Covid-19 and urban transport policy

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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

MSCroad

ACroad

2nd best subsidy

PT fare-Ptcost

Frequency cost ≈ crowding cost

PT Cost per passenger

User cost

Operator cost

PT Fare – PT

Frequency

+PT cost/pass

FIXED cost

Access

In-vehicle

Waiting time

road

Z

A

Z'

Public Transport
COVID URBAN TRANSPORT EQUILIBRIUM

STEP 1: TELEWORK

STEP 2: ADD COVID DISUTILITY

ACroad
MSCroad
AC PT Covid

Generalized price /trip

0 Road A' A'' A P' P'' Public Transport

TELEWORK

TELEWORK + COVID
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 $\uparrow$ or $\downarrow$ 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 separating 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

Baseline has a 2\textsuperscript{nd} best subsidy
Covering the external crowding cost
so that
Baseline fare = 0

Subsidy is paid by employers
Subsidy paid by government

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

Access
In vehicle
Waiting costs

Vehicle
Fuel
Time costs
+ pollution and climate costs

$\text{€/trip}$

Relative volumes in morning peak

Road non-school

PT non-school

PT school

Captive Users

ACroad

MCroad

MC(PT)

AC(PT-non-school)

AC(PT-school)

$150$

$210$

$250$
Results on fare, frequency, welfare, deficit – if only TELEWORK – shock

<table>
<thead>
<tr>
<th>TELEWORK</th>
<th>PT work</th>
<th>PT school</th>
<th>Frequency/h</th>
<th>Car gen. price</th>
<th>Deficit Absolute terms</th>
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</thead>
<tbody>
<tr>
<td>Baseline 0%</td>
<td>60</td>
<td>40</td>
<td>10</td>
<td>4</td>
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<tr>
<td>25%</td>
<td>13</td>
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## Results on fare, frequency, welfare, deficit – TELEWORK+ COVID (discomfort +50%) shocks

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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