

## **Green logistics**

**– demand for logistics services with a better environmental profile**

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**CHARLES UNIVERSITY**

Environment Center



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# City logistics: current state

## Freight commercial vehicles:

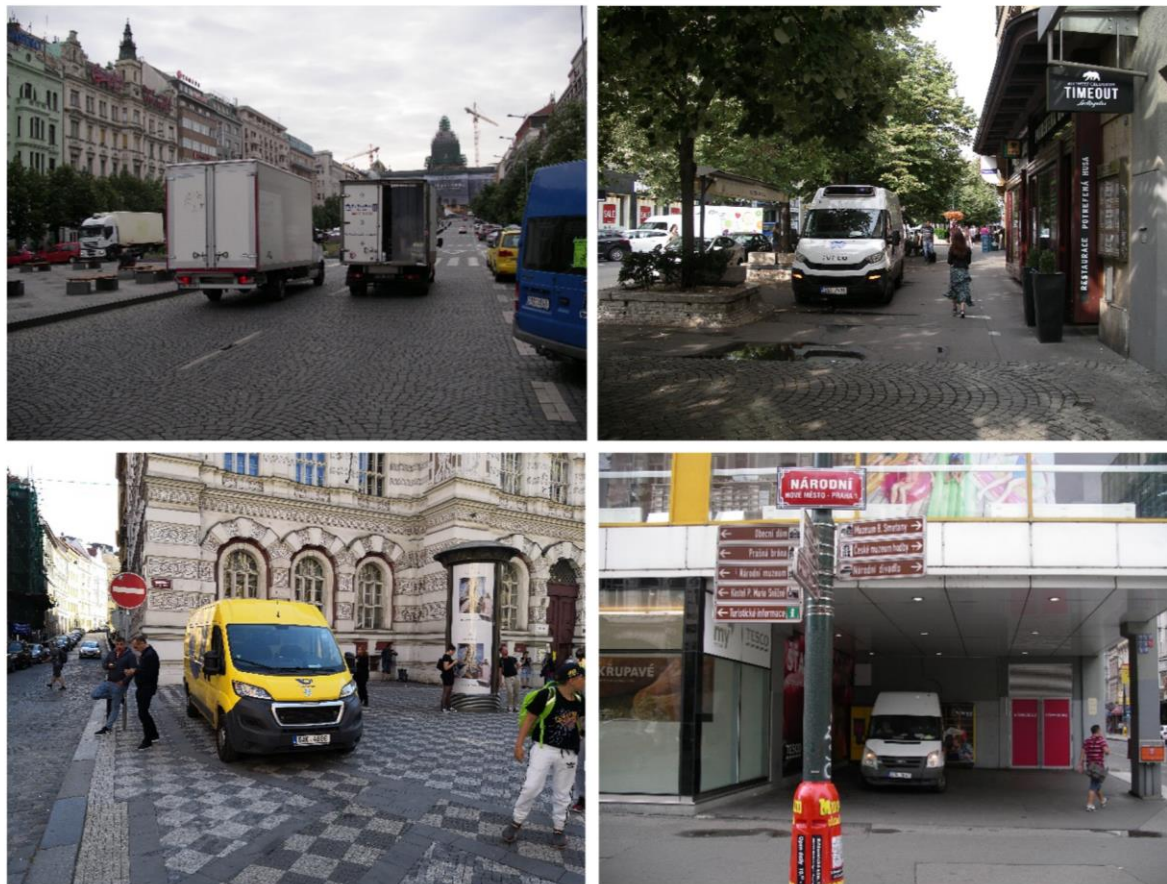
- travel 15-25% of the km in the city;
- occupy 20% to 40% of the urban road space;
- cause 20% - 40% of CO<sub>2</sub> emissions related to urban transport
- responsible for 30% to 50% of the main air pollutants (PM and NOx)

(Smart Freight Centre, 2017)

- BAU: contribution to total anthropogenic GHG emissions grow from 7 % to 16 % between 2012 and 2050
- It requires 60 % reduction in GHG emissions by 2050 (vs. 1990) to reach the goal to limit global warming below 1.5 °C

(McKinnon, 2018)

## PŘÍKLADY NEOPRÁVNĚNÉHO PARKOVÁNÍ ZÁSOBUJÍCÍCH VOZIDEL



Zdroj: Inventarizace vyhrazených stání pro zásobování a pro vozidla přepravující osoby se zdravotním postižením v hl. m. Praze, M.O.Z. Consult, 2018

# Initiatives of the City





# Objectives of our study

- to complement the initiatives of the city (focus on infrastructure, i.e. supply) with understanding of the demand side (customers decisions)
- to motivate logistics firms to enlarge their delivery services with green alternatives

# Objectives of our study

**alza.cz**







Zkuste nové Alza Premium | Moje Alza | Přihlásit | Pro firmy | Jak nakoupit | Kariéra | 

Co hledáte? Např. kabel AlzaPower... **Hledat**  **29 990 Kč**


1 Košík → 2 **Doprava a platba** → 3 Dodací údaje

TIP: Vyzkoušejte bezkontaktní AlzaBox, kam **doručujeme i o víkendu.**

**Zvolte dopravu**

<input type="checkbox"/>  AlzaBox - nonstop vyzvednutí	od 49 Kč	dnes od 15:30
<input type="checkbox"/>  Showroom Praha 7 - Holešovice	zdarma nebo od 45 Kč	ihned
<input type="checkbox"/>  Prodejny a odběrná místa	zdarma nebo od 45 Kč	ihned
<input type="checkbox"/>  AlzaExpres - Praha a okolí - vyberte si čas	99 Kč	zítra od 8:00
<input type="checkbox"/>  Doručení na adresu	99 Kč	zítra
<input type="checkbox"/>  Expresní doručení	od 189 Kč	dnes do 13:05

◀ Zpět **Pokračovat** ▶

 1x MacBook Macbook Air 13" M1 CZ Vesmírně Šedý 2020 **29 990 Kč**

atives

# Specific research questions

1. Would customers choose more sustainable logistics services (*of goods purchased online*), if they knew their environmental profile?
2. What is the role of customer's environmental motivation in their decisions?

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1. Would customers choose more sustainable logistics services (*of goods purchased online*), if they knew their environmental profile?
2. What is the role of customer's environmental motivation in their decisions?
  - Laymen's belief that people are not motivated enough to pay higher cost of green alternatives
  - evidence: pro-environmental motivation - decisions in all domains of everyday life  
(meta-analysis by Gardner & Abraham, 2008)



# Specific research questions

1. Would customers choose more sustainable logistics services (*of goods purchased online*), if they new their environmental profil?
  2. What is the role of customer ´s environmental motivation in their decisions?
    - ...
    - evidence: pro-environemntal motivation →
- Travel mode choice (Anable, 2005; Collins & Chambers, 2005; Gardner & Abraham, 2010; Groot & Steg, 2007; Donald et al., 2014; Susilo et al., 2012; Chng, et al., 2018)
  - Purchase of low-emission vehicles (Daziano et al., 2017; Lim et al., 2019)
  - Pro-environmental driving style (Taube et al., 2018)
  - Number of kms, fuel consumption (Ory & Mokhtarian, 2009; Flamm, 2006; Fransson & Gärling, 1999).

# Specific research questions II

1. Would customers choose more sustainable logistics services (*of goods purchased online*), if they knew their environmental profile?
2. What is the role of customer's environmental motivation in their decisions?
3. How stable is the preference for sustainable logistics services and the impact of pro-environmental motivation (COVID-19)?

# Method

Series of experimental studies ( $N = 2536$  Czech adults; 2020 - 2021)

- Different samples of population
- Different time points (pre-, during- COVID-19)
- Different levels of attributes of the delivery services

## Choice experiment

- Repeated choices
- Dep. variable: Intention to choose a delivery service
- Factors:
  - attributes of the service (price, time, delivery mode, CO<sub>2</sub> emissions)
  - pro-environmental motivation of the participant

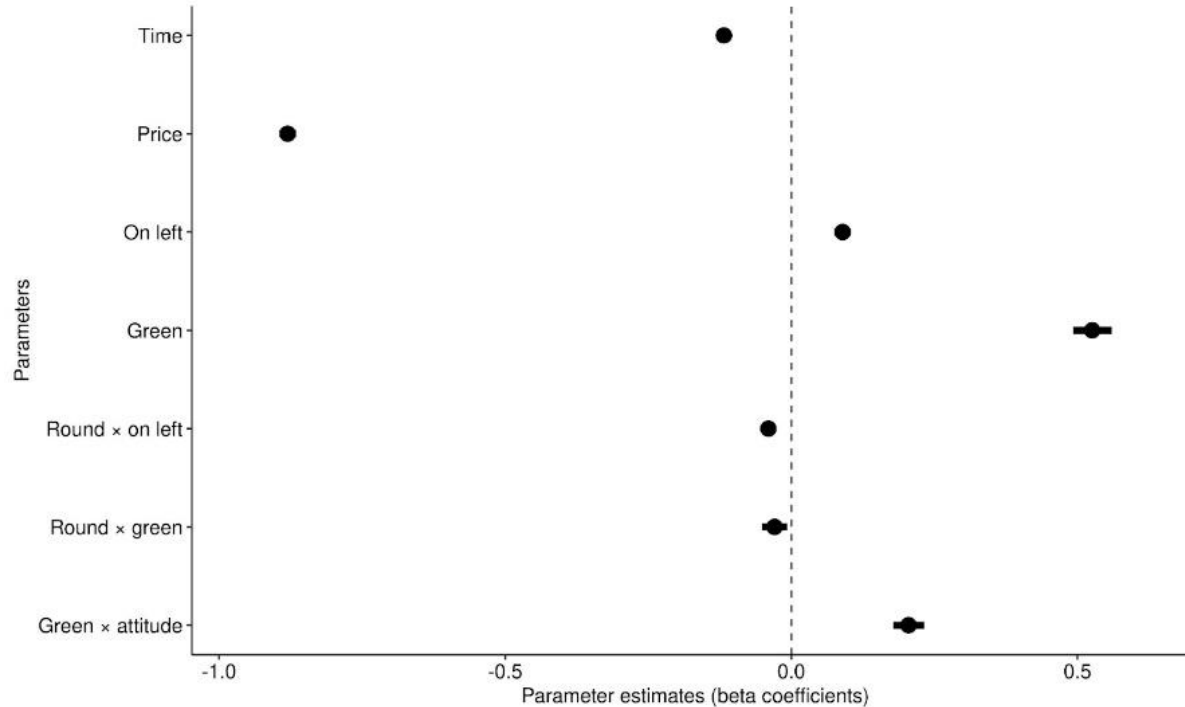
# Choice situation

Which of the following delivery modes would you prefer if you purchased a set of pots in the Czech online store?

Variant f	Varianta j
Delivery mode: Lorry	Delivery mode: Electric car
Delivery time: within 24 hours	Delivery time: within 12 hours
CO <sub>2</sub> emissions*: 250 g	CO <sub>2</sub> emissions*: 40 g
Price: 110 Kč	Price: 200 Kč

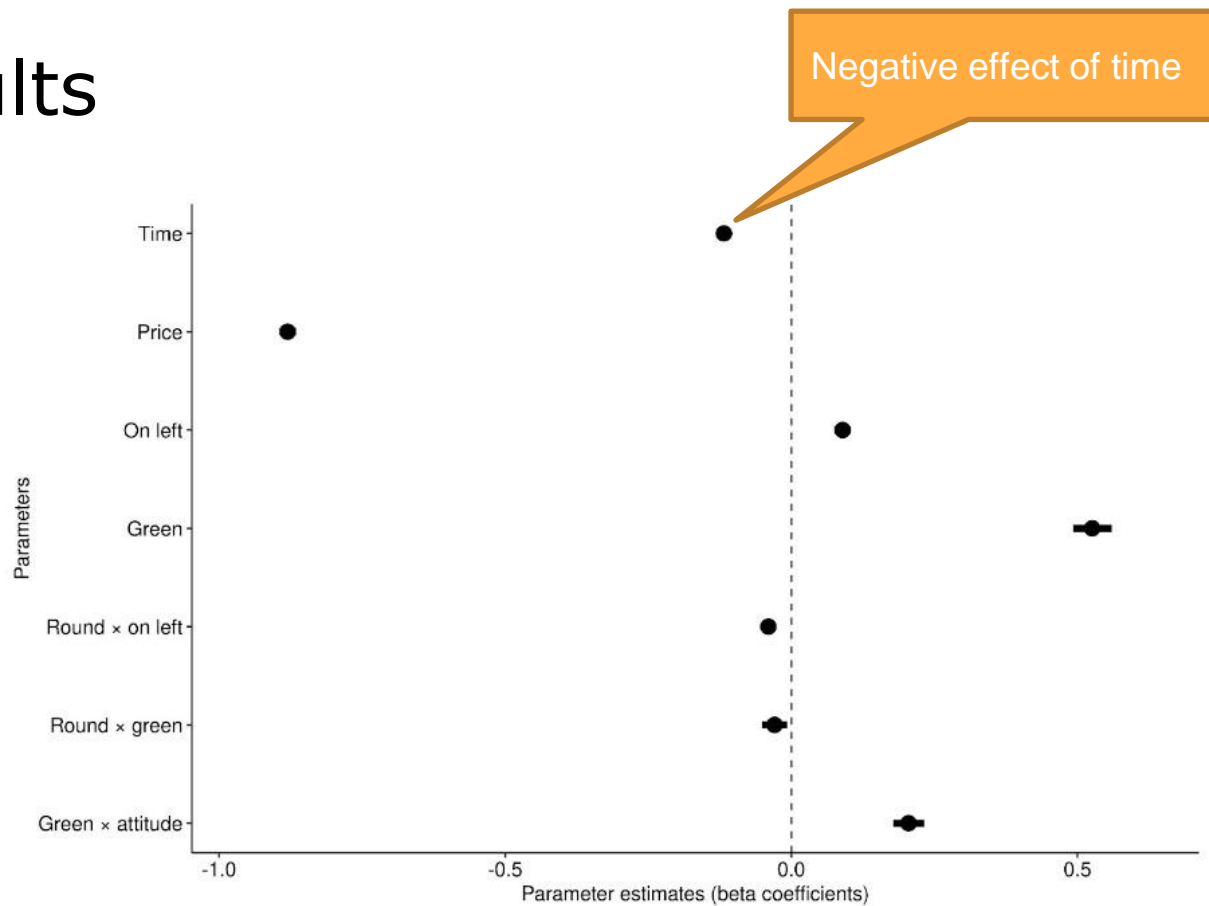
\*CO<sub>2</sub> emissions for the delivery of a consignment from a warehouse in your city by a given means of transport

# Results: model of the delivery service choice

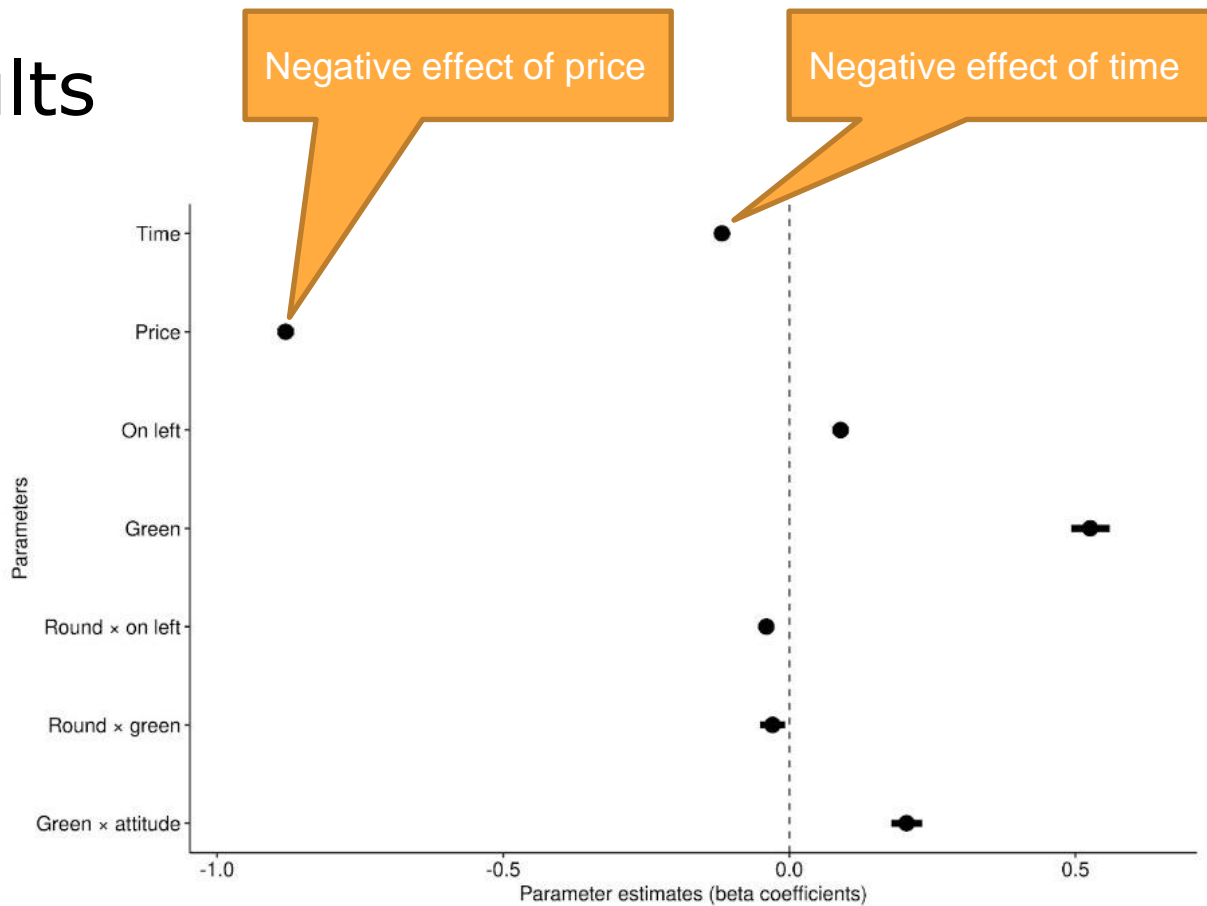


Estimates of a Bayesian mixed logit model

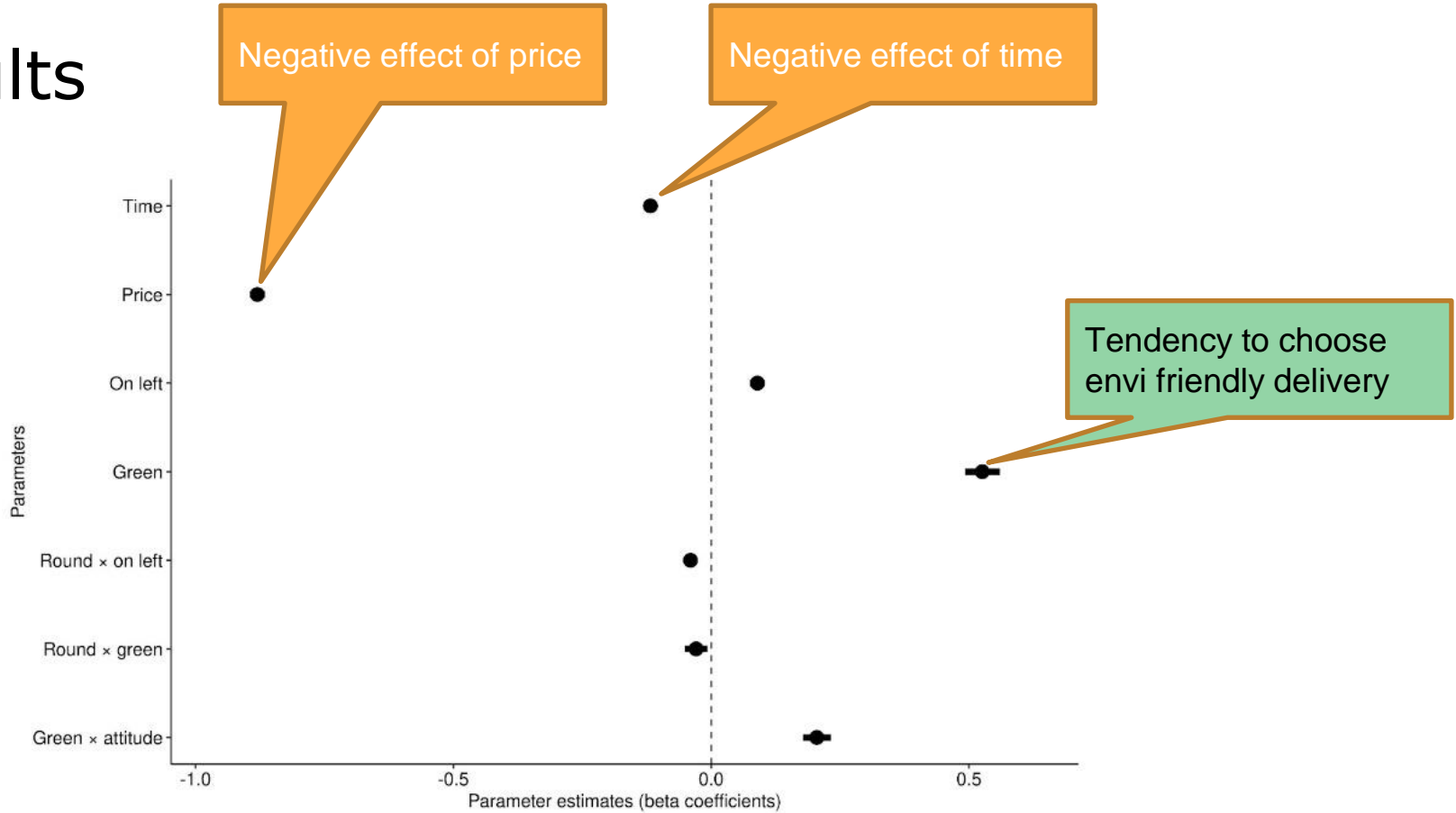
# Results



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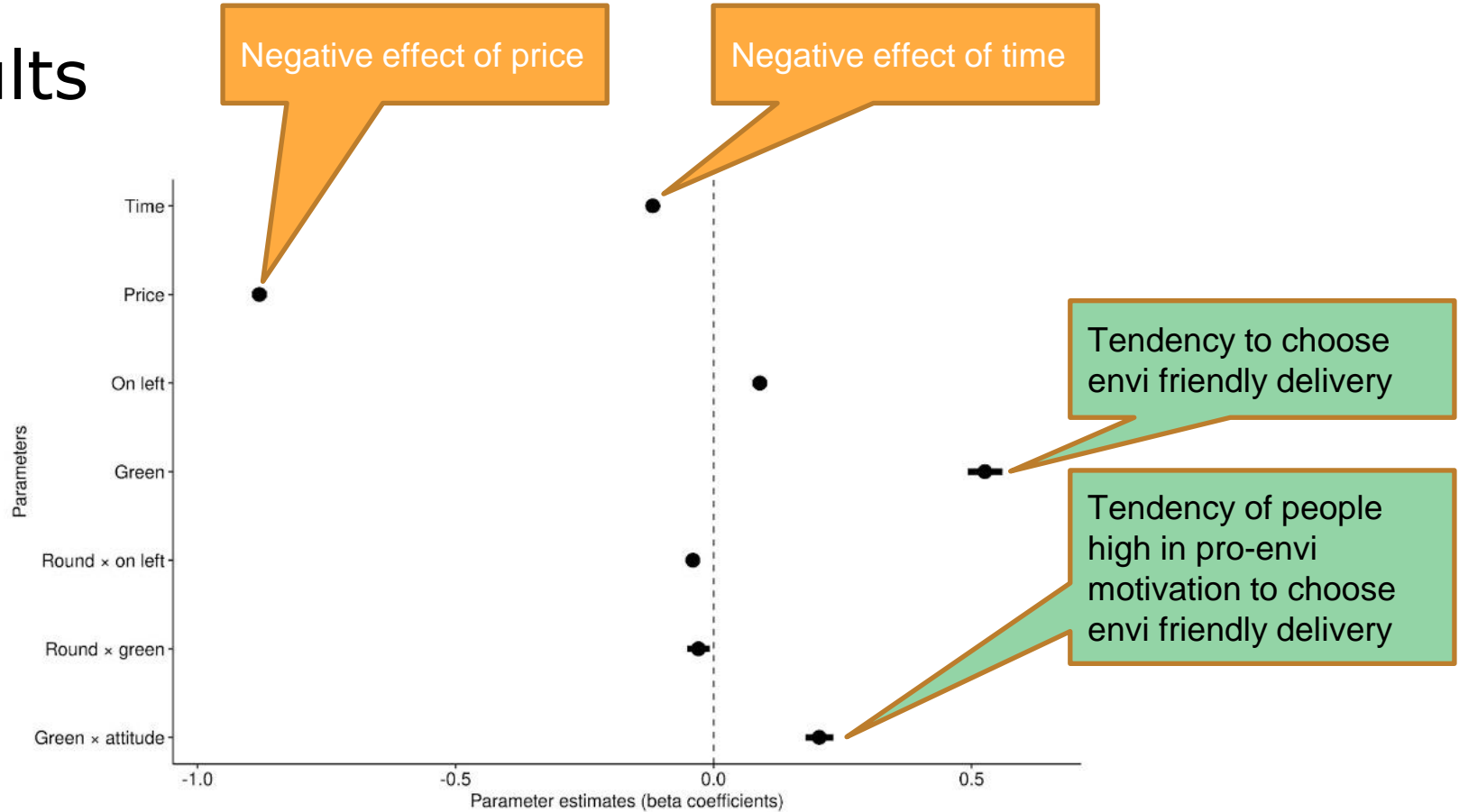


# Results

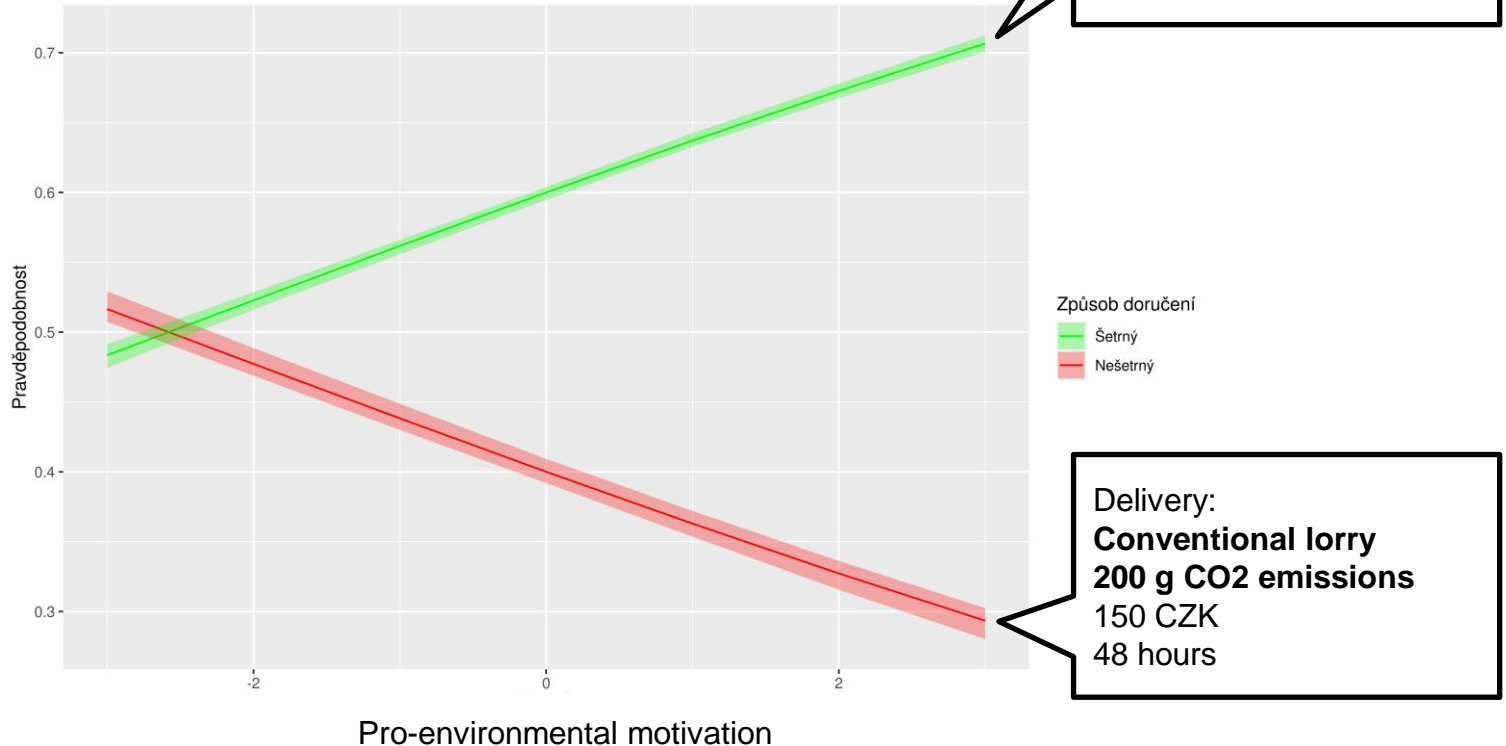




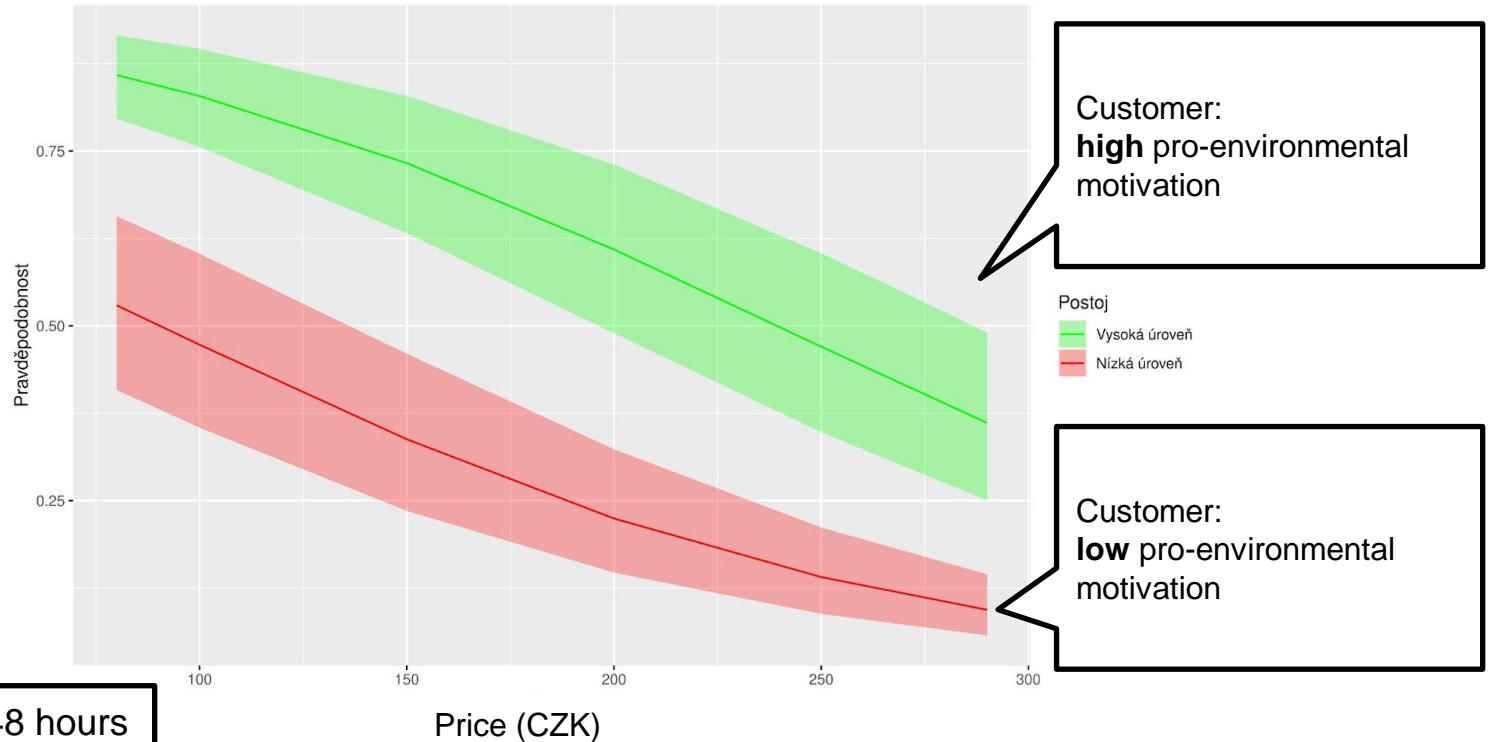
# Results



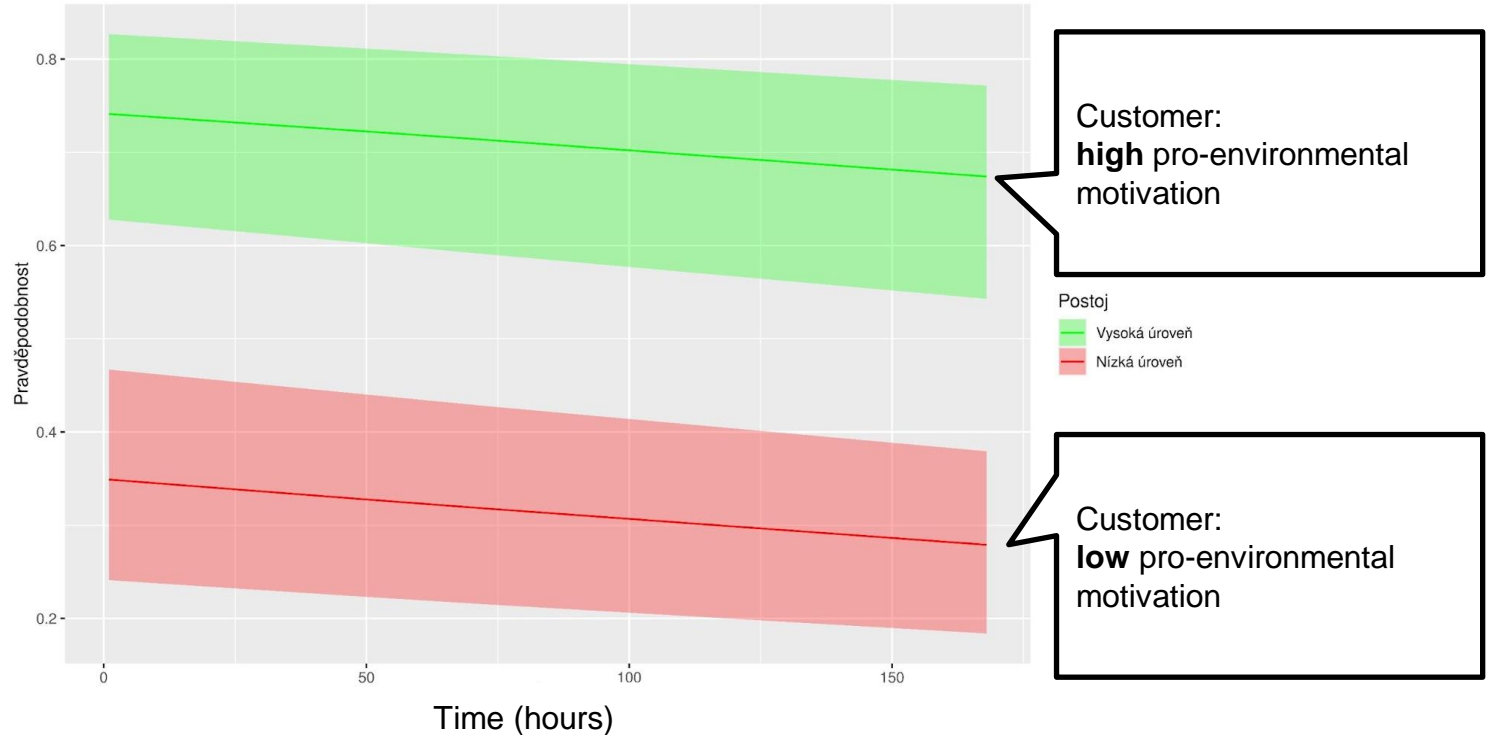
# Preference of the green service



# Choice of the green service - compensation of price effect by pro-environmental motivation



# Choice of the green service - compensation of time effect by pro-environmental motivation



Price: 150 CZK

# Summary

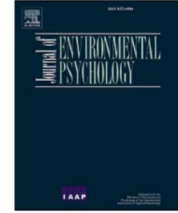
1. Customers choose on average more sustainable logistics services (*green delivery of goods purchased online*), if they get the info about environmental profile.
2. Customer's environmental motivation plays essential role in the decisions.
3. No effect of COVID-19 crisis on demand of green delivery services:
  - Unchanged preference for green delivery services
  - Unchanged level of pro-environmental motivation in population
  - Unchanged effect of the motivation on choices



Contents lists available at [ScienceDirect](#)

## Journal of Environmental Psychology

journal homepage: [www.elsevier.com/locate/jep](http://www.elsevier.com/locate/jep)



# The COVID-19 crisis does not diminish environmental motivation: Evidence from two panel studies of decision making and self-reported pro-environmental behavior<sup>☆</sup>

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### ARTICLE INFO

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### ABSTRACT

The literature shows that threats unrelated to environmental problems can shift attention away from these problems and affect pro-environmental behavior. It is not clear whether the COVID-19 crisis that started in 2019

# More results

- Delivery mode affects the choice beyond the effect of CO<sub>2</sub> emissions
  - Electric lorries preferred to conventional lorries, cargo bikes and taxi couriers
  - Cargo bikes perceived as environment friendly, but slower and less reliable than the other modes

# Free web-app for predictions

[https://berlab.shinyapps.io/logistics\\_v2/?\\_ga=2.165644159.156863851.1647968493-1208136843.1647968493](https://berlab.shinyapps.io/logistics_v2/?_ga=2.165644159.156863851.1647968493-1208136843.1647968493)



# Thank you for your attention

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The logo of the Czech Technological Agency (TAČR) is a red square containing the letters T, A, Č, and R in white, arranged in a 2x2 grid.

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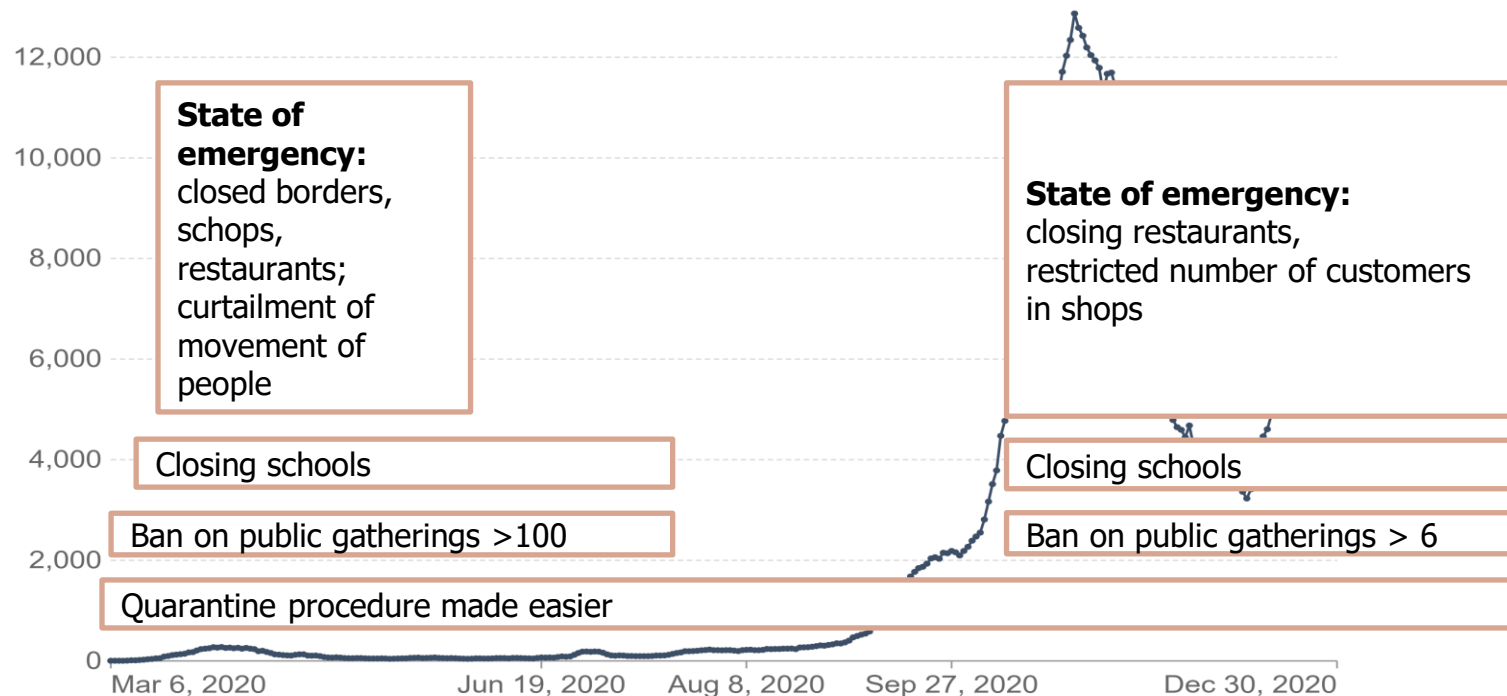
# Measures

1) **General Ecological Behavior** (Byrka, 2017; Kaiser, 2020; Urban et al., 2019, 2020)

- Scale of 50 self-reported behaviors, e.g. *„I use a clothes dryer“*
  - Implicit behavioral costs
  - Individual levels of envi attitude
- derived through Rasch measurement model (Bond & Fox, 2012)
- grounded in Campbell paradigm (Kaiser et al., 2010, Kaiser & Wilson, 2019)
- 9 invariant items with respect to behavioral cost (not-affected by COVID-19), e.g. *„I own an energy efficient car“*

# Daily new confirmed COVID-19 cases

Shown is the rolling 7-day average. The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.



Source: Johns Hopkins University CSSE COVID-19 Data

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Project supported by the Czech Technological Agency (No. TL02000437)

*Green logistics - tools for evaluating the impact of environmental attributes of logistics services on the demand for logistics services*