Promoting energy efficiency in car transportation through user experience or information?

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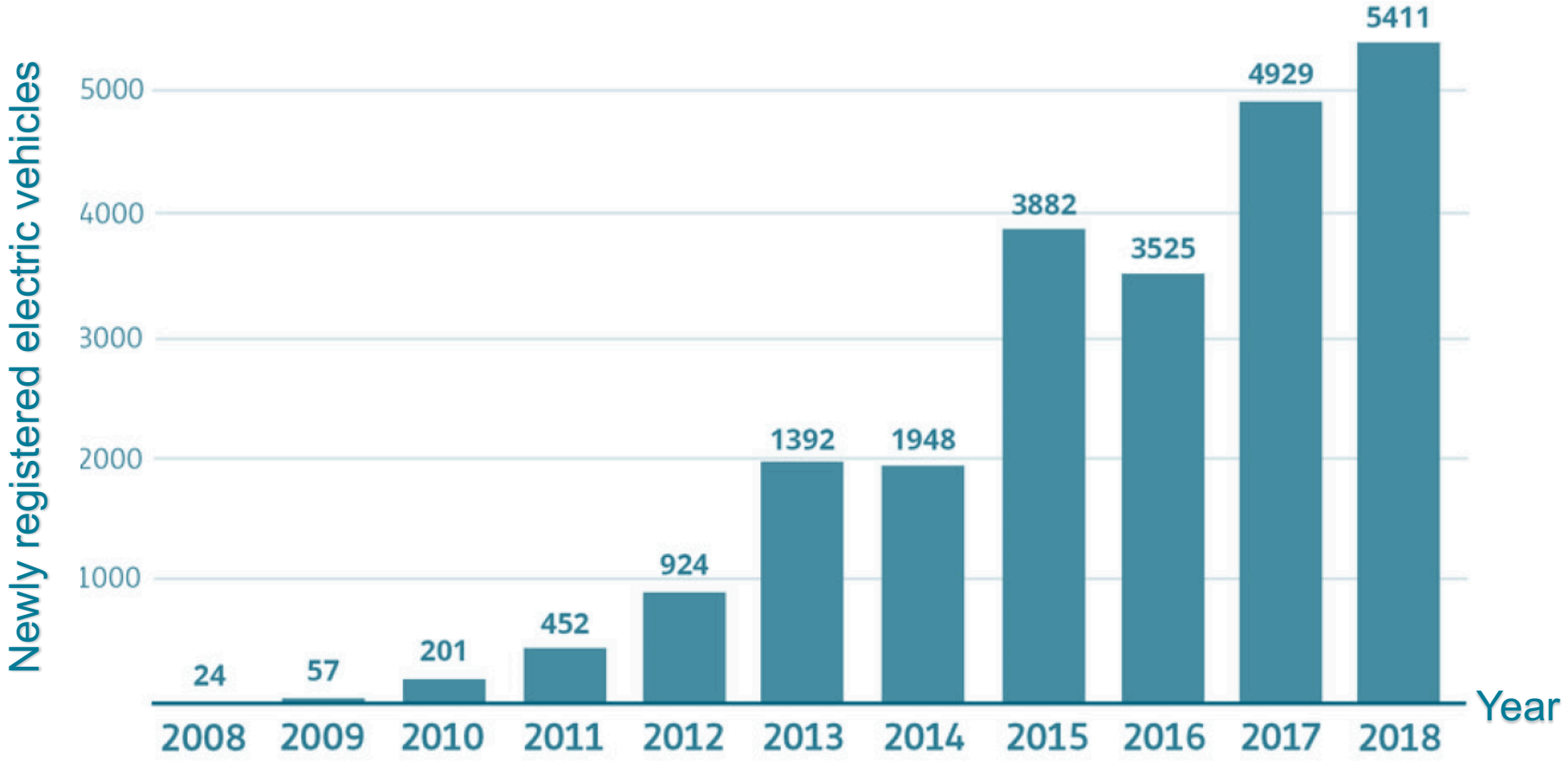
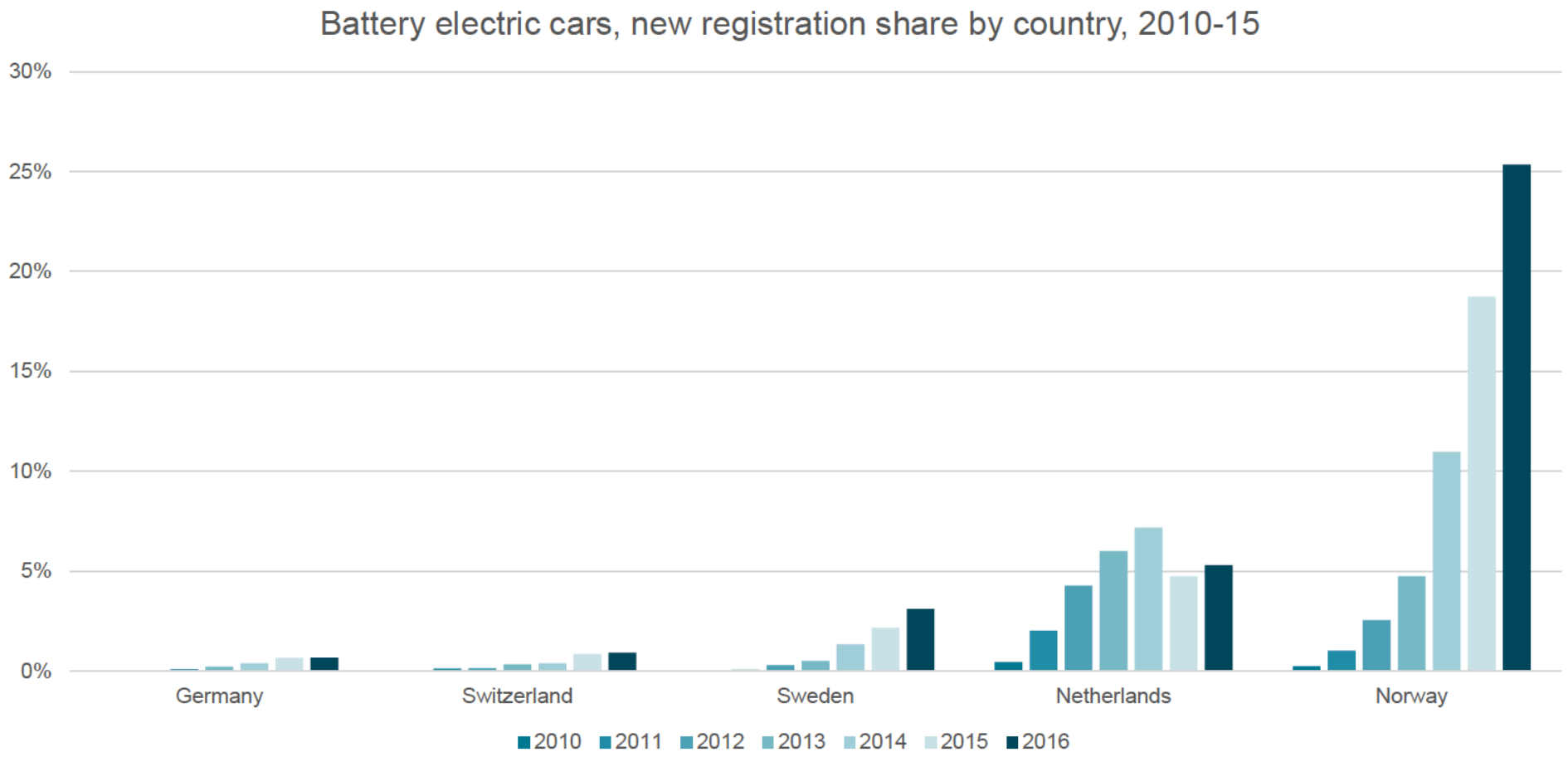
Prepared for 4th AIEE Energy Symposium, Rome

The number of EVs on Swiss roads is rising…



Data : SFOE 2019

… in international comparison …



Data: EAFO, OECD

… Switzerland is not yet performing well!

Drastic increase in EVs could reduce transport emissions and needed for 0 net - emissions in Switzerland!

Data: EEA 2017, EAFO 2017

Starting point

- Consumers' prejudices against EVs
  - Higher purchase price
  - Range anxiety
  - Charging possibilities (duration, time and space availability)
  - Safety + environmental concerns
  - Limited model/4x4 availability
- Weak incentives from the public sector in Switzerland
  - Purchase premia (only in very few areas)
  - Tax relief (only - 4% automobile tax)
  - Charging stations (in progress)
  - Parking (tbd)

Motivation for this study

- Consumers' prejudices against electric cars
  - → Might be changed through information
  - Currently consumers are still lacking knowledge on EVs (Long et al. 2019)
  - In China, significant pos. relationship between knowledge about EVs and perceived usefulness of EVs, leading to higher intentions to adopt EVs (Wang et al. 2018)

- Weak incentives from the public sector in Switzerland

→ testing specific incentives in this study

  - How information could be a policy option to promote EVs
  - How test-drives could be a policy option to promote EVs

Research question

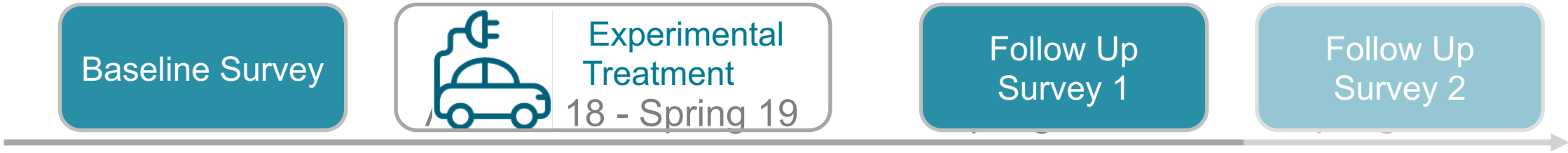
- What are the effects of
  1. **test driving** a battery electric vehicle
  2. **information** on **energy-efficient cars**

  on car holders'
  a. perceptions of EV attributes
  b. intention to switch car
  c. preferences regarding policies to promote energy-efficient cars

Could lack of information and experience explain low EV market shares?

- Self-selection into car ownership (EV or conventional car), self-selection into information gathering about EVs
- Overcoming these threats to causal inference through randomisation

→ RCT (randomised control trial) field experiment

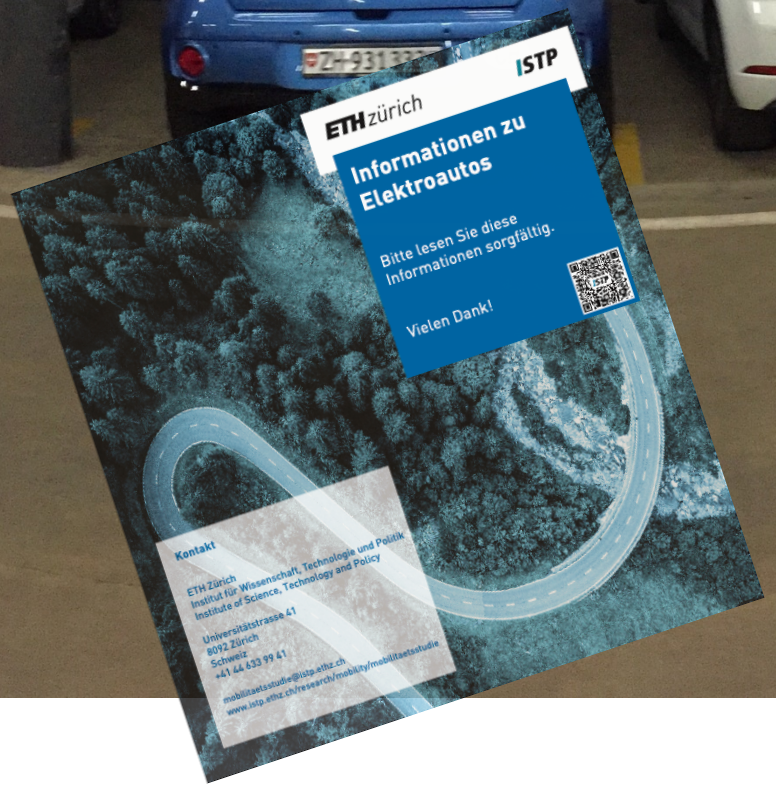


Sampling and set-up

- Random sample of Swiss car holders (cantons AG, SZ, ZG, ZH) with no BEV registered invited to baseline survey (response rate 21%)
- 4,148 survey participants randomly assigned to one of three experimental treatment groups:
  1. information on BEVs
  2. the same information on BEVs, plus test-driving of such a car;
  3. a control group with neither (1) nor (2).

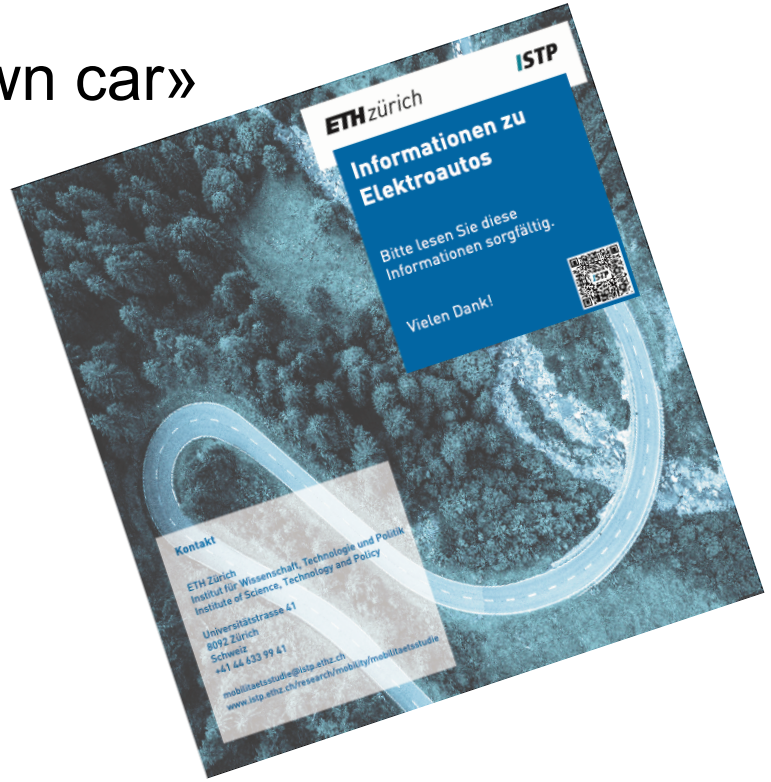
- Follow-up survey ≅ three weeks after the test-drive treatments / spring 2019

Test Drives & Information Treatment



Test Drives & Information Treatment

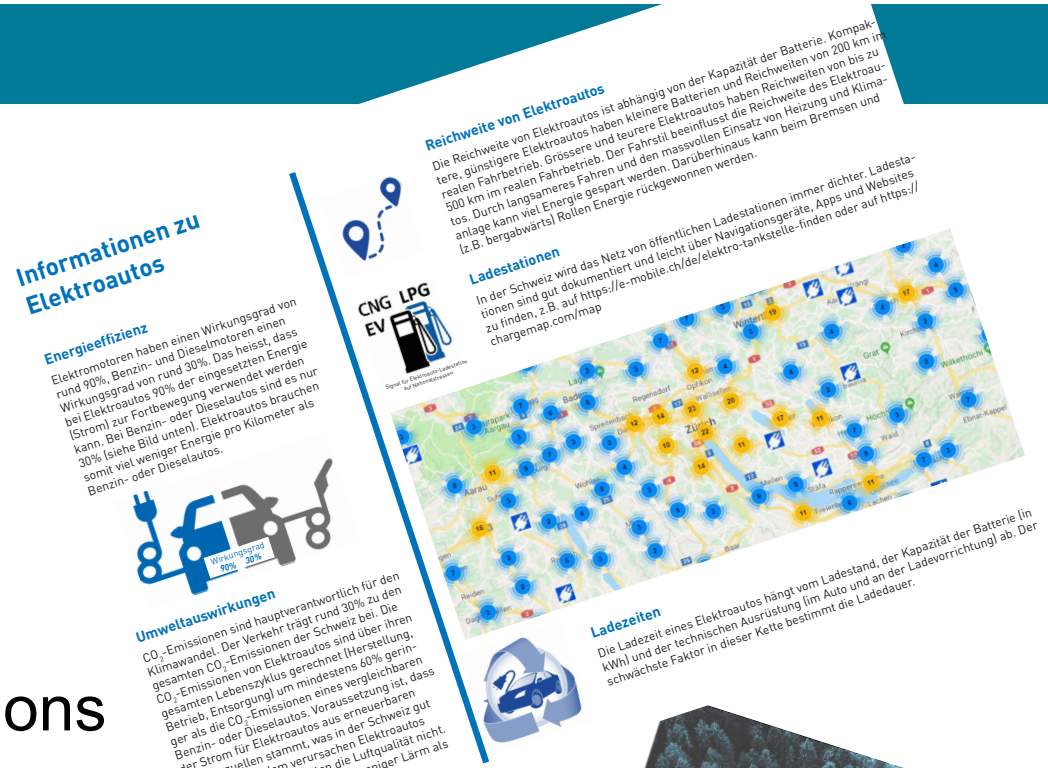
- Information sheet (printed)
- 48h test drive (with short technical introduction and opportunity to ask questions about the car)
- «Use as if it were your own car»



Information Treatment

- Energy efficiency
- Environmental impacts
- Range
- Charging duration and locations
- Costs
- Comparison EV and conventional car

- Delivered according to mode
  - On screen for online survey
  - In print for PAPI version

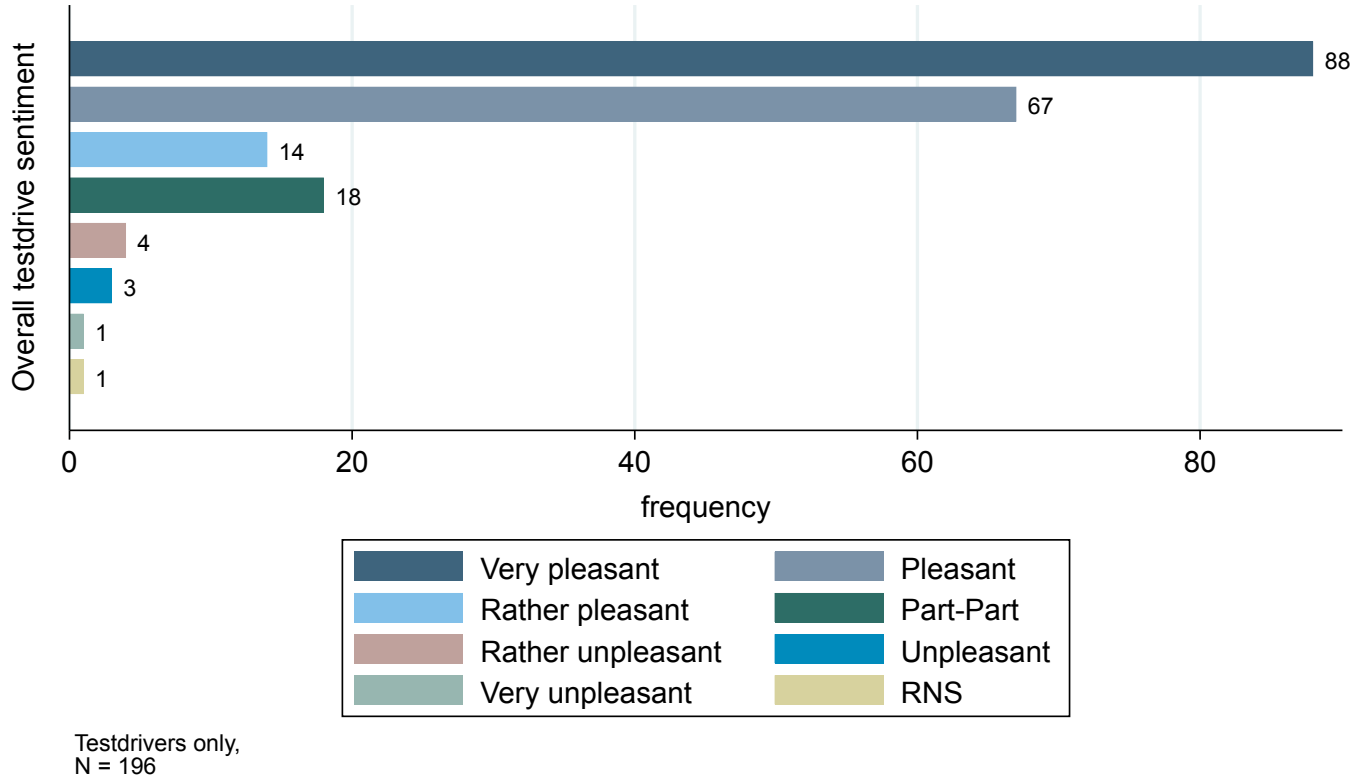


Threads to (perfect) randomization

- Attrition (n = 535 of 4,149 did not want to take part in a 2nd survey)
- Unwillingness to take part in a test-drive (n = 337 of 1,132) stated in baseline
- Abstentions from test-drive when offered (405 of 852)
- Limited amount of test-drives that could be offered (235 no test-drives offered)

→ Estimating treatment effects on the treated (TOT) using treatment-status from baseline as an instrumental variable (IV)

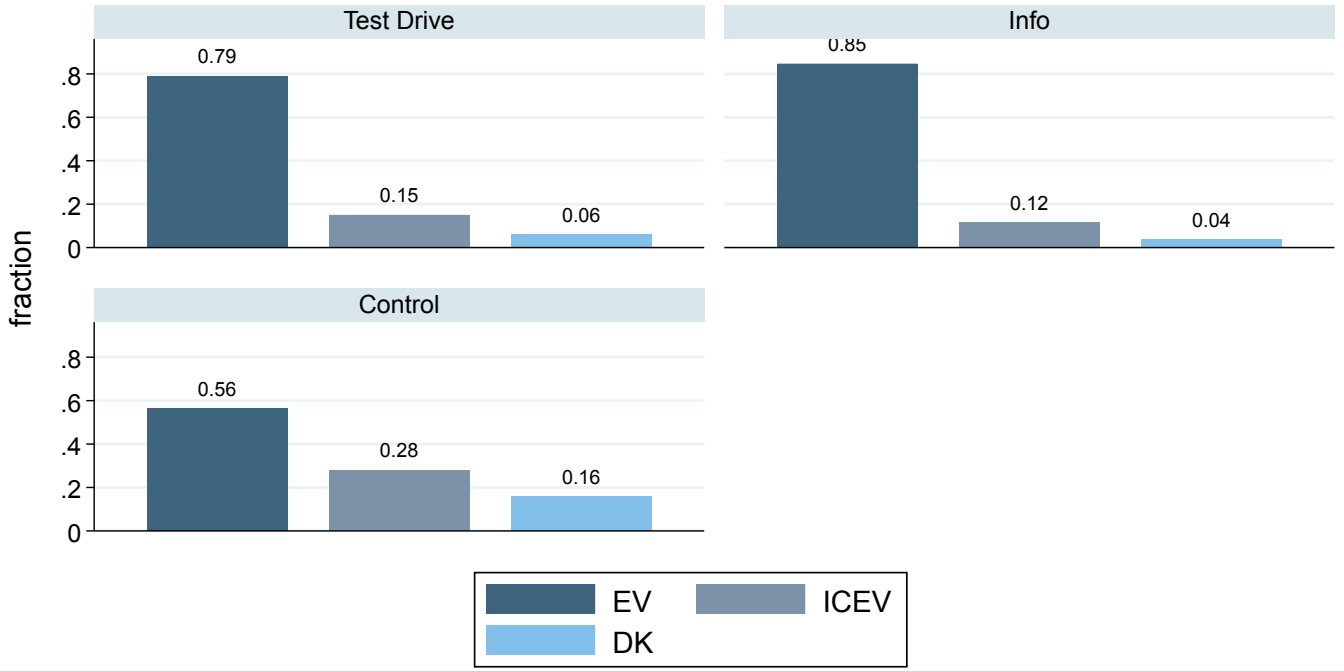
Perception of test drives



Overall test drives were rated «(very) pleasant».

Testdrivers only,
N = 196

Altering knowledge about energy efficiency of different cars?



Altering knowledge about energy efficiency of different cars?

	(1)	(2)	(3)
	1st stage: Test&Info	1st stage: Info	Second stage
Test&Info	0.27***	0.27***	
	(21.67)	(21.67)	
Info	7.94e-16	1.0***	
	(.01)	(84.10)	
Control	1	1	
	(.)	(.)	
Test&Info (realised)			0.764*
			(-2.52)
Info (realised)			0.672***
			(-13.10)
Control (realised)			1
			(.)
N	2450	2450	2450

Both treatments significantly* increase the knowledge about higher energy-efficiency of EVs.
*using IV

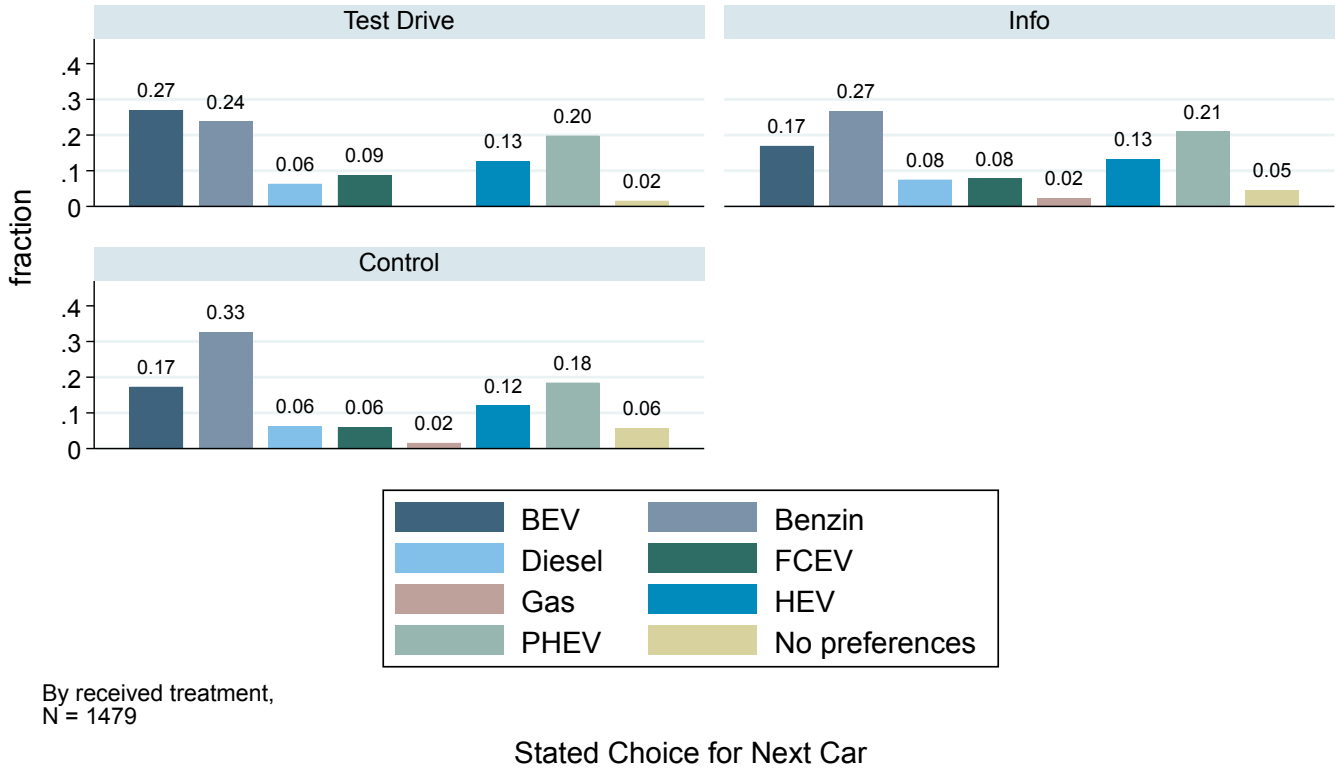
Exponentiated coefficients; t statistics in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001

Altering believes about electric cars?

- Both treatments increase perceived better environmental friendliness of EVs significantly
- Both treatments increase perceived lower running costs of EVs (only information significant)

- Both treatments increase perceived technological matureness of EVs and reduced road noise (not significant)

Planned next car purchase



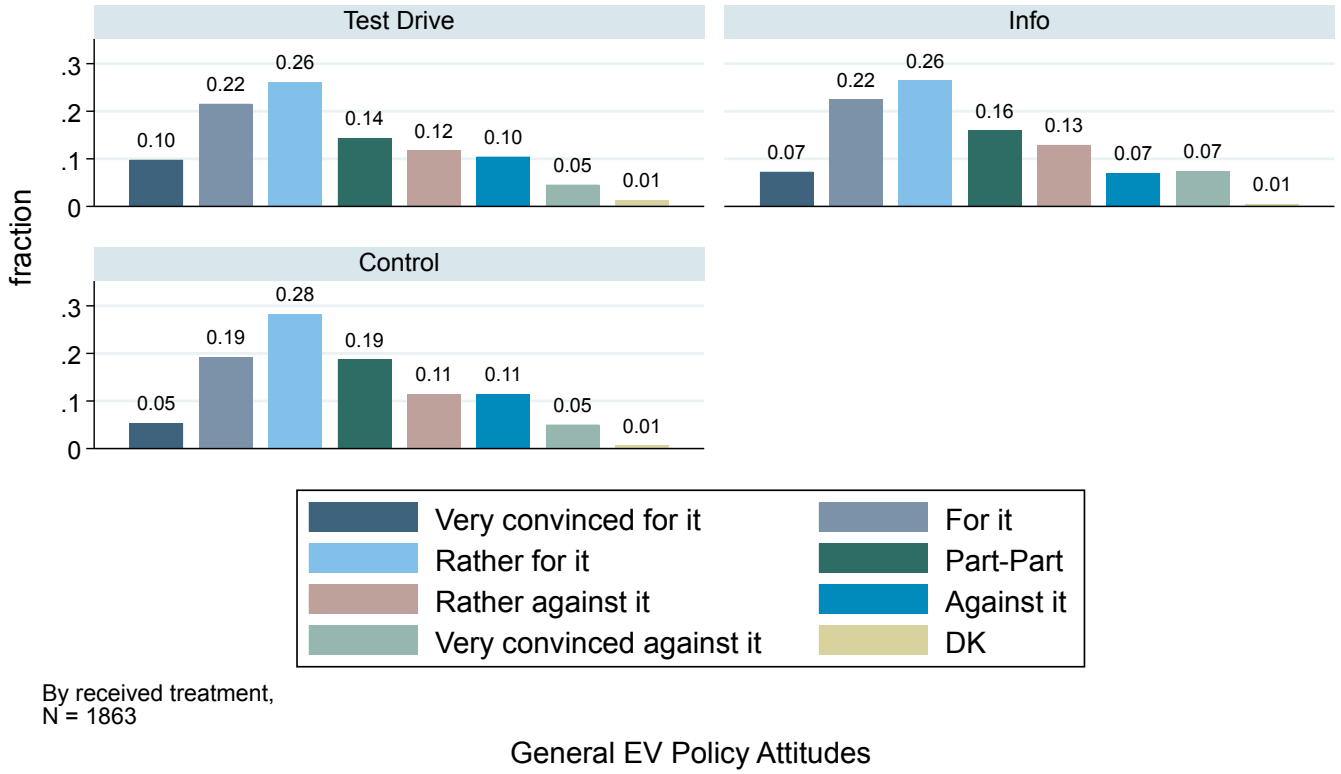
Intended next car purchase a BEV?

	(1)	(2)	(3)
	1st stage: Test&Info	1st stage: Info	Second stage
Test&Info	0.28***	0.25***	
	(0.13)	(0.01)	
Info	4.49e-15	1.0***	
	(0.01)	(0.01)	
Control	1	1	
	(.)	(.)	
Test&Info (realised)			1.053
			(1.00)
Info (realised)			1.010
			(0.63)
Control (realised)			1
			(.)
N	2425	2425	2425

Both treatments do not significantly alter the likelihood that the next car is a BEV. This includes people not wanting any car.

Exponentiated coefficients; t statistics in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001

General EV policy sentiment



General EV policy sentiment

	(1)	(2)	(3)
	1st stage: Test&Info	1st stage: Info	Second stage
Test&Info	0.26***	0.27***	
	(18.60)	(0.01)	
Info	-2.53e-15	1.0***	
	(0.01)	(72.18)	
Control	1	1	
	(.)	(.)	
Test&Info (realised)			.11
			(0.35)
Info (realised)			-.05
			(-0.51)
Control (realised)			1
			(.)
N	1,863	1,863	1,863

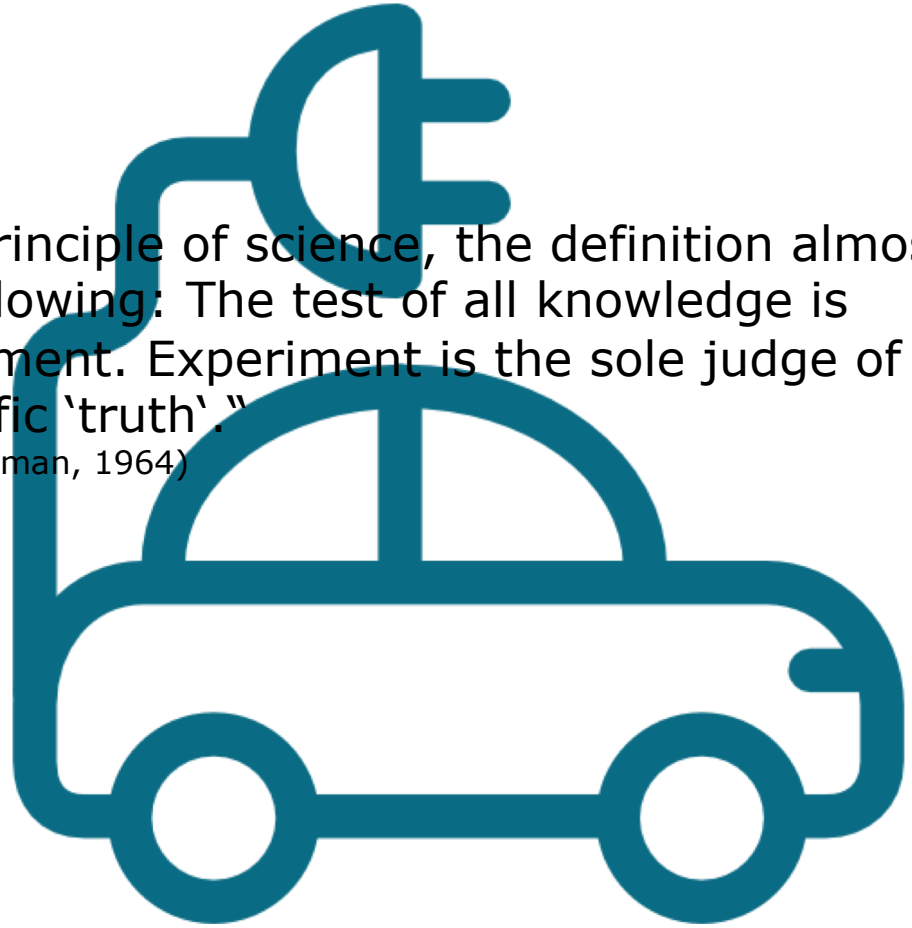
Both treatments do not alter the policy preferences.

Exponentiated coefficients; t statistics in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001

Main conclusions

- Both treatmens can increase the knowledge about EVs
- And have the potential to close the gap between perceived and actual EV attributes
- These interventions do not alter car purchase intentions or policy beliefs
- Many already want electric cars and EV policies
- 2nd Follow-Up survey already planned

Thank you for your attention!



„The principle of science, the definition almost, is the following: The test of all knowledge is experiment. Experiment is the sole judge of scientific 'truth'."
(R.P. Feynman, 1964)