Covid-19 and urban transport policy

Stef Proost (KULeuven (B))

Joint work with Bruno De Borger (U of Antwerp (B))

PROVISIONAL RESULTS

Research questions

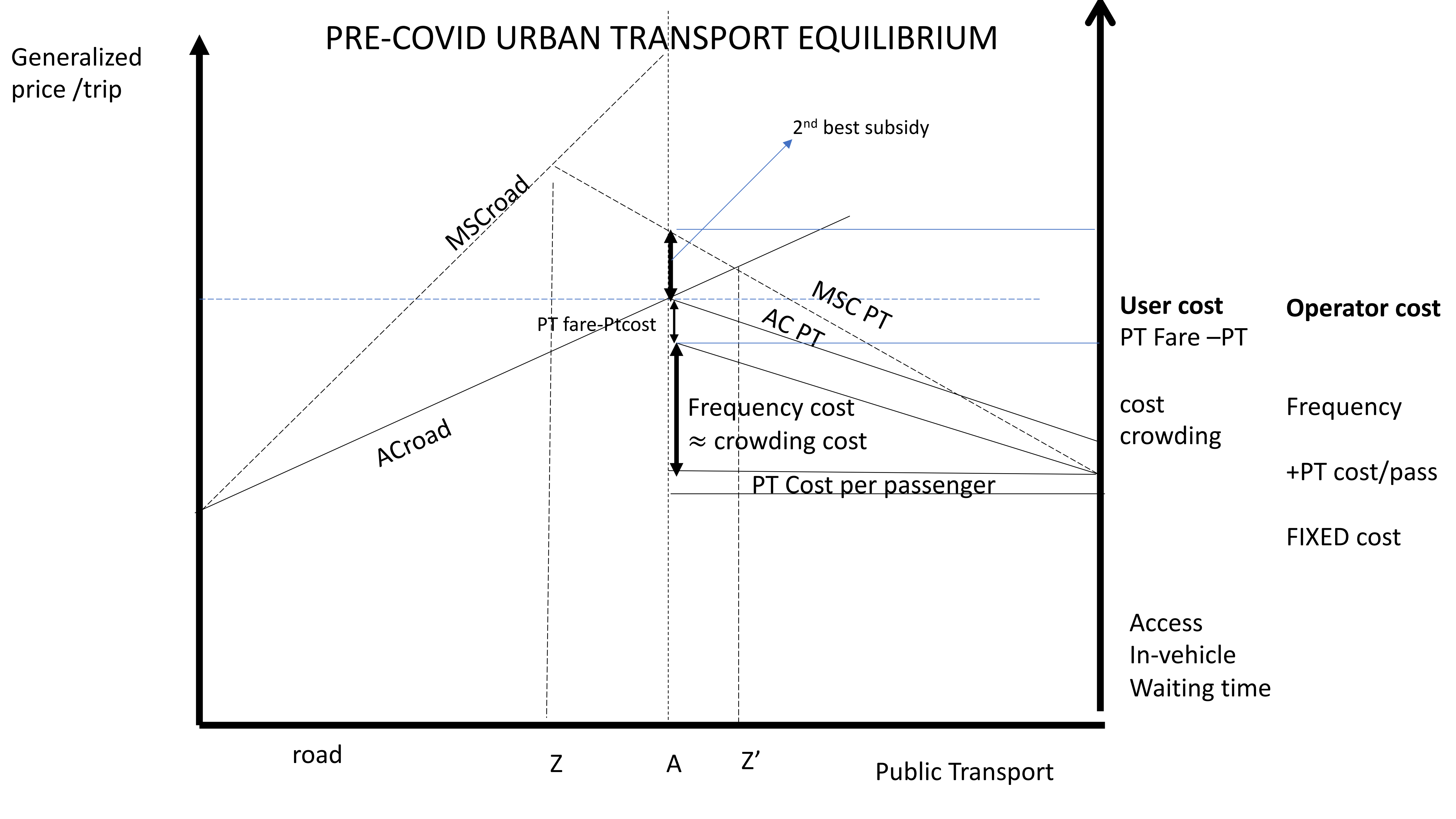
- Why do public transport (PT) trips decrease
- What is the optimal reply of public transport to the Telework and Covid infection risks in Short term and in Long term
  - Fare?
  - Frequency (capacity)?
- Will deficits increase and how to cope with them?

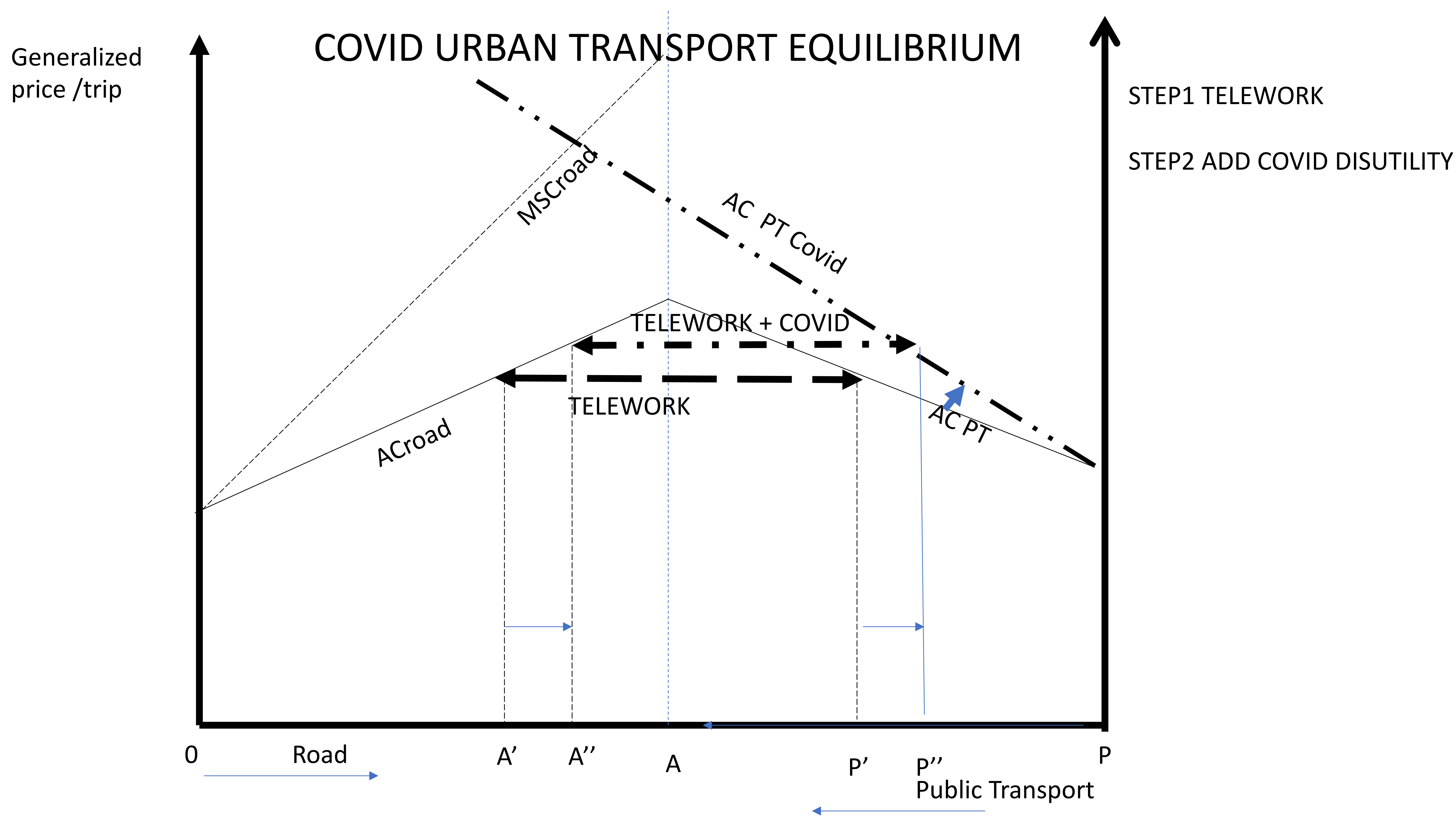
Approach – Main assumption

- Covid-19 infection risk increases the objective health cost of PT and increases the perceived crowding cost
- We cannot identify precisely the objective risk of covid infection: no ”natural” experiments with and without infection (PT operators vs virologists)
- But we see a strong revealed perceived Covid infection risk by a decrease of the PT use and its market share
- We take the perceived Covid risk as the revealed disutility of covid and this increased crowding externality will be used as externality
  - Distinguish between agents that are vulnerable (perceived) and non-vulnerable

Approach 2

- Simple Graphical exposition
  - Urban transport equilibrium before COVID
  - Urban transport equilibrium with COVID
- Some general results
- Case study illustration for Brussels


PRE-COVID URBAN TRANSPORT EQUILIBRIUM
Generalized price /trip
2nd best subsidy
MSCroad
MSC PT
AC PT
PT fare-Ptcost
ACroad
Frequency cost
≈ crowding cost
PT Cost per passenger
User cost
PT Fare –PT
cost
crowding
Operator cost
Frequency
+PT cost/pass
FIXED cost
Access
In-vehicle
Waiting time
road
Z
A
Z'
Public Transport



Generalized price /trip
COVID URBAN TRANSPORT EQUILIBRIUM
STEP1 TELEWORK
STEP2 ADD COVID DISUTILITY
MSCroad
AC PT Covid
TELEWORK + COVID
TELEWORK
ACroad
AC PT
0
Road
A’
A’’
A
P’
P’’
P
Public Transport

General results 1

- TELEWORK
  - reduces demand for both transport modes
  - Reduces plausibly the PT fare and the PT frequency
- COVID discomfort
  - decreases market share of Public Transport
  - Optimal frequency may increase or decrease
  - Optimal fare may increase
- TELEWORK +COVID
  - Effect on deficit depends on
    - fare> or < cost per passenger
    - Frequency ↗ or ↘ as frequency is important cost element

General results 2

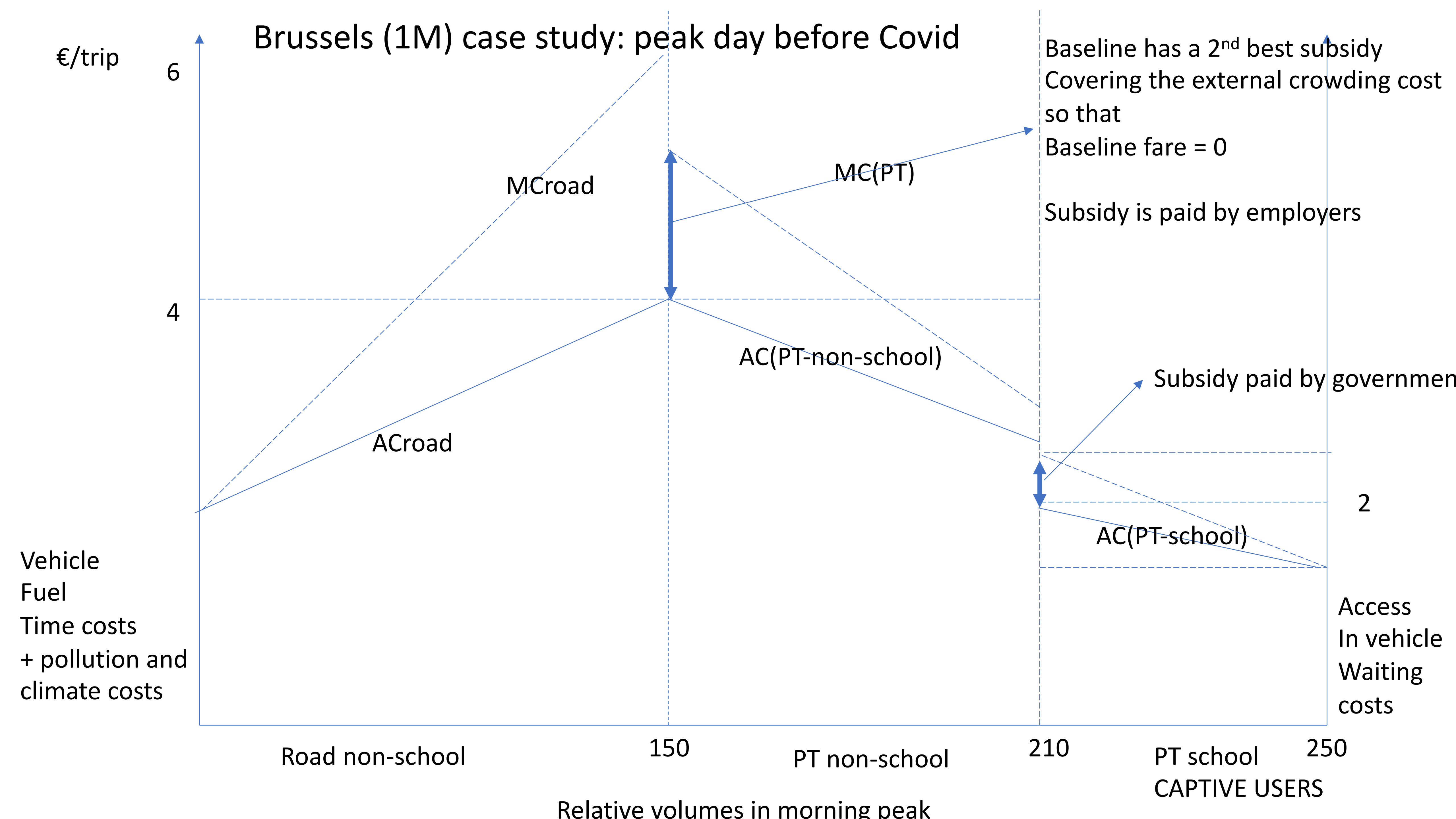
- TELEWORK +COVID

Treating vulnerable and non-vulnerable agents differently may improve welfare

Vulnerable agents have a higher WTP for space and one may reserve wagons for these agents

A seperating equilibrium requires the vulnerable agents to pay more for their use of more spaced wagons or to be easily identifiable

Brussels (1M) case study: peak day before Covid



Results on fare, frequency, welfare, deficit – if only TELEWORK – shock

TELEWORK	PT work	PT school	Frequency/h	Car gen. price	Deficit Absolute terms
Baseline 0%	60	40	10	4	100
25%	13	30	5	4	111
25%	0	30	3 (best)	4,1	75
50%	6	20	6	3,5	90
50%	0	20	3 (best)	3,6	50

Results on fare, frequency, welfare, deficit – TELEWORK+ COVID (discomfort +50%) shocks

TELEWORK	PT work	PT school	Frequency/h	Car gen. price	Deficit Absolute terms
Baseline 0%	60	40	10	4	100
25%	28	30	10	3,8	125
25%	0	30	3 (best)	4,1	75
50%	12	20	10	3,5	147
50%	0	20	3 (best)	3,6	50

Conclusions

- TELEWORK leads to lower frequency for PT and reconsideration of 2nd best subsidy as there is less road congestion
- TELEWORK + COVID leads to probably even lower frequency for PT as keeping a high frequency will less passengers is costly strategy
- TELEWORK +COVID makes it
  - Interesting to separate vulnerable and non-vulnerable users
  - To ease the pressure on PT by stimulating the use of “soft” modes for school and other journey purposes
- DEFICIT will increase if one does not decrease strongly the frequency of PT