2011 Indiana Construction Industry Conference

Dr. Kevin Christ, Ph.D., Associate Professor of Economics, Rose-Hulman Institute of Technology

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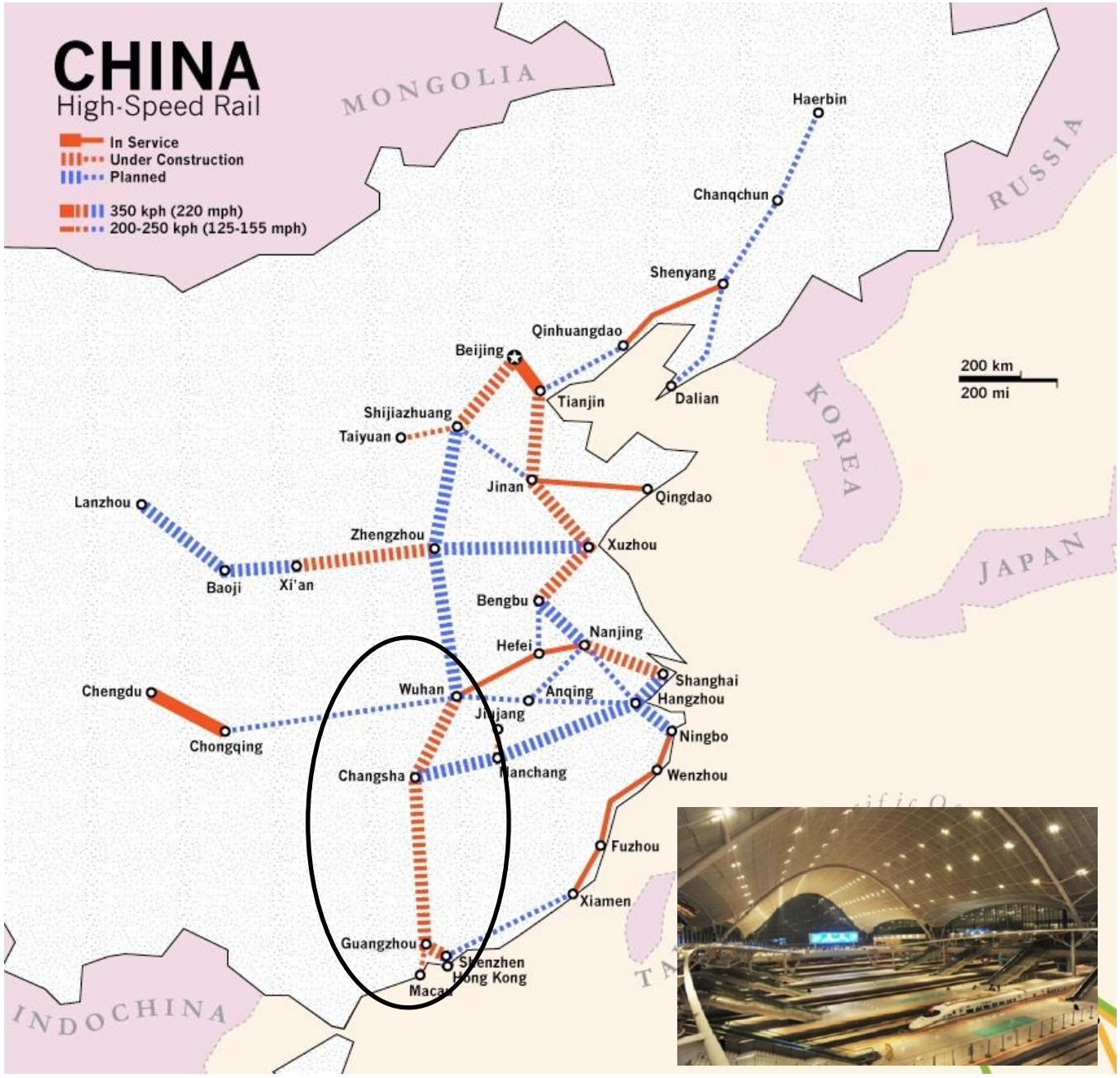
If You Build It …

1. What difference will it make?
   - Is our Infrastructure "adequate"?
   - Does infrastructure spending have measurable effects on overall economic performance?
2. Can we afford it?
3. Will it solve our present difficulties?

Crazy About Infrastructure

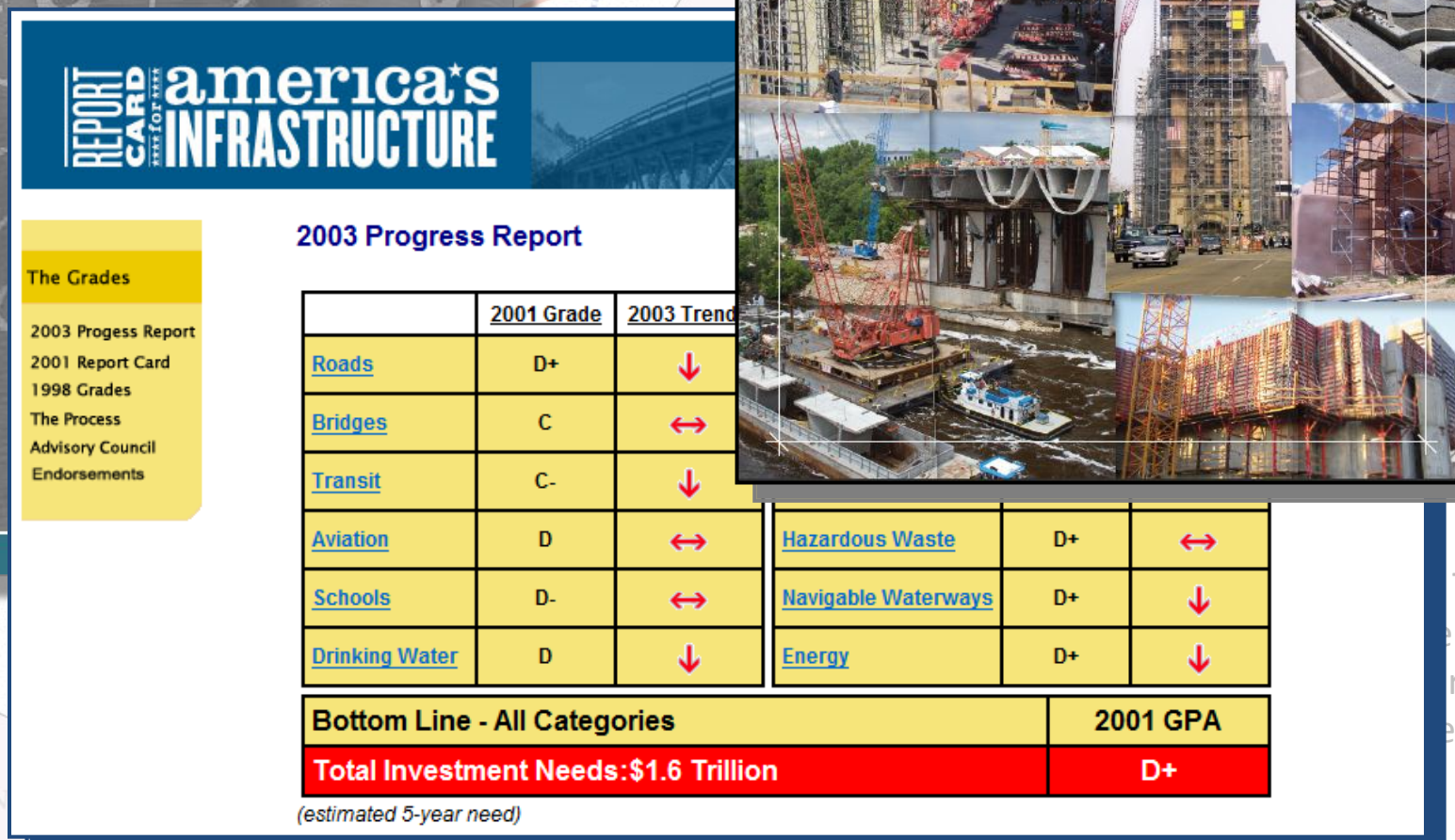


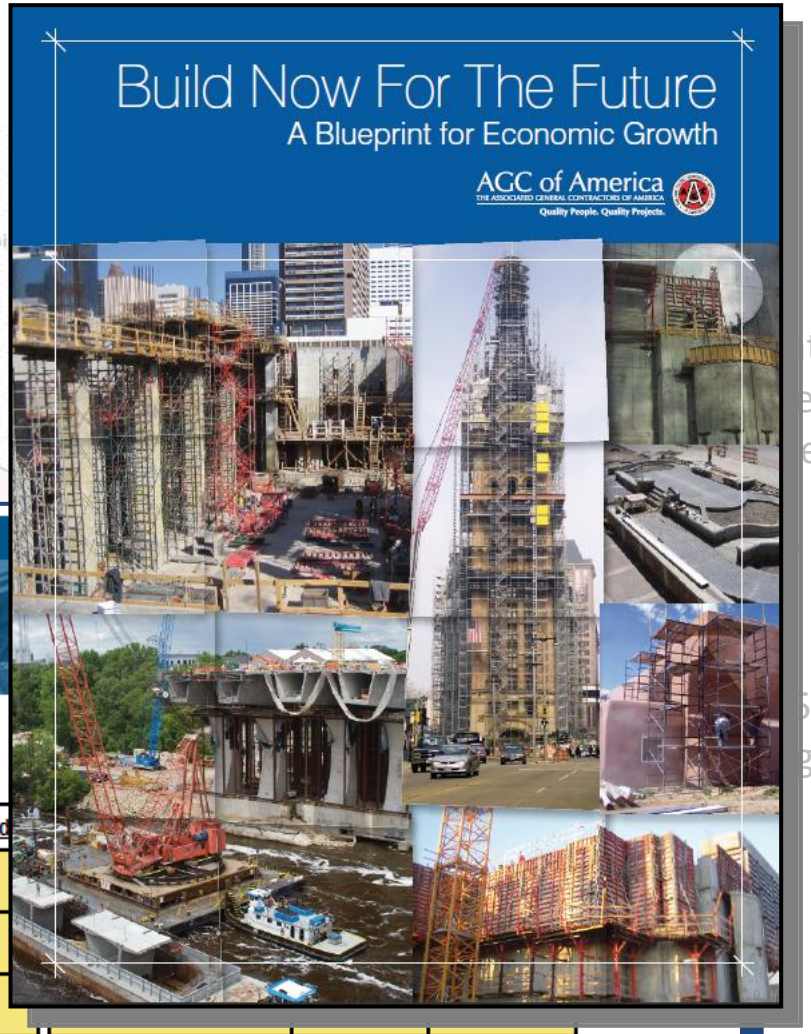
December 26, 2009:
The fastest rail link in the world was launched, connecting the cities of Guangzhou and Wuhan at the speed of 350 kilometers an hour, reducing the time required for the 1,069-kilometer journey to only three hours.

The project began in 2005 with the aim of expanding the high-speed network between Guangzhou and Beijing.

Beijing has been quite ambitious with the rail development program. The authorities are very keen on increasing the national rail network from the present 86,000 kilometers to 120,000 kilometers.

Crazy About Infrastructure





Infrastructure as an Economic Input

Economic Inputs

Economic Outputs

$$$

~ $250 billion hours of labor

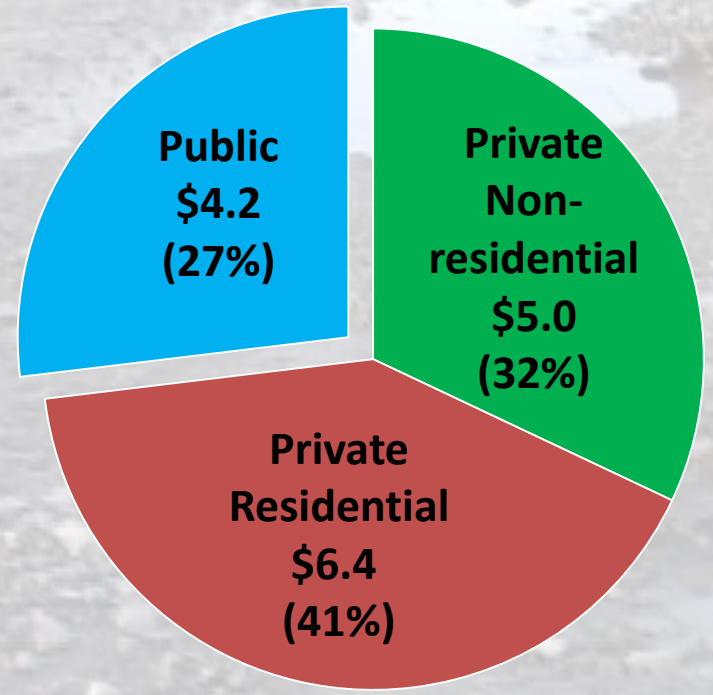
~ $41 trillion of "capital"

~ $13.2 trillion of goods & services

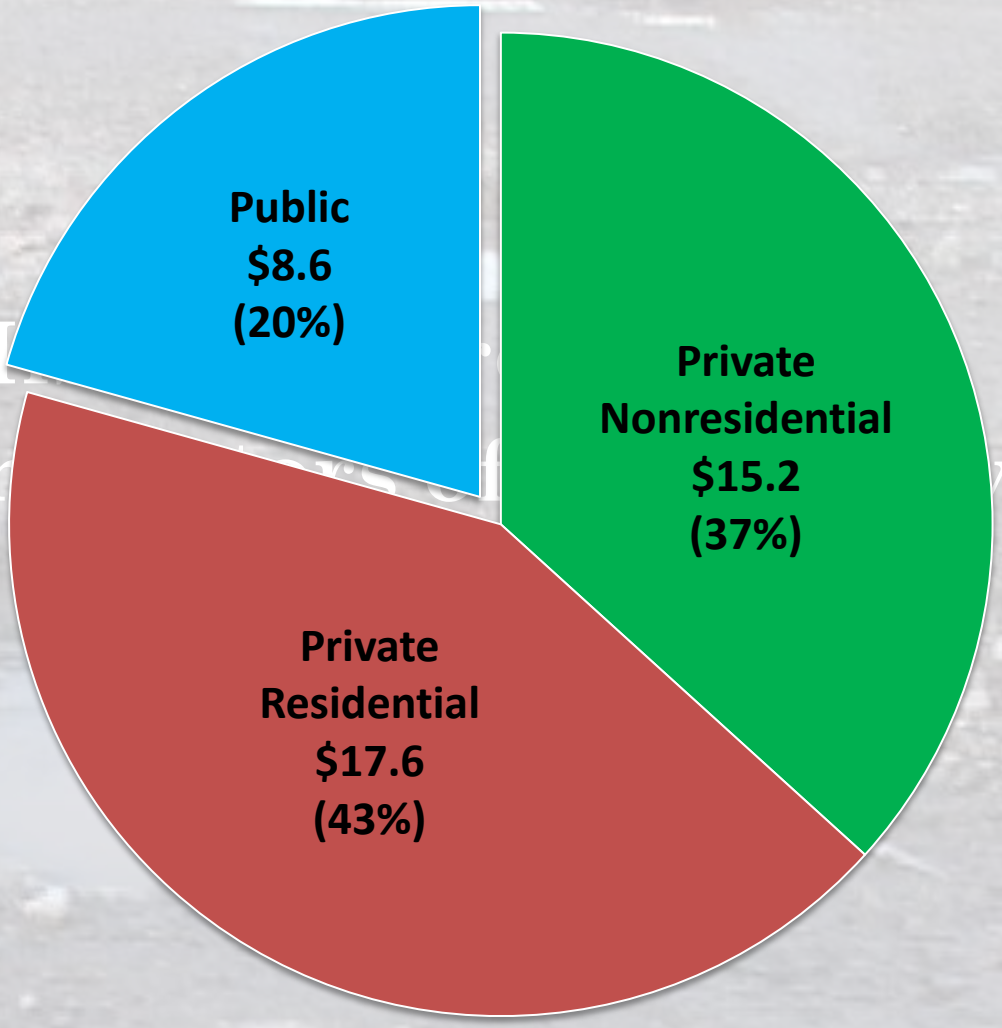
Some Basic Facts About Infrastructure Capital

U.S. Aggregate Capital Stock (Fixed Assets)

1970 Total Estimate: $15.6 trillion



2009 Total Estimate: $41.4 trillion



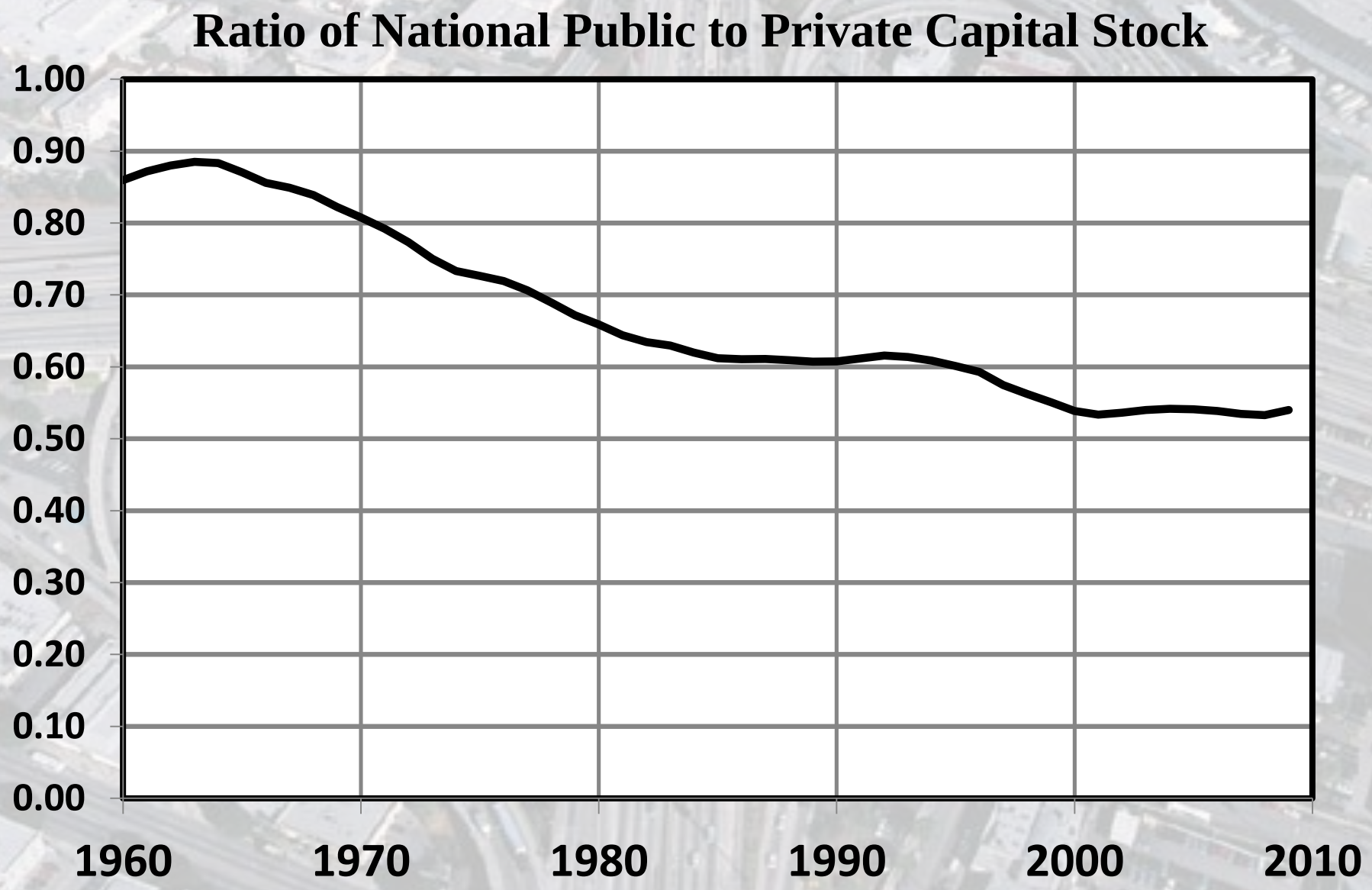
Source: Bureau of Economic Analysis Fixed Asset Tables 1.1 and 1.2, Chained 2005 dollars.

Is Our Infrastructure "Adequate"?

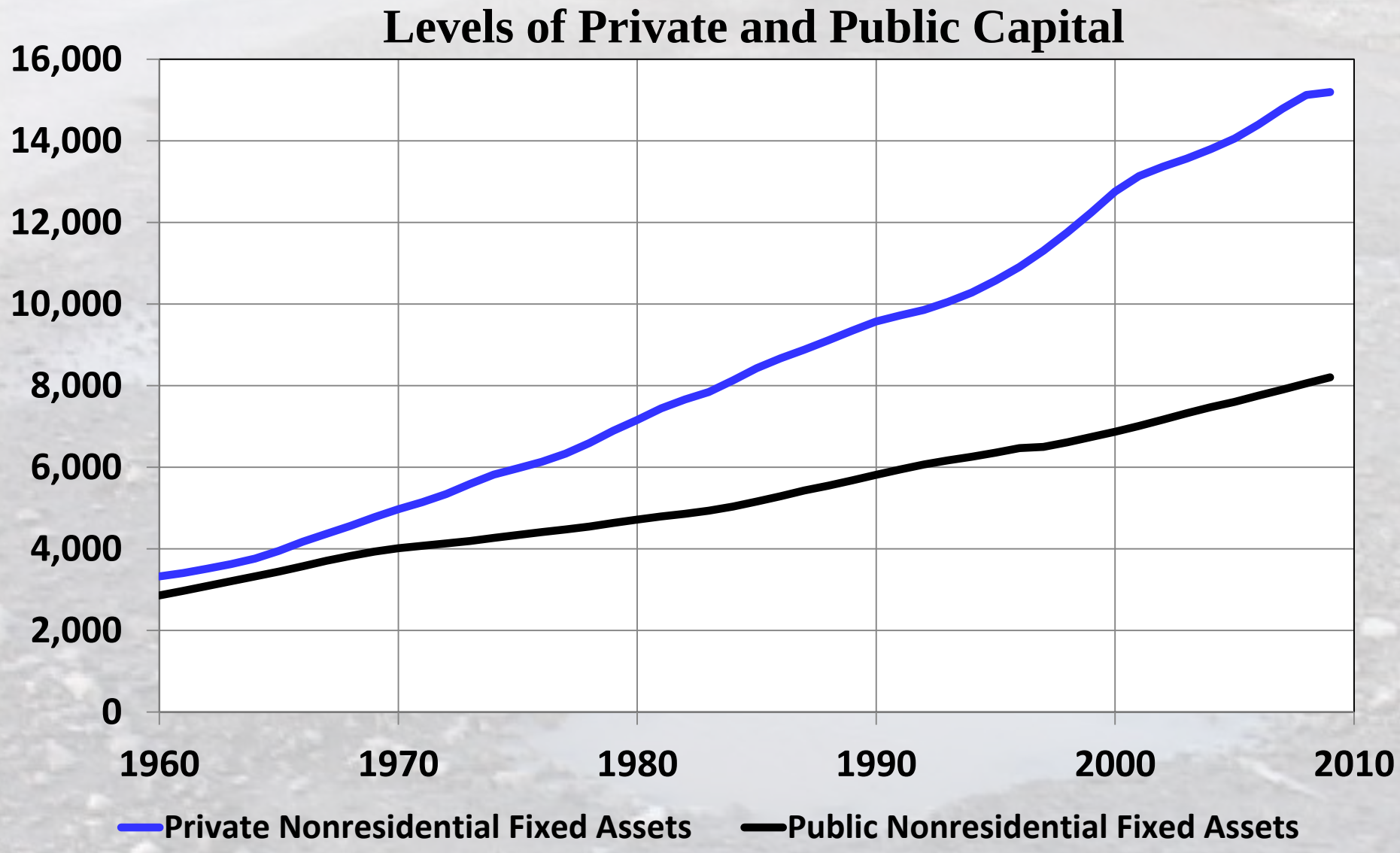
A surprisingly difficult question to answer …

Historical trends
Indicators of Optimality

Some Basic Facts About Infrastructure Capital

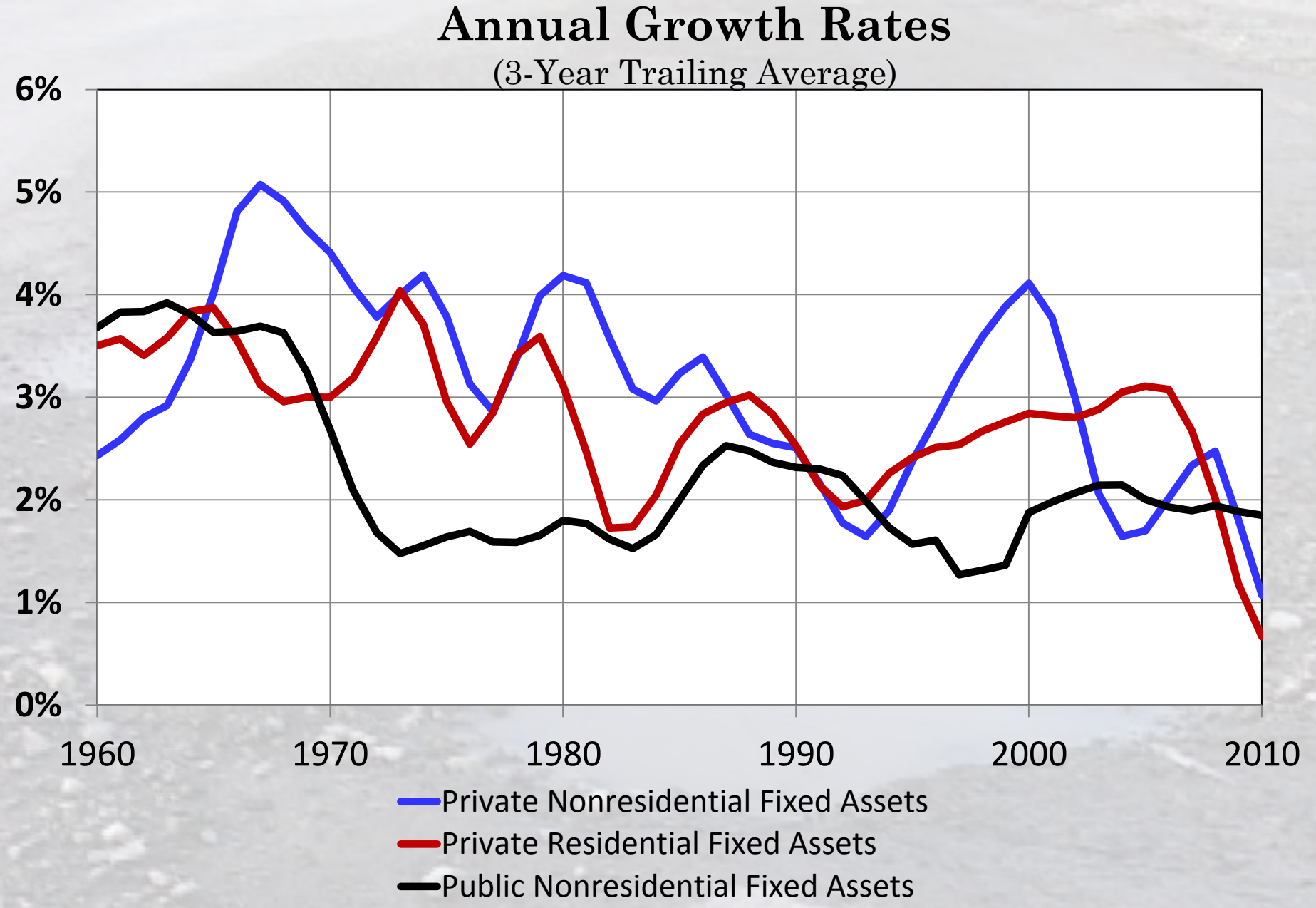


Some Basic Facts About Infrastructure Capital



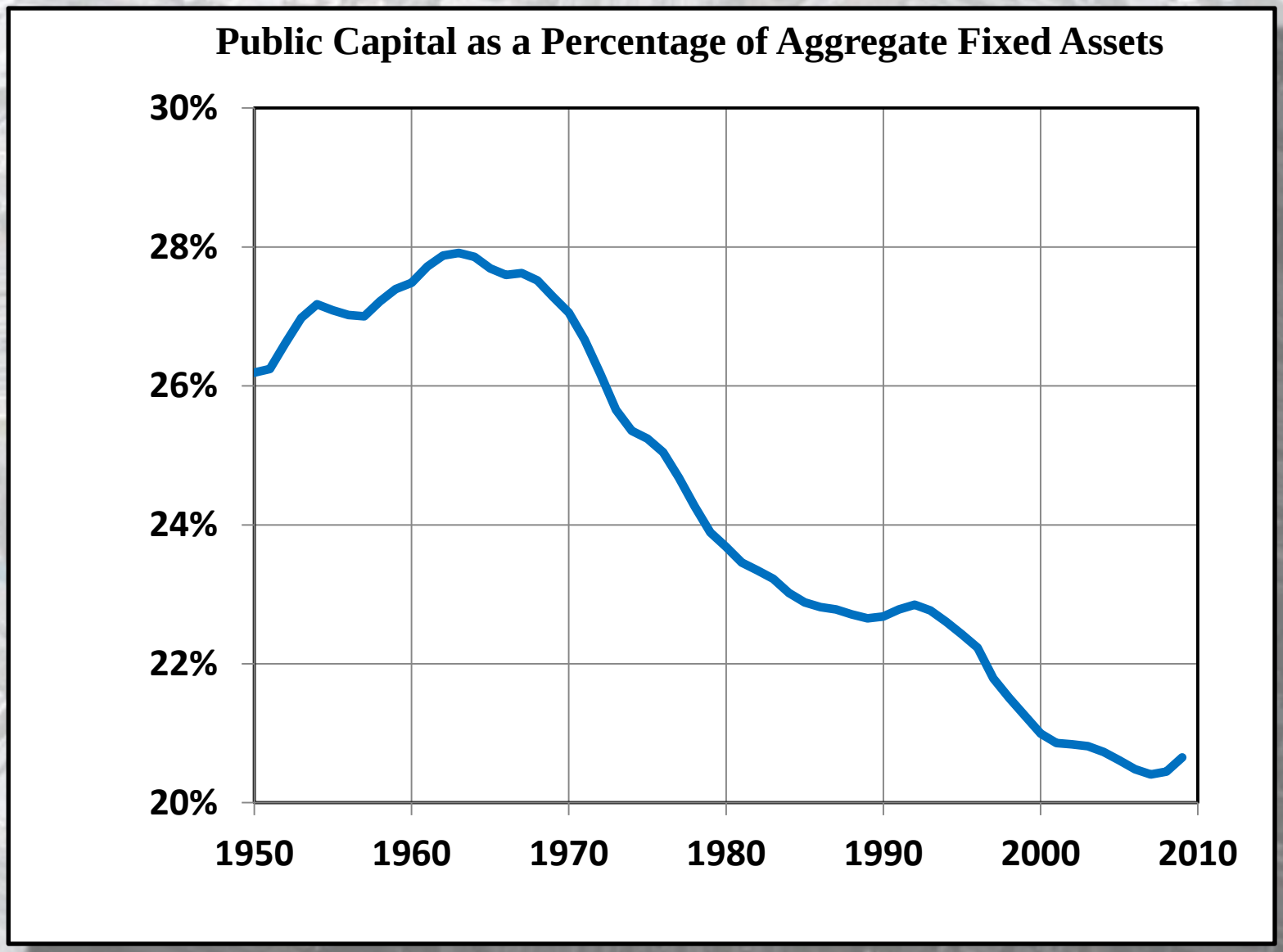
Source: Bureau of Economic Analysis Fixed Asset Tables 1.1 and 1.2, Chained 2005 dollars.

Some Basic Facts About Infrastructure Capital



Source: Bureau of Economic Analysis Fixed Asset Tables 1.1 and 1.2, Chained 2005 dollars.

Some Basic Facts About Infrastructure Capital



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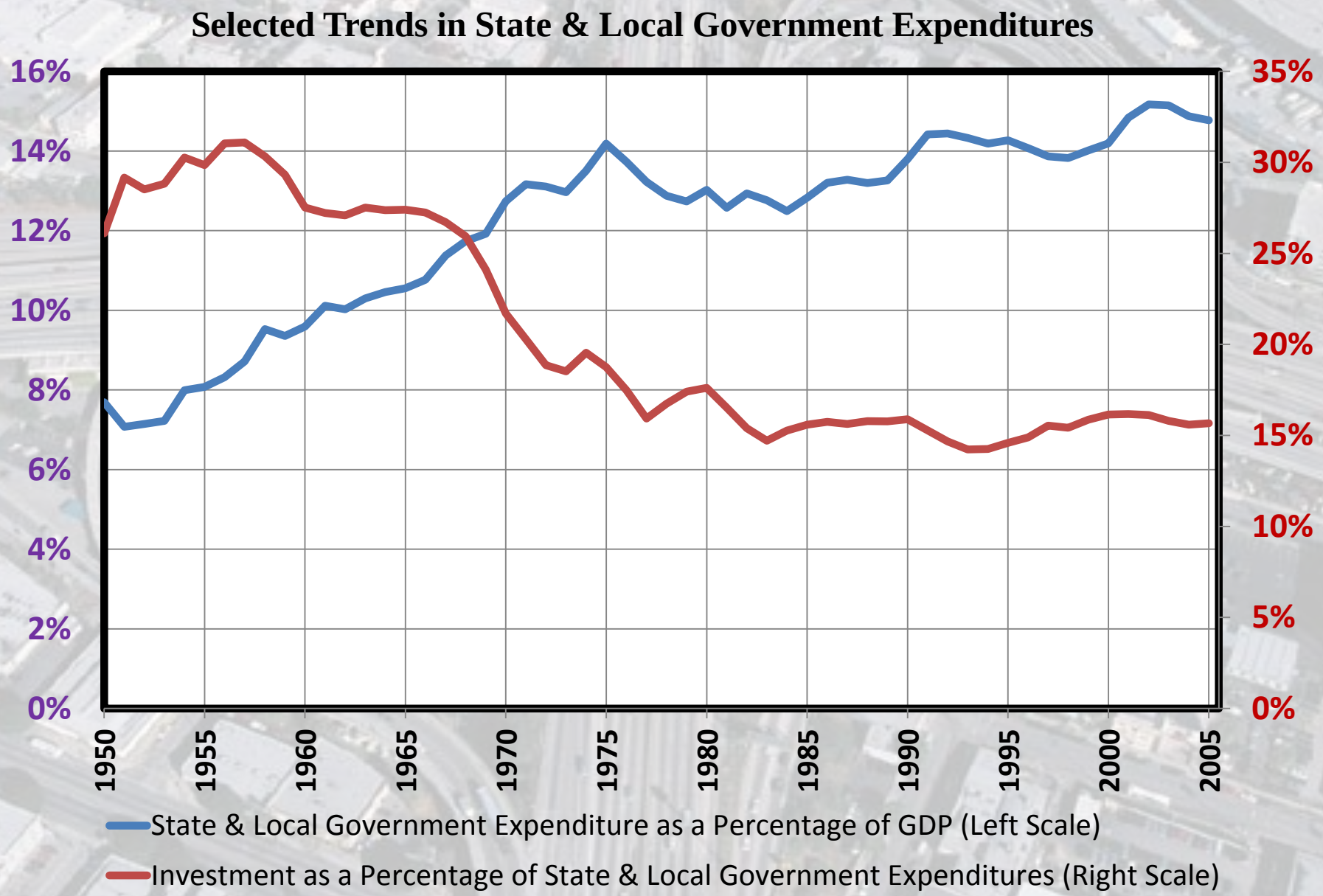
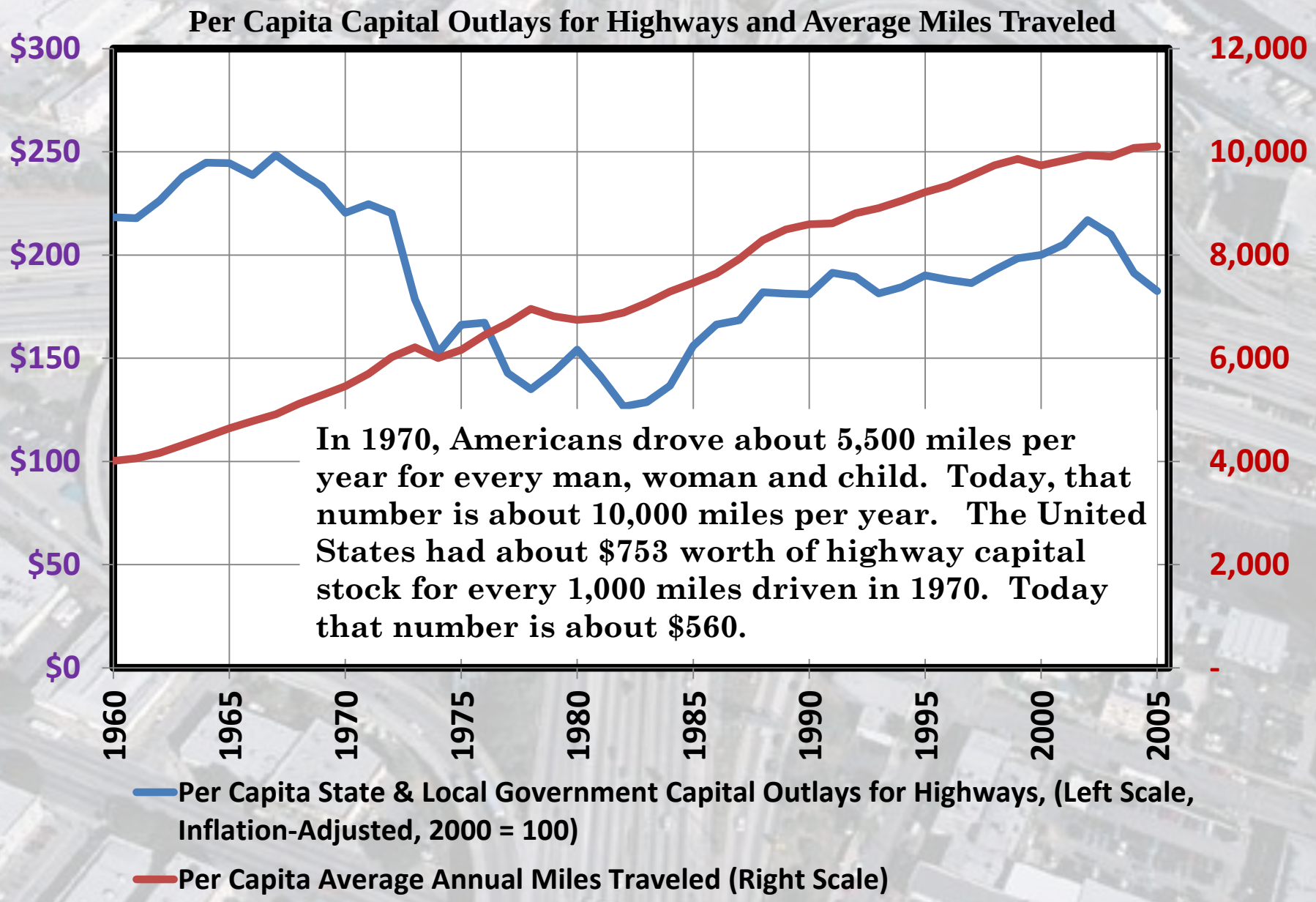
Some Basic Facts About Infrastructure Capital



Some Basic Facts About Infrastructure Capital



Is Our Infrastructure "Adequate"?

Historically there have been four approaches to this question:

- Engineering Needs Assessments

  "... do not make a compelling case for there being an overall shortage of infrastructure capital."

- Political Voting Outcomes

  "... no clear evidence of an infrastructure shortage from ... voting data."

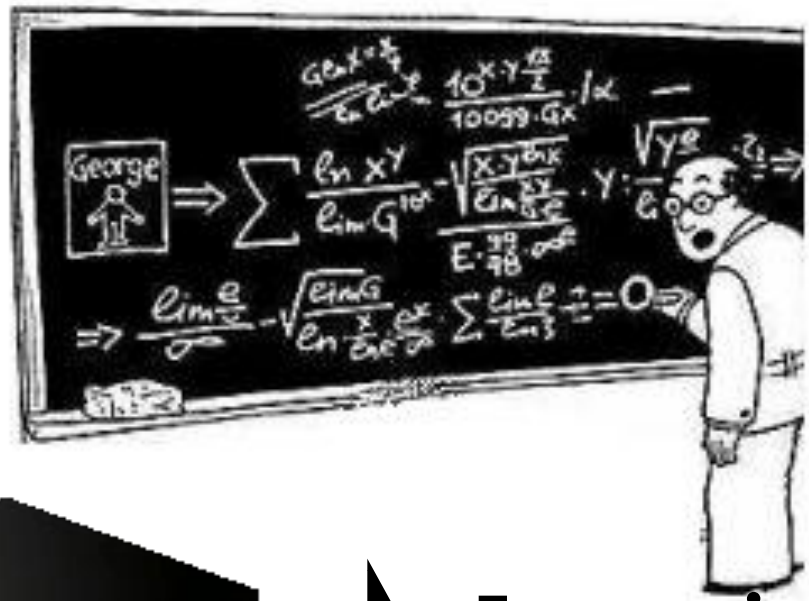
- C-B-A and Economic Rates of Return

  "... the picture is mixed."

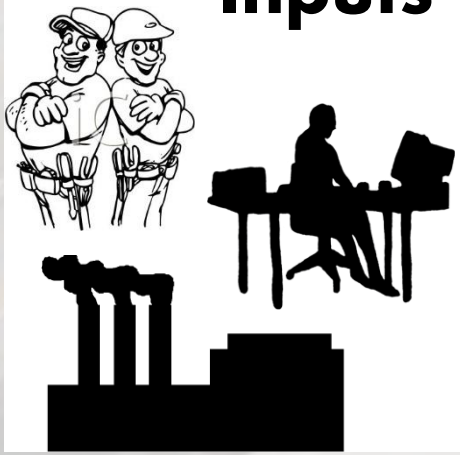
- Productivity Impact Estimates

Edward M. Gramlich, "Infrastructure Investment: A Review Essay", *Journal of Economic Literature* 32 (September 1994).

Estimating the Influence of Public Capital on the Economy



Economic Inputs



Economic Outputs

$$$

A Speculative Bubble in Public Capital Research

An *output elasticity* tells us how much output increases (or decreases) for each percentage change in public capital. Thus, given the estimates here, each 10% increase in public capital stock is associated with about a 2% to 4% increase in Gross Domestic Product.

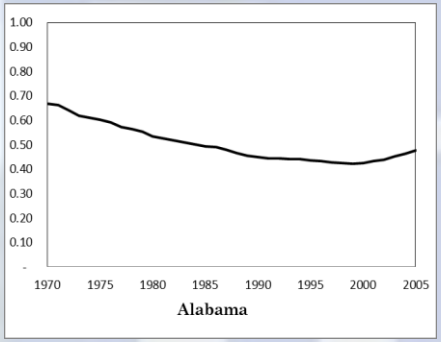
Study	Type of Public Capital	Sample	Output Elasticity
	National-Level Studies		
Aschauer (1989)	Nonresidential	1949 – 1985	0.39
Munnell (1990)	Nonresidential	1947 – 1987	0.34
Tatom (1991)	Nonresidential	1949 – 1973	0.28
Finn (1993)	Highways and Streets	1950 – 1989	0.16
	State-Level Studies		
Costa, Ellson and Martin (1987)	Nonresidential	48 states, 1972	0.20
Munnell (1990b)	Nonresidential	48 states, 1970 – 1986	0.15
Eisner (1991)	Nonresidential		0.17
Garci-Mila and McGuire (1992)	Highways and Streets	48 states, 1970 – 1983	0.05
Holtz-Eakin and Schwartz (1995)	Nonresidential	48 states, 1960 – 1988	

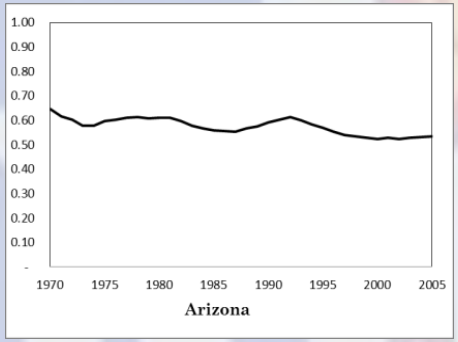
"As for the alleged infrastructure shortage, the evidence … is decidedly mixed."
Gramlich, Edward M., "Infrastructure Investment: A Review Essay." *Journal of Economic Literature* 32 (September 1994), 1193.

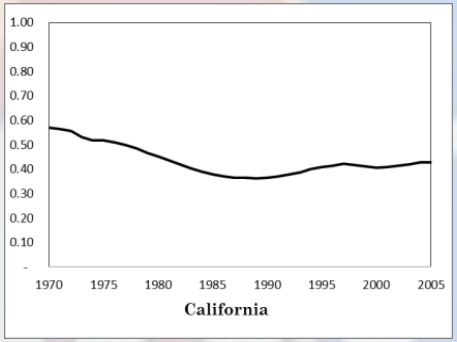
"… it will be hard to ever settle the debate about the effect of public capital on private productivity."
Vijverberg, Wim P. M., Chu-Ping C. Vijverberg, Janet L. Gamble, " The Public Capital and Private Productivity." *Review of Economics and Statistics*, 79:2 (May, 1997), 267.

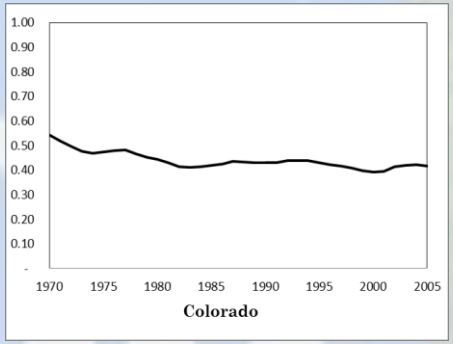
New Tests of Public Capital's Role in Production

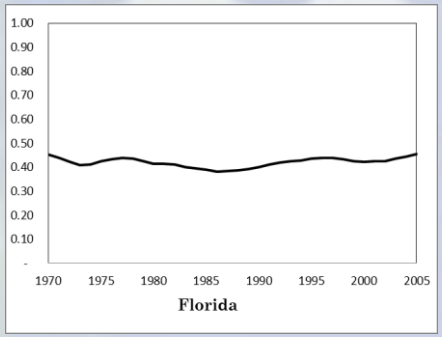
Ratios of Public to Private Capital Stock, Selected States

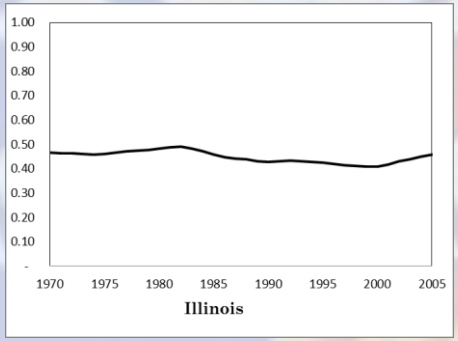


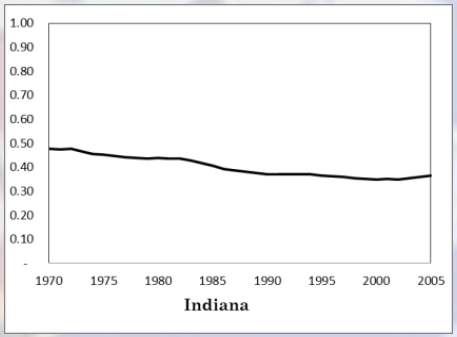


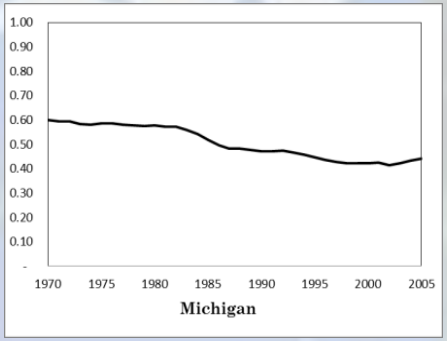


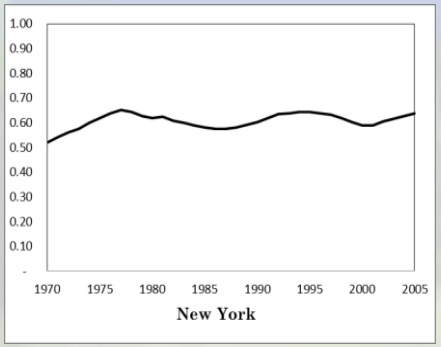


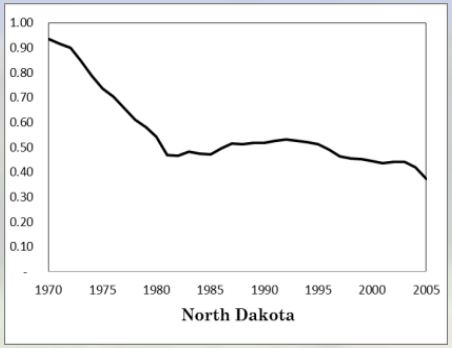


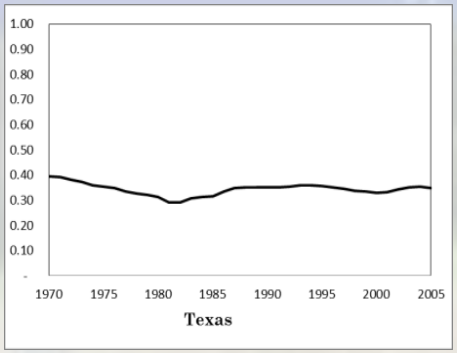


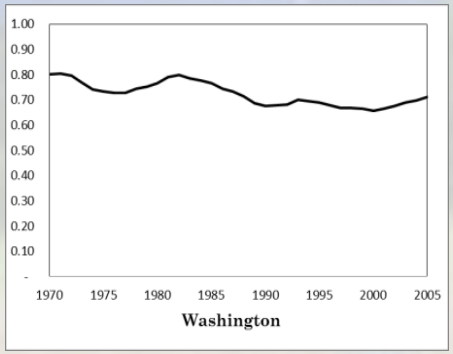






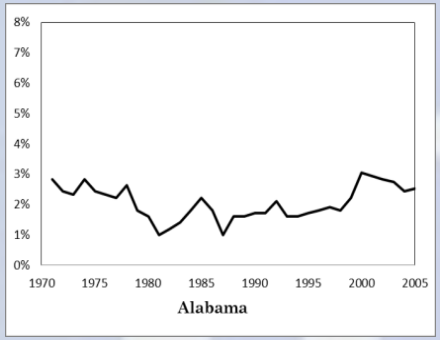


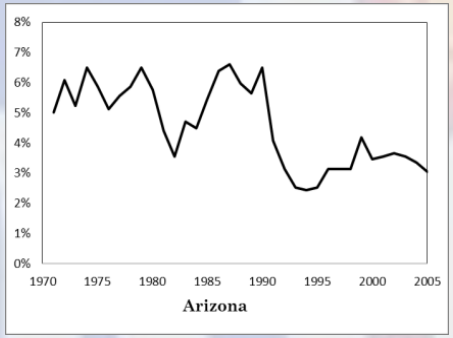


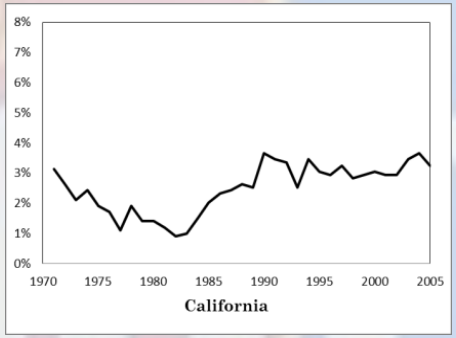


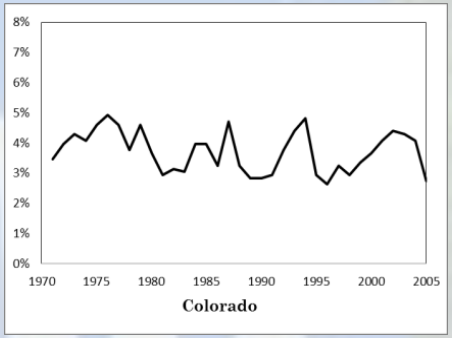
New Tests of Public Capital's Role in Production

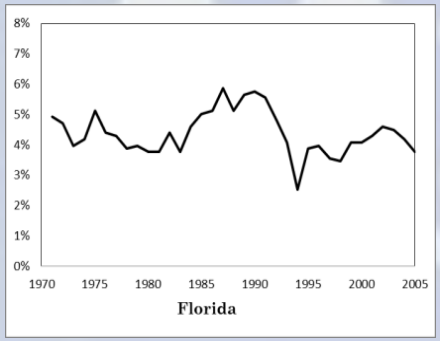
Annual Growth Rates of Private Capital Stock, Selected States

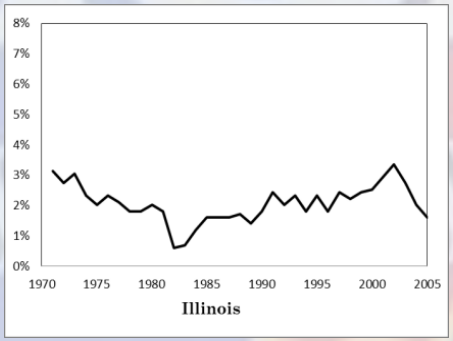


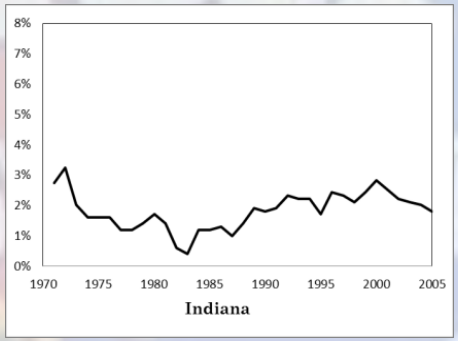


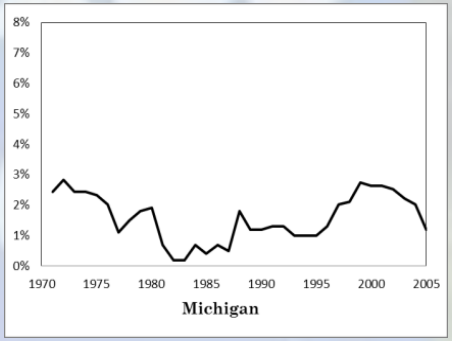


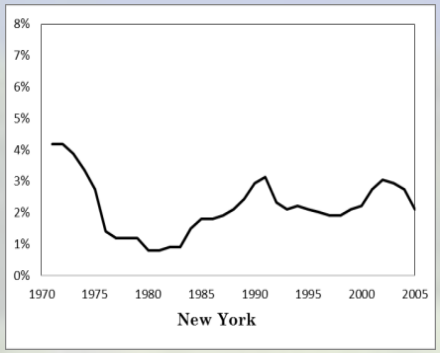


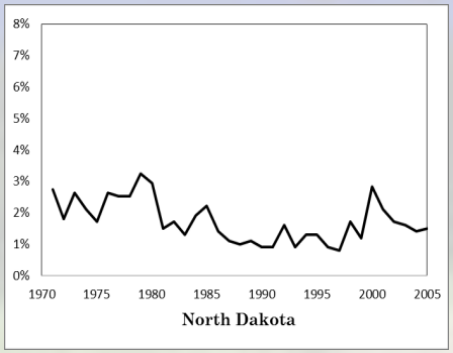


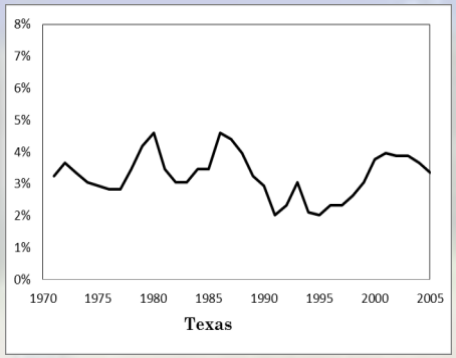


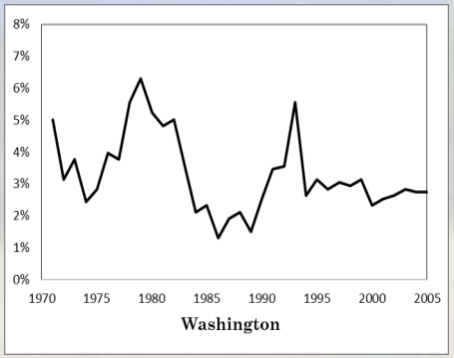












New Tests of Public Capital's Role in Production

Table 4: Aggregate Production Functions

Equation (1a): $lnY_{it} = a_0 + a_1 t + a_2 lnN_{it} + a_3 lnK_{it} + a_4 KG_{it}$

Equation (1b): $lnY_{it} = a_0 + a_1 t + a_2 lnN_{it} + a_3 lnK_{it} + a_4 KGCORE_{it}$

	Equation (1a): Total Public Capital Stock		Equation (1b): Core Public Capital Stock	
Estimation Method:	Fixed Effects	Random Effects	Fixed Effects	Random Effects
Constant, a_0	0.600	3.926**	0.798	4.721**
	(0.999)	(0.341)	(0.910)	(0.328)
a_1	0.005**	0.008**	0.005**	0.009**
	(0.001)	(0.000)	(0.001)	(0.001)
a_2	0.561**	0.604**	0.616**	0.659**
	(0.031)	(0.029)	(0.025)	(0.034)
a_3	0.427**	0.344**	0.445**	0.365**
	(0.037)	(0.033)	(0.042)	(0.037)
a_4	0.226**	0.149**	0.173**	0.067*
	(0.043)	(0.029)	(0.037)	(0.027)
F-statistic for H_0: $\alpha + \beta = 1$	0.052	3.237	2.024	0.916
Adjusted R^2	0.997	0.971	0.997	0.970

Dynamic OLS: Leads and Lags not shown; full estimation results available upon request.
Standard errors are in parentheses.

* Significant at a 5% confidence level.

** Significant at a 1% confidence level.

Can we afford it?

New Jersey's Governor Chris Christie:
The "political canary in the coal mine" of a looming state & local fiscal crisis?

Can we afford it?

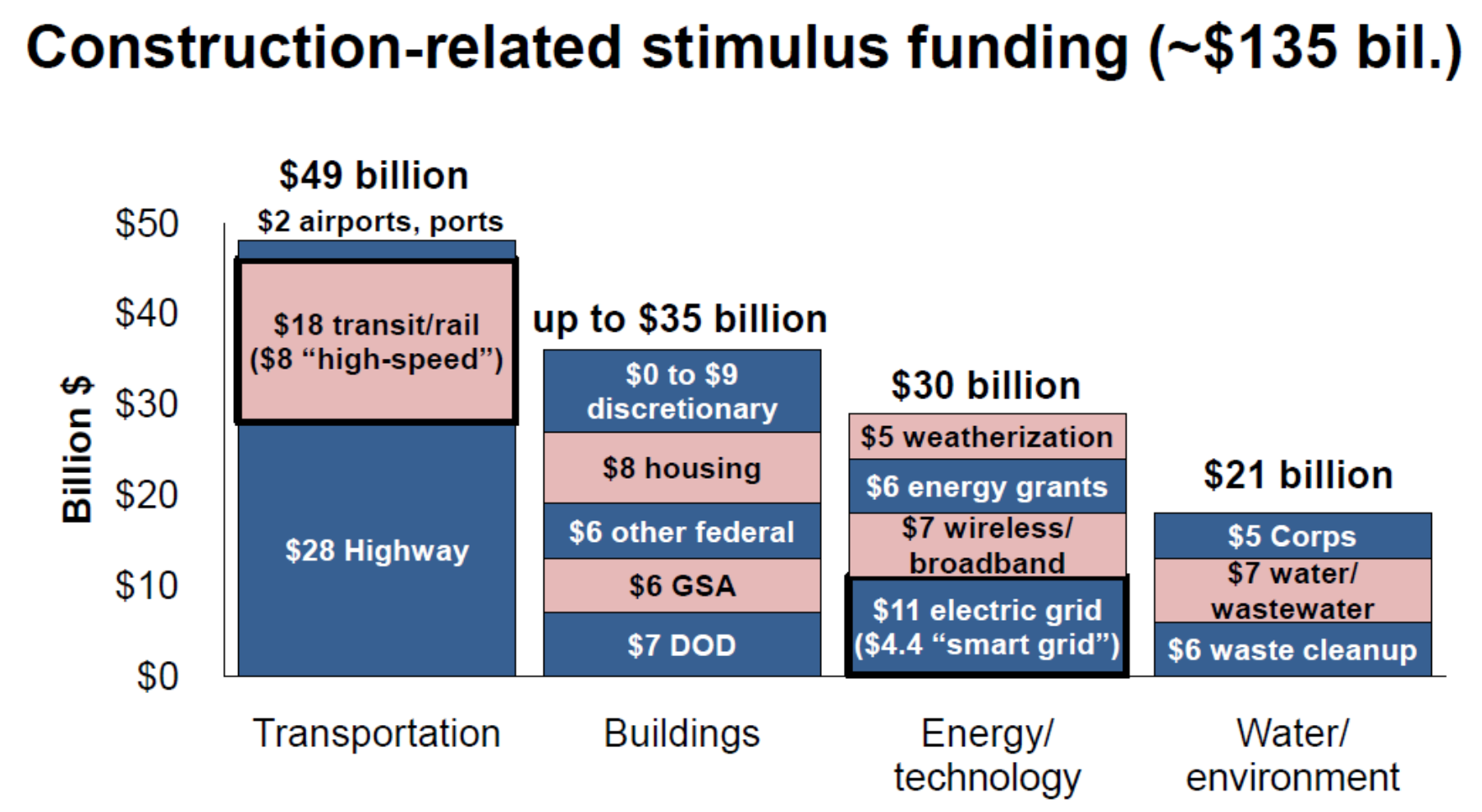
Three modest observations:

- Think ahead: Investments in public capital have long-term consequences for economic growth but long lags in effects.
- Penny wise, Pound foolish: failure to consistently invest in new public capital creates short-term budget benefits but long-term costs in terms of rising maintenance expense.
- Spend wisely: Build up public capital in ways that returns on investment are real and measurable.

Will it solve our present difficulties?

Fiscal Stimulus as False Works

Fiscal Stimulus as False Works -- Is it time to remove them?



Source: Ken Simonson, Associated General Contractors of America, "Construction and Materials Outlook", December 1, 2010