ERSA Conference 2024 Extended Abstract: Literature review on the international insights into the decision making process and spatial socio-economic and environmental consequences of high speed rail

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Abstract

Concerns about socioeconomic disparities and sustainability challenges have prompted calls for a more comprehensive assessment of wealth that extends beyond mere indicators of economic output. Consequently, when appraising transport infrastructural investments, challenges emerge in aligning goals and the assessment of a broader array of potential societal and environmental outcomes more explicitly, either within or alongside traditional appraisal methods. This study contributes to this challenge for the case of high-speed rail (HSR) by reviewing the (spatial) effects, motivations for construction, and decision making process of high speed rail in an international context.

Several systematic reviews, literature reviews, and meta-analyses have been used to develop a conceptual model on the decision making process and micro and macro-level impacts related to HSR. This conceptual framework served as the structure of the literature review. First, HSL reduces the generalised transport costs, which is the sum of all monetary and non-monetary transport costs expressed in one standard, such as a currency. Changing generalised transport costs consequently affect the micro-level. These micro-level impacts relate to changes in accessibility, trip choice (in terms of time and place), and location choice of firms and individuals. The first macro-level effect relates to alterations to the transport network in terms of modal choices and intensity (in terms of time and place). Network effects, influence the economic prosperity of places and the relocation of economic activity across space. Besides, network changes influence the environment and public health in terms of noise & air pollution, landscape, nature, traffic safety, and the emission of greenhouse gasses. Lastly, the conceptual model introduces a feedback between macro-level impacts and the decision making process.

The relevant literature was identified using a snowballing approach, beginning with existing reviews on the socioeconomic outcomes of HSR. This involved tracing the references and related literature cited in the papers used to construct the above described conceptual model. Additionally, governmental and institutional reports elucidating policy goals and presenting ex-ante and ex-post economic appraisals related to HSR were included.

This paper finds that the most cited reason for high speed rail construction is congestion on existing (rail) infrastructure. Other cited reasons relate to regional economic development, increasing the modal share of rail transport, or to strengthen territorial and national cohesion. Besides, the literature addressed the importance of the infrastructural choices about whether high speed and conventional equipment should be able to operate on high speed and/or conventional infrastructure. More complex infrastructure seemed to result in higher operating, maintenance, and construction costs.

For the decision making process the use of the social cost-benefit analysis (SCBA) seems paradoxical. On the one hand, governments state to use SCBA to identify socially profitable infrastructural investment ventures. On the other hand, SCBA seem to play a minor role in the final decision. Lobbying and electoral support seem influential in the decision making process and design of the infrastructure.

The existing empirical and theoretical literature on the spatial impacts of infrastructural investments seems to pay much attention to economic and distributional effects. This research paid attention to indicators on particularly economic growth, property prices and investment, productivity growth and innovation, and population change. This paper finds that spatial economic effects show parallels to the New Economic Geography literature: Agglomeration economics could cause an initial clustering of activities in densely populated agglomeration, but can eventually, under high clustering with soring property proces and congestion, stimulate the spread of economic activity towards (semi-)peripheral areas. Especially service sector firms and employees seems to be affected by HSR.

Such economic effects are linked to changes in accessibility. HSR can in fact increase accessibility, as long as existing train services and infrastructure maintenance continue. HSR moreover allows for greater flexibility in trip location and department time. HSR is partially able to generate a modal substitution from car and airplane towards rail and generates new transport demand.

The impact of HSR on the environment and public health, aligns with the description provided by the conceptual model. Experienced noise pollution is rather low due to lower speeds in urbanised regions and the construction of tunnels and noise barriers. Air quality might indirectly improve because HSR promotes market competition which incentivises innovation and efficient production, as well as accelerating the transition from secondary to tertiary economic activities. Moreover, this paper finds that HSR has a low incidence of traffic accidents and causes considerably lower CO_2-emissies due to high occupancy rates in comparison to conventional rail.

The academic literature provided a broad overview which seems to underline the relevance of congestion as a motivation for the construction of HSR-infrastructure. Economic development motivations are unsubstantiated by the empirical literature since this is highly context dependent. For this reason, future research could address this uncertainty by what factors contribute to this context. Moreover, future research could perform qualitative research into the decision making process about how different goals and motivations weighed in different context and what actors influence the actual outcomes. Lastly, qualitative methods could be used to research the underlying socioeconomic impacts.