

in brief...

# Investing in roads: the growth impact of China's highway network

Between 1990 and 2010, China constructed an extensive modern road network, including a national system of limited access highways. **Vernon Henderson** and colleagues investigate the impact on the growth of Chinese cities and regions.

Policy-makers around the world face important choices about which types of inter-regional transport infrastructure to build and how to prioritise public spending needs. Finite budgets mean that governments often have to choose between building large-scale infrastructure and expanding public service delivery. Effective policy decisions depend on understanding how various types of transport infrastructure affect the growth of cities and regions.

The massive transport infrastructure investments taking place in many developing countries today are highly durable and will shape cities and regions for decades to come. Infrastructure not only determines cities' trading interactions with each other and foreign markets, but it also shapes the capacity of governments to manage rising rates of internal migration into cities. By 2020, over half the population of developing countries will live in urban areas, many in slums, and this fraction is only expected to increase.

Our research examines these issues in the context of China, which constructed an extensive modern road network, including a national system of limited access highways, between 1990 and 2010. The limited access highways contributed towards increasing the freight ton-miles moved by road from under 5% in 1990 to well over 30% in 2010.

Better transport connections facilitate greater centralisation of production activities, shifting activity from hinterlands into regional centres

The Chinese experience is particularly useful for research purposes. China is a rapidly urbanising country that releases comprehensive, and relatively high quality, regional data. Considerable variation across cities and regions (in the extent and configuration of their road networks), together with the unique institutional history of the Chinese economy, help us to produce credible estimates of causal relationships between roads and outcomes of interest.

We study the effects of road infrastructure within a given radius (450km) of prefecture cities and access to international ports on GDP, population and GDP per capita in Chinese prefectures.<sup>1</sup> Our investigation faces two main challenges. The first is that road placement is typically not random. Highways are more likely to be allocated based on locations' actual or potential productivity and attractiveness as places to live.



<sup>1</sup> A prefecture is a political subdivision roughly equivalent to a metropolitan area in Chinese administrative geography. It ranks below a province but above a county.

## Easier access to international ports promotes growth in GDP, population and GDP per capita

We address this non-random allocation of roads across prefectures by using historical road networks as a source of quasi-random variation. Because historical roads were only used for very local travel and the movement of agricultural goods, they provide a useful source of variation in modern highway infrastructure after accounting for differences in prefectures' agricultural productivity, types of land endowments and historical populations.

The second challenge is that the economic output of a region naturally depends on output in other regions, due to trade and migration linkages. Given this, we cannot perfectly randomise regions into 'treatment' and 'control' groups.

The analytical framework used in our empirical work estimates the relative gains or losses to one city that result from a marginal change in its regional highway allocation, relative to other locations. Our study finds two striking results.

The first is that expanding the regional highway networks drives economic activity towards regionally important 'primate' cities. A 10% expansion in road length (within 450km of a prefecture city) reduces the population in an average non-primate city by an estimated 1.6% and increases the population in an average primate city by 2.5%.

We speculate that the effect of roads on primate cities in part reflects China's migration and capital market policies, but it also captures an important complementarity between roads and output in these central locations. Better transport connections facilitate greater centralisation of production activities, shifting activity from hinterlands into regional centres. While primate prefectures are larger than average, many are not among

the biggest cities in China. We show that the primacy effects are not due to city size, nor to potentially being a provincial capital or a nodal point in the highway system.

Our second striking result is that highways' facilitation of easier access to international ports promotes growth in GDP, population and GDP per capita for all prefectures. A 10% reduction in travel time to an international port results in a 1.6% increase in GDP, a 1% increase in population and a 0.5% increase in GDP per capita. This suggests that better access to international markets has had a high return in China, where the policy environment has emphasised export-driven investments and growth.



This article summarises 'Highways, Market Access and Urban Growth in China' by Nathaniel Baum-Snow, Loren Brandt, Vernon Henderson, Matthew Turner and Qinghua Zhang, SERC/Urban Programme Discussion Paper No. 200 (<http://www.spatial-economics.ac.uk/textonly/SERC/publications/download/sercdp0200.pdf>).

A longer version appears on the International Growth Centre (IGC) blog: <http://www.theigc.org/blog/when-models-fall-short-evidence-from-chinese-road-infrastructure-investments/>

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