

The effect of intercity high-speed-rail project on regional economic development:

Evidence from a natural experiment in Zhongshan, China

The Chinese mainland launched its first high-speed rail line in 2009, which has continued to rapidly develop. Following the popularisation of the high-speed railway and improvement of related construction technologies, the manufacturing of Electrical Multiple Unit (EMU) trains has also increased. These trains can encourage the flow of people along the route and promote economic exchanges, which may have a significant impact on regional economic development. Dr Yiming He, from the South China Agricultural University, investigated the impact of the Guangzhou-Zhuhai intercity high-speed-rail project on local economic performance and migration in Zhongshan.

Since its launch, the Chinese high-speed rail line has seen extensive development. Seven years after it opened, the operating mileage of the railway reached 23,600 km. Such developments have been particularly significant in Guangdong Province, one of the most densely populated provinces in mainland China, where the Guangdong Province high speed railway density has reached 0.83 km per hundred square kilometre. Developments have also included increased construction of Electrical Multiple Unit (EMU) trains. Three EMU lines have been built in the Guangdong Province: the Guangzhou-Shenzhen city rail transit, the Guangzhou-Zhuhai city rail transit and the Guangzhou-Foshan-Zhaoqing city rail transit, with more lines planned for the future. Due to the convenience and low cost of EMU trains, they are an effective way to promote the flow of people along the rail route as well as economic exchanges. Both of these factors may play an important role in impacting regional

economic development. Dr Yiming He and colleagues investigated the economic performance and the migration of 24 counties in Zhongshan, an area which is part of the Guangzhou-Zhuhai city rail route and was directly affected by railway developments.

TRANSPORT INFRASTRUCTURE AND ECONOMIC GROWTH

Previous research has demonstrated that transport infrastructure has a direct impact on economic growth rates. The improvement in transport infrastructure positively influences both economic output and population migration. Based upon this knowledge, Dr Yiming He developed four propositions to determine how the Guangzhou-Zhuhai city rail transit affected 24 counties in Zhongshan.

The first of these propositions is that if the two regional economies are heterogeneous and the time spent in traffic is shortened, regional resource allocation should be optimised and the development scale of the economy should be expanded, leading to improved economic growth. If the two regional economies are homogeneous and the cost of transit time (the time spent in traffic) is also shortened, the competition between economies is aggravated and if the appropriate market size is maintained, resources will not be skewed, which also serves to benefit economic growth. Regional development tends to be unbalanced in China because of the different resource allocations and the nature of government policies in China.

The second proposition is that if the opening of the train line shortens transportation time, the transportation



time cost remains consistent, the price of the product rises with the market scale enlargement and thus the local economy will also rise. The third proposition is that the difference between the equilibrium yield of the same area of transportation time cost and the equilibrium income of the manufacturer are greater than the difference in transportation time cost. The fourth proposition is that when the train line is opened, the regional economy and market scale will be increased, along with the regional division of labour and the optimisation of the train line, which shortens the transportation time. This results in more frequent journeys and thus GDP will rise.

USING A 'DIFFERENCES IN DIFFERENCES' MODEL

Dr Yiming He tested these four propositions using a Differences in Differences (DID) model. This is a statistical technique which attempts to mimic an experimental research design using observational study data. It investigates the differential effect of a treatment on a 'treatment group' (who receive the treatment) versus a 'control group' (who receive no treatment). This is achieved by comparing the average change over time in the outcome variable for the treatment group to the average change over time for the control group. In this research, the treatment is the rail project and the outcomes are economic performance and migration. The treatment group

Dr Yiming He's research showed that the setting of a railway station significantly increased the GDP of the province.

are areas affected by the rail project and the control group are areas unaffected.

Due to the high construction cost, the planning and construction of the intercity railway line is coordinated by the national or provincial government. The setting and route of the railway line take into consideration potential economic benefits, regional development balance, line distance, terrain conditions, construction difficulty as well as other factors. The decision to build a station

in a particular area is thus not entirely determined by the level of economic development. This means that the investigation of the impact of the intercity high-speed-rail project is defined as 'quasi-experimental'.

THE RAIL PROJECT AND ECONOMIC DEVELOPMENT

GDP is one of the most important indicators to measure economic development. It is affected by both the size of the population and the size



C39 to Hangzhou East.
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of the investment. The Guangdong Province has the largest imported labour force in mainland China and a large proportion of the population are non-native permanent residents. In Zhongshan city, which is located in the Pearl River Delta region, permanent residents of the population accounted for less than 50% of the total population between 2010 and 2015. However, as a result of the current household registration system, the household registration population is markedly different from the immigrant population in terms of real estate investment, education and labour quality.

Dr Yiming He's research showed that the setting of a railway station significantly increased the GDP of the province. It was particularly favourable for the more developed areas of the province, such as Guangzhou. Interestingly, the effect of the total registered population on GDP was not found to be significant. This demonstrates that the total registered population has little impact on the overall output of Zhongshan city, a region characterised by a large influx of immigrants which is not fully reflected in the household register.

THE RAIL PROJECT AND MIGRATION

The construction of intercity rail lines improves the traffic in the area, which increases the attractiveness of the area to new residents and thus affects the trend of population change. This population change subsequently influences both



Xiaolan Railway Station Platform. Photo credit: T88288 on Wikimedia Commons (CC BY-SA 3.0)

The opening of the Guangzhou-Zhuhai intercity rail line was associated with an annual increase of around 1028 residents.

economic and social development of the area. Dr Yiming He found that migration in the province of Zhongshan was significantly affected by the rail project. The areas used to build EMU train lines were much more attractive to future residents than other areas in the region. The opening of the Guangzhou-Zhuhai intercity rail line was associated with an annual increase of around 1028 residents.

CONCLUSIONS

The development of EMU railway lines will continue to form an important role in the construction of infrastructure for a long period of time. The construction of these railway lines requires a large amount of initial funding and involves navigating a range of issues, such as land expropriation and noise created in areas along the railway lines. However, these railway lines play a significant role in promoting both economic development and migration. Studying the influence of the construction of the intercity train line is thus of great importance.

Based on Dr Yiming He's research, it is clear that the opening of an intercity rail line is conducive to the migration of people from other areas to the area along the rail line, increasing the population agglomeration in the area and promoting economic growth in the region. However, the research also highlighted that the areas in the region are affected differently, with more developed areas experiencing greater economic benefits. This means that railway developments may further increase the economic gap between the most and least developed areas of a province.



G1 to Shanghai-Hongqiao. Photo credit: N509FZ on Wikimedia Commons (CC BY-SA 4.0)



Behind the Research

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Research Objectives

Dr He's work focuses on regional economic development in China.

Detail

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Bio

Dr He is a South China Agriculture University Phd, Professor and Phd Advisor, who won the Ten Thousand

Program of the national youth talent support project, national natural science twice, national social science three times, and China Scholarship Council visiting scholar program. He has published more than eighty papers on Man and the Economy and Energy Economics. Dr Yiming He is also the Ronald Coase Institute Young Fellow, Hong Kong Baptism University Adjunct Researcher and The University of Texas visiting Professor.

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Collaborators

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- Weikun Zhang
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Personal Response

How do you foresee future railway developments in China impacting migration and economic development?

|| This project will further expand the regional economic development gap and drive up migration. ||



CRH2 EMU at Xi'an, near Anyuan Gate. Photo credit: Jucember on Wikimedia Commons (CC BY-SA 3.0)