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High-speed rail networks, economic integration and regional specialisation in China and Europe ☆

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ABSTRACT

The role of transport in the process of economic development and integration remains an area of controversy. Policy makers, faced with the claim that the cost of high-speed rail (HSR) makes it an expensive way of achieving the supposed benefits, seek to identify wider economic impacts through productivity gains as a justification. This paper explores the development of HSR as an instrument for promoting economic integration both through enhancing competitiveness and achieving greater economic cohesion in China and the European Union. The paper examines changes in accessibility and provides evidence on changes in specialisation for both main cities and their hinterlands. The evidence confirms that impacts differ widely and that the process of convergence and divergence differs at different stages of economic development.

Introduction

The role of transport in the process of economic development and integration remains an area of controversy in both the economics literature and policy-making. The theoretical literature following the work on the new economic geography (Fujita et al., 1999) implies that there is no a priori certainty in whether improved accessibility will lead to convergence or divergence in economic performance. Despite this, policy makers have emphasised the importance of investment in transport infrastructure as an instrument of both economic growth and cohesion. Pre-eminent in this thinking has been the role of high-speed rail which has been seen as enabling a significant shift in transport supply equivalent to the introduction of a completely new mode of transport. This belief has been to the fore in both European transport policy and in the rapid development of high-speed rail in China.

As originally conceived, high-speed rail (HSR) was seen as a means of improving accessibility between core cities in the distance range 400–600 km (Vickerman, 2012). Studies in Europe focused on the way in which changing accessibility could impact on regional economic development from the early work of Bonnafous (1987) on the regional effects of the French TGV network. More detailed studies of the accessibility impacts followed (e.g. Gutiérrez et al., 1996, 2010), although some studies were more sceptical about the overall spatial impact of such changes (Vickerman et al., 1999). In Europe, evidence from Spain, France and the UK has shown that it may also have a role in enhancing internal regional integration in the distance range up to 200 km (Garmendia et al., 2012). A similar situation can be identified in China where HSR is seen as one of the elements in the long-term national economic integration and a catalyst for economic growth. Some segments of the network also have the objective of promoting development and integration within a particular region. An example of this is the HSR in the Pearl River Delta area, which aims to enhance the integration of Hong Kong with Guangdong (Wang et al., 2009; Hou and Li, 2011).

Policy makers are also faced with the claim that the cost of HSR makes it an expensive way of achieving the supposed benefits. Nevertheless many countries have been developing significant high-speed rail networks. This paper explores the development of HSR as an instrument for promoting economic integration both through enhancing competitiveness and achieving greater economic cohesion in the European Union and China. Both have developed ambitious plans for HSR networks. The key to understanding the effect is the impact on productivity which comes about from agglomeration. Evidence is presented on changes in

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industrial specialisation following the introduction of HSR as an initial exploration of these effects. Of course, HSR is only one of many factors influencing productivity change. Other changes in accessibility may have taken place as road improvements may also have taken place. Changes in international competitiveness may affect the location of industries. Nevertheless, it is valuable as a first approximation to explore what changes have taken place in the period following the introduction of HSR as these events rarely take place exactly in parallel. This evidence also provides pointers to areas for further research.

Methodology

Most studies of HSR have been of individual links or of networks within a single country. Furthermore most studies consider only the transport implications of HSR developments. This paper aims to embed the development of HSR in the wider process of economic integration which has been a major policy objective in Europe and China. By comparing HSR developments in Europe and China, two aspects will be considered:

(i) The rationale for the development of HSR: a comparison between Europe and China (essentially a comparison between the Trans-European Network for HSR in the EU and the National Plan for HSR in China).
(ii) The economic implications of the links: methods of estimating the economic impact on national and regional economies in terms of changing specialisation.

The new economic geography approach has demonstrated that the changing economic structure resulting from transport improvements would depend on the incidence of scale economies and the size of market areas of firms in different economic sectors and the relative elasticities of these to changing transport costs.

In his classic paper, Krugman (1991a) demonstrates in a simple two-sector- two-region model how transport costs may interact with various factors to give rise to different patterns of agglomeration. When the expenditure share of the consumer goods that incur transport costs is small and the elasticity of substitution among them is large, a sufficiently low level of transport costs will lead to the concentration of production in a city. The underlying assumption is that workers are attracted to locations with higher real wages. The larger number of workers creates a larger market for firms, which are able to exploit scale economies. They will not lose much business in other smaller cities if transport costs are low. Thus, if HSR leads to a lower level of transport costs, it is possible that further agglomeration will occur in core cities at the expense of smaller cities.

However, in an enriched model with intermediate and final goods, Venables (1996) shows that when economic integration comes with a reduction in transport costs (more generally, trade costs), both concentration and dispersion of industries are possible results, depending on the strength of the vertical linkages and the level of trade costs. Specifically, if vertical linkages are strong and trade costs are not low enough, agglomeration will occur. Conversely, if linkages are weaker and transport costs become very small, integration may lead to dispersion. In a similar model, Krugman and Venables (1995) postulate that a long-run decline in transportation cost could lead to first a divergence and then a convergence of income and economic structure across regions. Baldwin et al. (2003) provide a synthesis of relevant theories developed on this issue and Combes (2011) reviews the econometric tests of the bell-shape relationship between transportation (or trade) cost and spatial disparity.

By implication, as different economic sectors may have different relevant parameters, economic integration can lead to a change in the specialization patterns among regions. In the context of HSR development, whether a new line leads to further concentration of activities in large cities or it will help spread economic activities to smaller cities on the line depends on its economic structure which defines the linkage effects.

Although, as it is normally a purely passenger railway, HSR typically may be seen to have little direct impact on the integration of manufacturing (except from the relatively small amount of costs absorbed by business travel), it can have a significant indirect impact through the release of capacity on the existing network for both commuting traffic and freight.

The direct benefits from any transport investment can be measured by the estimated user benefits in terms of the willingness to pay for time savings. What is of particular interest however is the scope for wider economic benefits which derive from the contribution to agglomeration benefits. Recent research in the UK has identified that the potential for agglomeration economies are in fact much greater in service sectors, especially financial services (Graham, 2007; Venables, 2007; Vickerman, 2008a). This might suggest that the scope for wider economic impacts would also be significant in the Chinese case. However, such benefits are case-specific such that some basic research will be needed into the potential for such benefits in the local case on the basis of local economic structures. Such agglomeration effects are also much easier to identify in the case where HSR is used to increase the labour market potential of a metropolitan area. Here the evidence suggests that the distance decay of such benefits is quite pronounced. But what happens when HSR is used to link two or more major metropolitan regions. The approach so far has focussed just on the impact of each city and its hinterland (or a dominant core region and a peripheral one), not on two cities of similar size. Here the theory is generally lacking although some recent research suggests that by focussing on task specialisation rather than sector specialisation the process of agglomeration in an inter-urban context may be easier to explain (Michaels et al., 2013; Venables, 2013).

The allowance for these wider effects implies that conventional transport demand forecasting models which take existing patterns of demand and project these on the basis of the change in generalised costs will be inappropriate when there is both a significant shift in such costs and the introduction in effect of a new mode of transport (Loo, 2009). The existence of a new HSR connection may lead to a significant diversion of trips from other modes, other destinations and the generation of completely new trips. There is evidence that once half-day return trips become possible allowing up to four hours at the destination there is a significant shift in trip generation (Vickerman et al., 1999). In addition the simultaneous introduction of other measures of integration such as reduced border controls, removal of trade barriers, harmonisation of regulations, which are concomitant with economic integration, change international travel patterns significantly.

Because of the potential inequalities in the distribution of benefits between the affected regions, it is important to identify the decision-making processes involved to assess the degree to which different authorities seek to use the HSR as a means of increasing their competitiveness vis a vis neighbouring regions or as part of a cooperative venture to increase the agglomeration effect in a group of regions (Vickerman, 2008b).

It is thus important to emphasize that the impact of HSR on the location of economic activities depends on the specific economic and geographic conditions and how policy-makers react to the possible opportunities and challenges brought about by the availability of HSR lines. To demonstrate the diverse impact of the HSR, our empirical study will start from an analysis of how HSR lines in Northern Europe and China compress the travel time between cities and thus transform their accessibility. This is followed by an