

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



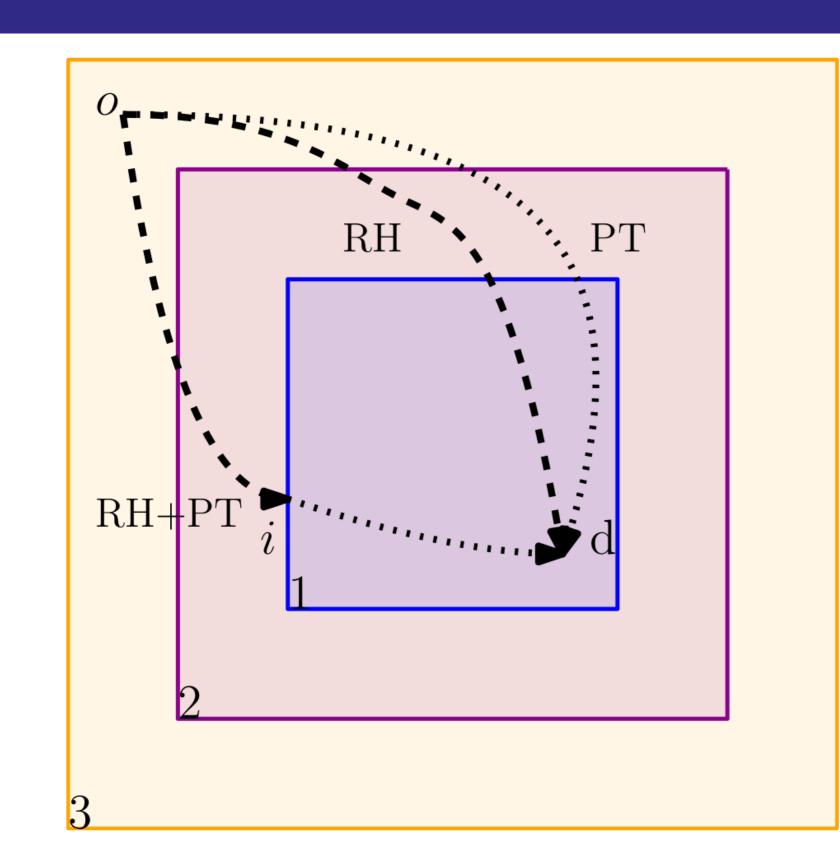
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Motivation

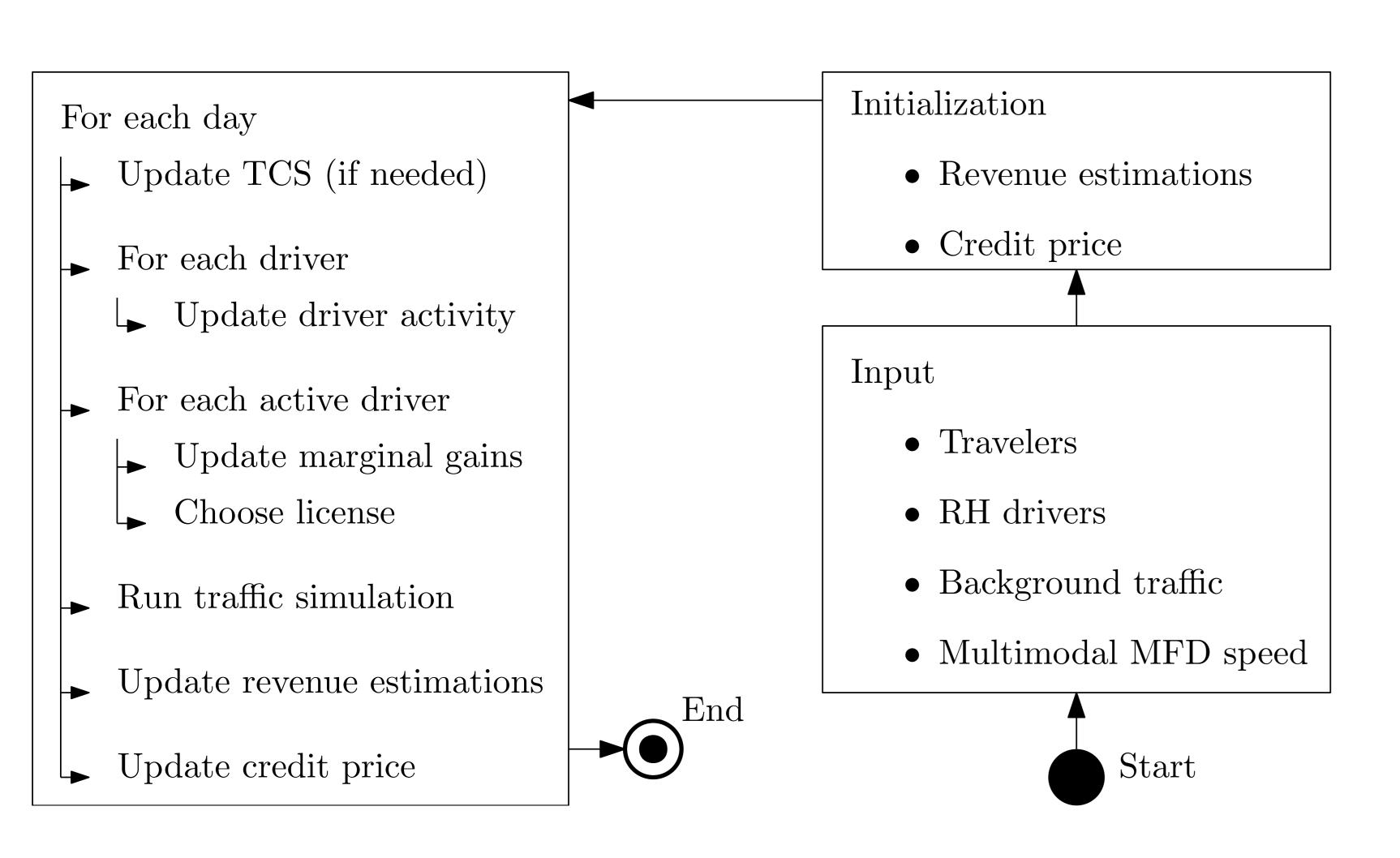
- Ride-hailing (RH) services may compete with public transportation (PT).
- We propose a Tradable Credit Scheme (TCS) to promote cooperation between RH and PT.
- The goal is to use RH in the suburbs to **complete** the sparse transportation offer.

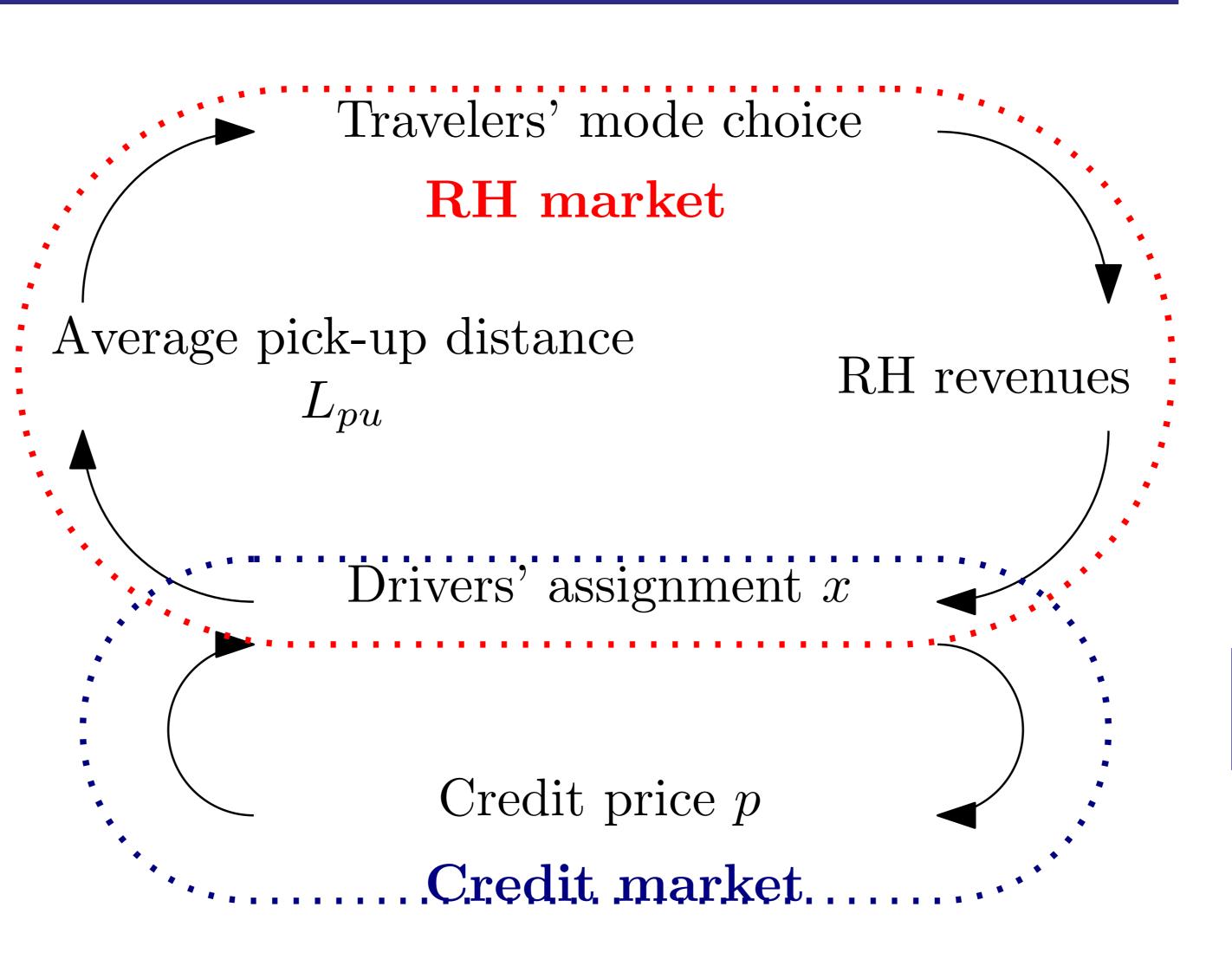
Model description and regulation



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

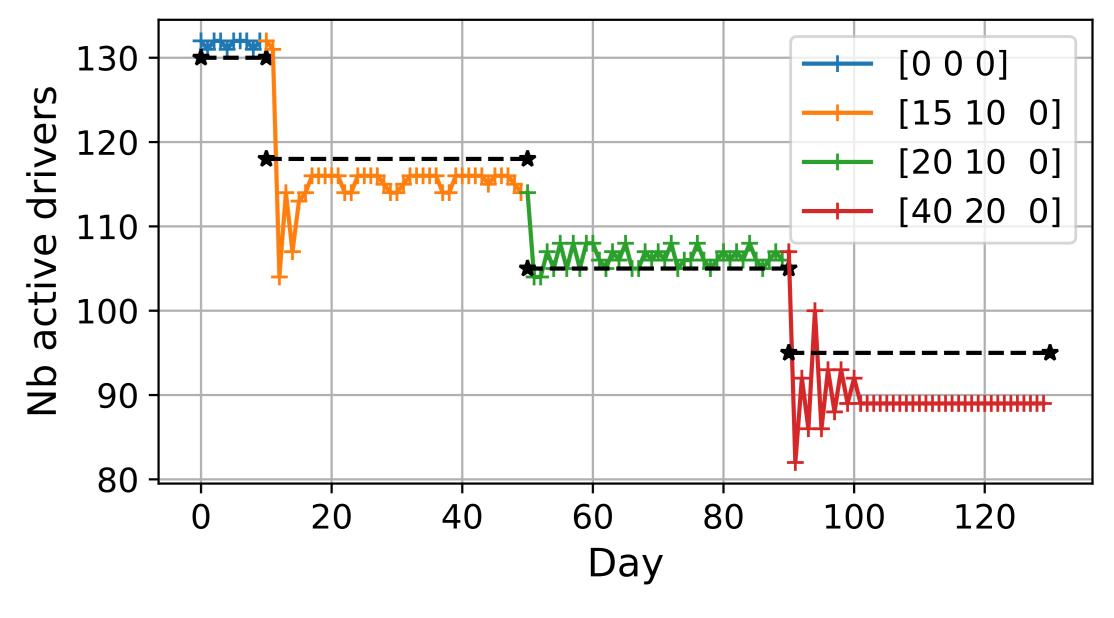
Equilibrium computation and day-to-day process

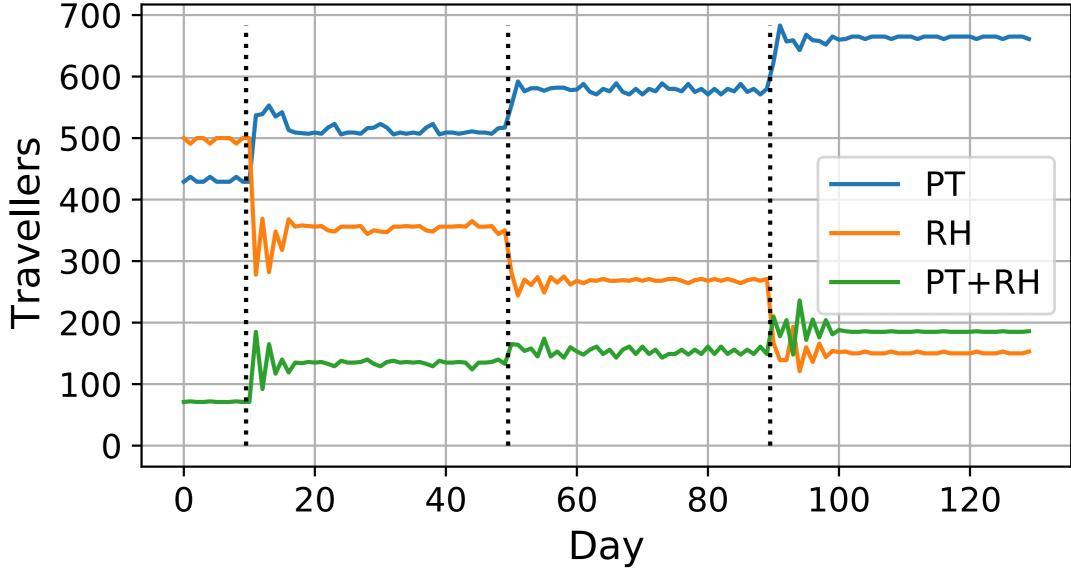


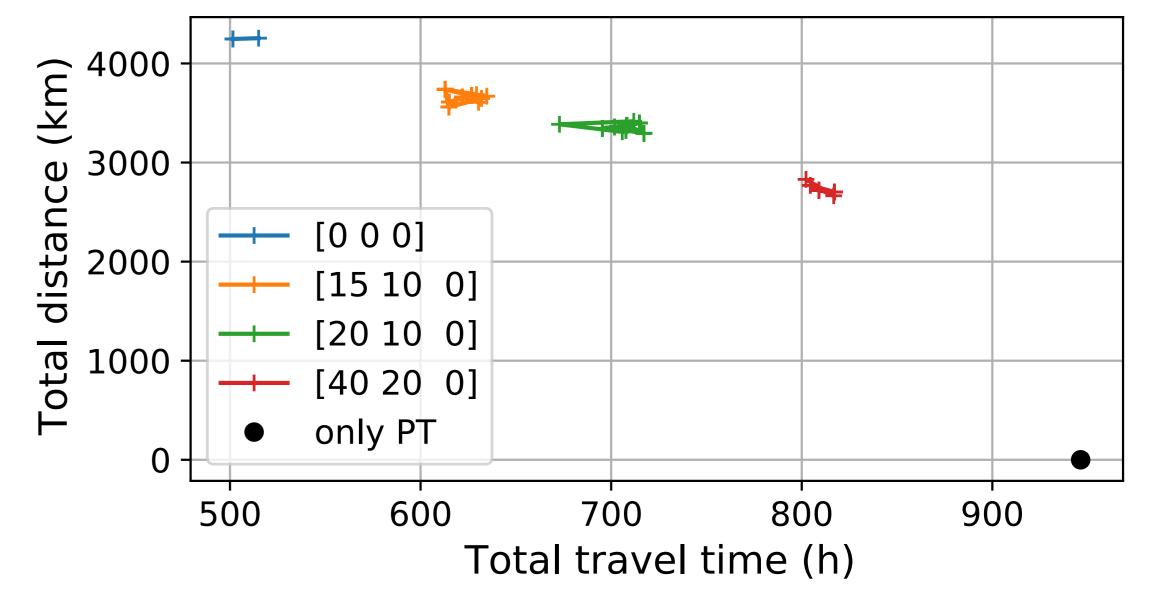


Results

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







Conclusion

- TCS regulates RH operations to foster PT and combined trips.
- Mitigates RH externalities at the expense of total travel time and provides **trade-offs** between laissezfaire and RH ban.



