



# The Impact of Sustainable Finance Literacy on Investment Decisions

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Historical Archives of the  
European Union, Florence, 2024

**Sustainable finance can be complex...**

# Sustainable Finance Literacy is low

- SFL: “*knowledge and skills needed to **identify** and **evaluate** sustainable finance products to make informed investment choices*” (Filippini et al., 2024)
- SFL is low – barrier to sustainable investments
- Experiment: provide education for SFL, link with incentivized investment experiment



+



**What happens if we give investors a map?**

# Research Objectives

1. Refine SFL measure from Filippini et al. (2024) and create educational treatment
2. Treatment effect on incentivized investment experiment, four dimensions:
  - Extensive/intensive margin
  - The role of sustainability attitudes
  - Complementary: effect on return chasing and sustainability perceptions

# Study Design & Data

Open-ended question: **investment priorities**

1/3  
**SFL**  
treatment

1/3  
**Awareness**  
treatment

1/3  
**Placebo**  
treatment

**Choice experiment**

**SFL elicitation**

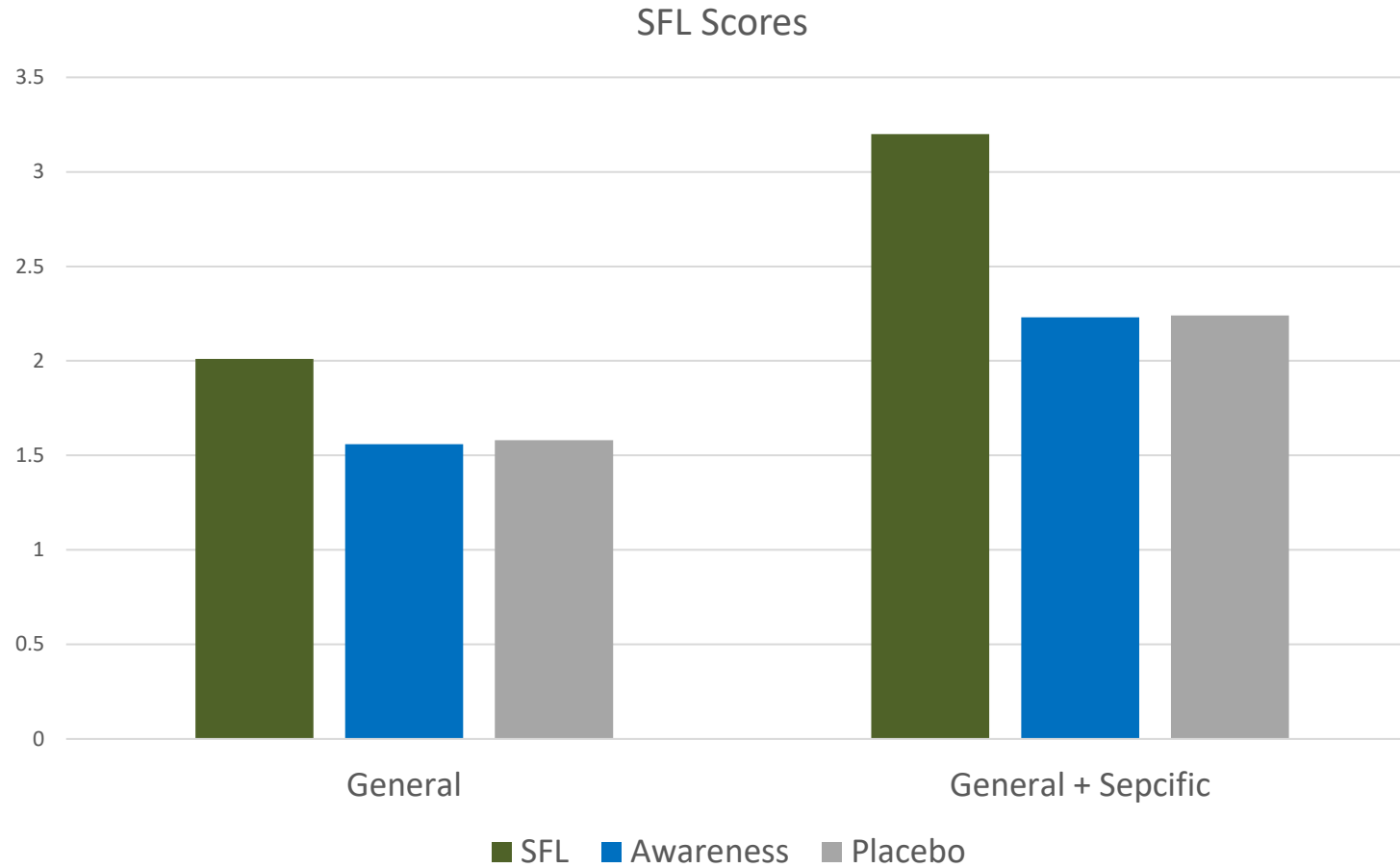
**Sociodemographic** characteristics

- 2021 experienced retail investors from German-speaking Switzerland (with high financial literacy)
  - 60% of CH pop market-based “401k” pension plan
- Survey experiment in March/April 2024
- Active and passive control groups (Haaland et al. 2023)
- Incentivized choice experiment
  - 4 winners: we invest 1000 CHF in their choice
- Preregistered on OSF

# Creating a SFL educational treatment

- Authors' interpretation of EU Sustainable Finance Disclosure Regulation (SFDR)
  - Four types: Art. 9, Art. 8 (+), Art. 8, and Art (6)
  - 3 „General“ dimensions that apply to all markets
  - 2 „Specific“ dimensions on the EU context
  - Less than 400 words
- Consulted experts from academia, EU and CH policymakers, financial industry
  - correctness and relevance
  - Multiple pre-tests for validation
- Five multiple-choice questions to measure SFL

# Descriptive Results – SFL level





# Choice Cards

Please allocate CHF 1000 to these four funds to create your own portfolio. You can invest the entire amount of CHF 1000 in one fund or distribute the amount evenly or unevenly among the different funds. If you wish to invest in a fund, you must invest at least CHF 50.

To continue, please note that the total investment amount should be CHF 1000. As soon as you are in this area, the "Continue" button will be displayed.

	Fund A	Fund B	Fund C	Fund D
Type of investment	Equity	Equity	Equity	Equity
Average net return per year in % (last 3 years)	4.7%	5.6%	6.5%	7.4%
Risk profile (past performance)	< 1 2 3 4 5 6 7 >	< 1 2 3 4 5 6 7 >	< 1 2 3 4 5 6 7 >	< 1 2 3 4 5 6 7 >
Investment target	Long-term returns and sustainable investments	Long-term returns	Long-term returns	Long-term returns
Sustainability features	Companies in the fund: <ul style="list-style-type: none"> <li>• lower CO2 emissions than comparable companies</li> <li>• do not harm any social aspects</li> </ul>	Companies in the fund: <ul style="list-style-type: none"> <li>• low CO2 emissions</li> </ul>		
Exclusion of controversial industries and poor corporate governance	Yes	Yes	Yes	No
Consideration of sustainability risks	Yes	Yes	Yes	No
Investment amount remaining budget: <b>1000 CHF</b>	0 CHF	0 CHF	0 CHF	0 CHF

# Investment Attitudes

Which criteria would be important to you when choosing a fund? **Please write your criteria in the text fields in the form of bullet points.** The order should reflect their priority (1: most important, 4: fourth most important).

Priority 1 (most important):

Priority 2:

Priority 3:

Priority 4:

Page 1/23

Next



AI-based semi-manual classification  
by Wekhof and Houde (2023):

- 51% mention sustainability

# Empirical Strategy

- Single hurdle model: separately extensive and intensive margins
- Model 1, Logit:

$$ExtensFund_{k,i} = \alpha + \beta_1 * TreatmentSFL_i + \beta_2 * TreatmentPlacebo_i + \beta * X_i + \epsilon_i,$$

- Model 2, Zero-truncated Poisson:

$$IntensFund_{k,i} = \alpha + \beta_1 * TreatmentSFL_i + \beta_2 * TreatmentPlacebo_i + \beta * X_i + \epsilon_i,$$

# Econometric Results: Extensive margin with attitudes

Table J.13: Hurdle Model, Logit AME - Zero

	Art. 9	Art. 8 (+)	Art. 8	Art. 6
T. SFL	0.049* (0.029)	0.021 (0.036)	-0.045 (0.038)	0.028 (0.032)
T. Placebo	0.026 (0.030)	0.020 (0.037)	-0.040 (0.039)	-0.020 (0.032)
SFL x Sust. prio	0.017 (0.048)	-0.005 (0.052)	0.025 (0.050)	-0.028 (0.048)
Placebo x Sust. prio	-0.035 (0.049)	-0.046 (0.054)	0.079 (0.048)	0.010 (0.050)
Sust. Priority	0.225*** (0.033)	0.042 (0.036)	-0.157*** (0.036)	-0.224*** (0.036)
Fin. Lit.	-0.057*** (0.019)	-0.041* (0.021)	0.029 (0.020)	-0.036* (0.018)
[...]	[...]	[...]	[...]	[...]
Num.Obs.	2021	2021	2021	2021

\* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

- Treatment effect for most sustainable fund: 5%
- No Heterogeneous treatment effect
- Sustainable attitudes:
  - +22% (Art.9)
  - -16% (Art.8) and -22% (Art.6)

# Econometric Results: Intensive margin with attitudes

Table J.14: Hurdle Model, truncated Poisson AME - Count

	Art. 9	Art. 8 (+)	Art. 8	Art. 6
T. SFL	-0.341 (0.340)	-0.266 (0.256)	0.299 (0.261)	-0.544* (0.281)
T. Placebo	-0.065 (0.350)	-0.199 (0.258)	0.476* (0.266)	-0.075 (0.294)
SFL x Sust. prio	0.759* (0.437)	-0.687** (0.338)	-0.753** (0.378)	0.281 (0.575)
Placebo x Sust. prio	-0.090 (0.424)	-0.452 (0.348)	0.329 (0.403)	0.819 (0.604)
Sust. Priority	3.053*** (0.292)	0.024 (0.252)	-0.975*** (0.280)	-2.570*** (0.389)
Fin. Lit.	-0.335** (0.150)	-0.105 (0.136)	0.867*** (0.162)	1.244*** (0.199)
[...]	[...]	[...]	[...]	[...]
Num.Obs.	2021	2021	2021	2021

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

- Treatment effect for least sustainable fund: -2.5%
- Heterogeneous treatment effect:
  - +3.5% (Art.9)
  - - 3.5 % (Art.8 plus) and - 4 % (Art.8)
- Sustainable attitudes:
  - +17% (Art.9)
  - - 4.5 % (Art.8) and - 12.5 % (Art.6)

# What's next?



Possible to teach  
Sustainable Finance



Helps investors align  
money with values

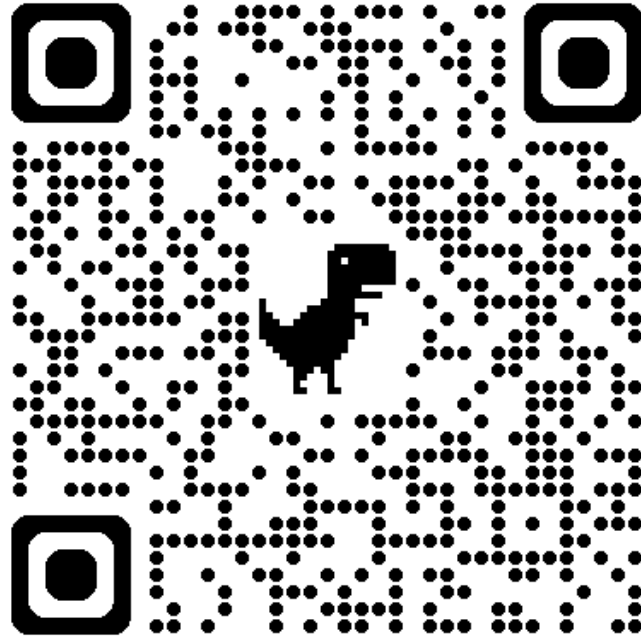


Provide banks with  
our crash course



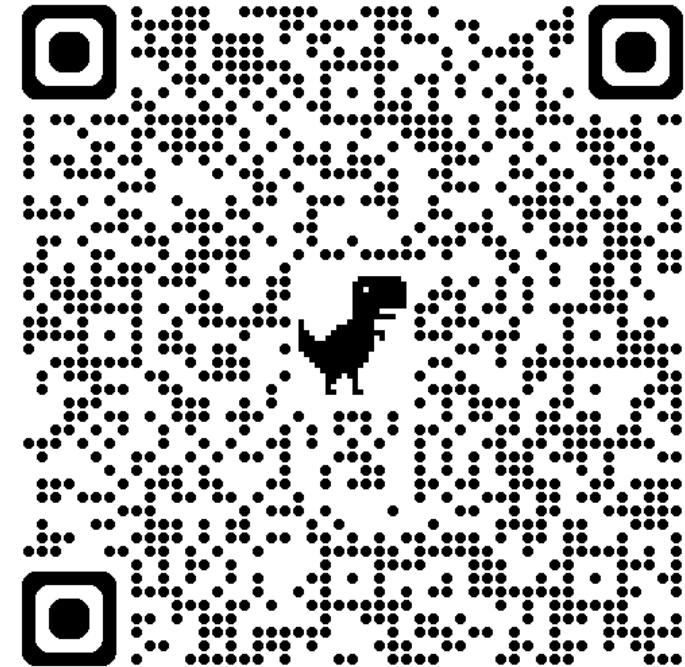
**Knowledge Empowers Investors!**

## Paper



[https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=5001691](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5001691)

## Policy Brief



[https://ethz.ch/content/dam/ethz/special-interest/mtec/cepe/energy-and-public-econ-dam/documents/PolicyBriefs/SFL\\_RC\\_T\\_policy\\_brief\\_301024.pdf](https://ethz.ch/content/dam/ethz/special-interest/mtec/cepe/energy-and-public-econ-dam/documents/PolicyBriefs/SFL_RC_T_policy_brief_301024.pdf)



# References

- Agarwal, S., & Mazumder, B. (2013). Cognitive abilities and household financial decision making. *American Economic Journal: Applied Economics*, 5(1), 193–207.
- Akyildirim, Erdinc, et al. "Greenwashing: Do Investors, Markets and Boards Really Care?." Swiss Finance Institute Research Paper 23-90 (2023).
- Anderson, A., & Robinson, D. T. (2022). Financial Literacy in the Age of Green Investment. *Review of Finance*, 26(6), 1551–1584.
- Bauer, R., Ruof, T., & Smeets, P. (2021). Get Real! Individuals Prefer More Sustainable Investments. *The Review of Financial Studies*, 34(8), 3976–4043.
- Filippini, M., Leippold, M. and Wekhof, T.: 2024, Sustainable finance literacy and the determinants of sustainable investing, *Journal of Banking & Finance* p. 107167.
- Garel, Alexandre, et al. "Do investors care about biodiversity?." *Review of Finance* 28.4 (2024): 1151-1186.
- Gibson Brandon, Rajna, et al. "Earnings Management and the Role of Moral Values in Investing." *European Accounting Review* (2023): 1-31.
- Heeb, F., Kölbel, J. F., Paetzold, F., & Zeisberger, S. (2023). Do Investors Care about Impact? *The Review of Financial Studies*, 36(5), 1737–1787.
- Bucher-Koenen, T., Alessie, R. J., Lusardi, A., & van Rooij, M. (2021). Fearless Woman: Financial Literacy and Stock Market Participation (Working Paper 28723; Working Paper Series). National Bureau of Economic Research.
- Gutsche, G., Nakai, M., & Arimura, T. H. (2021). Revisiting the determinants of individual sustainable investment—The case of Japan. *Journal of Behavioral and Experimental Finance*, 30, 100497.
- Gutsche, G., Wetzels, H., & Ziegler, A. (2020). Determinants of individual sustainable investment behavior—A framed field experiment. *MAGKS Joint Discussion Paper Series in Economics*.
- Greenwood, R. and Nagel, S. (2009). Inexperienced investors and bubbles. *Journal of Financial Economics*, 93(2):239–258.
- Haaland, I., Roth, C., and Wohlfart, J. (2023). Designing information provision experiments. *Journal of Economic Literature*, 61(1):3–40.
- Riedl, A. and Smeets, P. (2017). Why do investors hold socially responsible mutual funds? *The Journal of Finance*, 72(6):2505–2550.
- McDonald, R. P. (1999). *Test theory: A unified treatment*. Psychology Press.
- Tran, A. and Wang, P. (2023). Barking up the wrong tree: Return-chasing in 401 (k) plans. *Journal of Financial Economics*, 148(1):69–90.

Pictures: Historical Archives of the European Union 2024 (slides 1,4); M-image@AdobeStock (slides 2&4), Mehran@AdobeStock (slide 15)

# Creating a SFL educational treatment

- Authors' interpretation of EU Sustainable Finance Disclosure Regulation (SFDR)
  - Four types: Art. 9, Art. 8 (+), Art. 8, and Art (6)
- Extensive Validation of treatment and SFL measure:
- Consulted several experts from academia, EU and CH policymakers, financial industry, and NGOs
  - correctness and relevance
- Multiple pre-tests with more than 600 participants
  - ensure understanding, attention, clarity, and alignment of crash course to questions,

# SFL Measure

Question	Goal
SFL 1	Lack of uniform standards
SFL 2	ESG risk integration ≠ sustainable
SFL 3	ESG not always impact investing
SFL 4	EU SFDR (light green): characteristics
SFL 5	EU SFDR (dark green): objective

*General + Specific* { *General* {

- Omega Score (McDonald, 1999):  
 General + Specific: 0.71; General: 0.76; Financial Literacy (Big Three): 0.76

# Empirical Strategy

- Impact on SFL score (OLS)

$$\text{Model 1 : } SFL_i = \alpha + \beta_1 TreatmentSFL_i + \beta_2 TreatmentPlacebo_i + \varepsilon_i,$$

- Impact on investment choice: single hurdle model: separately extensive and intensive margins (logit and zero-truncated poisson)
  - Including effect of attitudes

$$\text{Model 2 : } ExtensFund_{k,i} = \alpha + \beta_1 * TreatmentSFL_i + \beta_2 * TreatmentPlacebo_i + \beta * X_i + \varepsilon_i,$$

$$\text{Model 3 : } IntensFund_{k,i} = \alpha + \beta_1 * TreatmentSFL_i + \beta_2 * TreatmentPlacebo_i + \beta * X_i + \varepsilon_i,$$

## Descriptive Results – Portfolio allocation

		SFL	Awareness	Placebo
<b>Art. 9</b>				
	Mean (CHF)	380	340	352.8
<b>Art. 8 (+)</b>				
	Mean (CHF)	226.4	240.7	228.6
<b>Art. 8</b>				
	Mean (CHF)	240.8	259.2	270.4
<b>Art. 6</b>				
	Mean (CHF)	152.9	160.1	148.2

- SFL Treatment: more investment in Art 9, less in other funds.
- Additionally: High zero-shares for all funds (between 25% and 60%)

# Econometric Results: SFL Treatment on SFL Score

Table J.10: SFL score, OLS

	General + Specific	General
T. SFL	0.966*** (0.074)	0.448*** (0.052)
T. Placebo	0.015 (0.074)	0.034 (0.052)
Fin. Lit.	0.350*** (0.057)	0.243*** (0.040)
[...]	[...]	[...]
Num.Obs.	2021	2021
R2	0.141	0.101

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

- SFL-Treatment increases literacy score.
- Awareness/Placebo treatments show no difference.

# Econometric Results: Hurdle Model

Table J.11: Hurdle Model, Logit AME - Zero

	Art. 9	Art. 8 (+)	Art. 8	Art. 6
Treatment SFL	0.059** (0.023)	0.019 (0.026)	-0.033 (0.026)	0.012 (0.025)
Treatment Placebo	0.018 (0.024)	-0.002 (0.026)	0.002 (0.026)	-0.022 (0.025)
Financial Literacy	-0.043** (0.020)	-0.038* (0.021)	0.020 (0.020)	-0.054*** (0.019)
[...]	[...]	[...]	[...]	[...]
Num.Obs.	2021	2021	2021	2021

\* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

Table J.12: Hurdle Model, truncated Poisson AME - Count

	Art. 9	Art. 8 (+)	Art. 8	Art. 6
Treatment SFL	0.173 (0.200)	-0.630*** (0.175)	-0.052 (0.199)	-0.492* (0.254)
Treatment Placebo	-0.088 (0.204)	-0.437** (0.178)	0.578*** (0.201)	0.120 (0.265)
Financial Literacy	-0.011 (0.151)	-0.146 (0.135)	0.764*** (0.163)	1.209*** (0.209)
[...]	[...]	[...]	[...]	[...]
Num.Obs.	2021	2021	2021	2021

\* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

- Extensive margin: SFL treatment *increases* Art. 9 by 6%.
- Intensive margin: SFL treatment *decreases* Art. 8 by 3% and Art 6 by 2.5%.
- Financial literacy: similar magnitude but opposite effect.

## Discussion

- The intervention increased retail investors in the most sustainable fund by 6% and reduced shares in less sustainable funds by 2.5% to 3%.
  - Confirms suggestive evidence by Filippini et al. (2024)
- The treatment effect was about 50% larger for investors with sustainability-friendly attitudes.
  - Importance of attitudes for sustainable investing (Bauer et al., 2021; Riedl and Smeets, 2017)
- Possibly, treated investors get a more realistic perception of mid-range funds.



## Empirical Strategy (2)

- Return Chasing

Model 4 :  $ExtensFund_{k,i} = \alpha + \beta_1 * TreatmentSFL_i + \beta_2 * TreatmentPlacebo_i + \beta_k * return_k + \varepsilon_i,$

Model 5 :  $IntensFund_{k,i} = \alpha + \beta_1 * TreatmentSFL_i + \beta_2 * TreatmentPlacebo_i + \beta_k * return_k + \varepsilon_i,$

- Subjective Sustainability Rating

Model 6 :  $Rating_{k,i} = \alpha + \beta_1 * TreatmentSFL_i + \beta_2 * TreatmentPlacebo_i + \varepsilon_i,$

# Econometric Results – Return chasing

Table 10: Hurdle Poisson, hypothetical returns, interacted treatment, AME

	Art. 9	Art. 8 (+)	Art. 8	Art. 6
<i>Binary</i>				
	(1)	(2)	(3)	(4)
Treatment SFL	0.102*** (0.038)	-0.033 (0.059)	-0.012 (0.061)	-0.016 (0.052)
Treatment Placebo	0.032 (0.043)	-0.086 (0.062)	0.007 (0.060)	-0.063 (0.053)
Own Return	0.067*** (0.004)	0.081*** (0.005)	0.073*** (0.005)	0.041*** (0.004)
Own Return x SFL	-0.014* (0.008)	0.009 (0.010)	-0.002 (0.010)	0.003 (0.009)
Own Return x Placebo	-0.005 (0.008)	0.016 (0.011)	-0.002 (0.010)	0.007 (0.010)
<i>Count</i>				
	(1)	(2)	(3)	(4)
Treatment SFL	1.411* (0.768)	1.573** (0.734)	0.333 (1.051)	-0.372 (1.266)
Treatment Placebo	-0.045 (0.925)	0.888 (0.779)	0.661 (0.990)	0.835 (1.584)
Own Return	1.272*** (0.068)	1.229*** (0.063)	1.084*** (0.086)	0.964*** (0.114)
Own Return x SFL	-0.225* (0.123)	-0.321*** (0.112)	-0.107 (0.169)	0.048 (0.210)
Own Return x Placebo	-0.019 (0.145)	-0.124 (0.121)	-0.043 (0.159)	-0.060 (0.237)
Num.Obs.	4042	4042	4042	4042

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

- Returns chasing is significant for extensive and intensive margin
  - *Extensive*: 1% higher return ~ 4% to 8% higher probability to invest
  - *Intensive*: 1% higher return ~ 5% to 6% more investments
  
- SFL reduces return chasing for sustainable funds
  - *Extensive*: 20% less for Art 9
  - *Intensive*: 17% less Art. 9 and 26% less Art 8 (+)

# Econometric Results – Subjective Sustainability Rating

Table J.14: Sustainability Rating (1-10), OLS

	Art. 9	Art. 8 (+)	Art. 8	Art. 6
Treatment SFL	-0.047 (0.092)	-0.274*** (0.083)	-0.344*** (0.095)	-0.046 (0.090)
Treatment Placebo	-0.077 (0.093)	-0.097 (0.084)	0.087 (0.096)	-0.065 (0.091)
Financial Literacy	0.196*** (0.072)	0.034 (0.064)	-0.031 (0.074)	-0.439*** (0.070)
[...]	[...]	[...]	[...]	[...]
Num.Obs.	2021	2021	2021	2021
R2	0.006	0.009	0.018	0.046

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

- SFL Treatment decreases sustainability perception for mid-range funds
- No difference between Placebo and Awareness treatments

# Open-ended topics

Table E.2: Topic frequencies for open-ended question (in %)

Topic	Priority 1	Priority 2	Priority 3	Priority 4	All
risk	44.48	19.25	11.33	8.02	72.69
return	19.64	28.06	18.41	13.31	71.70
sustainability	12.82	17.86	19.05	15.14	51.51
content_fund	8.96	13.90	17.91	18.80	43.25
fees	3.22	5.59	7.47	6.19	21.87
control	0.54	2.52	7.72	9.55	19.25
trust bank	3.86	3.51	4.65	7.17	17.47
transparent	1.14	2.28	3.61	4.70	11.23
development	2.57	3.22	2.52	3.46	11.18
hassle	0.30	0.79	2.33	3.46	6.73
bank_advisor	0.79	1.09	1.68	2.47	5.99
ETF	1.34	0.99	0.89	0.59	3.41
advice third	0.15	0.15	0.30	0.05	0.64
greenwashing		0.10		0.20	0.30
do not know	0.10	0.45	0.59	2.42	2.92
no answer	0.10	0.25	1.53	4.45	4.70

*Note:* This table presents the topic frequencies (in %) for each priority and jointly for all priorities.

# Sustainability Topic Dictionary

Table E.1: Topic frequencies for open-ended question

<i>sustainability</i>		<i>return</i>		<i>risk</i>	
word	freq.	word	freq.	word	freq.
sustainability	530	return	682	security	850
sustainable (sg.)	173	gain	206	risk	369
sustainable (pl.)	52	performance	100	safe (sg.)	129
ethical	39	interest rate	96	loss	49
social	33	yield	77	safe (pl.)	48
environment	33	profitable	28	stability	41
ecological (sg.)	31	profit	28	low-risk	21
eco-friendly	24	profitable	26	long-term	19
ecological (pl.)	15	value increase	9	risks	18
ecology	14	distributing	6	balanced	16

*Note:* This table presents the most frequent words for the topics sustainability, return, and risk. The words were originally in German and translated for this table. For this reason, some words appear multiple times because in German, the word is differentiated by its singular and plural form.