



The Economics Of China's High-Speed Rail

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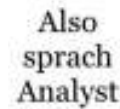
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The huge "accident" of [two high-speed rail trains crashed near Wenzhou](#) is not an accident at all (via [China Geeks](#)) because given the poor operating records, it is hardly inconceivable that something serious might happen some day.

Safety records aside, which is pretty dismal (by the way, the models of the trains can be translated literally into "Concord", which is the same as the Anglo-French super-sonic plane "Concorde", which only had one major accident in its decades of services), I have been arguing here for a number of times that the aggressive push in high-speed rail and infrastructure makes little sense except making the GDP numbers up (and I would speculate that the aggressive push in affordable housing will end up making very little sense except making the GDP numbers up).

Now I have mentioned that the high-speed rail is built on having the [Ministry of Railways taking on enormous debts](#), and the tickets are expensive for most people, which means that the network will most likely be under-utilised, and entire project is not going to make a lot of money. Thus it is not at all inconceivable that these debts will go bad. For weeks and months, we have been hearing news on cutting services and lowering operating speed for a number of high-speed rail routes, including the terrible operation of the Beijing-Shanghai route, of which the trains have failed for a number of times within days of opening.



Image: AlexHe34 vis Wikimedia

In *10 reasons to short China*, I have already pointed out that infrastructure projects, and particularly railroads projects, are famous for their costs overrun and overly optimistic passenger forecasts. I cited the research by Bent Flyvbjerg, one of the researchers with the most comprehensive infrastructure projects data, that:

... average cost overrun for railroad projects amounts to 44.7%, and 84% of the times the rail passenger forecasts were wrong by more than 20%, and 90% of the times the rail passenger forecasts over-estimated traffic.

This is hardly surprising. Politicians selling such plans would always like to present the plan as very cost effective and has enormous benefit, only to realise that their forecasts are mostly all wrong.

Today, reading the document titled “[The Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link Patronage Forecast, Economic Benefit and Operational Viability](#)” submitted to the Legislative Council of Hong Kong is just as puzzling as more than a year ago when the opposition of the high-speed rail in Hong Kong was at its peak. But it gives us a glimpse on the economics of the high-speed rail in China.

First off, here comes the patronage forecasts for the year 2016 for the Hong Kong section:

Table 2 – Daily Cross-boundary Patronage Forecast for 2016

	Low Case	Base Case	High Case
XRL	89,000	99,000	116,400
Through Train	4,400	5,200	6,500
Boundary Train	301,200	315,900	329,400
Cross-boundary Coach	238,800	250,300	256,700
Cross-boundary Ferry	24,600	27,600	36,100
Total	658,000	698,000	745,500

It is not even bother to make any assumption about passengers who fly by planes. And here’s the detail breakdown for high-speed rail passengers:

Table 3 – Patronage Forecast of XRL in 2016

	Low Case	Base Case	High Case
Shuttle service	75,500	84,000	99,900
Shenzhen	59,800	65,400	75,000
Haven	5,000	5,900	7,500
Siob	10,700	12,700	17,200
Long-haul service	13,500	15,000	16,500
Total	89,000	99,000	116,400

Are such forecasts aggressive? I have no idea. But judging from the worse-than-expected passengers numbers in China, it will not be too surprising if these numbers for Hong Kong turn out to be overly optimistic too. But let’s say it is realistic, and we look at the following table:

Table 1 – Patronage forecast and economic benefit of the Hong Kong section of the XRL

Forecast 2-way Daily Patronage in 2016 (Two-way)	99,000
West Kowloon – Shenzhen/Humen/Guangzhou	84,000
West Kowloon – beyond Guangzhou	15,000
Estimated Operational Margin ³ in 2016	34%
Average time saving over 50 years of operation per annum	42 million hours
Discounted economic benefits ⁴ over 50 years (in 2009 prices, mainly in terms of time savings to passengers)	\$87 billion
Economic Internal Rate of Return (EIRR) in real terms	6% ⁴

First off, the Hong Kong segment will cost around HK\$70 billion, and it will be operated entirely underground. The discounted economic benefit as forecasted here is HK\$87 billion, mainly from saving 42 million hours in everyone's life per annum. And the discount rate? The footnote 3 says:

³ Social discount rate at 4% per annum.

Then the footnote 4 says:

⁴ Calculated based on the relevant part of the cost of railway works. It is generally considered viable if EIRR exceeds the social discount rate of 4% adopted in government projects.

Even if we accept its patronage forecasts, one serious question to be asked here is: why the social discount rate is 4%? You are working on a huge infrastructure project that is risky, and involves a lot of people and deployment of enormous amounts of resources and capital, and you will never be sure if it is going to make money anyway.

Now let's look at the supposedly risk-free 30-year US Treasury Bond (which may be no longer risk-free within 12 hours, but let's assume it is still risk-free). The yield of a 30-year Treasury security was around 4.7% during the heated debate on the high-speed rail (now it stands at 4.257%). To be fair, of course, the social discount rate of 4% is probably a real rate of return, not nominal, so direct comparison between the required rate of return for the high-speed rail and the nominal yield of US Treasury securities is not entirely appropriate. But bear in mind that the government's forecast has a 50-year time horizon, and I am not aware of the existence of 50-year US Treasury securities. In any case, I have no idea why 4% is indeed "generally considered" as a rate of return good enough for such project: it certainly does not sound very right to me.

Of course, this only concerns the "quantifiable" benefit. The document also cites loads of indirect benefits, which one can always say that it's bluff.

Linking the National High Speed Rail Network

The value of the Hong Kong section of the XRL is to enhance the connectivity between Hong Kong and the Mainland, strengthening the Hong Kong's position as the international city in the Pearl River Delta region, and enhancing and reinforcing Hong Kong's competitiveness as an international service centre.

...

Induced/Additional Patronage

Making reference to global experience, induced patronage due to the commissioning of high speed rail can be as much as 20% or even 30% of the overall patronage. The induced patronage will also promote the economic activities in the relevant districts.

Table 7 – Patronage Analyses of High Speed Rail in Other Region⁸

Patronage source	Railway projects	East-South Line, Paris - Grande-Vitesse, France	Svevia/Årstadbanan, Sweden	Alta Velocidad Española, Spain	
				Madrid - Barcelona	Madrid - Sevilla
Induced additional patronage		21%	30%	20%	34%
Diverted from road traffic		10%	15%	9%	27%
Diverted from other rail traffic		59%	55%	70%	15%
Diverted from air traffic		10%	-	11%	26%

Some European academic researches point out that the demand for high speed rail services depends on population density. The Hong Kong section of the XRL connects to the high speed rail network in the Mainland. With the

population density of the Mainland cities much higher than that of the European cities, the demand for the XRL Hong Kong section services is beyond doubt from the perspective of transport demand.

In addition, connecting to densely populated cities will induce traffic demand. In 2011, it is estimated that the four cities along the XRL will be densely populated, each with tens of million of residents and floating population. Local academic also points out that patronage induced by the XRL will be higher than that in Europe.

Generally speaking, the competitive advantages of high speed rail service cover the areas within 4-hour journey time, i.e. around 1,000 kilometres in length. Some studies point out that connecting to the Mainland high speed rail network the Hong Kong section of the XRL allows Hong Kong citizens to reach Mainland cities much further away within four hours. Population of at least 60 million will be covered in area within four-hour journey time from the West Kowloon Terminus, which will be the largest coverage in the world. It is possible that the XRL patronage may follow the exponential growth pattern, similar to that of Tōkaidō Shinkansen in Japan.

Market Integration and Mutual Complement with Pearl River Delta Region

The XRL will reduce significantly the travel time and cost between Hong Kong and Mainland cities. More Mainland cities and regions will be embraced in the daily living area of Hong Kong residents. The concept of one-hour living circle of the Pearl River Delta area can be materialized.

...

Creation of Job Opportunities

The XRL will bring in a larger number of visitors and huge business opportunities. In short term, there will be on average 5,500 jobs created during the construction period of the Hong Kong section of the XRL and 11,000 at the peak. Over 1,500 jobs will be created immediately, including more than 1,100 labourers and over 400 clerical and technical/professional staff during the early construction stage of the Hong Kong section of the XRL (estimated to be from December 2009 to June 2010). At the peak of construction activities, there will be more than 11,000 jobs created, with over 9,100 labourers and over 2,400 clerical and technical/professional staff. When the XRL comes into operation, it will provide 10,000 employment opportunities, which include those relating to railway operation, maintenance, station management, catering, retails, boundary control, etc.

Development of Services Industry

Mainland residents can visit Hong Kong to spend money or acquire professional services much faster and more easily, resulting in substantial jobs creation in various sectors, such as consumer goods/services, catering and professional services.

...

Development of Tourism

Stakeholders in tourist industry point out that Mainland visitors will be the major market for further development of the industry. In complementation with the development of the high speed rail system in the Mainland, the XRL will make it much more convenient for visitors along the XRL corridor to come to Hong Kong, which will bring more Mainland visitors to Hong Kong.

At the same time, connecting Hong Kong and its neighbouring cities by the XRL will help them complement each other, facilitate the development of "point-to-point" travel mode. Local or foreign visitors may depart from Hong Kong and go to various Mainland cities along the XRL corridor, materialising "one-trip multi-stops" by the rail link. This will attract more overseas visitors stopping at Hong Kong before heading north, further consolidating Hong Kong's status as the southern gateway of China.

In addition, the XRL terminus will be in proximity to the West Kowloon Cultural District, which will create synergy. It is expected that more visitors, who are fond of international art and cultural performance or exhibition, will come to Hong Kong for art and cultural exchange via the XRL.

According to a rough but conservative estimation, if there are 10% of additional Mainland visitors induced (on top to the current patronage forecast where no induced passengers have been taken into account) with the commissioning of the XRL, there will be an addition of \$3-6 billion expenditure in Hong Kong each year.

Benefits of Re-allocating Transport Resources

As mentioned in para. 33 above, the XRL has its competitive advantages mainly over areas within 4-hour journey time, i.e. around 1,000 kilometres in radius. Aviation services within the same catchment area will inevitably face competition from the XRL. However, at the same time, the airlines will have more opportunities in developing air-railway inter-modal products, which may open up new market segments. In addition, airlines will be able to launch more international long-haul services which are more profitable and strategically important, thereby strengthening Hong Kong's status as an international and regional transport hub.

Environmental Benefits

The Hong Kong section of the XRL runs in tunnel, and hence impact to the environment and the local communities will be minimised. In addition, the high speed rail provides environmentally friendly train services when compared with other cross-boundary transport modes. In the United Kingdom, on a per passenger-kilometre basis, the carbon emission on an Eurostar journey is only about 15% and 25% of that by plane and bus/coach respectively. It also consumes less energy and emits fewer pollutants by a similar magnitude. At the same time, comparing with aeroplanes that emit pollutant in the air and vehicles that travel everywhere on land, the emission of the XRL will be mainly in the power plants, impact of which to the environment is relatively easier to mitigate.

In Hong Kong, if all XRL passengers, i.e. 99,000 daily passengers in 2016, use the cross-boundary coach instead, it is estimated that around 13 tonnes of additional carbon dioxide will be emitted every day or 4,700 tonnes annually, for the 26 km journey of the Hong Kong section alone.

Transport Service of Higher Quality

XRL passengers will enjoy wider and more comfortable travelling environment than air or coach passengers. The trains in motion are also relatively more stable. With telecommunication access on board, XRL passengers can use their mobile phones or hook up onto the Internet as they wish. Apart from travel time savings, XRL passengers can make better use of their time aboard to process their personal and business affairs. As such, the productivity loss due to travelling can be reduced.

This article originally appeared here: [The Economics Of China's High-Speed Rail](#)
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The Water Cooler

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Terry on Jul 25, 5:21 AM said:

High speed rail will not work any better, likely worse, in the US - the only winners will be the unions. Kill the high speed rail projects and save trillions

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Brewskie on Jul 25, 3:19 PM said:

@Terry: It won't cost trillions. The estimated cost of building the entire Interstate Highway System is \$700-some billion in inflation-adjusted dollars.

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Of course then you run into the debate of how to run it - do you go public or private? Typically, high-speed rail systems of other developed nations, while nice and well operated, typically can't manage without life support from tax payers; some have required bailouts (France's SNCF seems to be an exception). Private probably will result in better service, better fiduciary management, but will only come about if the market demands it (which is tough considering the car- and plane-happy US).

But of course roads & bridges themselves are an expensive exercise from taxpayers, too; and to drive, you have to pay car maintenance/repairs, the occasional auto replacement, and higher fuel costs. With six years of flat oil production (note I'm not a peak oil doomer: I'm an adherent to the prolonged plateau/slow decline school of thought on global peak production, which I believe the past six years backs up), we do need to ask ourselves how fuel efficient we wish to be.

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Terry on Jul 25, 5:22 PM said:

@Brewskie: The costs of road infrastructure and maintenance is paid for by vehicle and fuel taxes - the same cannot be said about rail, especially high speed rail.

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Brewskie on Jul 25, 6:55 PM said:

@Terry: They partly pay for it. The federal government still picks up part of the tab.

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As for rail it may be better for private enterprise. Government isn't always the best for rail transit. I remembered while attending college in Madison, WI, politicians were pushing an idiotic light transit system that would extend to the far east side to Middleton, a western suburb; some were even envisioning it going out to a northwest town 20 minutes away.

With the exception of maybe going west to far opposite sides, the project made no sense going to say downtown (which is a 15 minute drive at most no matter where one lived), when one considered he/she would likely drive to a rail stop, park, take the train (which would likely take longer than 20 minutes considering stops), arrive at the stop and then walk to where you needed to go.

But some rail projects do work, even with government operation. Can you imagine NYC without the subway - flaws and all?

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The Goy on Jul 25, 7:19 AM said:

anyone notice any private companies that want to put in high speed rail without gov't assistance? No, hmmm can't figure out why.

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heyho56 on Jul 25, 9:20 AM said:

governments have to put in efforts to invest in high speed trains now. now is the moment to prepare for post-oil era. how do you travel when oil is so expensive that filling the car tank has become a real luxury ? (considering it is not already the case). for that, western europe is pretty well prepared, and in france the trains/metros/trams network is for sure one of the best. and so are japan and south korea.

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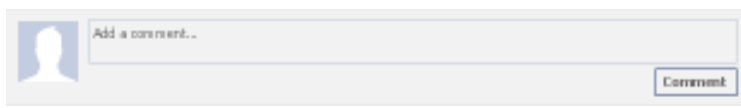
Dan on Jul 25, 10:59 AM said:

High-speed rail is a losing proposition, it's just a debt hole. Any place they've done it debt follows (Europe, Japan, China...) I don't think high-speed rail is the future at all, certainly not in this country. We have to come up with something even better at half the cost. That's what true free-market capitalism does.

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