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Costs, emissions, and preferences for electric vehicles: Evidence from a stated choice experiment with randomized information interventions

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1. Background

- In the European Union (EU) 25% of all greenhouse gas emissions are caused by the transportation sector
- One main measure is the transition to electric vehicles
- High purchase prices and CO₂ emissions in the production are important barriers (e.g. Hackbarth and Madlener, 2013; Krishna, 2021; Kanberger and Ziegler, 2024)
- Electric vehicles tend to be less costly and emission-causing in their life cycle (e.g. Helmers and Weiss, 2017; Cox et al., 2018; Moon and Lee, 2019)
- Life-cycle costs especially depend on electricity costs, fuel costs, and the number of driven kilometers (e.g. Bubeck et al., 2016, Liu et al., 2021)

- CO₂ emissions especially depend on the electricity mix, vehicle attributes, and driving patterns (e.g. Helmers and Weiss, 2017, Shafique and Luo, 2022)
- Potential savings in costs and CO₂ emissions in the future are undervalued during the purchase decision (e.g. Greene, 2011, Allcott and Wozny, 2014, Leard, 2018)
- Different framings to present information about CO₂ emissions in use can increase the willingness to pay (e.g. Averini and Waygood, 2013, Daziano et al., 2017)
- Adding total (monthly) costs of ownership as vehicle attribute can increase the preferences for electric vehicles (e.g. Dumortier et al., 2015)

Main contribution of this study

- Analysis of the causal effect of general information interventions addressing total costs and CO₂ emissions on the preferences for electric vehicles in a randomized control trial
- Analysis of the causal effect of the cost treatment on the preferences for the purchase price and the fuel costs
- Analysis of the causal effect of the emission treatment on the preferences for CO₂ emissions in the production and in the use of a vehicle
- Analysis of heterogeneous treatment effects regarding the total number of kilometers (km) driven in the last 12 months and regarding the planned mileage within one year

2. Data and variables

Survey

- Basis: Large-scale computer-assisted web survey among citizens in Germany
- Cooperation with the German market research company Psyma in April and May 2021
- Target population: Adults solely or partially responsible for household decisions
- Sample was stratified according to gender, age groups, place of residence, and education so that it is widely representative for target population in Germany
- Questions regarding vehicle purchase intentions and following questions about desired vehicle features
- Median completion time of survey: About 31 minutes

Stated choice experiment

- Survey especially comprised labeled stated choice experiment (to keep experiment more realistic) in terms of vehicle type, i.e.:
 - Conventional (gasoline or diesel) vehicle
 - Plug-in hybrid electric vehicle
 - Extended-range electric vehicle
 - (Pure) battery electric vehicle
- Six different choice sets for 2,243 respondents with two different information treatments before the first choice set
- The number of observations (choices) is thus 13,458
- To reduce the hypothetical bias, a cheap talk script was implemented (e.g. Cummings and Taylor, 1999, List, 2001)

Overview of attributes and levels

Attributes	Vehicle types	Attribute levels
Purchase price	Conventional, plug-in hybrid electric, extended-range electric, pure electric	70%, 80%, 90%, 100%, 110%, 120%, 130% of stated reference value (in Euro)
CO ₂ emissions per 100 km	Conventional, plug-in hybrid electric, extended-range electric	60%, 80%, 100%, 120%, 140% of reference value according to stated vehicle class (in kg)
	Pure electric	0%, 30%, 60%, 80%, 100%, 120%, 140% of reference value according to stated vehicle class (in kg)
CO ₂ emissions in production	Conventional, plug-in hybrid electric, extended-range electric, pure electric	60%, 80%, 100%, 120%, 140% of reference value according to stated vehicle class (in kg)
Range with fully charged battery	Conventional	--
	Plug-in hybrid electric	50 km, 75 km, 100 km, 150 km, 200 km
	Extended-range electric	100 km, 200 km, 250 km, 300 km, 400 km
	Pure electric	150 km, 200 km, 300 km, 450 km, 600 km
Range with full tank	Conventional	450 km, 600 km, 750 km, 900 km, 1050 km
	Plug-in hybrid electric	300 km, 400 km, 500 km, 600 km, 700 km
	Extended-range electric	50 km, 100 km, 150 km, 200 km, 250 km
	Pure electric	--
Time to recharge battery	Conventional	--
	Plug-in hybrid electric	15 minutes, 30 minutes, 60 minutes, 120 minutes
	Extended-range electric	30 minutes, 60 minutes, 120 minutes, 140 minutes
	Pure electric	45 minutes, 90 minute, 180 minutes, 360 minutes
Time to refuel tank	Conventional	3 minutes, 5 minutes, 6 minutes
	Plug-in hybrid electric	2 minutes, 3 minutes, 5 minutes
	Extended-range electric	1 minute, 2 minutes, 3 minutes
	Pure electric	--
Fuel costs per 100 km	Conventional, plug-in hybrid electric, extended-range electric, pure electric	60%, 80%, 100%, 120%, 140% of reference value according to stated vehicle class (in Euro)

Exemplary choice set (translated)

Let us start with the first set of choices. Which of the following four cars would you most likely choose?

	Vehicle 1: Pure electric vehicle	Vehicle 2: Electric vehicle with range extender	Vehicle 3: Gasoline or diesel vehicle	Vehicle 4: Plug-in hybrid vehicle
CO ₂ emissions per 100 km	10.1 kg	11.2 kg	22.9 kg	21.2 kg
CO ₂ emissions in production	5,000 kg	5,800 kg	6,000 kg	8,600 kg
Range with fully charged battery	300 km	400 km	-	150 km
Range with full tank	-	50 km	900 km	400 km
Time to recharge battery	180 minutes	60 minutes	-	120 minutes
Time to refuel tank	-	2 minutes	3 minutes	5 minutes
Fuel costs per 100 km	3.50 Euro	7.20 Euro	5.50 Euro	7.50 Euro
Purchase price	8,400 Euro	15,600 Euro	14,400 Euro	12,000 Euro
My choice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Cost information treatment: Information about costs for use and purchase price as well as about overall life-time costs for two exemplary vehicles and two exemplary total distances per year
- CO₂ emission information treatment: Information about CO₂ emissions in use and production as well as about overall life-time CO₂ emissions for two exemplary vehicles and two exemplary total distances per year
- Control group: 1,128 respondents
- Cost information treatment group: 561 respondents
- CO₂ emission information treatment group: 554 respondents

Cost information treatment

*“When making your decision, please note that the **total costs of the cars over their entire service life depends on the operating costs** and thus on the average fuel costs for gasoline, diesel, or electricity per 100 km driven, as well as on the purchase price.*

The total costs of two example cars over their entire service life are shown below:

	Example car 1	Example car 2
Costs in use	10 Euro per 100 km	5 Euro per 100 km
Purchase price	20.000 Euro	24.000 Euro

The purchase price for example car 1 is lower than for example car 2. The costs in use, on the other hand, are lower for example car 2 than for example car 1.

*With an average total distance of **20,000 km driven per year**, the **total costs of example car 2** with the higher purchase price are thus **already lower** than example car 1 **after four years** of use.*

*With an average total distance of **10,000 km driven per year**, the total costs of example car 2 with the higher purchase price are **only lower** than example car 1 **after eight years** of use.*

CO₂ emission information treatment

*“When making your decision, please also bear in mind that the total CO₂ emissions of cars over their entire service life depend on the **CO₂ emissions caused during use** and thus on the average CO₂ emissions caused per 100 km driven, as well as on the **CO₂ emissions caused during car production**.*

The total CO₂ emissions of two example cars over their entire service life are shown below:

	Example car 1	Example car 2
CO ₂ emissions in use	20 kg per 100 km	10 kg per 100 km
CO ₂ emissions in car production	5.000 kg	13.000 kg

The CO₂ emissions in car production for example car 1 are lower than for example car 2. CO₂ emissions in use, on the other hand, are lower for example car 2 than for example car 1.

*With an average total distance of **20,000 km driven per year**, the total CO₂ **emissions of example car 2** with the higher CO₂ emissions in car production are thus **already lower** than example car 1 **after four years of use**.*

*With an average total distance of **10,000 km driven per year**, the total CO₂ emissions of example car 2 with the higher CO₂ emissions caused during car production are **only lower** than example car 1 **after eight years of use**.”*

3. Econometric analysis: Main results

Econometric approach

- Simulated maximum likelihood estimation of flexible mixed logit models by assuming normally distributed attribute parameters
- Use of 1,000 Halton draws (i.e. quasirandomly drawn numbers) for the simulation of choice probabilities
- Robust estimation of the variances of the estimated parameters
- Alternative specific constants for the three electric vehicle alternatives (conventional vehicle is base category)
- The parameters of the interaction terms are assumed to be fixed
- The two attributes for range are summarized in one range variable

Main estimation results I

Explanatory variables	Estimates (robust z-statistics)		Mean WTP estimates in Euro (based on purchase price)
	Mean of the parameter	Standard deviation of the parameter	
Purchase price (in 1000 Euro)	-0.078*** (-12.31)	–	–
Extended-range electric vehicle	-1.343*** (-11.06)	1.121*** (14.84)	-17,185.22
Plug-in hybrid electric vehicle	-0.795*** (-8.38)	1.781*** (25.79)	-10,169.10
Battery electric vehicle	-1.306*** (-8.47)	1.071*** (7.52)	-16,714.35
CO ₂ emissions per 100 km (in kg)	-0.021*** (-5.37)	0.082*** (12.75)	-273.47
CO ₂ emissions in production (in tons)	-0.029*** (-3.83)	0.080*** (5.09)	-371.99
Range with fully charged battery / full tank (in 100 km)	0.161*** (16.19)	0.213*** (14.39)	2,060.52
Time to recharge battery (in hours)	-0.193*** (-8.26)	0.364*** (9.94)	-2,469.06
Time to refuel tank (in minutes)	-0.036** (-2.42)	0.396*** (17.39)	-462.76
Fuel costs per 100 km (in Euro)	-0.136*** (-14.23)	0.239*** (19.60)	-1,740.74

Main estimation results II

Explanatory variables	Estimates (robust z-statistics)		Mean WTP estimates in Euro (based on purchase price)
	Mean of the parameter	Standard deviation of the parameter	
Extended-range electric vehicle × cost treatment	0.204 (1.19)	–	–
Plug-in hybrid electric vehicle × cost treatment	-0.044 (-0.28)	–	–
Battery electric vehicle × cost treatment	0.273 (1.29)	–	–
Purchase price × cost treatment	-0.002 (-0.15)	–	–
Fuel costs per 100 km × cost treatment	-0.005 (-0.25)	–	–
Extended-range electric vehicle × emission treatment	0.193 (1.06)	–	–
Plug-in hybrid electric vehicle × emission treatment	0.164 (1.02)	–	–
Battery electric vehicle × emission treatment	0.316 (1.41)	–	–
CO ₂ emissions in use per 100 km × emission treatment	-0.005 (-0.61)	–	–
CO ₂ emissions in production × emission treatment	-0.003 (-0.18)	–	–

4. Estimated heterogeneous treatment effects

Results number of km traveled by car I

Explanatory variables	Less than or equal to 8,000 km			More than 8,000 km		
	(1)	(2)	(3)	(4)	(5)	(6)
	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)
Extended-range electric vehicle × cost treatment	0.010 (0.05)	–	–	0.546** (1.97)	–	7,430.79
Plug-in hybrid electric vehicle × cost treatment	-0.296 (-1.45)	–	–	0.263 (1.10)	–	–
Battery electric vehicle × cost treatment	0.244 (0.92)	–	–	0.141 (0.44)	–	–
Purchase price × cost treatment	-0.017 (-0.88)	–	–	0.007 (0.44)	–	–
Fuel costs per 100 km × cost treatment	-0.009 (-0.34)	–	–	0.006 (0.22)	–	–
Extended-range electric vehicle × emission treatment	0.022 (0.10)	–	–	0.433 (1.47)	–	–
Plug-in hybrid electric vehicle × emission treatment	-0.056 (-0.25)	–	–	0.444* (1.87)	–	6,050.40
Battery electric vehicle × emission treatment	0.126 (0.44)	–	–	0.418 (1.22)	–	–
CO ₂ emissions per 100 km × emission treatment	-0.012 (-1.16)	–	–	0.004 (0.33)	–	–
CO ₂ emissions in production × emission treatment	-0.001 (-0.06)	–	–	-0.006 (-0.24)	–	–
Number of observations (choices)	8,238	8,238	8,238	5,220	5,220	5,220

Results number of km traveled by car II

Explanatory variables	More than 10,000 km			More than 12,000 km		
	(7)	(8)	(9)	(10)	(11)	(12)
	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)
Extended-range electric vehicle × cost treatment	0.733** (2.33)	–	10,204.01	0.593 (1.59)	–	–
Plug-in hybrid electric vehicle × cost treatment	0.408 (1.41)	–	–	0.363 (1.13)	–	–
Battery electric vehicle × cost treatment	0.344 (0.89)	–	–	0.088 (0.20)	–	–
Purchase price × cost treatment	0.009 (0.47)	–	–	0.004 (0.20)	–	–
Fuel costs per 100 km × cost treatment	0.020 (0.60)	–	–	0.022 (0.59)	–	–
Extended-range electric vehicle × emission treatment	0.695* (1.95)	–	9,672.30	0.652* (1.67)	–	11,058.38
Plug-in hybrid electric vehicle × emission treatment	0.589** (2.09)	–	8,200.34	0.739** (2.40)	–	12,541.04
Battery electric vehicle × emission treatment	0.538 (1.36)	–	–	0.600 (1.42)	–	–
CO ₂ emissions per 100 km × emission treatment	0.004 (0.27)	–	–	0.012 (0.73)	–	–
CO ₂ emissions in production × emission treatment	-0.013 (-0.43)	–	–	-0.012 (-0.39)	–	–
Number of observations (choices)	3,630	3,630	3,630	2,802	2,802	2,802

Results planned mileage

Explanatory variables	Less than or equal to 10,000 km			More than 10,000 km		
	(1)	(2)	(3)	(4)	(5)	(6)
	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)
Extended-range electric vehicle × cost treatment	0.273 (1.04)	–	–	0.498 (1.54)	–	–
Plug-in hybrid electric vehicle × cost treatment	-0.485* (-1.92)	–	-5,205.35	0.261 (0.92)	–	–
Battery electric vehicle × cost treatment	0.334 (1.01)	–	–	-0.003 (-0.01)	–	–
Purchase price × cost treatment	0.007 (0.30)	–	–	-0.021 (-1.29)	–	–
Fuel costs per 100 km × cost treatment	-0.023 (-0.75)	–	–	0.014 (0.41)	–	–
Extended-range electric vehicle × emission treatment	0.004 (0.01)	–	–	0.784** (2.37)	–	12,570.47
Plug-in hybrid electric vehicle × emission treatment	-0.502* (-1.91)	–	-5,388.15	0.704** (2.49)	–	11,295.13
Battery electric vehicle × emission treatment	-0.034 (-0.09)	–	–	0.588 (1.52)	–	–
CO ₂ emissions per 100 km × emission treatment	-0.012 (-0.91)	–	–	-0.008 (-0.60)	–	–
CO ₂ emissions in production × emission treatment	-0.001 (-0.03)	–	–	0.005 (0.19)	–	–
Number of observations (choices)	5,256	5,256	5,256	4,002	4,002	4,002

5. Conclusions

Conclusions

- Considering the full sample, we do not find any significant treatment effects
- Considering split samples regarding the total driven km within 12 months and the planned mileage, both information treatments can increase the preferences for electric vehicles
- Targeted information campaigns for individuals with an extensive vehicle use can increase the preferences and the willingness to pay for electric vehicles
- To reach the target of 15 million battery electric vehicles in Germany in 2030, it should be considered to use combined measures to additionally address other barriers such as range anxiety

Thank you!

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Appendix

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Screenshot of exemplary choice set

Beginnen wir nun mit der ersten Auswahl. Für welches der folgenden vier Autos würden Sie sich am ehesten entscheiden?

(1 / 12)

	Auto 1: Reines Elektrofahrzeug	Auto 2: Elektrofahrzeug mit Range Extender	Auto 3: Benzin- oder Dieselfahrzeug	Auto 4: Plug-in Hybridfahrzeug
CO ₂ -Emissionen pro 100 km	10,1 kg	11,2 kg	22,9 kg	21,2 kg
CO ₂ -Emissionen in der Produktion	5.000 kg	5.800 kg	6.000 kg	8.600 kg
Reichweite bei voller Batterie	300 km	400 km	-	150 km
Reichweite bei voller Tankfüllung	-	50 km	900 km	400 km
Zeit zum Aufladen der Batterie	180 Minuten	60 Minuten	-	120 Minuten
Zeit zum Auftanken des Tanks	-	2 Minuten	3 Minuten	5 Minuten
Kraftstoffkosten pro 100 km	3,50 Euro	7,20 Euro	5,50 Euro	7,50 Euro
Kaufpreis	8.400 Euro	15.600 Euro	14.400 Euro	12.000 Euro
	Meine Wahl	Meine Wahl	Meine Wahl	Meine Wahl

Würden Sie lieber keines der dargestellten Autos auswählen und stattdessen ein anderes Auto bevorzugen?

Ja

Nein

Weiter

Attributes for vehicles

- Purchase price in Euro (1000 Euro)
 - Average CO₂ emissions in use per 100 km in kg
 - Total CO₂ emissions in production in kg (tons)
 - Average range with fully charged battery in km (100 km)
 - Average range with full tank in km (100 km)
 - Average time to fully charge battery in minutes (hours)
 - Average time to fill up tank in minutes
 - Average fuel cost per 100 km in Euro
- Some attributes were customized according to the information from the respondents to keep the hypothetical vehicle alternatives as realistic as possible

Frequencies of chosen vehicle types

Conventional vehicle	Plug-in hybrid electric vehicle	Extended-range electric vehicle	Battery electric vehicle
Control group, 1128 respondents, six choice sets, 6768 observations (choices)			
2875 (42.48%)	1631 (24.10%)	823 (12.16%)	1439 (21.26%)
Cost information treatment group, 561 respondents, six choice sets, 3366 observations (choices)			
1338 (39.75%)	748 (22.22%)	463 (13.76%)	817 (24.27%)
CO ₂ emission information treatment group, 554 respondents, six choice sets, 3324 observations (choices)			
1276 (38.39%)	808 (24.31%)	449 (13.51%)	791 (23.80%)

Results number of km attributes I

Explanatory variables	Less than or equal to 8,000 km			More than 8,000 km		
	(1)	(2)	(3)	(4)	(5)	(6)
	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)
Purchase price (in 1000 Euro)	-0.081*** (-9.03)	–	–	-0.073*** (-8.21)	–	–
Extended-range electric vehicle	-1.075*** (-6.89)	1.168*** (12.06)	-13,273.53	-1.764*** (-9.29)	1.181*** (10.54)	-24,025.53
Plug-in hybrid electric vehicle	-0.648*** (-5.15)	1.844*** (19.61)	-8,009.62	-0.993*** (-6.94)	1.749*** (16.12)	-13,517.29
Battery electric vehicle	-1.014*** (-5.13)	-1.210*** (-5.98)	-12,531.39	-1.594*** (-7.03)	-0.628** (-2.43)	-21,705.90
CO ₂ emissions per 100 km (in kg)	-0.019*** (-3.65)	0.088*** (10.85)	-237.57	-0.024*** (-3.98)	0.078*** (9.61)	-331.02
CO ₂ emissions in production (in tons)	-0.032*** (-3.28)	0.067** (2.23)	-400.37	-0.023* (-1.89)	0.064 (1.29)	-312.03
Range with fully charged battery / full tank (in 100 km)	0.127*** (10.12)	0.201*** (9.77)	1,563.77	0.217*** (13.05)	0.223*** (10.41)	2,948.58
Time to recharge battery (in hours)	-0.177*** (-6.39)	0.365*** (9.04)	-2,190.60	-0.239*** (-5.43)	0.372*** (5.97)	-3,261.37
Time to refuel tank (in minutes)	-0.036* (-1.80)	0.391*** (13.04)	-441.54	-0.019 (-0.83)	0.394*** (12.62)	--
Fuel costs per 100 km (in Euro)	-0.135*** (-10.64)	0.240*** (14.49)	-1,672.77	-0.138*** (-9.42)	0.233*** (12.45)	-1,878.26
Number of observations	8,238	8,238	8,238	5,220	5,220	5,220

Results number of km attributes II

Explanatory variables	More than 10,000 km			More than 12,000 km		
	(7)	(8)	(9)	(10)	(11)	(12)
	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)
Purchase price (in 1000 Euro)	-0.072*** (-6.71)	–	–	-0.059*** (-5.25)	–	–
Extended-range electric vehicle	-1.800*** (-7.39)	1.141*** (7.94)	-25,048.36	-1.817*** (-6.56)	1.174*** (7.32)	-30,819.90
Plug-in hybrid electric vehicle	-0.989*** (-5.75)	1.742*** (13.50)	-13,764.25	-1.043*** (-5.33)	1.650*** (11.40)	-17,684.35
Battery electric vehicle	-1.503*** (-5.44)	-0.172 (-0.18)	-20,921.44	-1.507*** (-5.08)	-0.159 (-0.54)	-25,567.19
CO ₂ emissions per 100 km (in kg)	-0.028*** (-3.86)	0.076*** (8.19)	-394.29	-0.027*** (-3.29)	0.075*** (8.20)	-461.69
CO ₂ emissions in production (in tons)	-0.024 (-1.64)	0.098*** (3.44)	--	-0.025 (-1.61)	0.098*** (3.36)	--
Range with fully charged battery / full tank (in 100 km)	0.236*** (12.07)	0.223*** (9.17)	3,291.07	0.245*** (10.87)	0.222*** (7.52)	4,160.07
Time to recharge battery (in hours)	-0.250*** (-4.84)	0.367*** (5.17)	-3,474.26	-0.205*** (-3.09)	0.263** (2.46)	-3,483.03
Time to refuel tank (in minutes)	-0.017 (-0.63)	0.410*** (10.94)	--	-0.041 (-1.29)	0.413*** (10.39)	--
Fuel costs per 100 km (in Euro)	-0.149*** (-8.46)	0.233*** (10.31)	-2,077.74	-0.140*** (-7.40)	0.216*** (8.83)	-2,371.92
Number of observations	3,630	3,630	3,630	2,802	2,802	2,802

Results planned mileage attributes

Explanatory variables	Less than or equal to 10,000 km			More than 10,000 km		
	(1)	(2)	(3)	(4)	(5)	(6)
	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)
Purchase price (in 1000 Euro)	-0.093*** (-9.09)	–	–	-0.061*** (-6.13)	–	–
Extended-range electric vehicle	-1.212*** (-6.00)	1.158*** (10.05)	-13,002.40	-1.746*** (-7.57)	1.241*** (9.24)	-28,190.84
Plug-in hybrid electric vehicle	-0.427*** (-2.70)	1.893*** (16.34)	-4,584.58	-1.000*** (-5.60)	1.872*** (14.01)	-16,195.50
Battery electric vehicle	-1.119*** (-4.27)	1.308*** (6.69)	-12,011.60	-1.446*** (-5.35)	-0.660** (-2.04)	-23,243.45
CO ₂ emissions per 100 km (in kg)	-0.020*** (-3.04)	0.089*** (8.48)	-209.95	-0.024*** (-3.18)	0.083*** (8.87)	-370.61
CO ₂ emissions in production (in tons)	-0.027** (-2.23)	0.058* (1.70)	-290.65	-0.016 (-1.20)	-0.078*** (-2.81)	-260.58
Range with fully charged battery / full tank (in 100 km)	0.169*** (10.41)	0.228*** (10.55)	1,815.41	0.238*** (12.09)	0.234*** (9.34)	3,902.03
Time to recharge battery (in hours)	-0.230*** (-5.49)	0.394*** (5.72)	-2,467.84	-0.247*** (-5.24)	0.411*** (6.96)	-4,104.43
Time to refuel tank (in minutes)	-0.034 (-1.34)	0.406*** (10.93)	–	-0.030 (-1.09)	0.383*** (11.09)	–
Fuel costs per 100 km (in Euro)	-0.146*** (-9.16)	0.247*** (13.22)	-1,568.67	-0.144*** (-8.07)	0.256*** (11.49)	-2,344.82
Number of observations	5,256	5,256	5,256	4,002	4,002	4,002

Results planned mileage

Explanatory variables	Less than or equal to 10,000 km			More than 15,000 km		
	(1)	(2)	(3)	(7)	(8)	(9)
	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)	Mean of the parameter	Standard deviation of the parameter	Mean WTP estimates in Euro (based on purchase price)
Extended-range electric vehicle × cost treatment	0.273 (1.04)	–	–	0.310 (0.68)	–	–
Plug-in hybrid electric vehicle × cost treatment	-0.485* (-1.92)	–	-5,205.35	0.248 (0.53)	–	–
Battery electric vehicle × cost treatment	0.334 (1.01)	–	–	-0.471 (-0.91)	–	–
Purchase price × cost treatment	0.007 (0.30)	–	–	-0.068*** (-2.76)	–	-1,570.21
Fuel costs per 100 km × cost treatment	-0.023 (-0.75)	–	–	-0.011 (-0.22)	–	–
Extended-range electric vehicle × emission treatment	0.004 (0.01)	–	–	0.812* (1.72)	–	18,613.10
Plug-in hybrid electric vehicle × emission treatment 2	-0.502* (-1.91)	–	-5,388.15	1.029** (2.37)	–	23,608.11
Battery electric vehicle × emission treatment	-0.034 (-0.09)	–	–	1.060** (1.99)	–	24,314,00
CO ₂ emissions per 100 km × emission treatment	-0.012 (-0.91)	–	–	0.008 (0.44)	–	–
CO ₂ emissions in production × emission treatment	-0.001 (-0.03)	–	–	0.029 (0.76)	–	–
Number of observations	5,256	5,256	5,256	1,980	1,980	1,980