External Costs

Evaluation of external costs change due to High Speed Rail in Italy

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The external costs of transport: the definition

External costs are costs generated by transport users and not paid by them but by the society as a whole such as congestion, air pollution, climate change, accidents, noise but also up- and down-stream processes, costs for nature and landscape or additional costs in urban areas.

There is a market failure because transport prices are not reflecting their costs and transport users are choosing their transport mode with a wrong price signal.

EU developed a specific calculation guidelines included in Handbook on the External Costs of Transport.

UIC recommends internalization of these external costs to allow transport users to take the right decisions and the polluter pays principle to optimize the transport sector.
Italy - Figures from the Handbook

*Data for aviation and maritime: rough estimations for Italy based on selected ports/airports (Ports: Genova, Trieste, Venice – Airports: Rome Fiumicino)
** Only electric train are considered

Average external costs

<table>
<thead>
<tr>
<th>Mode</th>
<th>€-cent/km</th>
<th>€-cent/pkm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maritime*</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Aviation*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IWT</td>
<td>15.2</td>
<td></td>
</tr>
<tr>
<td>Rail**</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>HGV</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>LCV</td>
<td>13.0</td>
<td></td>
</tr>
<tr>
<td>Aviation*</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>Rail**</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>21.8</td>
<td></td>
</tr>
<tr>
<td>Bus/Coach</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td>7.9</td>
<td></td>
</tr>
</tbody>
</table>

Total external costs (billion € per year)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Total</th>
<th>€-cent/pkm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maritime*</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Aviation*</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>IWT</td>
<td>0.009</td>
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<tr>
<td>Rail</td>
<td>0.4</td>
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<tr>
<td>HGV</td>
<td>5.2</td>
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<tr>
<td>LCV</td>
<td>9.1</td>
<td></td>
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<tr>
<td>Aviation*</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Rail</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>12.8</td>
<td></td>
</tr>
<tr>
<td>Bus/Coach</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td>53.9</td>
<td></td>
</tr>
</tbody>
</table>

HSR=1.9 €-cent/pkm!!!

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Case Study

HSR evolution for the case study

Milan - Rome

1992
Firenze - Roma

2008 Dec
Milano - Bologna

2009 Dec
Bologna - Firenze

2013
HS Station: Reggio Emilia, Bologna

In the meantime in the Italian HSR market...

February 2009: launch of the Trenitalia 'Frecce' brands

April 2012: NTV Italo starts operating

June 2015: launch of Frecciarossa Mille

December 2017: Italo ETR 675 starts operating
Case study

Methodology and data

Known data

- Trenitalia **Passengers** on studied HS relation 2008/2019
- **Modal share** on HS relation 2008/2019 by Trenitalia surveys

What we evaluated

- Total **Passengers** for each mode on studied HS relation 2008/2019
- **Passengers - km** on studied HS relation 2008/2019

### Milan – Rome distance [km]

<table>
<thead>
<tr>
<th></th>
<th>Mode</th>
<th>2008</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>471*</td>
<td>471*</td>
</tr>
<tr>
<td>Plane</td>
<td></td>
<td>574</td>
<td>571</td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td>518</td>
<td>518</td>
</tr>
<tr>
<td>Train</td>
<td></td>
<td>-</td>
<td>496</td>
</tr>
</tbody>
</table>

*M*Straight flying distance
Rome - Milan

Modal share data and estimated absolute passengers

Modal share 2008

- Rail 36%
- Aviation 49%
- Car 13%
- Coach 2%

Modal share 2019

- Rail 74%
- Aviation 17%
- Car 7%
- Coach 2%

Estimated absolute passengers

- Rail: x2.7
- Coach: x1.5
- Car: x0.8
- Aviation: x0.4

Demand 2019 $\cong 1.3 \times$ Demand 2008
Rome - Milan

Evaluation of external costs

Total external cost\textsubscript{m} = Average cost\textsubscript{m} \cdot Pax − km\textsubscript{m}

### External costs 2008 (million €)

- Rail: 30.3
- Aviation: 46.0
- Coach: 1.2
- Car: 30.9

### External costs 2019 (million €)

- Rail: 48.9
- Aviation: 20.4
- Coach: 1.9
- Car: 23.4
Rome - Milan

Evaluation of external costs

External costs 2008

Total external costs/pax = 20.3 euro/pax

External costs 2019

Total external costs/pax = 13.5 euro/pax

 WITHOUT CONGESTION!!!
Rome - Milan

Evaluation of external costs

**Modal share**

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>30%</td>
<td>26%</td>
</tr>
<tr>
<td>Coach</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>Aviation</td>
<td>42%</td>
<td>21%</td>
</tr>
<tr>
<td>Rail</td>
<td>27%</td>
<td>51%</td>
</tr>
</tbody>
</table>

111 €Mn

**External costs 2008**

Total external costs/pax = 20.8 euro/pax

**External costs 2019**

Total external costs/pax = 13.9 euro/pax

WITH CONGESTION!!!
Conclusions and further developments

✓ Surveys on Rome-Milan relation registered an important modal shift in favour of rail transport after the HSR completion. **Train modal share** passed from **36% in 2008**, before HSR construction, **to 74% in 2019**.

✓ Based on available data, modal share data and Trenitalia passengers on Milan-Rome relation, we **estimated** an **increase of transport demand of 30%** on this relation.

✓ **The external costs on Rome-Milan relation**, evaluated by Handbook on the External Costs of Transport methodology, **decreased in 2019 respect to 2008** even if demand transport increased. This result could be explain by these facts:
  ✓ HSR absorbed a part of plane modal share and a little of private car modal share.
  ✓ HSR absorbed the most part of the increase of demand transport.

✓ The construction of HSR on Rome-Milan relation led out the decreased of total external costs on this relation.

✓ In June 2023 UE released a tender for the **update of the EU Handbook** on the external costs with the aim to support and assess the degree of the implementation of the 'user pays' and the 'polluter pays' principles in the transport field in the EU Member States and in other developed economies.
  ✓ It could be interesting repeat the evaluation with updated value for other years after 2019.
Thank you for your attention