

#### Fostering Cooperation Between Public Transport And On-demand Services Through Tradable Credits: A Modeling Framework Based On The Trip-based Macroscopic Fundamental Diagram

Louis Balzer, Ludovic Leclercq

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#### Université Gustave Eiffel **FOSTERING COOPERATION BETWEEN PUBLIC TRANSPORT AND ON-DEMAND SERVICES** THROUGH TRADABLE CREDITS: A MODELING FRAMEWORK BASED ON THE TRIP-BASED MACROSCOPIC FUNDAMENTAL DIAGRAM

X Ride-hailing (RH) services may **compete** with public transportation (PT). i We propose a Tradable Credit Scheme (TCS) to **promote cooperation** between RH and PT. X The goal is to use RH in the suburbs to **complete** the sparse transportation offer.



# Equilibrium computation and day-to-day process







European

Commission

L. Balzer, L. Leclercq Univ Gustave Eiffel, ENTPE, LICIT,-ECO7 F-69675 Lyon, France louis.balzer@univ-eiffel.fr

# Motivation

# Model description and regulation

- X Each traveler can use **RH**, **PT**, or a combination of **RH and PT** to travel from its origin o to its destination d.
- X The city is divided into three **concentric regions**. RH drivers need a **license** *lic*, to operate in the regions with an index higher or equal to r.
- City model: one reservoir with trip-based MFD.
- $\mathbf{X}$  Each active RH driver gets  $\kappa$  credits, needs  $\mathbf{\tau}_r$  credits to buy license lic<sub>r</sub>. They trade credits with the regulator, which adjusts the price to be budget-neutral. X The RH offer is elastic: RH drivers can join or leave the service based on the expected RH revenues.
- X RH drivers choose regions of operation according to expected gains: RH revenues minus license price.

Allocation  $\kappa$  is 10 credits and the credit charges  $\tau$  are set to [15,10,0] on day 10, [20, 10, 0] on day 50, and finally [40, 20, 0] on day 90.







combined trips. faire and RH ban.





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### Results

### Conclusion

TCS regulates RH operations to foster PT and

Mitigates RH externalities at the expense of total travel time and provides trade-offs between laissez-