

Discussion of Infrastructure and Urban Development: Evidence from Chinese Cities

by David Levinson

August 27, 2012

"History doesn't repeat itself, but it rhymes" - attributed to Mark Twain.

The growth of infrastructure in China is the investment story of the early 21st Century. Yan Song's paper documents much of what is happening. This plot underlying this story has played out previously in other developing countries, including the United States in the 19th and 20th centuries, and the United Kingdom in the 18th and 19th centuries. Rapid growth was seen in the Railroads during the 19th century, following a familiar life-cycle pattern, as illustrated in Figure 1. One of the key features of many life-cycle processes is over-shoot. Shortly after peaking in 1920, US railway mileage began a long inexorable decline, a process to date repeated with all technologies after maturity and when some better technology comes along.

China is in the midst of riding what we call "The Magic Bullet" (Garrison and Levinson 2006). The "Magic Bullet" (shown in Figure 2) describes the feedback between economies of scale, service quality, demand and cost drives the growth of systems.

Economies of scale, the property that average costs decrease as throughput (satisfied demand) increases, are found in systems like railways in their growth stage. While some of the economies may be kept as profits, in general, during the growth phase, the economies are reinvested and returned to users either as price reductions or service quality improvements as investors seek future profits. On a passenger rail link, for example, the more the traffic, the less the cost of movement (due to more frequent services and thus lower schedule delay) and the better the service, at least until congestion sets in.

While the early railroads in the 19th century had to discover this process, China is in a position of not having to invent the railroad, but instead can intelligently emulate, deploying a well-understood technology across an under-developed landscape. This spatial diffusion process should be expected to follow the traditional S-shaped life-cycle curve, as the best links are built first, and links continue to be added so long as the benefits outweigh the costs. By developing later, China has the advantage of being able to deploy better technologies (e.g. high-speed rail) which the US missed in its first round of deployment and is only now thinking about building.

Interestingly, the last decade has seen a lower share of self-financing than previous, and more coming from government budgets and borrowing. Self-financing was used primarily for the US interstate highway system (via the motor fuel tax), but borrowing was de rigueur for railways, which at first didn't have enough revenue to pay for itself.

Later many of the investors were paid back (though many others did not, as most US railways went through bankruptcy at one point or another, wiping out investors).

The deployment of infrastructure mirrors and reinforces the growth of Chinese cities. Rapid urbanization enabled by economic expansion and the differential rewards for urban living is resulting in the transformation of cities and the nearby countryside into modern developments. Clearly there is some concern about spatial equity in China, as the paper reports significant investments in rural areas despite the greater urban growth rates.

Song documents the fascinating explosion of Shanghai. We have seen rapid urbanization before. As US places became connected to the national and global system of cities, and new areas could be developed, growth was profound. Figures 3-6 show the transformation of growth in Minneapolis, Minnesota from 1865-1891. The Minneapolis-St. Paul metropolitan area (including the City of St. Paul) peaked at 9th largest in the US in the 1890 Census. (The City of Minneapolis was the 15th largest in the US at its 1930 peak). The scale of course differs in China, with Shanghai (at 13.5 million in 2009) much larger than greater Minneapolis, at 305,000 in 1890 (or 3.2 million today). While Shanghai is building a subway network to serve its core, like large cities before it. This paper corroborates that infrastructure drives development, it is not clear if development also leads infrastructure from this analysis, though one suspects it is true. Minneapolis and St. Paul saw land growth driven by streetcars in the late 19th century (Xie and Levinson 2010). In the Twin Cities case, streetcars led land development. In other cases, like London, there is mutual causation (Levinson 2008), and in New York, the subway tended to chase population (King 2011).

The life-cycle discussion is central in any international comparisons. The US, Japan, and Europe are mature, and have well-developed infrastructure now, so do not demand the same level of investment as fast growing countries like China with proportionally less infrastructure. That China is investing rapidly, and presumably sees returns, does not imply the US or Europe should do likewise. China should heed the experiences of those that went before and learn from them.

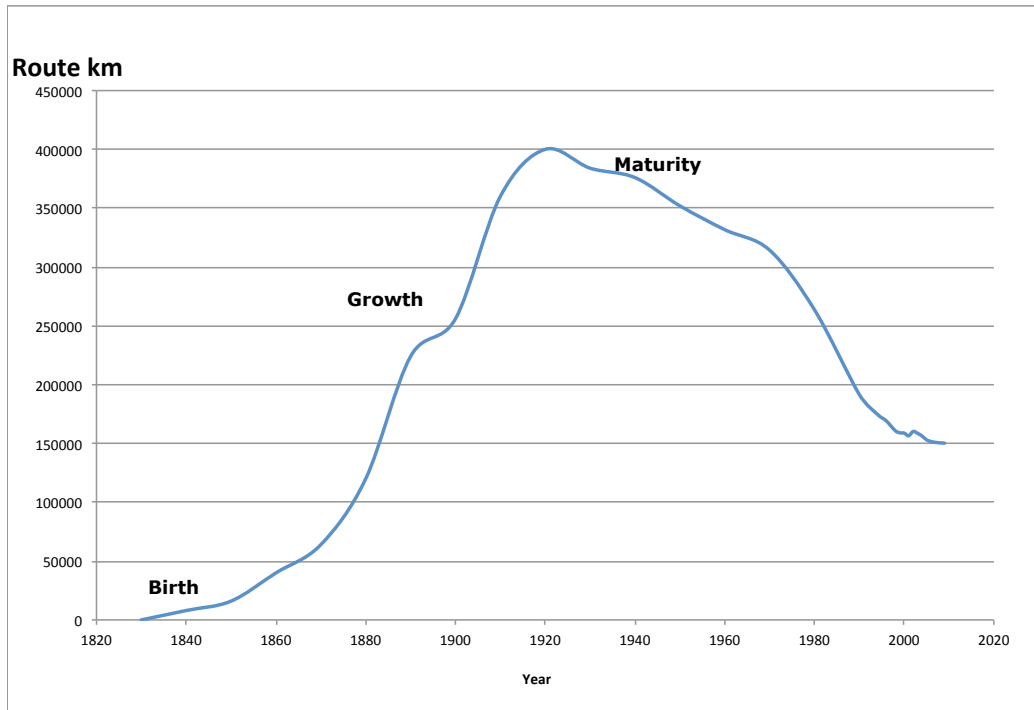


Figure 7.4

Figure 1: Life-cycle of US Railroads

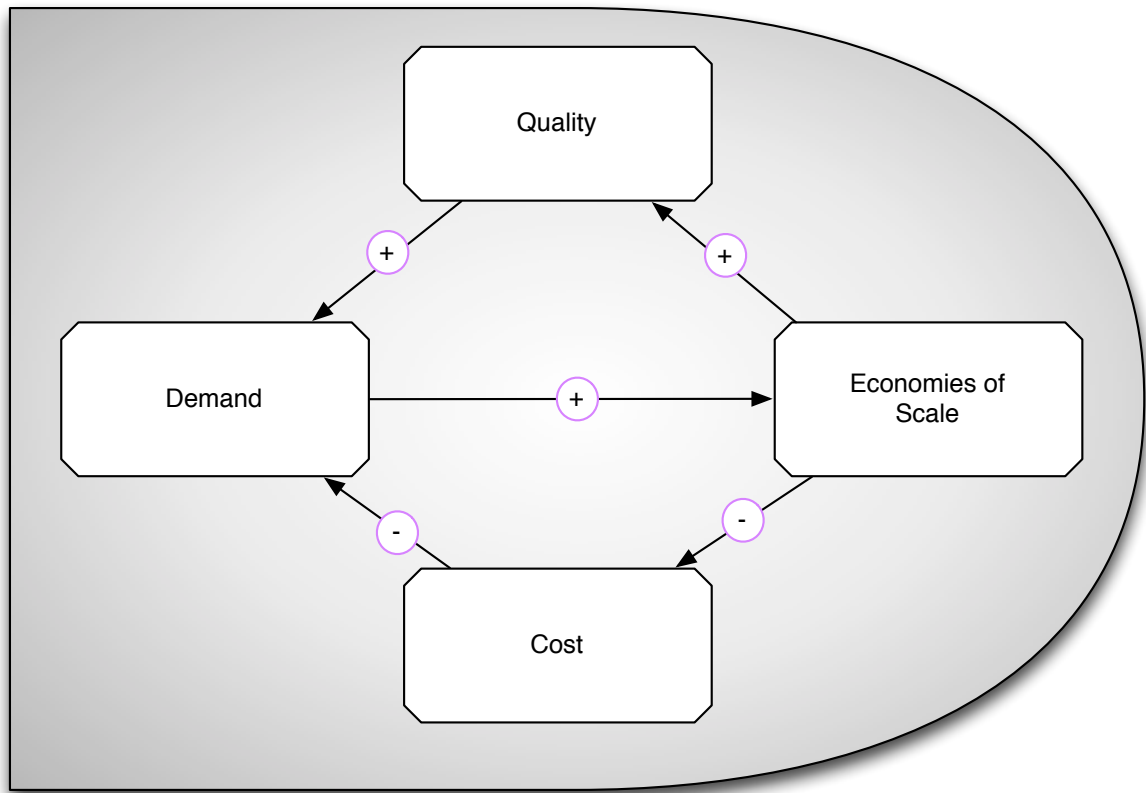


Figure 2: The Magic Bullet

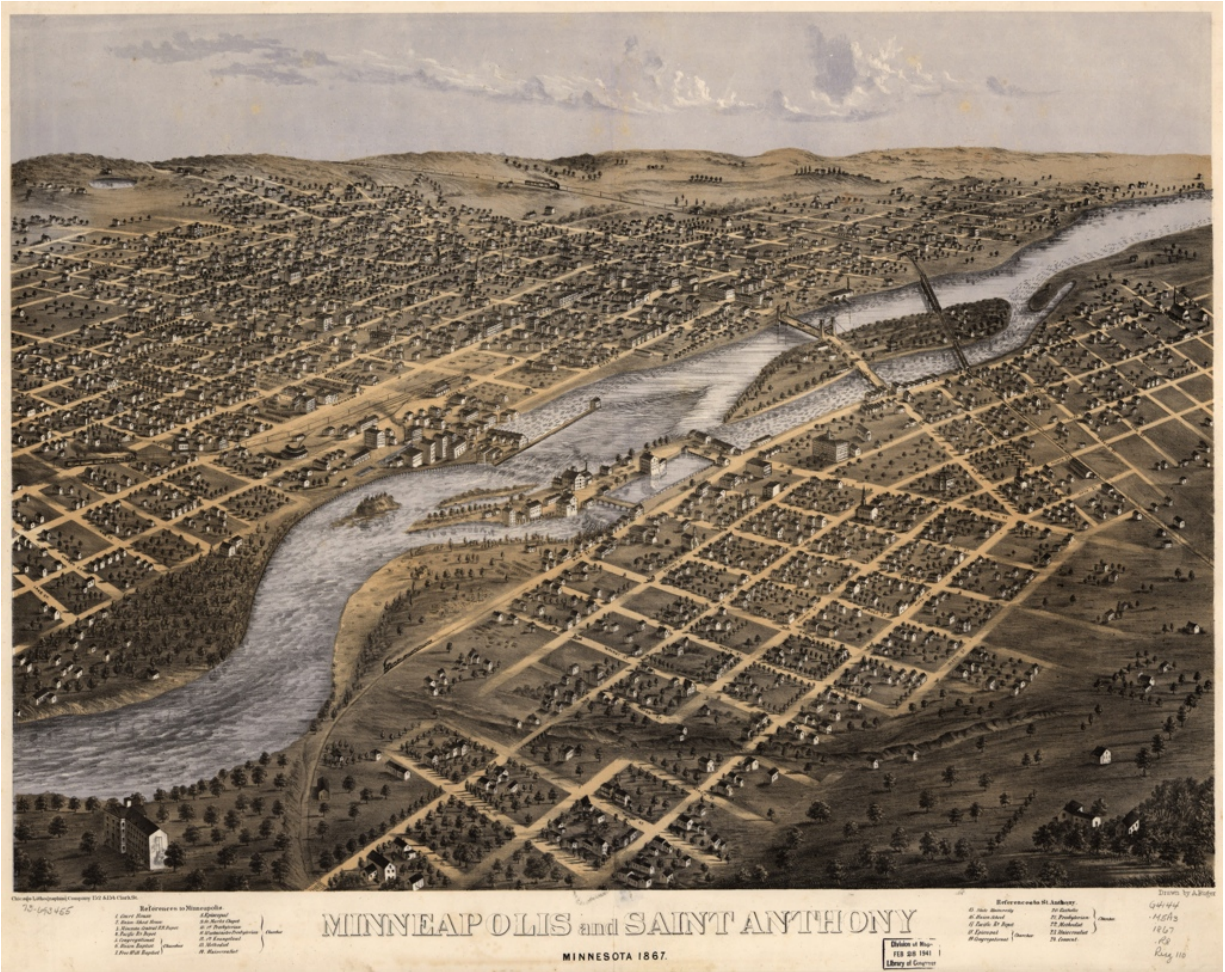


Figure 3: Bird's Eye View of Minneapolis (1865)



Figure 4: Bird's Eye View of Minneapolis (1870)



Figure 5: Bird's Eye View of Minneapolis (1885)

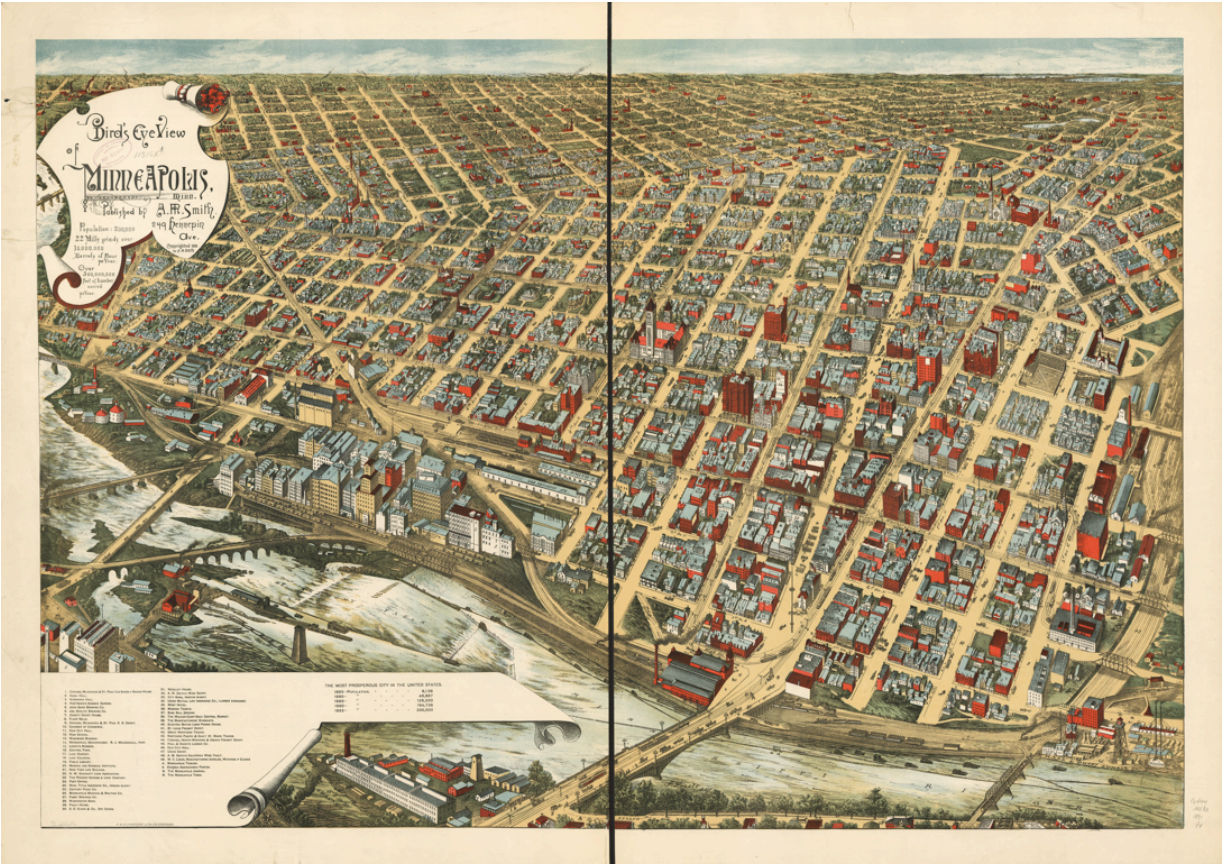


Figure 6: Bird's Eye View of Minneapolis (1891)

REFERENCES

@book {garrison2006transportation,
title={The transportation experience: policy, planning, and deployment},
author={Garrison, W.L. and Levinson, D.M.},
year={2006},
publisher={Oxford University Press, USA}
}

@article {king2011developing,
title={Developing densely: Estimating the effect of subway growth on New York City land uses},
author={King, D.},
journal={Journal of Transport and Land Use},
volume={4},
number={2},
year={2011}
}


```
@article{levinson2008density,  
  title={Density and dispersion: the co-development of land use and rail in London},  
  author={Levinson, D.},  
  journal={Journal of Economic Geography},  
  volume={8},  
  number={1},  
  pages={55--77},  
  year={2008},  
  publisher={Oxford Univ Press}  
}
```

```
@article{xie2010streetcars,  
  title={How streetcars shaped suburbanization: a Granger causality analysis of land use and transit in the Twin Cities},  
  author={Xie, F. and Levinson, D.},  
  journal={Journal of Economic Geography},  
  volume={10},  
  number={3},  
  pages={453--470},  
  year={2010},  
  publisher={Oxford Univ Press}  
}
```