Can we capture the effect of an e-bike city?

Idea and challenges

Presentation

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Can we capture the effect of an e-bike city? Idea and challenges

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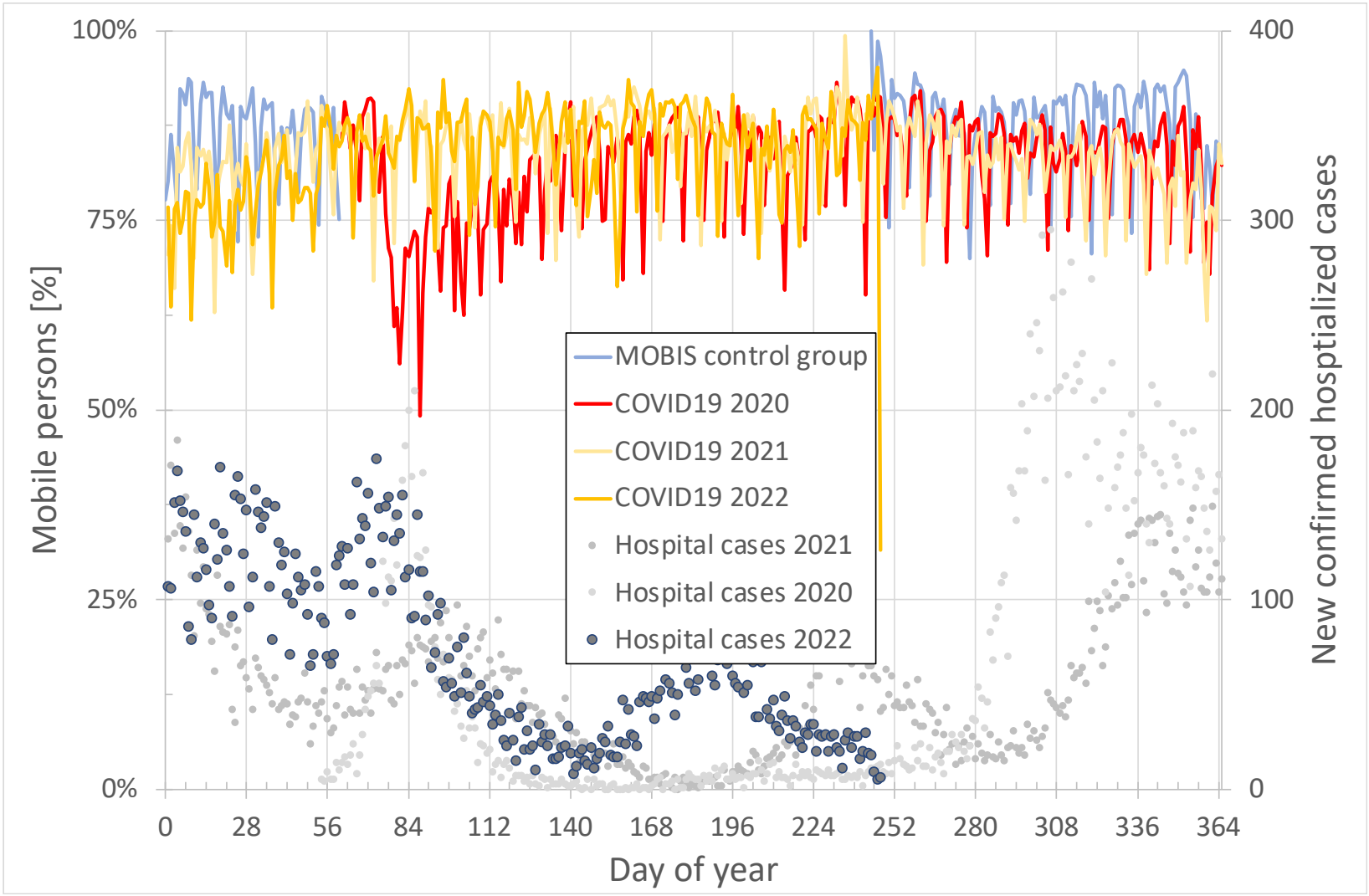
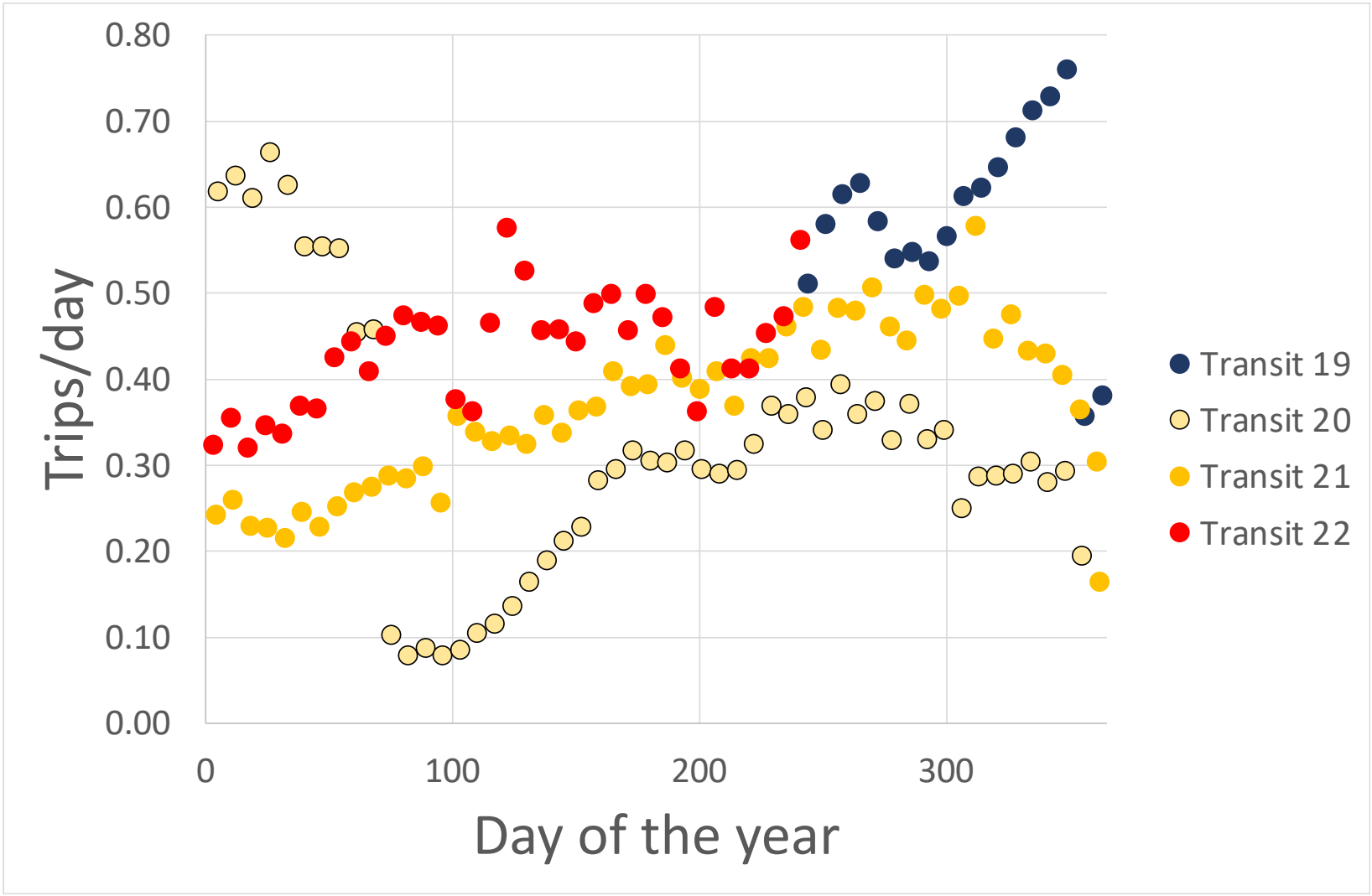
Prelude: Changeability of travel behaviour

Share of mobiles since September 2019



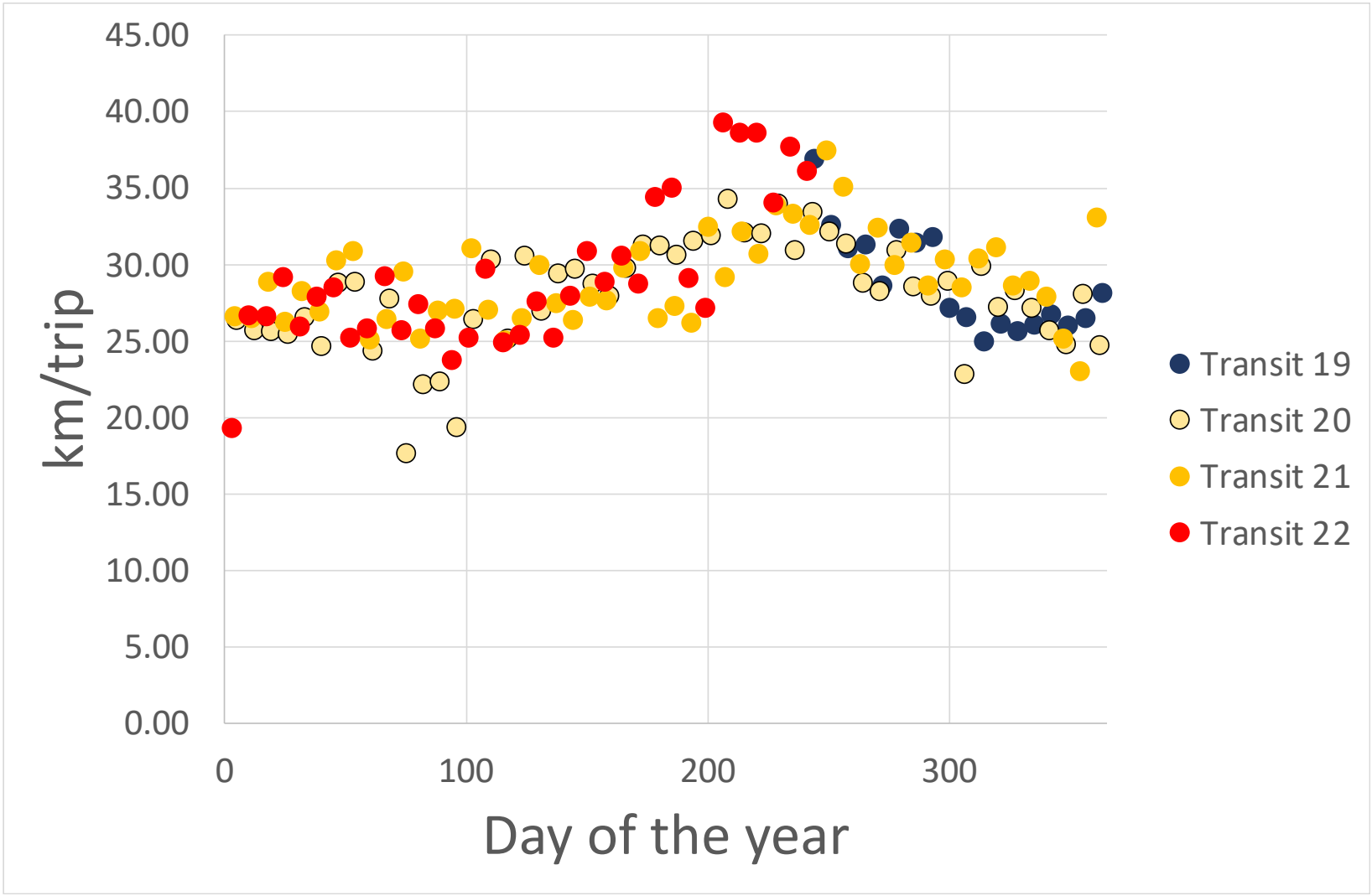
Source: MOBIS/COVID19 GPS panel

Average number of transit trips since fall 2019



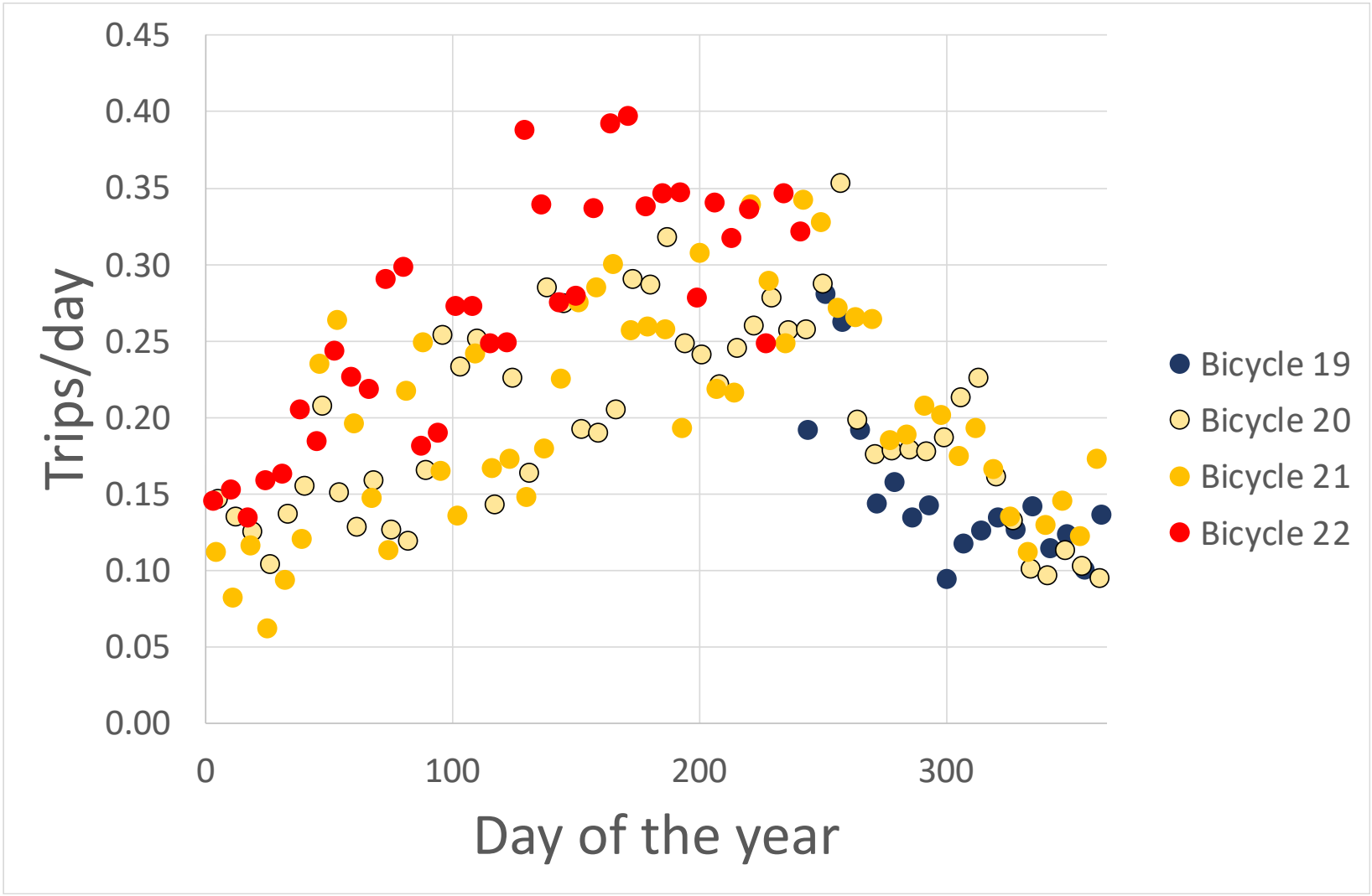
Source: MOBIS/COVID19 GPS panel

Average transit trip length since fall 2019



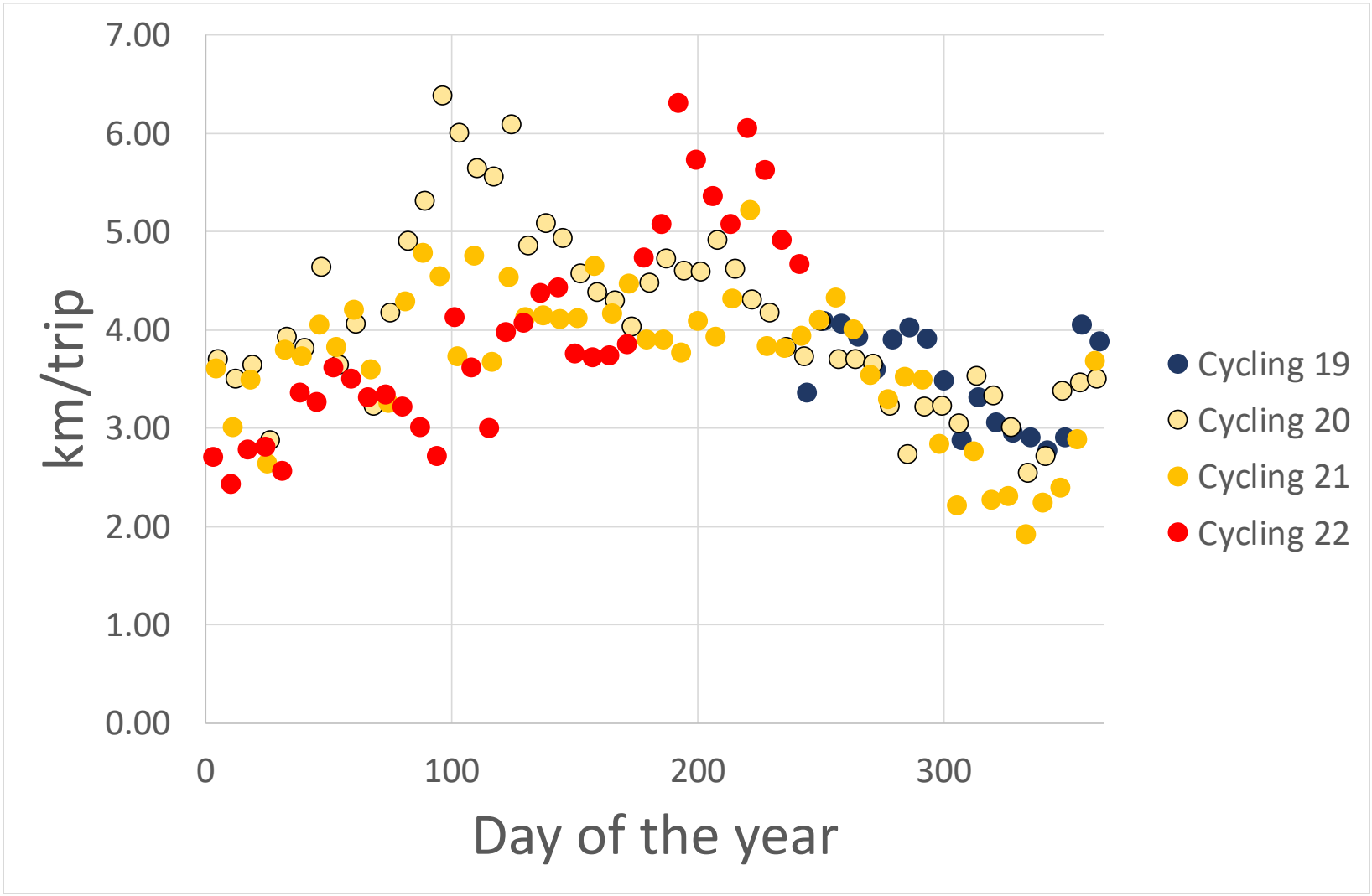
Source: MOBIS/COVID19 GPS panel

Average number of cycle trips since fall 2019



Source: MOBIS/COVID19 GPS panel

Average cycle trip length since fall 2019



Source: MOBIS/COVID19 GPS panel

Dilemma of transport policy

Transport

is a

Normal (private) good

i.e.. it has a negative generalized cost elasticity

Demand elasticities with respect to

Accessibility	Share of mobiles	0.61
	Number of trips	0.44
	Trips per hour	0.24
	Out-of-home time	0.10
	Total distance travelled	1.14
Transport price index	Share of mobiles	-0.06
	Number of trips	-0.19
	Trips per hour	-1.66
	Out-of-home time	-1.95
	Total distance travelled	-0.84

Source: Weis und Axhausen (2013)

What dilemma ?

What dilemma ?

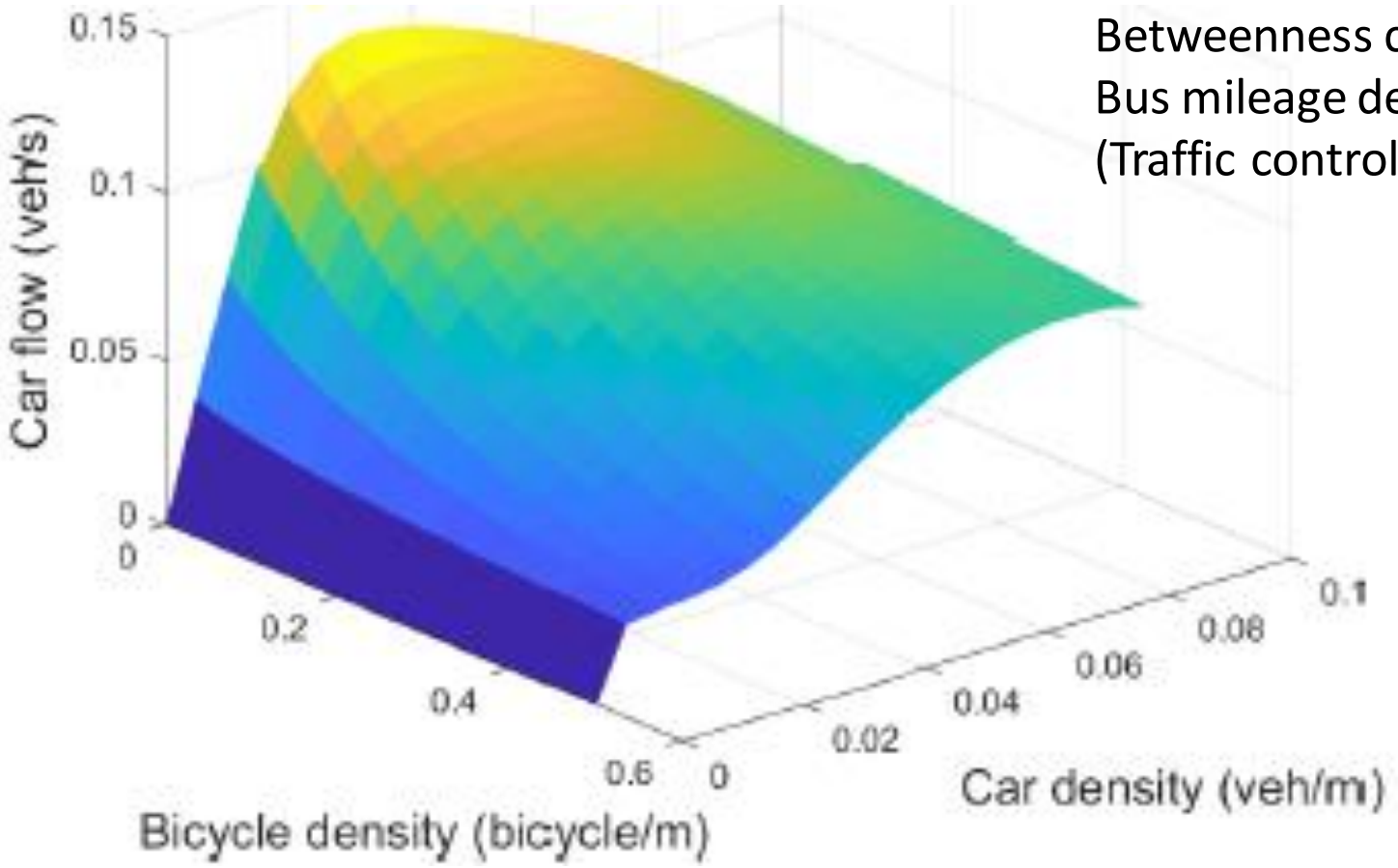
- Higher accessibility improves productivity and social capital

- Underused unpriced off-peak capacity due to (additional) capacity for population (growth) in the peak (roads, parking, transit) encourages overuse otherwise
- Induced demand due to the lower GC of electric and automated private and public transport
- Working from home making PT less relevant for many

- CO_2 reduction requirements
- Sprawl
- VMT growth and congestion

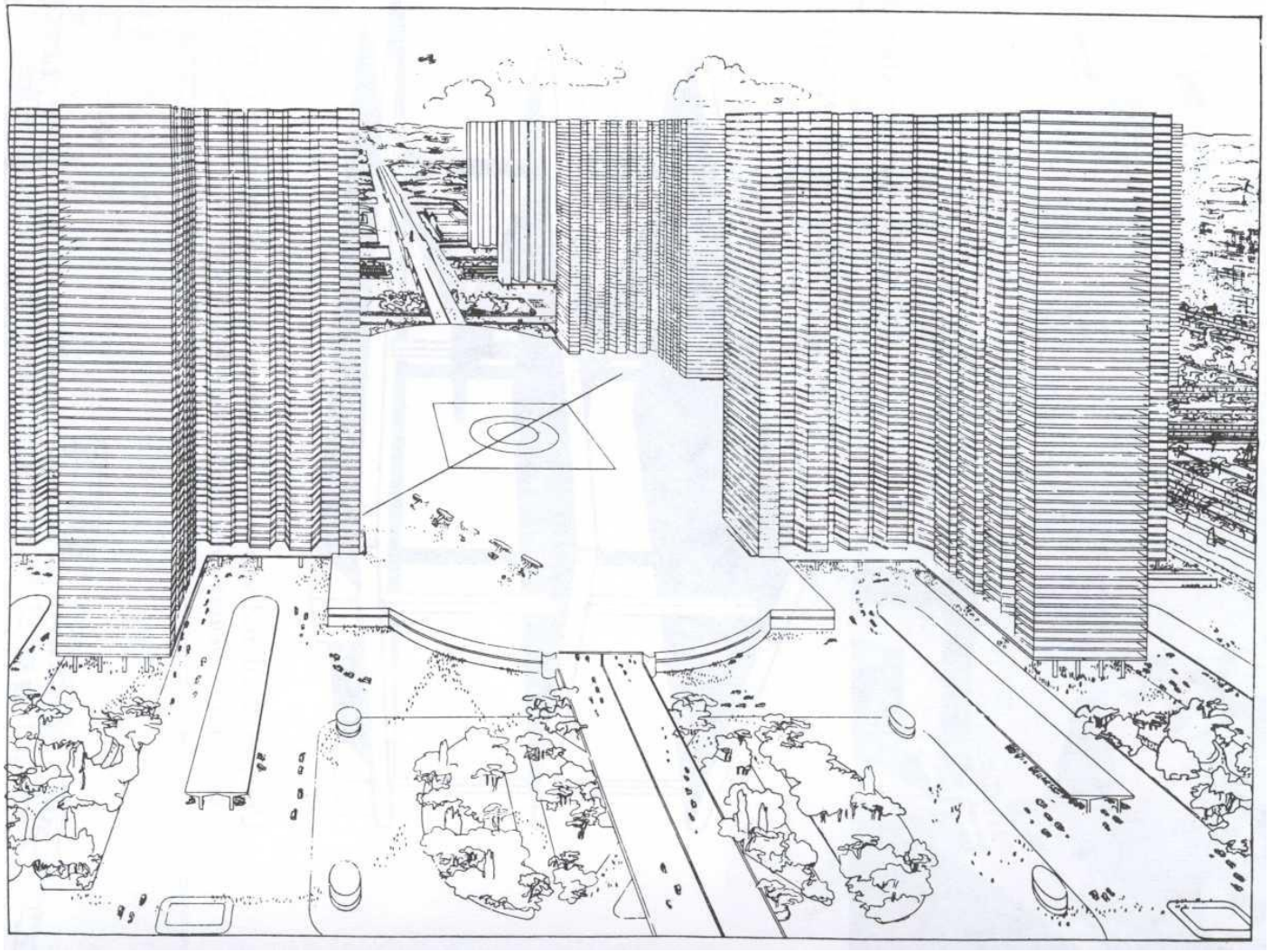
Nearly fixed urban network capacity =

Junction density,
Lane miles density
Betweenness centrality,
Bus mileage density
(Traffic control)

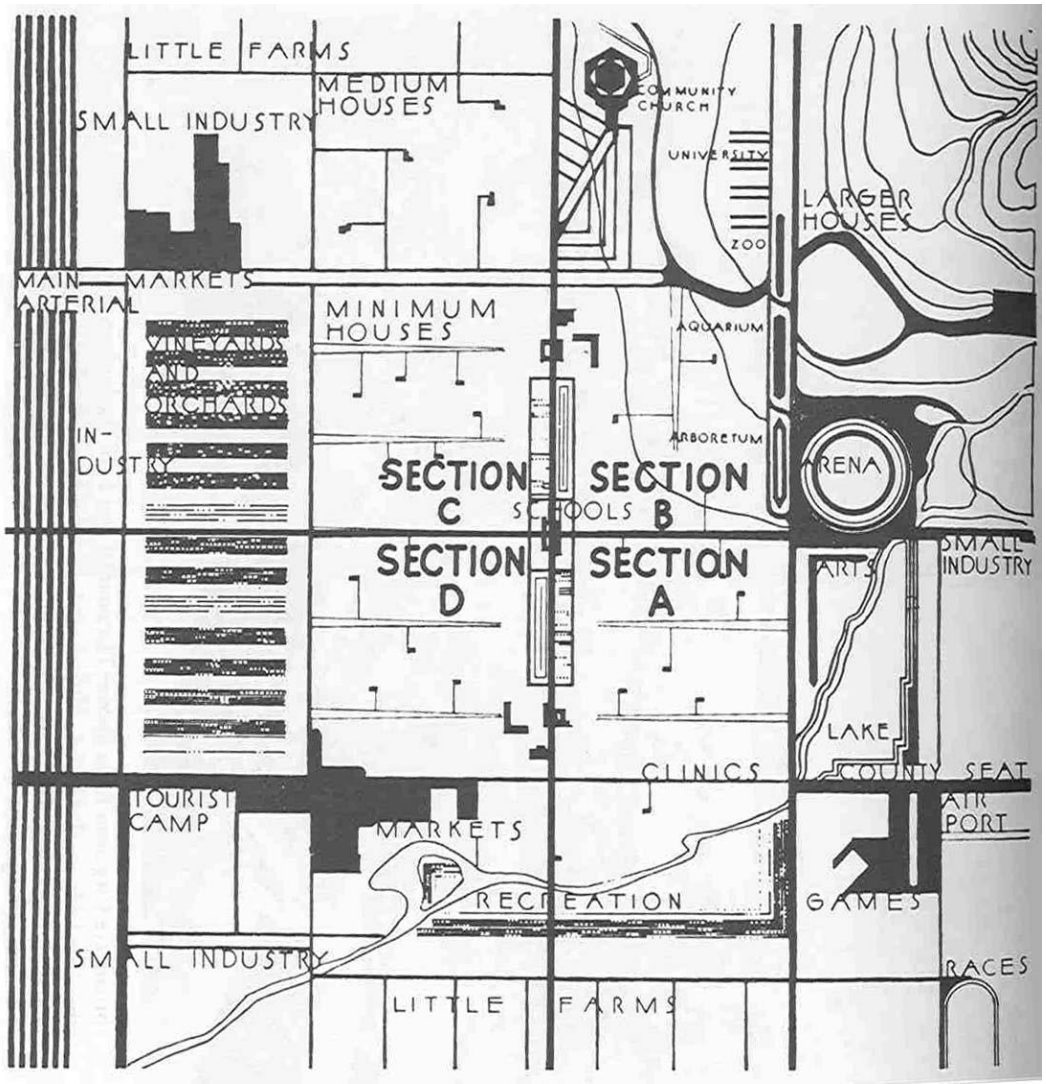


What were the past visions ?

Radical dreams: Le Corbusier's City Radieuse



Past radical dreams: Lloyd Wright's Usonia



Past radical dreams: Motorways

Dr. Wolf Strache, Public domain, via Wikimedia Commons

Which future are we discussing?

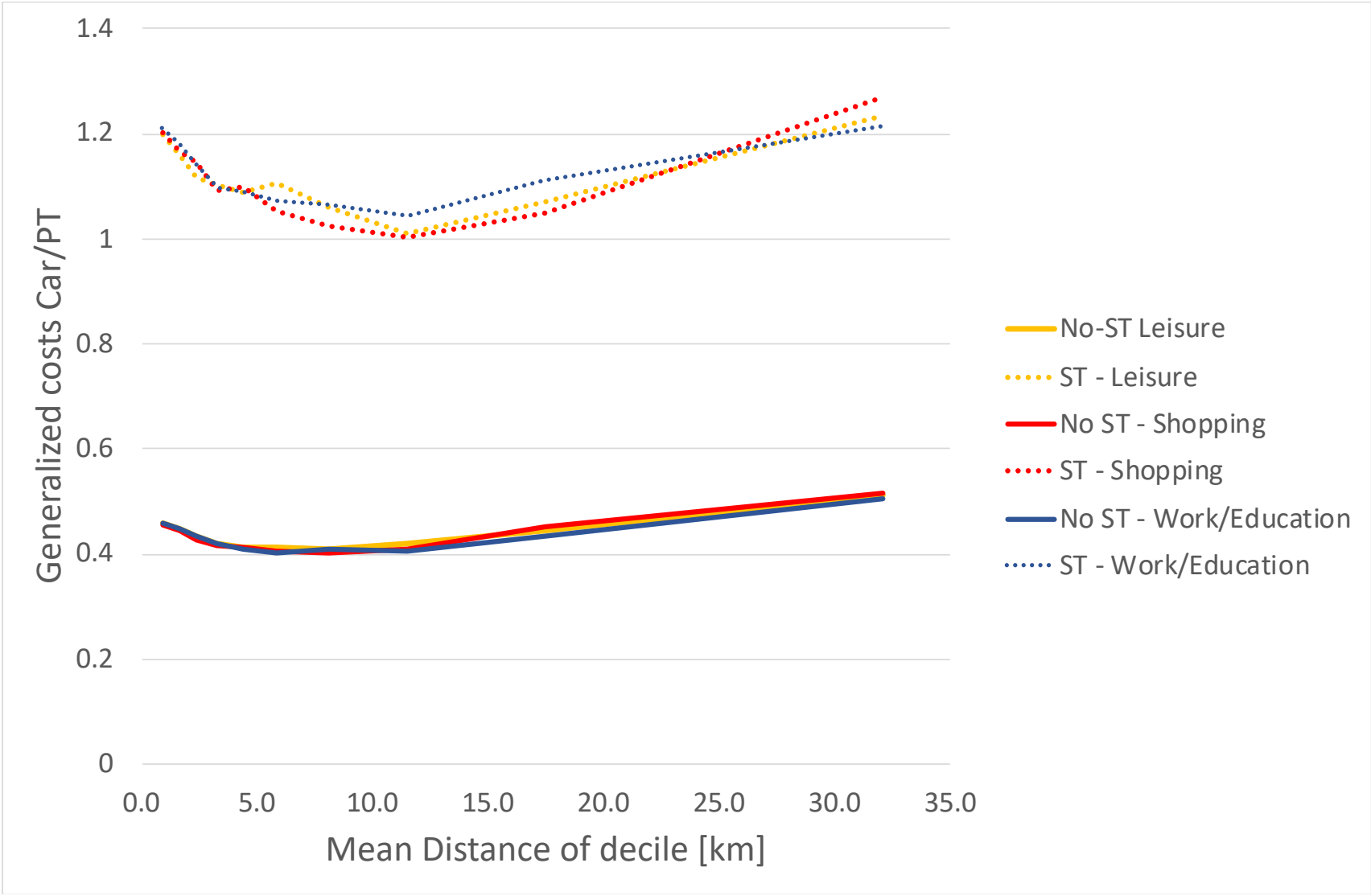
A managed/co-ordinated one

A managed/co-ordinated one

- *Mobility pricing*
  - Two-part tariffs for infrastructure
    - Option fee
    - Pay-as-you-go for usage
  - Congestion pricing
  - (Demand responsive) parking pricing
  - CO_2 pricing
  - Local emission pricing

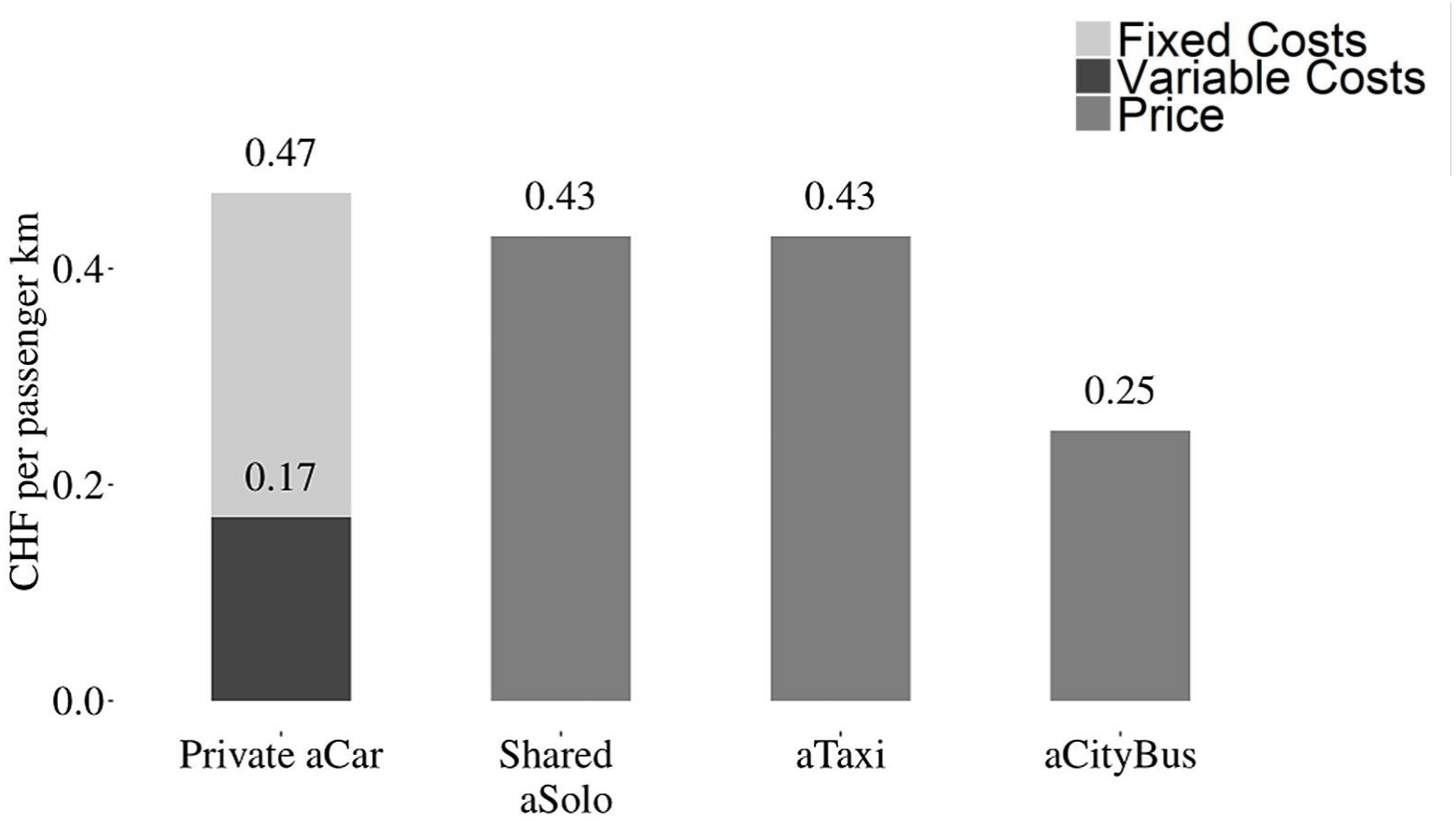
- MaaS improved shared mobility

A managed/co-ordinated one? Comparison of MOBIS GC



An automated one? First robust cost estimates

Structure of the pkm full costs for today's usage levels



Source: Bösch, Becker, Becker and Axhausen (2017)

A car free/reduced one,

A car free/reduced one,

- a 15 min city ?
- a net-zero CO_2 city ?
- an e-Bike city ?

An e-bike city?

The idea of an e-bike city

- 50% of road space for slow vehicles (e-bike, bike etc.)
- Maintaining of current accessibility levels (for all)
- Integration with shared services for the larger demand variations

Concurrent changes in need of modelling

- “Working from home” (amount, timing, location)
- e-commerce (amount, pick-up location and timing, facilities, cold storage, pricing)
- e-vehicles (recharging, rental systems and fleets)
- Small-vehicle pooling (2-8 seats)
- Densification

Can we model such radical changes?

Activity scheduling dimensions

Time use (especially WFH, secondary activities and e-shopping)
Number and type of (out-of-home) activities
Sequence of (out-of-home) activities (embedding pick-up activities)

- Start and duration of activity
- Composition of the group undertaking the activity
- Expenditure division
- Location of the activity
  - Location of parcel pickup/delivery
  - Movement between sequential locations
    - Location of access and egress from the mean of transport
      - Parking type
      - Parking search
    - Vehicle/means of transport
    - Route/service
    - Group travelling together (pooling)
    - Expenditure division

Supply side dimensions

- Change of building uses (Residential, Third-spaces, social, commercial, delivery points)
- Densification
- New buildings
- “Rückbau” (demolition and reuse)

- Road space allocation
- One-way-street optimisation
- Placement of additional road links/bridges/tunnels

- Placement of bus-lanes/tram/light rail alignments and of stops
- Sizing of “Large vehicle”/”Small vehicle” public transport fleets
- Timetable and service network design
- Sizing of active mode “shared” vehicle fleets
- Repositioning of shared fleets

- Optimal pricing

Activity scheduling dimensions: Data needs (examples)

- Joint survey/tracking of time use, location, expenditure and group composition
  - TimeUse+ survey
- Number of deliveries and the delivery points
  - MSc Mesaric
  - Small surveys (MOBIS/COVID19 survey)
- Parking behaviour
  - Search
  - Location and price paid
- Mobility tool ownership
  - Car
  - Season ticket
  - Sharing “memberships”
- Location quality
  - Survey with location generator and interpreter (Gramsch)
  - “Value for money”
  - Crowding and service levels

Possible starting points

- MATSim
  - Janody & Bierlaire schedule choice & schedule generation
  - Tchervenkov parking search
  - Household & SN modelling ?
  - Delivery simulation ?

- R-Logit for schedule choice as a time-space path?

- Location choice at facility level
  - Gramsch's location generator
  - Ordonez "activity repertoire" choice models

- Taxi (pooling) simulation

E-bike-city project

- DBAUG Lighthouse
  - IVT (Axhausen, Corman, Kouvelas)
  - IBI (Adey)
  - IRL (Kaufmann)
  - IfU (Hellweg)

- Team VPL
  - Lukas Ballo
  - Clarissa Livingtson
  - Adrian Meister
  - Lucas Meyer de Freitas

Questions?

- www.ivt.ethz.ch
- www.e-bike-city.baug.ethz.ch

Data needs and IVT examples: Papers

Becker, H., A. Loder, B. Schmid and K.W. Axhausen (2017) Modeling car-sharing membership as a mobility tool: A multivariate Probit approach with latent variables, *Travel Behaviour and Society*, **8**, 26–36.

Erath, A. (2006) Value of travel time savings for shopping trips in Switzerland: Conference paper STRC 2006, paper presented at the *6th Swiss Transport Research Conference*, Ascona, March 2006

Mesaric, R., A. Meister, C. Winkler, T. Schatzmann and K.W. Axhausen (2021) How many people come to our door?, paper presented at the *100th Annual Meeting of the Transportation Research Board (TRB 2021)*, online, January 2021.

Tchervenkov, C. and K.W. Axhausen (2022) Measuring parking search behaviour using GPS data, paper presented at the *22nd Swiss Transport Research Conference (STRC 2022)*, Ascona, May 2022.

Winkler, C., A. Meister, B. Schmid and K.W. Axhausen (2022) TimeUse+: Testing a novel survey for understanding travel, time use, and expenditure behavior, paper submitted for presentation at the *102nd Annual Meeting of the Transportation Research Board (TRB 2023)*, Washington, D.C., January 2023.