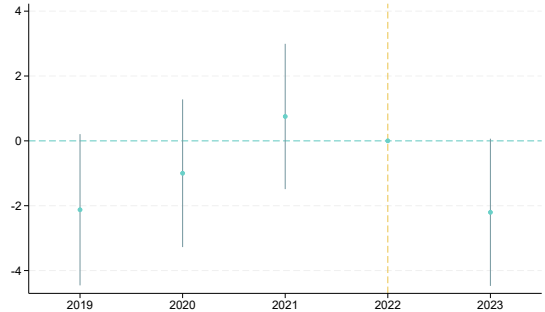

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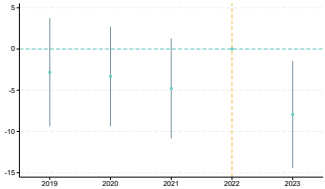
Data: population car register

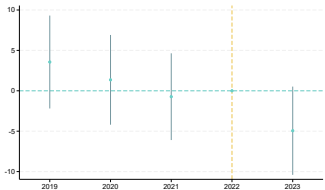
	Gen. Population	Pplus Members	No Choice	Sustainable	High	Low & Medium
Bought a Car	0.12	0.09	0.09	0.07	0.11	0.10
	(0.33)	(0.29)	(0.29)	(0.26)	(0.32)	(0.30)
Type of Car:						
EV or PHEV	0.20	0.33	0.32	0.48	0.35	0.29
	(0.40)	(0.47)	(0.47)	(0.50)	(0.48)	(0.45)
Price (Purchase Price + Profit + VAT):						
Average Price, EV or PHEV	252907.01	261338.12	263891.74	254792.88	249808.10	255565.45
	(88,761.41)	(83,260.87)	(85,987.74)	(71,861.64)	(73,209.77)	(68,568.48)
Average Price, Conventional	89,940.35	95,129.40	94,290.58	111933.12	95,459.79	100979.22
	(36,971.37)	(35,844.16)	(35,156.96)	(36,409.00)	(38,155.90)	(37,971.82)
Emissions of the Purchase:						
Average CO2 Emissions	80.70	282.92	340.60	49.96	68.26	77.44
	(47.81)	(14,568.51)	(16,421.06)	(56.20)	(51.76)	(50.33)
Average CO2 Emissions, EV or PHEV	10.19	7.73	7.59	3.18	9.51	7.04
	(14.25)	(13.11)	(13.03)	(9.32)	(14.34)	(11.63)
Average CO2 Emissions, Conventional	108.46	453.58	544.25	112.33	109.60	110.79
	(19.90)	(18,532.37)	(20,835.55)	(19.06)	(18.58)	(17.78)
Observations	1964739	60832	49620	1256	6542	3413

Average CO^2 emissions: PLAN

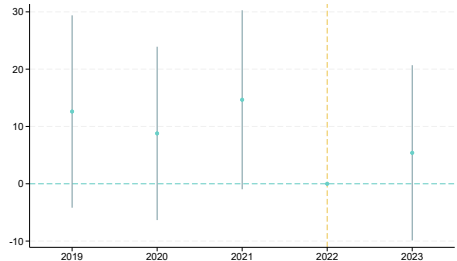
Medium Risk



High Risk



Sustainable



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