European Commission

TRIMIS
TRANSPORT RESEARCH AND INNOVATION MONITORING AND INFORMATION SYSTEM

D I G E S T

Issue 9
June 2019

Financing Transport Infrastructure

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Source: de Ruis, G. and Socorro, M. P. (2019) Pricing and investment in alternative transport infrastructures. Transportation Research Part A. 119, 96-107.
Available here

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Pricing and investment in transport infrastructure

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A study examined pricing and investment decisions in transport infrastructure planning. It found a charging scheme (e.g. tolls) can favour the creation of a particular transport infrastructure network, which may not necessarily be beneficial for users and society. Postponing the expansion of a network could be more socially beneficial if the required demand does not exist.

Pricing and investment in transport infrastructures are not independent and must be taken together. Although different infrastructure charging schemes may be applied in practice, the best price for the use of a particular transport infrastructure should include the option of switching to other transport modes.

In Europe, decisions regarding access pricing for transport infrastructure are often made by independent agencies. These agencies analyse specific characteristics of one type of transport infrastructure and decide on access pricing but do not always consider cross-effects between different transport modes. As a consequence, charging may be set in the short-term to cover full costs (i.e. operating and construction costs).

Prices affect demand and, as a consequence, the social benefits derived from the investment project. Before evaluating transport infrastructure, the associated charging scheme needs to be known, such as analysing the social benefits of a toll-free bridge. If there is no charge for the bridge and there are only fixed costs, the bridge should be constructed if user benefits are higher than the construction costs. If there is a charge for the use of a bridge, this may reduce social benefits and lead to a situation where the optimal decision is not to build the bridge.

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Pricing and investment in transport infrastructure

A game-theory model was used in the study to analyse the effects of different charging schemes on transport infrastructure investments. In the model, users demand services in two transport modes – air and rail. Given the users' preferences, the regulator must decide to invest in air or rail, or both transport modes; or postpone the investment. Two possible charging schemes were considered:

- charging according to short-term costs;
- charging mark-ups over the short-term costs to cover construction costs.

In this situation, the study showed that a government may favour the construction of rail infrastructure by choosing a charging scheme based on short-term costs.

A cases study of the route to Madrid-Barcelona (Spain), which is 600-650 km in length, is used in the analysis. For this route two possible transport modes were considered: air transport and high speed rail (HSR). The minimum number of trips required for constructing both the air and HSR infrastructure was about 32 million trips, if the regulator uses a charging scheme based on short-term costs. Using real data the study found that the minimum demand threshold was not met. With the present level of demand, the HSR should not have been constructed in the Madrid-Barcelona segment. With such a level of demand, only constructing air transport is the optimal alternative, even if the regulator decided to charge for the use of transport infrastructure to meet short-term costs.

The cost of building airports varies substantially with the level of demand. The higher the level of demand, the greater the size of the airport and the cost. In contrast, the cost of constructing the rail infrastructure varies little with the level of demand since the costliest part of such infrastructure is the construction of the tracks. Once two regions have been connected by airports, only one more airport is needed to connect to the third region (half of the previous investment). However, once the two regions have been connected by rail, the cost of connecting the third region is almost the same. Moreover, airports allow regions to be connected by short, medium or long-haul flights, while HSR is only competitive for distances below approximately 800 km.

The study concluded that investment planning at government level should not be separated by product, such as air and rail transport. It is common for public agencies at different government levels to be organised by product instead of by function. They often have an independent planning structure that is not well coordinated. HSR should be constructed only for those cases where the social benefits are clearly higher than the benefits of the next-best alternative. This occurs when the level of demand is sufficiently high – and that depends strongly on the charging scheme. The long-term consequences of investing in suboptimal infrastructure projects can be paramount. It may be that this is not the optimal network, but the irreversibility of the investment converts this suboptimal state into a long-term equilibrium. Once infrastructure has been constructed, it should be used. However, this does not mean that new segments should be added to the existing network. The planner should wait until the demand reaches the required threshold for social profitability. Meanwhile, postponing the expansion of the network can be socially worthwhile.