Why is infrastructure important?

Please vote!

Transport infrastructure and regional economic growth: evidence from China (Hong et. al. 2001)

- **Increase demand** of goods and services
- Reduce **travel time** and save **costs**
- Increase the **accessibility** to distant markets and raw material
- Lower **inventories** and cut **storage** and maintenance costs
- Attract **foreign direct investment** and stimulate economic agglomeration

Quantity and quality measurement of transport infrastructure between 1999-2008 (Hong et. al. 2011)

Table 1 Measurement of transportation infrastructure using factor analysis

Constructs/measured variables	Mean	Standard deviation	Factor loading	% of variance	Internal consistency
Land transportation					
Density of railway (= railway length/land area)	0.016	0.015	0.878	74.277	0.827
Density of road (= roadway length/land area)	0.427	0.325	0.854		
Quality of road (= highway length/total roadway length)	0.016	0.013	0.853		
Air transportation					
Area of airport lounge	56770.719	73357.425	0.865	68.691	0.845
Length of runway	3306.129	374.522	0.729		
PCN	67.597	17.516	0.908		
Density of airport(= the number of airports/ land area in a province)	0.037	0.055	0.802		
Water transportation					
Sum of number of berth/the distance to seaport	1.120	3.684	0.940	88.323	N/A
Sum of number of deep-berth/the distance to seaport	0.330	0.827	0.940		

Data source: China Statistical Yearbooks, 1999–2008 and Statistical Data on Civil Aviation of China, 1999–2008

Regional difference in 2007

Table 2 Development of transport infrastructure across regions in 2007

	Land transport	Air transport	Water transport
Eastern China	0.849	0.773	0.731
Central China	−0.114	−0.454	−0.274
Western China	−0.702	−0.406	−0.488

The measures for land, air and water transport infrastructure are based on calculations in Table 1. The values are standardized and range between −1 and 1. A positive number indicates the score is greater than the mean value, while a negative number implies the reverse

The factor analysis in Table 1 is based on 10-year data during the study period. Table 2 only reports the results in 2007. Therefore, the values for each type of transport infrastructure do not sum up to 0 in Table 2

Measurement of the impact

$$g_{it} = a_{it} + \alpha \ln(q_{i,t-1}) + \beta k_{it} + \gamma l_{it} + \phi h_{it} + \tau t_{it} + \varepsilon_{it} \quad (1)$$

where g represents the annual growth rate of real GDP per capita; q represents GDP per capita; k, l and h denote physical capital, labor force and labor quality respectively; t is infrastructure endowment in the region; ε is the error term, and $a, \alpha, \beta, \gamma, \phi, \tau$ are coefficients to be estimated.

Table 5 Estimation results

	Pooled OLS (1)	Random effect (2)	Fixed effect (3)	Fixed effect, 2SLS (4)	Fixed effect, 2SLS (5)
Constant	9.701*** (26.70)	9.733*** (21.94)	7.727*** (7.05)	8.223*** (6.14)	5.995*** (3.91)
Per capita GDP (−1)	−0.00007 (−1.24)	−0.00015*** (−3.35)	−0.00038*** (−6.36)	−0.00044*** (−4.74)	−0.00006 (−0.46)
Per capita investment	17.383*** (7.91)	18.399*** (12.23)	21.117*** (11.15)	22.099**** (7.05)	18.722*** (5.91)
Population density	−17.654*** (−3.56)	−26.499*** (−4.35)	21.359 (0.68)	13.790 (0.26)	−9.974 (−0.18)
Labor quality	−26.696*** (−5.81)	−7.807 (−1.21)	32.455*** (3.88)	35.016*** (3.37)	29.829*** (3.13)
Land transport	0.554*** (2.65)	0.938*** (3.68)	1.331*** (3.92)	1.456*** (2.64)	2.757*** (4.02)
Air transport	−0.427** (2.40)	−0.287 (−1.17)	0.092 (0.28)	1.846 (0.88)	1.425 (0.72)
Water transport	0.184*** (1.42)	0.318* (1.74)	0.615*** (3.01)	0.938*** (4.12)	−9.015** (−2.48)
Square of land transport					−1.038*** (−5.34)
Square of air transport					−0.289 (−0.65)
Square of water transport					1.234** (2.56)
Hausman test		30.40***			
No. of observations	310	310	310	279	279
R-square	0.580	0.675	0.782	0.698	0.669
Hansen J-statistic of overidentifying restriction (*p*-value)				2.851 (0.091)	1.015 (0.314)

(The abbreviation 2SLS indicates two-stage least-squares. Instruments are one-year lagged values of land, air and water infrastructure, one and two-year lagged values of real per capita GDP, and other non-transport variables in Eq. 1

*, **, *** Denote significance at the 10, 5 and 1% levels, respectively. *t*-statistics are in parentheses. The estimated standard deviations have been corrected using a White matrix

$$g_{it} = a_{it} + \alpha \ln(q_{i,t-1}) + \beta k_{it} + \gamma l_{it} + \phi h_{it} + \tau t_{it} + \varepsilon_{it}$$

Land and water transport contributes significantly to regional economic growth, while airway transport has insignificant impact

The square of the transport infrastructure variables examine the nature of returns to scale of transport infrastructure.

The *** & -ve coefficient of the square of land transport=its effect is inversely related to its prior level.

The ** & +ve coefficient of the square of water transport and -ve coefficient of water transport=the relationship of water transport infrastructure & economic growth is U-shaped.

i.e. Land transport infrastructure contributed more to economic growth in provinces with poor land transport conditions, water infrastructure contributed +ve only after the scale exceeded a threshold level.

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Investment incentives (Bai and Qian 2010)

- Infrastructure may yield significant social returns but this does not guarantee that investors of infrastructure projects can get sufficient private return

- How can one provide incentives for private investment, as well as for public investment?

- What can you tell from the table below:

Investment Incentives

Table 2
Investment in fixed assets in urban area by jurisdiction of management and registration status: production and supply of electric power and heat power (unit: billion yuan).

Year	Total	By jurisdiction		By registration status			By registration status		
		Central	Local	Domestic	HK, Macao, Taiwan	Foreign	State	Collective	Private
2004	485.4	169.9	315.5	446.3	23.8	15.4	392.4	6.3	8.7
2005	650.3	219.4	430.9	601.6	31.3	17.4	507.7	6	12
2006	727.4	266.2	461.2	682.2	27.4	17.8	571.7	42.4	80.3

Sources: China Statistical Yearbook 2005–2007 (NBS, various years).

Table 3
Source of funds of investment in urban area by sector: production and supply of electric power and heat power (unit = billion yuan).

Year	Total	By sources of funds				
		State budget	Domestic loans	Foreign investment	Self-raised funds	Others
2004	499.8	19.2	222.2	18	206.7	33.6
2005	643.7	25.6	296.7	13.6	269.7	38.1
2006	729	31.4	338.7	8.1	304.6	46.3

Sources: China Statistical Yearbook 2005–2007 (NBS, various years).

Investment Incentives (continued)

- **Extra-budgetary funds** was encouraged
- **Separation** of government and business function
- Introduce **competition** by breaking up the National Electric Power Corporation and among localities
- Market oriented **commodity** under the control of State-owned Asset Supervision and Administration Commission
- Considerable **autonomy** at provincial branches of the grid companies with collectively owned sister company engaging the side-line and related businesses
- Lead to **income inequality** and **over-investment**

Electricity (continued)

- Before 1978, **highly centralized** and under rigid state plan. No separation of government and business functions
- Despite of the high growth rates, electricity shortage was a severe problem due to **misallocation**
- Between 1978 and 2002, state plan was loosened. Government and business functions began to separate. **Competition was limited**
- 1985, investment in electricity generation from outside of the state budget was allowed. **Dual track system** emerged.
- 1987, provincial **electric power corporation** was set up parallel to the government bureau of electricity industry. **Market was segmented**

Electricity (continued)

- 1997 the **National Electric Power Corporation** was established and lead to surplus of electricity
- 1998 **Ministry of Electricity Industry** was abolished and government functions was taken up by the State Economic and Trade Commission and made the wrong decision to suspend electricity generation for 3 years.
- 2002 **separate** electricity generation from its transmission and distribution as well as other businesses
- The **number of players has increased**: 2 monopolistic transmission and distribution cos., 5 generation cos,., 4 engineering and construction cos,. but the state still maintains a dominant position

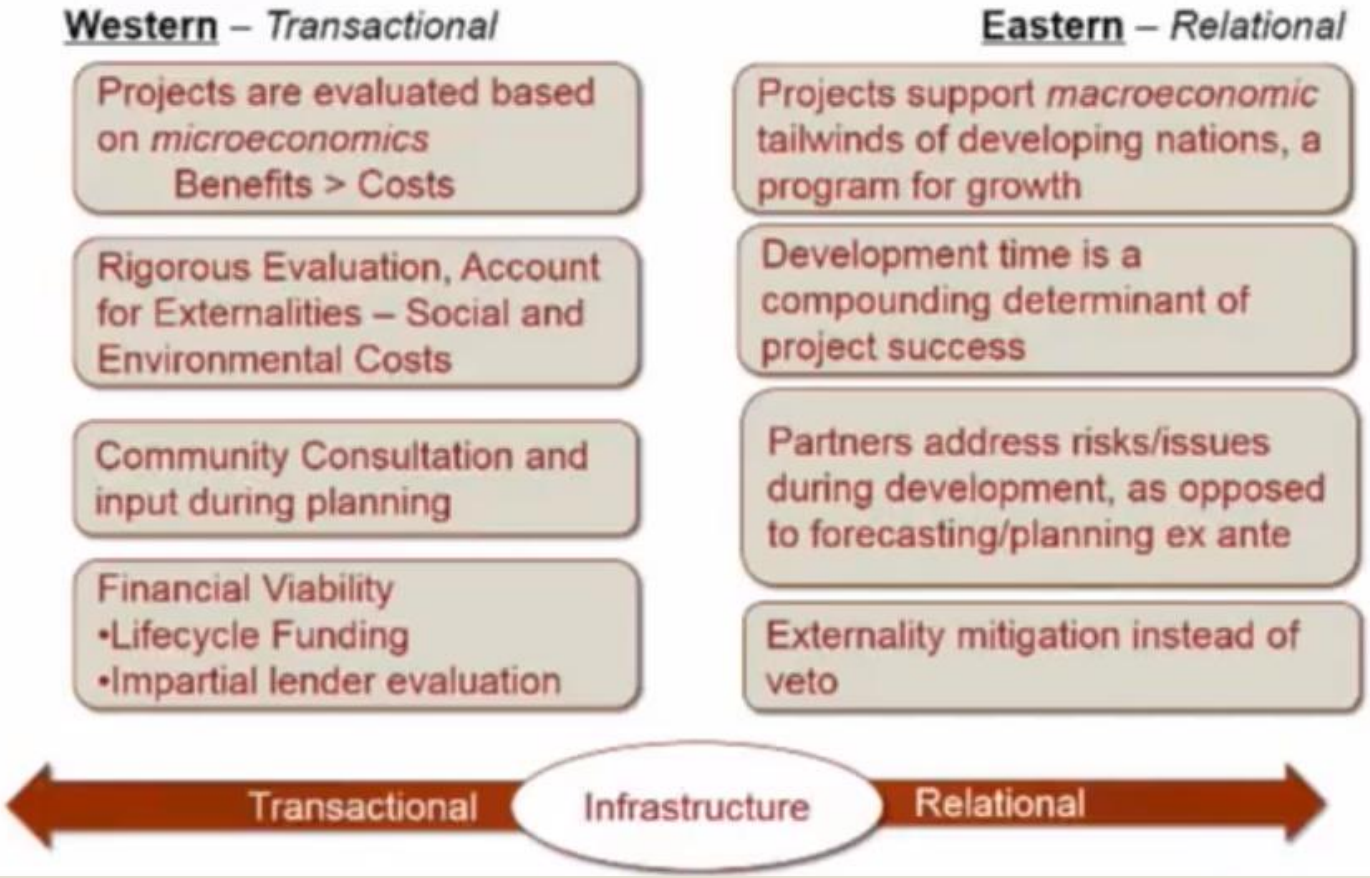
China's infrastructure investment as a development strategy (Fukuyama 2018)

- "No country has ever gotten rich by just investing in public health…Infrastructure is desperately needed—people want roads, electricity and this is not being met by Western agencies"

- Chinese drivers:
  - authoritarian advantage
  - geopolitical positioning
  - Over-productivity

- How these decisions and tradeoffs are being made

Cultural Approaches to Infrastructure Development



Source: Constructing a New Global Order
Western and Chinese Infrastructure Development Abroad
https://www.csis.org/events/western-and-chinese-infrastructure-development-abroad

Literature review – key factors

 Relational vs. transactional paradigms	Economic exchanges driven by relational and cultural norms versus viability across microeconomic, social, and environmental costs *(Dore, 1983; Zukin and Dimaggio, 1990; Chan, 2010)*
 Obsolescing bargain	Once firms have invested in fixed capital, governments can renege on original commitments *(Vernon, 1971)*
 Optimism bias	Infrastructure cost overruns, and demand forecasts fail to materialize; become a draft on the economy *(Ansar, Flyvbjerg, et al. 2016)*
 Transparency and comparability	Need for more transparency and information sharing. Differing categories of official finance bring up issues of comparability *(Dollar, 2016; Bräutigam, 2012)*
 Compliance and safeguards	Concern over varying standard of environmental and social safeguards and compliance. Import/match local requirements *(Dollar, 2016; Foster et al. 2009)*

Source: Constructing a New Global Order
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https://gps.ucsd.edu/news-events/news/chinas-infrastructure-investment-as-a-development-strategy.html (22:25-52:44)