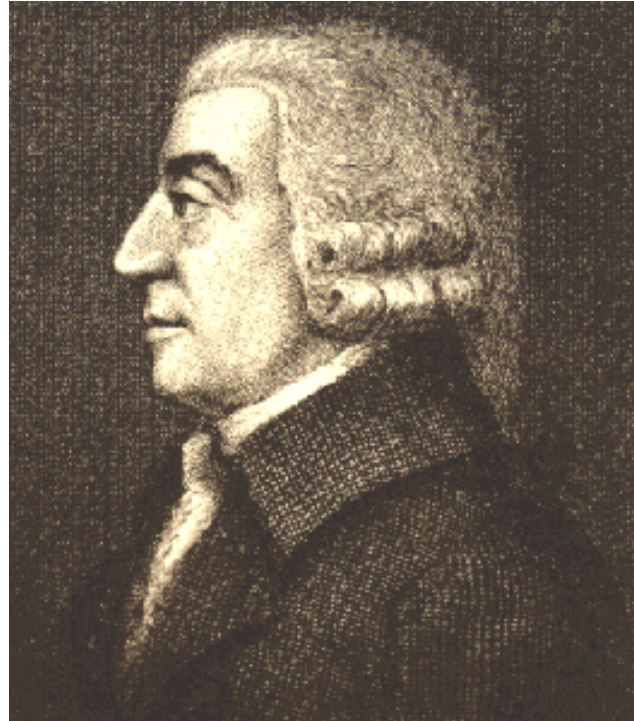


Development Policy

Financing Development: Public Saving and Investment

James Riedel

Adam Smith
1723-1790



“Peace, easy taxes, and all the rest comes naturally.”

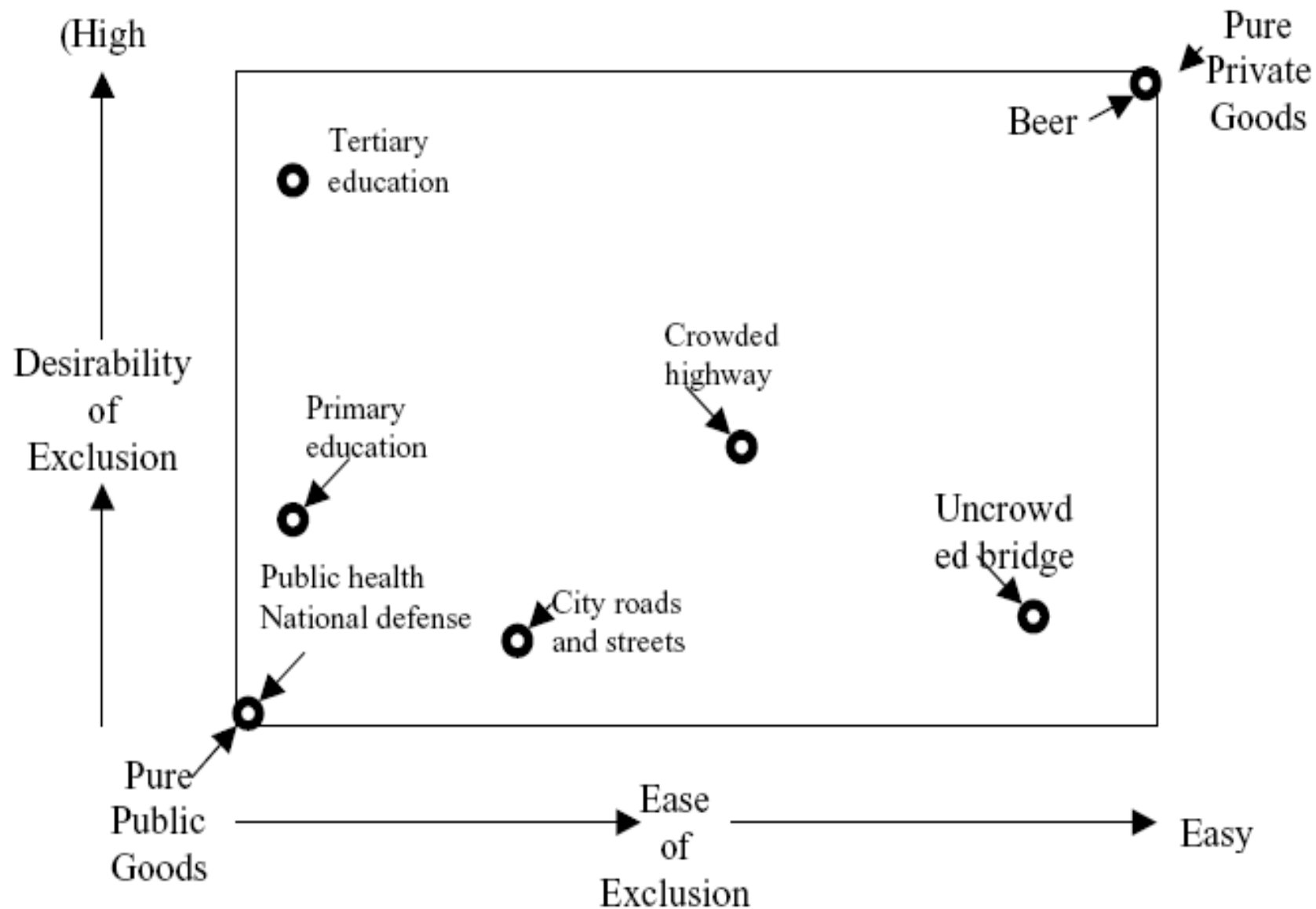
The Role of Government according to Adam Smith (*The Wealth of Nations*)

The first duty of the sovereign, that of protecting the society from the violence and invasion of other independent societies, can be performed only by means of a military force.

The second duty of the sovereign, that of protecting, as far as possible, every member of the society from the injustice or oppression of every other member of it, or the duty of establishing an exact administration of justice.

The third and last duty of the sovereign or commonwealth is that of erecting and maintaining those public institutions and those public works, which, though they may be in the highest degree advantageous to a great society, are, however, of such a nature that the profit could never repay the expense to any individual or small number of individuals, and which it therefore cannot be expected that any individual or small number of individuals should erect or maintain.

Public versus Private Goods: Non-excludability & non-rivalness



Government saving and growth: the crowding-out effect

Recall, public saving (S_G) is government revenue (T) minus spending (G), just as private saving (S_P) is private disposable income ($Y - T$) minus private consumption (C).

$$S_G = T - G$$

$$S_P = Y - T - C$$

These two equations reveal the “crowding-out” of private saving by public saving when government spending is financed by taxation. When government spending is financed by borrowing there is also a crowding-out effect since an increase in government borrowing raises the interest rate, which leads to lower private investment.

The growth effects of crowding-out can be illustrated in a simple growth model:

$$g = r \left(\frac{I}{Y} \right) = r \left(\frac{S_P}{Y} \right) = r \left(\frac{s_P(Y - T)}{Y} \right) = r \cdot s_P(1 - \tau) \quad \text{where } \tau = \frac{T}{Y}$$

The growth rate declines linearly with increases in τ when tax revenues finance government current (i.e. consumption) spending.

Government investment spending and growth

It is a different story when government invests (I_G) in “public capital” (K_G), which largely takes the form of infrastructure. If σ is the share of government spending invested in public capital, then:

$$G_I = \sigma G = \sigma T = \sigma \tau Y$$

It is commonly held that government infrastructure investment raises the return to private investment (r), but the effect on r diminishes as G_I/Y increases.

$$r = \phi\left(\frac{G_I}{Y}\right) = \phi(\sigma \cdot \tau) \quad \phi' > 0 \quad \phi'' < 0$$

Substituting the above function (ϕ) into our simple growth equation we get:

$$g = \phi(\sigma \cdot \tau) \cdot s_P(1 - \tau)$$

When government taxation finances government infrastructure investment it has both a positive and a negative (crowding-out) effect. If, as we assume, there are diminishing returns of public investment ($\phi'' < 0$) then the relation between growth and taxation exhibits an inverse-U relationship.

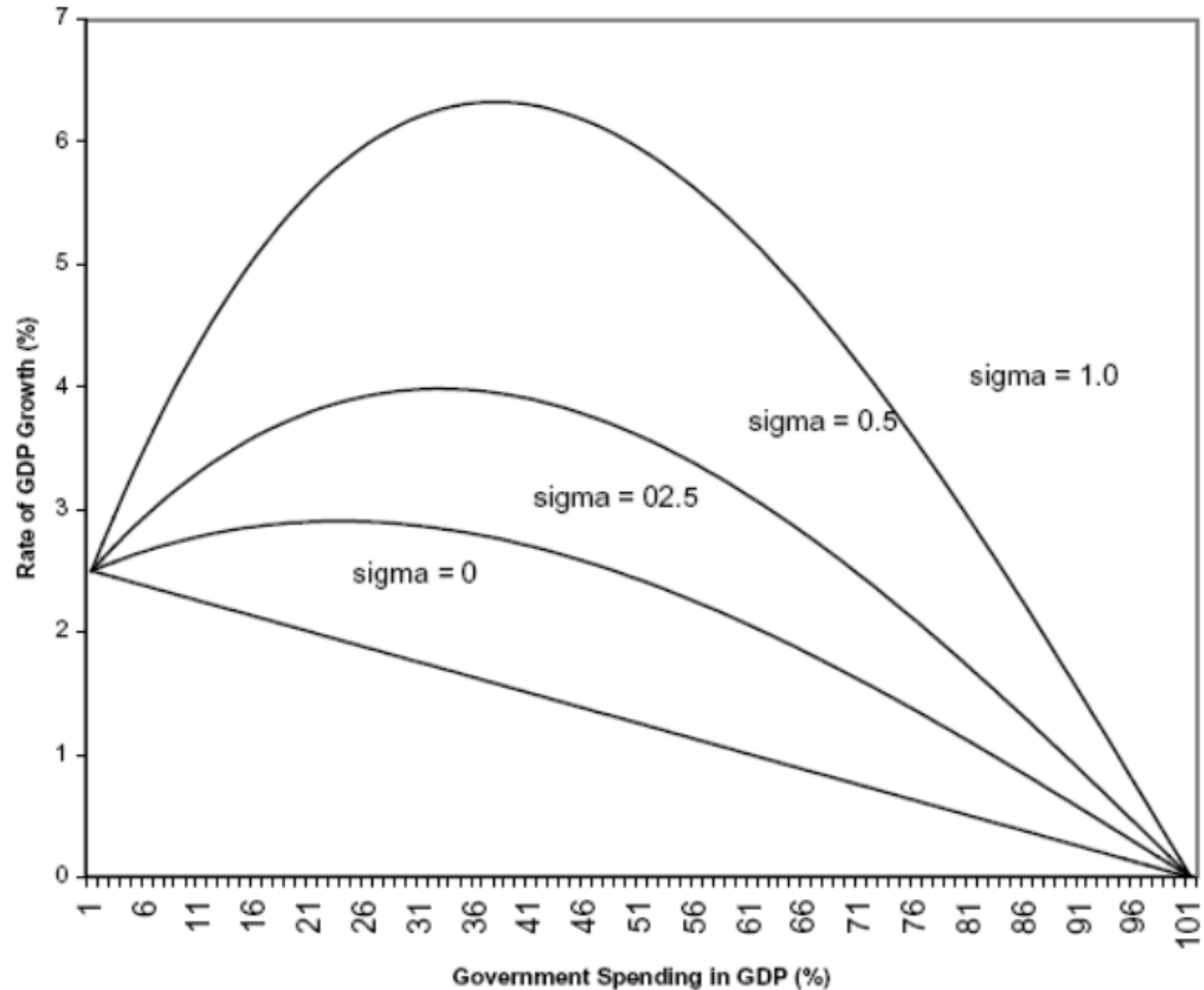
Government investment spending and growth: An illustration

The relationship between g and $\tau = T/Y$ for different values of $\sigma = G_I/G$ is simulated by the following quadratic equation:

$$g = g_0 + a_1(\sigma \cdot \tau) - a_2(\sigma \cdot \tau^2)$$

where

$$g_0 = 2.5\% \quad a_1 = 1 \quad a_2 = 0.5$$

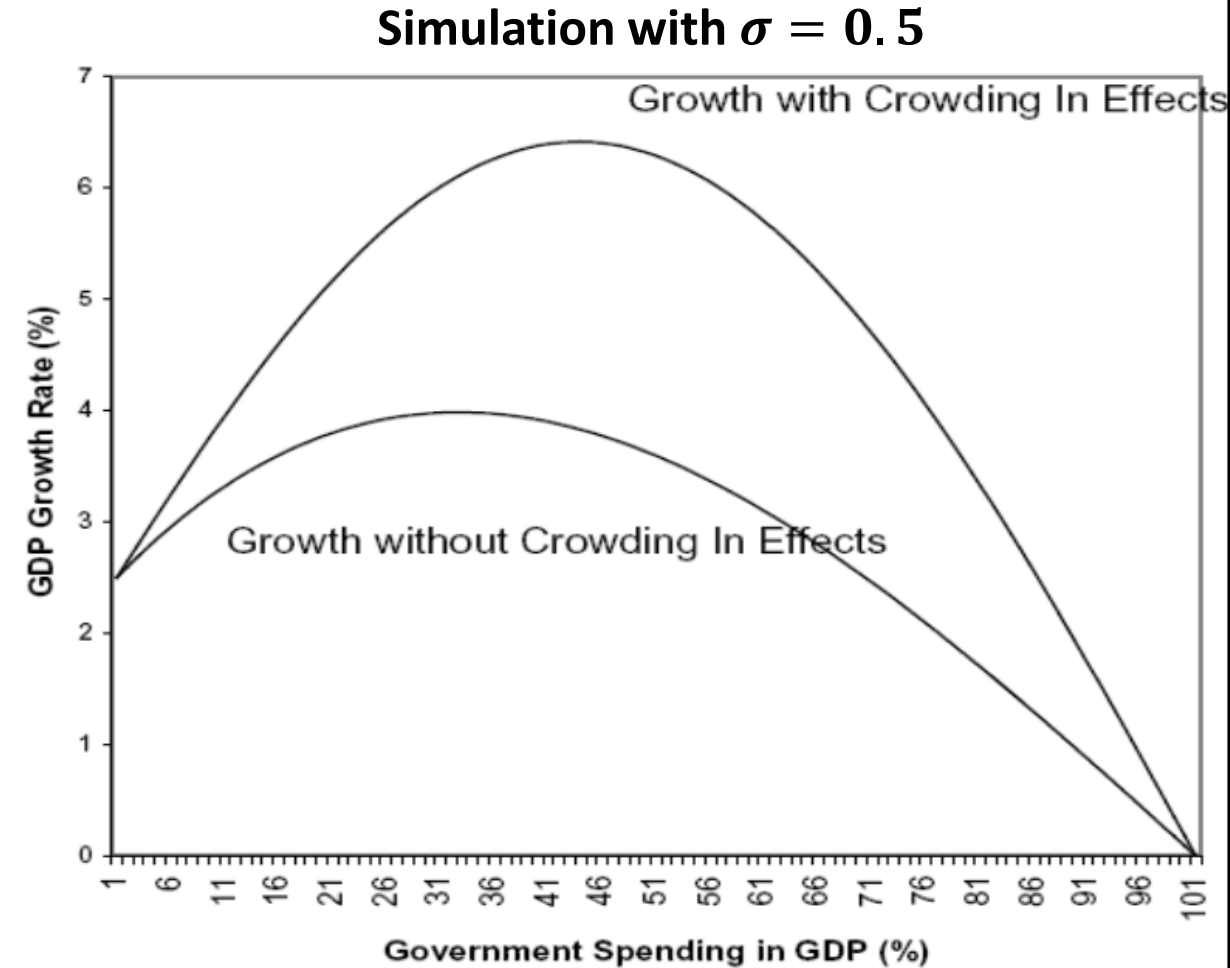


Government investment spending and growth: Crowding-in effect

Government spending on public capital can not only raise the return on private saving and investment, but also increase the rate of private saving and investment if private investors respond to a higher return by investing and saving more than they would otherwise.

The positive effect of public investment spending on private saving and investment is called the “crowding-in” effect.

The figure illustrates the crowding-in effect when the saving rate is endogenously determined by government investment spending.



Public Investment is not always an equivalent increase in Public Capital

Lant Pritchett's classic paper (2000) begins with an "old joke."

Two ministers of transportation (Mr. A from country A and Mr. B from country B) meet at the home of Mr. B. Mr. A remarks "What a beautiful apartment you have. How can you afford it on your government salary?" Mr. B takes Mr. A to the window and points to a superhighway running through the city and says "**10%**".

Subsequently B has occasion to visit A and is invited to A's home. Mr. B remarks that "Your country is much poorer than mine, but your apartment is even more luxurious than mine. How can you afford it?" Mr. A take Mr. B to the window and says "See that superhighway out to the jungle?" Mr. B: "I don't see any superhighway." Mr. A winks and says: "**100%.**"

This scenario is not exclusive to poor countries. Sarah Palin (U.S Vice-Presidential candidate in 2008 and former governor of Alaska) landed in hot water when it was revealed that she had lobbied for an received hundreds of millions of taxpayer's money to finance "**the bridge to nowhere**", a bridge connecting the Alaskan mainland to an island on which lived 55 people who had cheap access to the mainland by ferry.

Lant Pritchett, "The Tyranny of Concepts: CUDIE is *Not* Capital," *Journal of Economic Growth*, 2000



Measuring the Cost and Value of Public Capital

The standard method for measuring the capital stock is the Perpetual Inventory Method, according to which the capital stock is cumulated past investment, adjusted for depreciation:

$$K_t = K_{t-1} - \delta K_{t-1} - I_t \Rightarrow \Delta K_t = K_t - K_{t-1} = I_t - D_t$$

$$K_T = \int_0^T (I_t - D_t) dt$$

Under idealized conditions, the cost of capital (K_T) equals the value of capital (V_T), which is the present value of the future stream of profit (π) the capital generates, discounted at the real rate of return (r):

$$V_T = \int_T^\infty \pi \cdot e^{-rt} \cdot dt$$

Private capital markets value private capital continuously. But there is no market for public capital or most of the goods/services produced in the public sector. As general rule the value of public capital is assumed to equal to its cost. Therein lies a **big problem!**

The cost of public capital is not the value of public capital

“Unlike with private investors, there is no plausible behavioral model in which every dollar that the public sector spends as investment creates economically valuable capital” (Pritchett, 2000, p. 361).

The accounting cost of capital (AC), or CUDIE, must be differentiated from its economic costs (EC), which is the minimum cost of creating a capital good. The ratio of the two is a measure of the efficiency, or efficacy, of public investment (γ):

$$\gamma = \frac{EC}{AC} = \frac{\int_0^T (\gamma I_t - D_t) dt}{\int_0^T (I_t - D_t) dt}$$

The assumption that $I = \Delta K$ rests on a behavioral model in which investors minimize cost and hence $\gamma \rightarrow 1$. Such a model is unrealistic even in private corporations due to “agency problems” (limitations on the ability of owners to monitor and control manager).

In government the “agency problem” (limitations of the ability of citizens to monitor and control government officials) is qualitatively much more difficult.

Agency Problems in the Public Sector

1. Government monopoly on power (police, judiciary and military)
 - The state can extract resources irrespective of citizens views about the profitability of public investment.
 - The state can restrict the ability of citizens' ability to monitor government investment by restricting access to information.
 - The state holds monopoly power in many services it provides, making it difficult to compare cost and efficiency because there are no alternative providers.
 - State can restrict new entrants into industries in which the state acts as an inefficient monopolist.
2. No market for ownership
 - Unlike private corporations, ownership is not traded, so mismanagement by the state does not trigger a sell-off, a fall in the price of stock and a take-over bid.
3. Nature of public-sector production
 - Many public sector investments are in the public sector because they are "public goods," where private investment would likely be suboptimal.

Empirical Estimates of Differences in Investment Efficacy Across Countries

Table 1. Economic rates of return on government investment projects financed by the World Bank.

	Number of Projects	Cumulative Investment (millions)	Median <i>ex post</i> Economic Rate of Return
An African country	31	915	0
A South Asian country	88	19,718	16.5
An East Asian country	41	8,233	19.5
All countries			14.1

Source: Author's calculations from World Bank's Operations Evaluation Department database.

Source: Pritchett, 2000.

Table 2. Costs of construction of a kilometer of similar road in selected countries in 1985 dollars.

Country	High-Cost Countries	Country	Low-Cost Countries
Honduras	\$771,068	Chile	\$143,840
Ethiopia	721,160	India	143,306
Guatemala	631,965	Costa Rica	131,966
El Salvador	540,632	Philippines	111,343
Pakistan	434,650	Uruguay	95,440
Nigeria	426,839	Korea	92,072
		Sri Lanka	5,277

Notes: Average cost: \$287,350. Brazil and Argentina were not included in the high and low lists because of doubts about appropriate deflation and exchange-rate conversion under hyperinflation. Source: Canning and Fay (1996).

Empirical Estimates of Differences in Investment Efficacy Across Countries

Table 3. Alternative calculations of the returns to investment in public and private sectors in India.

Period	Return on Capital employed from Firm Accounts (Rajaiah, 1989)			Inferred from contribution to growth (Joshi and Little, 1994)			
	Goods Producing Public Enterprises	Private Sector	Ratio Private/ Public	Whole Public Sector	Manufacturing		
					Public	Private	Ratio Private/ Public
1960s and 1970s	3.9	24.9	6.4	5.4	2.1	11.1	5.3
1976 to 1986				6.2	5.2	22.6	4.3

Source: Rajaiah (1989, tables 3.5 and 6.1 to 6.10); Joshi and Little (1994, table 13.4, estimates based on adjusted labor quality).

Empirical Estimates of Differences in Investment Efficacy Across Countries

Pritchett (2000) reports growth regression results typical of the hundreds that have been published over the years.

The coefficient on $I_P/Y \approx 2 \times I_G/T$

The average relative effectiveness of public investment (γ_G/γ_P) is

$$\frac{\gamma_G}{\gamma_P} = \frac{\beta_G/\alpha_G}{\beta_P/\alpha_P} = \frac{0.119/0.89}{0.229/0.11} = 0.63$$

where α_G, α_P are the shares in total investment of the public and private sectors, respectively.

Typical cross national growth regression with public and private investment included separately

	Coefficient (β)	t-statistic
I_P/Y	22.9	6.41
I_G/Y	11.9	2.82
$Y(0)$	-0.42	1.17
..	.	.
.	.	.
<i>Adjusted R²</i>	0.45	

The data indicate that the growth effect of public investment is 50-60% that of private investment

Public Investment Efficacy versus the Productivity of Public Capital

Do these results imply that the productivity of public capital is low?

Not necessarily! The regression coefficient on public investment (β_G) is an estimate of growth effect of public investment and that is the product of (1) the productivity of public capital and (2) the efficacy of public investment:

$$\frac{dg}{dI_G} = \frac{dg}{dK_G} \cdot \frac{dK_G}{dI_G}$$

The evidence summarized above indicates that public investment efficacy ($\gamma_G = dK_G/dI_G$) varies widely across countries and is generally low in poor countries with weak institutions.

In such countries, where public capital is scarce, it is likely that the productivity of public capital (dg/dK_G) is relatively high. In other words, public investment has a weak effect on growth because much of public investment is wasted and, because so much public investment is wasted, the return on public capital is likely relatively high.

Evidence of the high productivity of public capital in inefficient countries

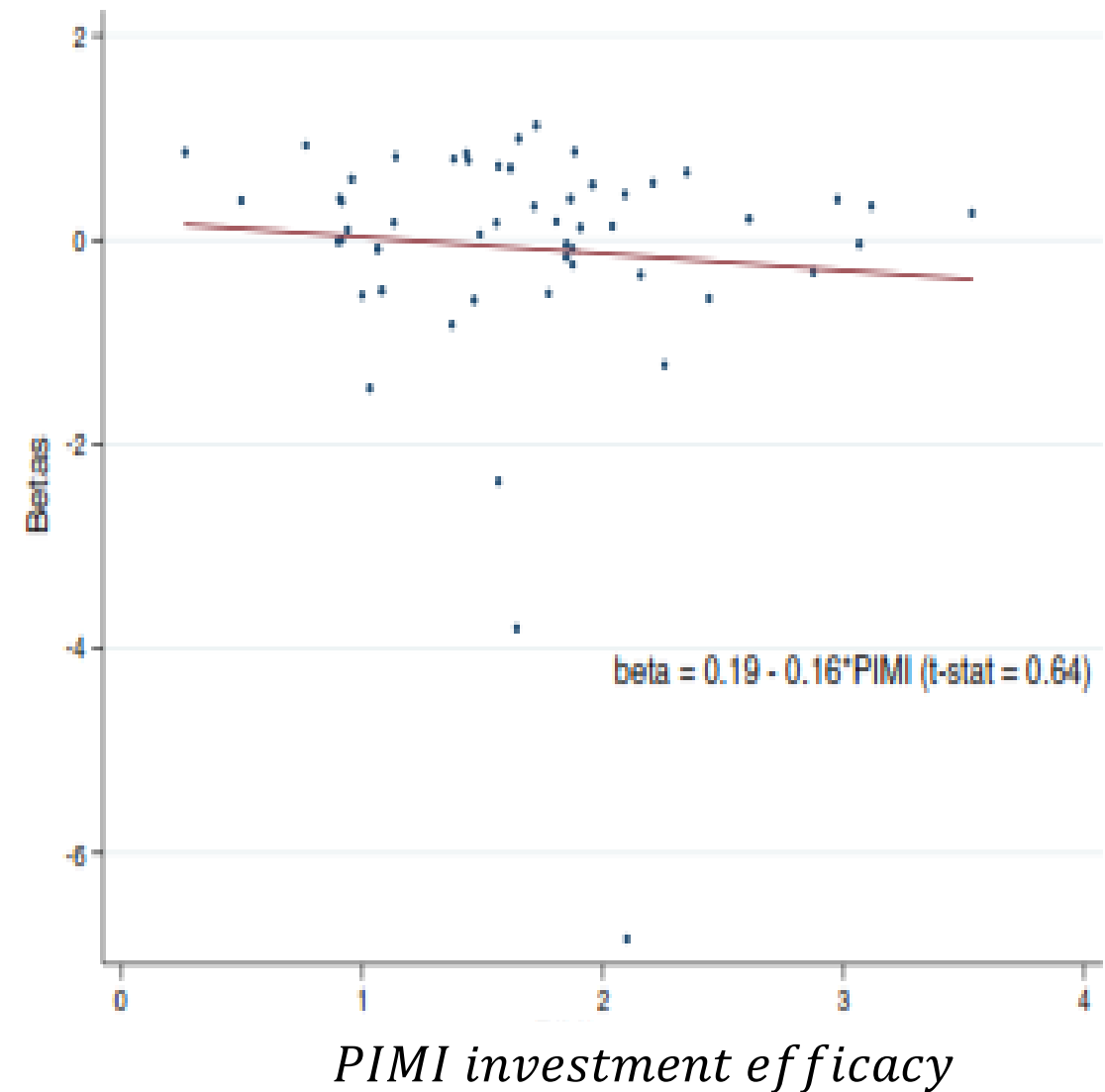
A recent study (Berg, et. al. 2015) found that the growth effect of public investment is about the same in more- and less-efficient countries.

The efficiency of a country's public investment is measured in this study by a "Public Investment Management Index" (PIMI), based scores (from one to four) on the quality of a country's (1) project appraisal, (2) selection, (3) implementation and (4) evaluation.

This study reasons that since Public Capital is subject to diminishing returns, where it is inefficient (efficient), it is scarce (abundant) and hence the productivity of public capital is high (low).

Policy implication: invest in investing!

β (the growth impact)



Government Spending?

