Wider Effects of Railways
The Palermo-Catania High-Speed line, Italy

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13th September 2023
Agenda

1. Introduction – Legal Framework and Global Project Palermo - Catania

2. Applied Methodologies

3. Case Study: New connection Palermo - Catania
Wider Economic Impacts

The Legal Framework

2016

The Italian Public Contracts Code (D. Lgs. 50/2016)

According to the standard, interventions are included in the Multiannual Planning Document (DPP) on the basis of the economic and financial feasibility assessment.

2017

Guidelines for the Evaluation of Investments in Public Works (D.M. 300/2017 del MIT)

Indirect impacts of a transport investment are defined as those impacts on other macroeconomic sectors and markets that may result from interventions in transport supply (e.g. impacts on employment, demographics, housing and others).

2021

Guidelines for the drafting of the Technical-Economic Feasibility Project to be used as a basis for the awarding of public works contracts of the NRRP and PNC(L. 108/2021)

In addition to the CBA, the socio-economic and employment impact analysis and the sustainability report are introduced as further decision-making tools to be taken into account.

2021

Operational Guidelines for the Railway Sector (D.M. 496/2021 del MIT)

The Guidelines suggest that the social dimension of transport infrastructure should be considered in the presentation stage. When assessing the social impacts of an infrastructure, it is necessary to evaluate the expected impacts both in the medium to long term (caused by the operation of the infrastructure) and in the short term (caused by the construction of the infrastructure).

2023

The new Italian Public Contracts Code (D.Lgs. 36/2023 e s.m.i.)

Investments in public works are included in the economic and financial document, "with an indication of the expected performance criteria in terms of infrastructure development, socio-economic rebalancing between areas of the national territory, environmental sustainability, ..." (art. 39 comma 3.a).

Additional impacts generated by the investment (not strictly transport-related) are not made explicit

Impacts that are not strictly transport-related and not considered in the CBA are introduced

Alongside the environmental part (geological, ...), the Council began to focus on issues related to economic growth, development and productivity

The guidelines provide a list of possible impacts to be considered beyond the scope of the CBA (accessibility, equity, employment, attractiveness of the area...)

The new Italian Public Contracts Code introduces other criteria for the evaluation of a railway infrastructure project, in addition to economic and financial feasibility
Wider Economic Impacts

Short and medium/long-term impacts

The following socio-economic and territorial impacts are not included in the perimeter of the Cost Benefit Analysis because they are not strictly related to transport, as defined in the Ministerial and European guidelines. RFI has prepared some internal tools to assess these impacts, which are related to the same perimeter of intervention considered in the Transport Study and in the Cost Benefit Analysis, in order to satisfy the requests of institutional stakeholders such as the Special Committee of the CSLPP, the CIPESS and for Public Debates:

CONSTRUCTION PHASE (Short term)

Macro impacts of construction sites on value added and employment: direct, indirect and induced effects

EIA (Economic Impact Assessment) Model of FS Group developed by FS, RFI, ITF, ANAS with the collaboration of IRPET

OPERATION PHASE (Medium/long term)

Accessibility

Contribution to reducing inequalities

Agglomerative effect
The project envisages upgrading the Palermo-Catania link on the 178 km section from Fiumetorto to Bicocca, increasing the capacity of the existing single track line and raising the speed limit to 200 km/h.

The Global project includes two macro-phases, as follows:

➔ First Macrophase: double track Bicocca-Catenanuova and Fiumetorto-Lercara, new single fast track Lercara - Catenanuova with safety tunnels parallel to the long tunnels of the enlarged section;

➔ Second Macro-phase: activation of the double track sections and variations to the historical line between Lercara and Nuova Enna.

The total cost of the Investment Programme is estimated at a total of 7,913.4 million euro.
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Accessibility measures

Macro statistical-indicators

- The analytical concept of **accessibility** represents the ability of an area to have access to **relevant markets**: in the absence of infrastructure linking different regions, this advantage is determined solely by geography. Transport infrastructure, on the other hand, reduces the **generalised cost of transport** (CGT) and the actual distances between connected areas. We could say that cities located on a railway line are actually "closer" to each other.

- **Two macro-indicators** have been defined to measure accessibility, representing respectively:

  **Accessibility of Basic Services**
  - It includes access to:
    - health and social care services
    - professional firms
    - tour operators
    - artistic and sporting activities

  **Accessibility to Education and Culture**
  - It includes access to:
    - Training courses
    - Primary education
    - Secondary education
    - Post-secondary education
    - Libraries, museums and other cultural activities
Accessibility measures

Methodological note

A measure of active accessibility is estimated, which measures the ease with which a user can reach opportunities located in the area. It is evaluated as a function of the number of employed or the number of facilities located in the territory, in relation to the average travel time, including entry and exit time, necessary to reach the destination "d", where the employed (or facilities) are concentrated, from all the municipalities of origin "o" belonging to the study area.

ACCESSIBILITY OF BASIC SERVICES

\[ A_O = \sum_d \frac{Add^\alpha}{T_{0od}} \]

\[ \bar{A}_O = \sum_d \frac{Add^\alpha}{T_{1od}} \]

ACCESSIBILITY TO EDUCATION AND CULTURE

\[ A_O = \sum_d \frac{STRU^\alpha}{T_{0od}} \]

\[ \bar{A}_O = \sum_d \frac{STRU^\alpha}{T_{1od}} \]

For a synthetic reading of the results, a provincial aggregation was carried out with a weighted average of the resident population in the municipality of origin. The % change represents the improvement in accessibility to basic services and to education and culture by province of origin.

(*') Source: The role of transport accessibility within the spread of the Coronavirus pandemic in Italy, Armando Carteni, Luigi Di Francesco, Maria Martino
Contribution to reducing inequality: Gini index

Methodological note

In order to estimate a single synthetic indicator of the change in territorial equality, we have used one of the most widely used measures in the field of socio-economic and transport applications, namely the Gini concentration index, which measures the inequality of a distribution.

The Gini index thus makes it possible to represent, for the same population, the variation of a given attribute in the face of an intervention.

The attribute chosen is accessibility, measured as described above, which makes it possible to quantify whether the population of the study area has a more balanced distribution of access to the services defined by the two indices considered above (Acc. basic services and Acc. education and culture) than the baseline scenario (non-project).

\[ G = \frac{\sum_{i=1}^{n-1}(p_i - q_i)}{\sum_{i=1}^{n-1} p_i} = 1 - \frac{\sum_{i=1}^{n-1} q_i}{p_i} \]

The Lorenz curve, \( L(x) \), is a graphical representation of the cumulative distribution of an attribute/quantity in a population, while the Gini index \( G \) is the corresponding measure of the dispersion (inequality) in the distribution of the attribute in a population derived from the Lorenz curve. Graphically, the Gini index is the ratio of the equality line (the bisector of the Cartesian plane) to the Lorenz curve.

The Gini index takes values between 0 (perfect equality) and 1 (perfect inequality).
Agglomerative effect

Methodological note

Investment in railways reduces travel time, which has an impact on effective employment density, defined as the level of employment in an area compared to the Generalised Cost of Transport (CGT) required to reach it.

Effective employment density is used as a measure of the productivity effects of agglomeration economies.

Three sources can be identified to explain the link between firm density and productivity:

• **Technological spillovers**: firms are more likely to adopt innovations from other geographically close firms;

• **Input market advantages**: in areas where there is a higher concentration of firms, there is a greater variety of inputs from suppliers.

• **Advantages in labour market**: similarly to the input market, a higher concentration of workers ensures that firms can select workers with specific skills.

\[
H_0 = \text{baseline scenario} \quad H_1 = \text{project Scenario} \quad T_{0\text{td}} = \text{travel time of baseline scenario} \quad T_{1\text{td}} = \text{travel time of project scenario} \quad E = \text{Employees}
\]

The elasticity of productivity to employment density has been estimated by the British Department for Transport to be 0.04. This means that a 1% increase in employment density leads to a 0.04% increase in productivity.
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Economic and Employment Impact – Application of Model EIA

Results

The economic and employment impact of this programme of measures is mainly during the construction phase. It is assumed that the annual operating costs of the railway infrastructure do not have a significant impact on the economy and employment.

The analysis carried out shows that the modernisation of the railway systems generates Value Added and strengthens the employment system.

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Value Added (Mln euro)</th>
<th>FTE (,000)</th>
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</thead>
<tbody>
<tr>
<td>Direct and indirect impacts</td>
<td>5,384</td>
<td>70</td>
</tr>
<tr>
<td>Induced effects</td>
<td>699</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>6,083</td>
<td>83</td>
</tr>
</tbody>
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Taking into account the direct and indirect effects, the value added is more than 5 billion, with a corresponding employment impact of about 70,000 FTE. Taking a broader view that also includes induced effects, the value added is estimated at about 6 billion, with an employment impact of more than 80,000 FTE.
The results of the accessibility calculation show that Agrigento, Enna and Caltanissetta are the provinces that will benefit most from the investment programme. Although the investment is a link between two poles, it also benefits municipalities in the Sicilian hinterland. Applying the Gini index to the accessibility results in order to assess the change in inequalities at regional level brought about by the investment, the result is a reduction of 0.3% in terms of accessibility to basic services and 0.5% in terms of accessibility to education and culture. This implies a small contribution of the investment to the reduction of territorial disparities considered in this study.
The results of the agglomeration effect confirm what has been shown for accessibility, namely that Enna, Caltanissetta and Agrigento are the provinces that will benefit most from the investment programme. Since effective employment density is a measure of the impact of agglomeration economies on productivity, this increase translates into higher productivity for those employees in the area.
Thanks