Transport infrastructure and accessibility: how to foster the impacts on economic development

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Outline

• Beyond CBA: the final effects
• What do we know about location effects
• What do we know about growth effects
• Impact of policies
To assess location and growth effects, it is necessary to go beyond CBA

BEYOND CBA
Interest and limits of traditional CBA

• Interest (unvaluable):
  – Provides an overall view of the interest of the project
  – Allows to compare different projects
• But:
  – It provides only the first round of the effects of the project:
    • The transport users
    • The environmental effects to the neighbours of the track
  – It does not provide the final effects:
    • For instance: the reduction in freight transport costs are passed on to the final consumers
  – It does not provide any break-down of the effects
    • Especially no indication on the consequences in terms of location
• Our interest: the location effects and level of economic activity effects
• The sources of knowledge:
  – Economics Analysis
  – Statistical studies
  – Results of modeling exercises
  – Ex post observations, case studies
A universal tool: accessibility

• Accessibility: an index showing how close you are from the « rest of the world »:
  – Depends on the size of nodes around you
  – Weighted by the « distance » (cost, time, ..) between you and each node
• A formula:
  – Node j has a size $W_j$ (for instance its wealth)
  – And is distant from you by transport cost $C_j$
  – An accessibility index is for instance:
  – Each node is weighted proportionally to its size and inversely to its farness
• It shows how well you are located vis-à-vis the markets or the settlements or the employments

$$A = \sum_j \frac{W_j}{C_j^\alpha}$$
A universal tool: accessibility

\[ A = \sum_{j} \frac{W_j}{C_j^\alpha} \]
Infrastructure improvements induce polarization and concentration

LOCATION EFFECTS
Speed distorts geography
Effect of HST in France
Speed distorts geography
Railways change accessibility: the case of Netherlands

• Maps of successive relative accessibility levels (Koopmans and alii):
  – Difference of each area to the average accessibility level of the country
  – Rail development increases disparities, induce polarization
Accessibility changes locations: the case of Netherlands

• Consequences for population location (Koopmans and alii)
  – Relation between rail accessibility and growth of population
    • Rail accessibility improvements induce population increases
    • But to a rather small extent compared to other factors such as general urbanization/crowding trends (5 to 10%?)
The lessons of economic geography

• As transport costs decrease:
  – Polarization and concentration
  – Peri-urbanisation around the stations, connections and interchanges

• When a link between two agglomerations is improved:
  – Migrations from the smaller to the larger agglomeration

• Checked by econometric studies
Spatial Modelling

• The principles of spatial models
  – A transport submodel, modelling the transport flows issued from a given economic activity
  – An economic activity model, analysing how economic activity and the corresponding transport flows are shaped by transport costs
  – Many such models: CGEurope, Rhomolo, Delta
Modelling: the case of the Grand Paris Express
Lessons from ex post studies

• Effects around stations (maximum 1 km):
  – New urbanization
  – Increase in density

• Extension of commuting to distances up to 100 km → sleeping cities
Stylized facts about the urban location effects for USA (Turner 2009)

• Effects of roads
  – Roads increase the population density nearby land.
  – Roads change the composition of production and population.
  – Roads disproportionately attract wealthier people.
  – Roads decrease density in cities.

• Effects of mass transit
  – Transit increases the population of cities.
  – Transit disproportionately attracts poorer people to cities.
Infrastructure improvements induce increase in GDP, to various extents and with heterogeneities.
A loose link between accessibility and growth

Figure 7.2.1: Accessibility and GDP per capita in NUTS-3 regions
Accessibility and economic growth

Relation of economic performance to location
- Strong underperformance
- Clear underperformance
- Underperformance
- Little underperformance
- Little overperformance
- Overperformance
- Clear overperformance
- Strong overperformance
Impact of public infrastructures on GDP

• A lot of econometric studies (Graham and Melo 2013)

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<td>0.060</td>
<td>0.016</td>
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N — number of observations; SD — standard deviation; CV — coefficient of variation.
Urban economics point of view: The agglomeration effects

• When accessibility is improved, productivity and economic activity grows.
• The three effects on productivity
  – Sharing
  – Matching
  – Learning
• The effect is mainly intra-urban
• Elasticity of productivity to accessibility:
  – In the range of 2%-5%
  – Depending on the sector: larger in services, lower in primary industries
  – The effects vanish with distance: 80% within 50 km
• Improved accessibility positively impacts the labour market:
  – Decrease of unemployment
  – Reducing exclusion zones
  – Improve the situation of remote areas
Lessons of Economic geography

• General lesson:
  – Decrease in transport cost induce polarization and concentration
  – Due to increasing returns to scale and increasing variety of goods, and larger market, the « big » agglomeration benefits more

• The « problem of the three bodies »
Results of modelling (SASI): changes in accessibility ↓ GDP ↓
Lessons of ex post studies

• Rail effects on firms
  – Re-organization of firm between headquarters and affiliates
    • With increases in productivity and in employment
  – Mainly on services and tourism
  – Depending on the size of the agglomeration (larger for large agglomerations)

• Road effects on firms
  – Enlargement of markets
  – Increase in competition → increase in variety of goods and services, decrease of prices
The additionality issue

• Several approaches
  – Macro-economic impact of infrastructure on GDP
  – Agglomeration effects
  – Results of large models
  – Case studies

• Do they add each other or overlap?
  – They overlap
  – The most robust one are agglomeration effects

• Do they add to CBA results?
IMPACT OF POLICIES
Preconizations are hazardous

- No clear automatic outcome
- Specificity of each situation
  - HST in Spain
- A lot of uncertainty
Lessons from ex post studies

• Beneficial consequences are not automatic
  – The size of agglomeration matters, as well as the proximity of other cities, depending on whether they are large or small: the Lille and Macon cases
  – Urbanism around the stations
  – The importance of a pre-existing economic potential
    • The indirect effects are linked to direct effects
  – Dynamism of local authorities and entrepreneurship
Lille (1,2 Minhab, 600 km²) : Euralille
600 000 m² of offices and houses
Macon (60 000 inhabitants)
The role of public policies

• Transport policy:
  – Importance of the feeders to the main infrastructure
  – Organization of parkings around the stations

• Other public policies
  – Urban regulation for housing and offices around the stations, and farther
    • In order to facilitate the migrations and changes induced by the new infrastructure
HSTs and TGVs in France
Cooperation between public authorities and private firms

• A careful design and monitoring of urban development
• Examples:
  – Société du Grand Paris: working groups gathering the major actors of urban development around each station
  – Seine Nord Escaut: « road shows » for attracting private firms along the waterway, and fostering intermodal platforms
  – Japan Railways: the station operators act as developers around the stations
Some specific points

• The role of nodes
  – Stations are not just transport exchanges
  – Intermodal platforms foster location of activities

• Target the right sectors
  – Services and tourism for high speed transports
  – Shopping and delivery for roads
Main messages

• Infrastructures induce location effects and foster economic activity
  – To various extents depending on the mode and on the specific situation
  – The size of those effects is linked to the direct effects
• Beneficial effects are not certain
• They depends
  – First on natural tendancies;
    • it is important to have a good knowledge of them
    • as it is not sensible to fight against them
  – Second on public policies and private entrepreneurship
    • And their coordination
    • Building the infrastructure is just the first step
Thank you for your attention
A few references

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