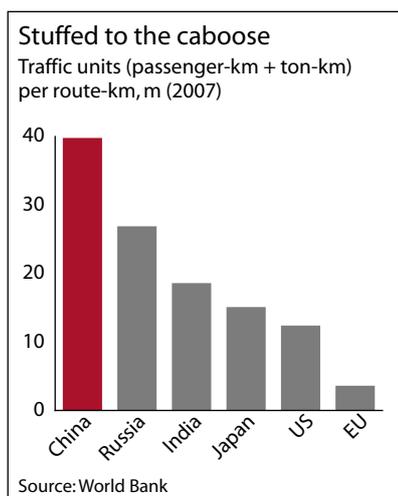
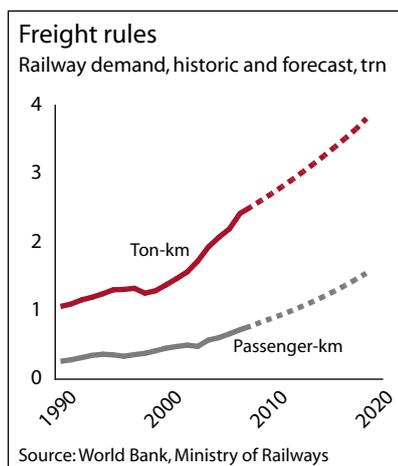


High-speed rail

The iron rooster spiffs up

by Will Freeman



Rocketing through China's heartland on the 350 km per hour Wuguang Harmony Express is a great way to travel. The train carries passengers 1,000 km from Wuhan to Guangzhou – roughly the distance between Washington DC and Chicago – in just three hours. Seating is comfortable, travelers are free to walk around, and cell phones and other electronic devices are permitted. Yet critics of China's high-speed rail program argue that this latest investment in transportation infrastructure, following the billions of dollars already poured into building a national expressway network, is unnecessary and wasteful. Since few passengers will be able to afford the high-speed ticket prices, the spiffy new trains are doomed to become high-speed white elephants carrying nothing but an enormous pile of debt.

That criticism is almost entirely off-target, and betrays a fundamental misunderstanding of the nature of China's development. The high-speed rail program is a carefully considered component of a comprehensive – and desperately needed – upgrade of China's entire rail network. The principal long-run economic benefit of building new passenger lines will be a vast increase in capacity on the nation's freight lines, slashing logistics costs and speeding the development of an integrated national consumer market. The cost premium of building high-speed rather than conventional rail lines is far lower in China than in other countries, and the advantage of high-speed lines is that they are more likely to draw passengers away from air and car travel, meaning a net improvement in energy efficiency and a reduction in carbon emissions. While the debt load incurred to build the new lines is substantial, the long-run economic benefits will almost certainly outweigh that debt.

Speedy connections

Economic stimulus funds accelerated investment in high-speed rail in 2009-10, but plans for a high-speed network were on the table for many years. The State Council approved the Ministry of Railway's (MOR) mid- to long-range network plan for railway expansion, which included plans for a high-speed passenger rail, in 2003. The plan outlines a 34,000 km expansion of the railway network – about the length of Australia's entire rail system – to a total 120,000 km by 2020. Total investment for this expansion, according to MOR's latest estimate, will run to Rmb5 trn. About half the additional length and the majority of the cost will go into building a new 16,000 km high-speed rail network mainly comprising four north-south and four east-west corridors and 19 inter-city lines. The new network will connect most major cities in eastern and central China as well as several western cities including Kunming, Chongqing,

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Chengdu and Xi'an. High-speed rail will come in two varieties, with top speeds of 250km/hr or 350km/hr. Of the eight main corridors, five will be 350km/hr and three will be 250km/hr. About 4,000 km, or one-quarter, of the high-speed rail network is already complete.

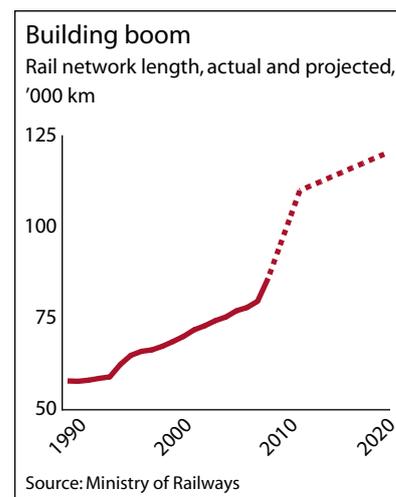
Such a massive railway expansion is necessary because China has faced chronic capacity shortages in both passenger and freight rail since the 1980s. A World Bank study in 2008 determined that the capacity shortage (for combined passenger and freight) was 10-20%. China's rail network is clogged, and likely to become more so. Freight carriage doubled between 1998 and 2008, and even on conservative growth assumptions will rise another 55% by 2020; passenger-km is forecast to double. On a combined passenger-freight basis, China's intensity of rail use is double India's, triple the US's, and a dozen times higher than the EU's. China carries a quarter of the world's combined rail freight and passenger traffic with only 6% of the world's combined rail network. Those who argue that China has even remotely enough track – let alone an excess – simply do not know what they are talking about.

The hare beats the tortoise

The need to expand rail capacity is undisputed, and the cost of building high-speed lines in China is not as exorbitant as critics claim. A 350 km/hr dedicated high-speed passenger line costs only 20%-30% more than a conventional mixed use (passenger and freight) line, according to the World Bank's John Scales, who is overseeing US\$3 bn of loans for high-speed rail projects. Costs are much lower in China than in developed countries, thanks to the country's cheap labor and economies of scale. China is also laying as much of the new track as possible on viaducts, to minimize reimbursing farmers for lost agricultural land.

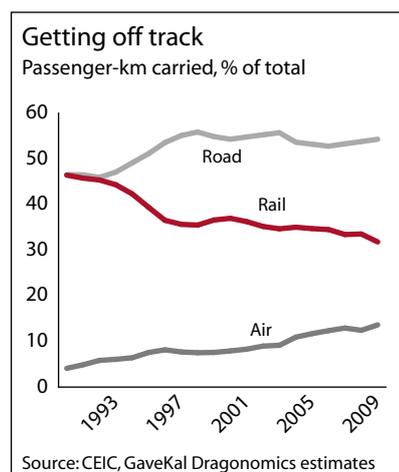
High-speed rail offers clear benefits over slower lines. One is the potential to substitute for air and long-distance car travel, which are far more energy intensive. Conventional wisdom suggests that high-speed train lines over 1,000 km long are no match for planes, but the non-stop Wuguang Harmony Express was packed on a Thursday afternoon. One of the main reasons passengers cited for taking the train over a plane was the lower ticket price: a second class train ticket costs Rmb490 versus an average plane ticket price of Rmb700. With average household income in 36 of China's largest cities at Rmb72,000 in 2009, there are millions of customers who can afford the price of a high-speed ticket, in addition to business travelers. Besides, present-day incomes are a poor indicator of the usefulness of a transportation infrastructure that will last a century, especially in an economy growing as quickly as China's. One could just as well argue that China's past investment in highway and airport infrastructure was a waste because most Chinese do not own passenger vehicles and only a small fraction of the population flies.

In a forthcoming report, the World Bank reviews around 50 high-speed rail lines across a number of countries. Annual passenger traffic ranges from 5m up to 82m on Japan's busiest line. Paul Amos, the former senior



China already has enough citizens able to afford high-speed train tickets

The economy



If NPLs from China's infrastructure roll-out become too big for banks to bear, the government will probably take over the liabilities

transport advisor to the World Bank, who worked on both the World Bank reports on China's railway network, confidently expects that China's Beijing-Hong Kong line will exceed 82m passengers annually within just a few years, and that most Chinese high-speed rail lines will be among the world's busiest. He also points out that China's growing urban density will increase the intensity of passenger use. In most countries with high-speed rail, lines run from city A to city B – usually the capital to a large regional center. But in China, says Amos, “you get a huge city – one the size of a European capital – every 200-300km. All of a sudden there's not one city pair, but several per line, and therefore the density of passengers increases.”

Another debt muddle-through

Still, critics point out, managing the debt burden remains a major challenge. Freeing up mixed-use lines for higher freight volumes should bring in enough extra income to cover most capital costs for high-speed passenger lines, according to Amos. Yet MOR's cash flow position will unquestionably deteriorate over the next few years, thanks to the lag between its present investments and the time when profits from increased freight traffic begin to accrue. MOR's total liabilities rose from Rmb870 bn in 2008 to Rmb1.3 trn in 2009, pushing its debt-to-asset ratio up from 47% to 55%. One rather extreme estimate by CITIC Securities projects MOR's total liabilities at Rmb3 trn by 2020 with a debt-to-asset ratio of 70%.

Clearly the debt risk is not small, and it is difficult accurately to predict how fast rising freight income will enable MOR to start paying down this debt. But China has a history of successfully managed large-scale debt-financed infrastructure programs, and there are several mitigating factors that should help MOR execute the classic Chinese debt muddle-through. First, Beijing may step in and directly appropriate budgetary funds for railway expansion. MOR has argued that it cannot be completely commercially viable if Beijing forces it to build railways for the social good, such as lines from Lanzhou to Urumqi. It is likely that Beijing will appropriate central funds to subsidize some of the build-out as part of the 12th Five Year Plan in 2011-15. This is not without precedent as the Qinghai-Tibet railway was highly subsidized.

Second, the loans that finance the MOR-local government JVs that own these railway lines are for very long terms, generally 10-15 years. This allows time for MOR to increase revenue from freight carriage, and for local governments to increase the tax revenues they will use to service their debt. In any case, it is likely that banks will roll over the principal amounts, which means that the ultimate risk from the infrastructure build-out is being borne by the banks. If non-performing loans from this and other infrastructure programs become too big for the banks to bear, the central government will have to assume the liabilities, effectively bringing some of the cost of rail and other infrastructure on to the central budget. This would not be disastrous: it is perfectly normal for central

governments to bear the capital cost of building high-speed rail lines, and using bank debt to substitute for fiscal expenditure is a perfectly rational method of government cash-flow management that works fine so long as the economy achieves long-run nominal GDP growth of 10% or more – which is almost certain in China for the next decade.

The great railroad business bonanza

The broader economic benefits of a much bigger rail network are hard to calculate, but they will be significant. First, improved delivery times will decrease inventory holding costs for manufacturers, and enable them to move closer to just-in-time delivery systems. Second, transporting goods by rail rather than truck is, ton for ton, at least three times cheaper. Lowering inventory and shipping costs will help manufacturers keep goods prices low and spur the development of consumer markets. Finally, better connectivity will persuade more businesses to invest further afield, expanding commercial opportunities nationwide.

According to Moshe Givoni, a senior researcher at the Transport Studies Unit at Oxford University, the economic impact of high-speed rail networks depends on a number of accompanying conditions like local economies' ability to take advantage of new opportunities offered by high-speed rail, complementary government policies, and a long-term political vision. China generally scores high on these measures: the central government clearly has a long-term vision of how the rail network will support economic growth; that vision is complemented by other policies on urbanization and the development of consumer markets; and China's rapidly developing urban economies are nothing if not dynamic. China appears in a good position to take full advantage of a high-speed transport network that connects almost every major city in the country.

Planes, clean trains and automobiles

Energy efficiency and carbon intensity in passenger transport

	Energy use	CO ₂ emissions
Airplane	67	170
Automobile	42	100
Train (high-speed)	32	30
Train (conventional)	20	20
Bus	16	40

Energy use: watt-hours or ml per passenger-km; CO₂ emissions: g/passenger-km

Source: World Bank