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Should Government Spending on Capital Goods Be Raised?

A GROWING BODY of public opinion and analysis argues that government spending for capital formation is deficient and should be increased. Such spending is largely for goods called infrastructure. Adam Smith (1937) referred to spending on infrastructure as the third rationale for the state (behind the provision of defense and justice).¹ Today, these capital goods include highways, mass transit systems, airports, electric and gas facilities, wastewater treatment facilities, water supply and distribution, in addition to the facilities and equipment used in governmental and judicial administration, police and fire protection and health and educational institutions.

In 1988 the National Council on Public Works Improvement concluded in its final report to Congress and the President that "the quality of America's infrastructure is barely adequate to fulfill current requirements, and insufficient to meet the demands of future economic growth and development" (1988, p. 1). It recommends a

national commitment to improve infrastructure that could double spending on public works by the year 2000.²

The dearth of infrastructure spending has also been noted by others. For example, Benjamin Friedman argues that the relatively large federal budget deficits of the 1980s created pressure to reduce infrastructure spending. He stresses the ways in which infrastructure investment affects the business sector:

"Government investment in roads, bridges, airports, port facilities, and other kinds of infrastructure also has a direct bearing on how easy or difficult it is, and also how cheap or costly, for many companies to do business."

In Friedman's view, the economic policies of the 1980s created a situation in which "we have been cheating our future in all these respects—not just in business capital formation but in government infrastructure and education too."³

¹See Smith (1937), Book V, part 3, especially p. 682. Krueger (1990) attributes the principal comparative advantage of government to its provision of infrastructure. Krueger's focus is on global trends in government activity not just trends in the United States. She argues that the failure of government to promote economic development has resulted from the diversion of specialized organizational and administrative resources that provide infrastructure to activities in which government does not have a comparative advantage (e.g., manufacturing, regulating markets or licensing).

²The National Council was established by the U.S. Congress in 1984 to assess the state of the nation's infrastructure.

³See Friedman (1988, p. 202 and p. 204, respectively). Friedman includes educational spending in infrastructure and argues that reduced educational spending lowers the quality of labor and, hence, income and productivity. The stock of human capital is not included in the analysis of public capital accumulation conducted here. Public educational facilities are included in the physical public capital measures analyzed below, however.

Table 1

The Composition of the Public Capital Stock: 1989 (millions of dollars, 1982 prices)

	Federal	State and Local	Total	
Non-military structures	\$190,617	\$1,321,477	\$1,512,094	(90.9)
Highways and streets	13,926	544,458	558,384	(33.6)
Educational buildings	831	242,997	243,828	(14.7)
Other buildings	22,921	134,080	157,001	(9.4)
Hospital buildings	7,933	36,376	44,309	(2.7)
Water supply facilities	—	78,259	78,259	(4.7)
Sewer systems structures	—	152,753	152,753	(9.2)
Conservation & development	116,975	26,073	143,048	(8.6)
Industrial buildings	21,148	—	21,148	(1.3)
Other structures	6,883	106,481	113,364	(6.8)
Non-military equipment	49,991	101,366	151,357	(9.1)
Non-military structures and equipment	240,608 (14.5)	1,422,843 (85.5)	1,663,451 (100.0)	
Military equipment	382,548	—	382,548	
Military structures	82,813	—	82,813	
Total	\$705,970 (42.4)	\$1,422,843 (85.5)	\$2,128,813 (128.0)	

NOTE: Shares of the non-military total are given in parentheses. Components may not add to total due to rounding.

Ratner (1983), and later, Aschauer (1989a, b) and Munnell (1990) provide evidence that the services of the public capital stock affect private sector output. Aschauer and Munnell argue that the slowdown in U.S. public capital formation accounts for the slowing of U.S. productivity and general economic growth since the early 1970s. Their arguments and evidence have fostered the view that there is a "third" deficit (over and above the trade and government budget deficits) that threatens this nation's future standard of living.⁴ As Malabre (1990) notes, Aschauer attributes up to 60 percent of the "productivity slump" to the "neglect of our core infrastructure."

This is the first of two articles focusing on the issue of whether a public capital deficiency ex-

ists. This article examines recent trends in public capital formation and some of the factors that might be responsible for these trends.⁵ This article concludes that the decline in public capital formation can be explained, in part, by fundamental economic influences. Thus, while there may be convincing reasons to boost public capital formation, they are not found among those examined here.

HOW MUCH CAPITAL DOES THE PUBLIC WANT?

Table 1 provides a breakdown of the types of public capital held by federal, state and local governments in 1989. The data are the constant dollar (1982 prices) net stocks of capital of various types estimated by the Bureau of Economic

⁴This characterization is described in Malabre (1990) and contained in Aschauer (1990). Reich (1991) expresses a similar view of the critical role of public capital formation in both accounting for past shortcomings in U.S. economic performance and in facilitating future economic growth.

⁵The second article will focus on the empirical evidence that links public capital formation with private sector performance.

Analysis, U.S. Department of Commerce.⁶ Since the public capital formation debate focuses on non-military capital, military capital goods are reported separately. These goods make up more than 60 percent of the total federal capital stock and more than 20 percent of the total government capital stock. Public capital includes highways and streets, educational buildings, hospitals, water supply and sewer facilities, other structures (electric and gas production and distribution facilities, transit systems, airfields, etc.), conservation and development structures (e.g., locks, dams) and non-military equipment. Most non-military public capital is owned by state and local governments; the largest categories are highways and streets and educational structures.

Public capital goods produce "public" goods or services that are typically provided on a large scale to many consumers. The use of these goods or services is generally described as "non-rivalrous" or "non-exclusive," indicating that use by one consumer does not impinge on the ability of others to use the same product.⁷ In addition, the goods or services yielded by such capital goods are sometimes considered insufficiently profitable to be provided by the private sector. Therefore, in the absence of government provision, these goods or services would be produced in relatively small quantities or, perhaps, not at all.⁸

The Optimal Quantity of Public Capital

How much capital is it optimal for government to accumulate? The demand for public capital, like that for private capital goods, is

derived from the value placed on the assets' services by its users. The present value of an asset's current and future services is the maximum that government would pay for the capital if it seeks to promote an efficient allocation of the nation's resources. The principle of diminishing returns indicates that, as the quantity of an asset and its services rises, the value of a unit of its services declines, so that the price of these services and the maximum price of the asset declines. The optimal quantity of capital goods occurs when the price of public capital assets equals this present value of current and future goods and services.⁹

When "too little" public capital exists, the value of the goods and services provided by the asset is worth more than its price. Conversely, when there is "too much" public capital, the supply price exceeds the present value of the asset. More importantly, the optimal quantity of public capital will decline if the supply price of public capital assets rises or if the demand for these assets declines. Proponents of the public capital hypothesis suggest, however, that the quantity of public capital has fallen simply due to neglect or budget pressures.

The Sources of Demand For Public Capital

There are two types of goods or services produced by public capital goods: final goods or services which yield valuable benefits directly to consumers or final users, and intermediate goods or services which assist in producing other final goods or services. In either case, the value of

⁶The net capital stock data used in this article were provided by John Musgrave, U.S. Department of Commerce; these data are described in U.S. Department of Commerce (1987) and Musgrave (1988). The net stock series deduct depreciation from gross stock measures that cumulate gross investment less discards or assets that are scrapped. The depreciation estimates use straight-line depreciation for service lives equal to 85 percent of those given in the U.S. Treasury Department's Bulletin F. The use of constant prices, instead of historical or current cost valuation, results in a measure of the quantity of capital. The focus on net capital stock measures follows the literature on the public capital hypothesis. Tatom (1989) discusses the tendency of these data to understate the rise in the quantity of private capital, especially in the first half of the 1980s.

⁷These descriptions are based on Krueger (1990). Similar discussions of public goods and public choice models are found in Musgrave and Musgrave (1984) and other public finance texts.

⁸There is a vast and growing "public choice" literature that questions the existence of these public goods. See

Musgrave and Musgrave (1984) and other public finance texts for a discussion of this issue and these models. Moreover, many public capital assets are quite similar to private capital goods and are used to produce goods and services similar to private sector output. These similarities are ignored below, however; all public capital goods are assumed to produce public goods and services.

⁹According to public choice theorists, the use of an economic efficiency criterion to determine an optimal stock of public capital may be a poor guide to actual public policy decisions. The quantity of public capital goods may not be determined on purely economic grounds. Nevertheless, the prices of resources used in the public sector and the benefits of the goods and services produced with these resources to consumers and firms are important, even in public choice models. Thus, efficiency-based considerations of an optimal public capital stock offer some insight into the causes and implications of recent trends in public capital formation.

the capital good is derived from the value of the goods and services produced directly or indirectly. Some examples include the public capital that produces publicly provided gas, electric, water or sewer services used in the home or in the production of other goods and services. Highways and roads are used to facilitate the acquisition of raw materials, labor and other capital services for private sector production and distribution, as well as for recreational and other consumer purposes. Public capital provides educational services with both immediate and future consumer benefits and affects the productivity of labor services. Lock and dam systems provide conservation and recreational benefits as well as intermediate services to business by lowering the cost of transporting goods and services.

The demand for public capital goods, their present value, is the sum of the values placed on the services of the asset by both business and consumers.¹⁰ Suppose that, initially, the present value of the services of a unit of public capital equals its price. Given the current stock of public capital, a decline in the value placed on public capital goods by consumers will reduce the total demand for public capital so that the value of a unit of public capital is lower than its price. If government decision-makers are concerned with promoting an efficient allocation of the nation's resources, they will reduce the quantity of public capital accordingly. This decline would lower the quantity of public capital available for use by firms even though their demand for public capital has not changed.

In addition, the optimal quantity of public capital would decline if business sector demand for public capital falls. Therefore, if the public capital stock has fallen (either absolutely or relative to some measure of private firms' demand), the reason for the decline must be

determined prior to drawing any conclusions about whether to raise public capital spending.

The Quantity of Public Capital Could Affect Private Sector Performance

Proponents of raising public capital spending argue that public capital increases private sector output both directly and indirectly. The direct effect of public capital on private output depends on whether public capital provides important intermediate services to private sector firms. If so, an increase in public capital would raise private output just as an increase in the use of private capital (or labor) would raise output.

The indirect effect arises, according to proponents of this argument, because the use of a larger quantity of public capital raises the rate of return on private sector capital, providing an incentive for firms to increase private capital formation. Therefore, private sector output and productivity, measured as output per worker or per hour, rise further. In this case, public and private capital are said to be "complements." Thus, according to the public capital hypothesis, a decline in public capital reduces private sector output (direct effect), productivity and the rate of return to capital in the short run. Given time to adjust, firms would reduce the amount of private sector capital per worker and this would further reduce private sector output (indirect effect) and productivity.¹¹

TRENDS IN THE GROWTH OF PUBLIC CAPITAL SPENDING

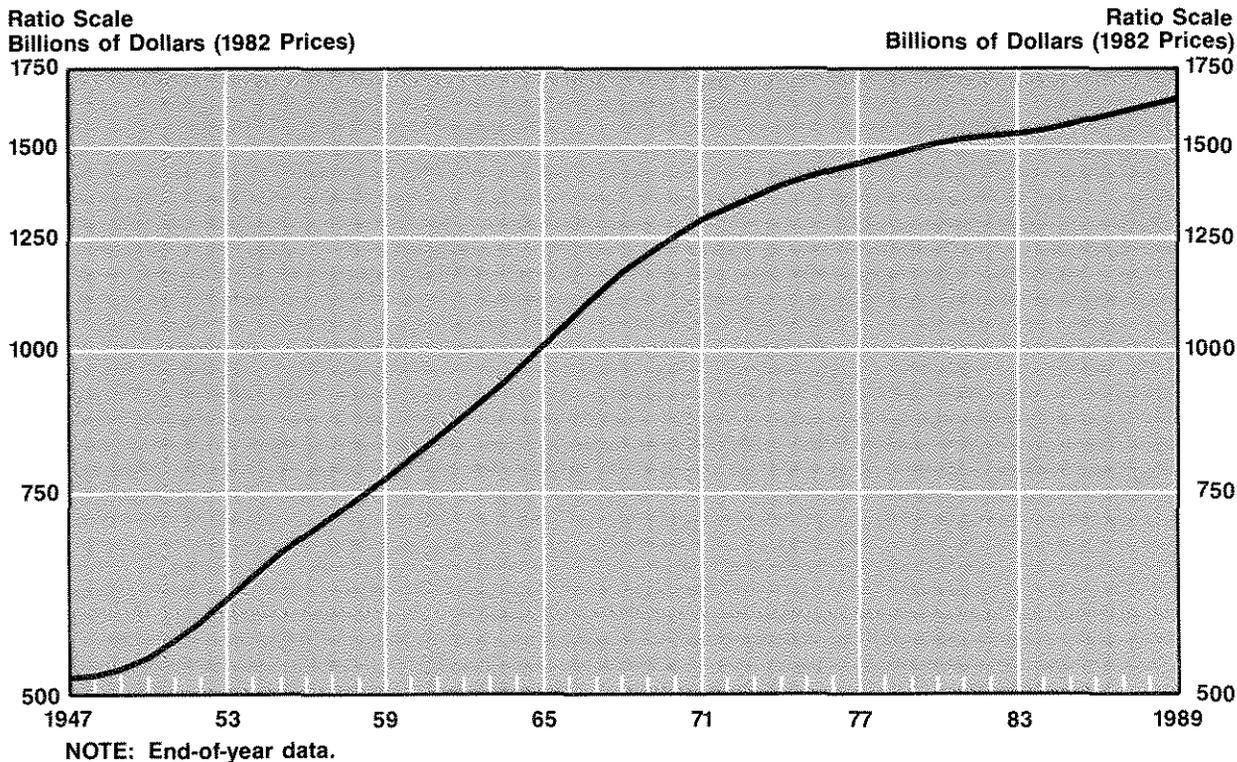
Figure 1 shows the real (constant cost) net stock of public capital (1982 prices) at the end of each year from 1947 to 1989. The capital stock displays a strong positive trend until 1970, when, as the critics of public sector performance point out, the growth of public capital slows.

¹⁰See Musgrave and Musgrave (1984), pp. 47-69, or other public finance texts for a more extensive discussion of the differences between public, or social, goods and private goods. The extreme assumption of non-exclusivity for public goods can be relaxed without affecting the analysis here. In particular, there are "mixed goods" which are private but yield external benefits or costs, and public goods whose use can entail congestion or other costs for others. In either case, the analysis here applies so long as the services of the public capital goods are not exclusive.

¹¹While public capital may provide valuable services to private firms, close substitutes for these same services

could also be available from private producers. If this is the case, a rise in the quantity of such public capital would lower the value, or rate of return, of acquiring new private capital goods. As a result, less private capital investment would take place. In this event, public and private capital are "substitutes." Public capital formation would "crowd out" private capital formation by lowering its rate of return, instead of "crowding in" private capital formation by raising its rate of return. Aschauer (1985), for example, argues that public and private sector spending are generally substitutes.

Figure 1 Net Stock of Nonmilitary Public Capital



The quantity of public capital per member of the civilian labor force, referred to as "per worker" below, is useful for assessing the trend in public capital formation.¹² Growth of the public capital stock per worker is plotted in figure 2; the amount of public capital available each year is measured by the amount in existence at the end of the previous year. Federal, state and local components of public capital per worker are also shown.

Public Capital Stock Per Worker

Figure 2 shows that the trend of public capital per worker was sharply different after 1971 than it had been previously. From 1948 to 1971, total public capital per worker rose at a 2.6 percent annual rate. Since 1971, the amount of capital per worker has declined. Figure 2 suggests that public capital formation's contribution

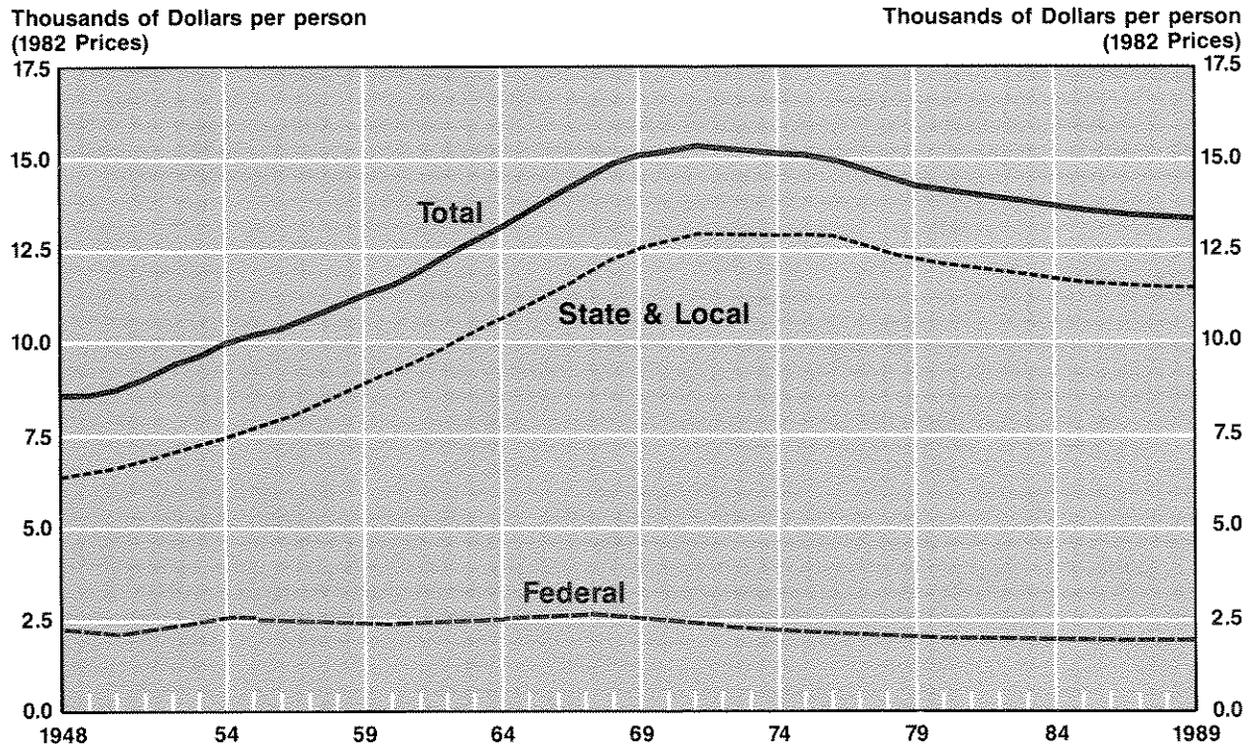
(if any) to the growth of the U.S. standard of living disappeared after 1971; its contribution (if any) since then has been negative.

The figure also shows that this trend shift was concentrated in state and local government capital spending. The trend in the stock of net federal capital per worker has been nearly flat or slightly declining throughout the whole period. In particular, it declined slightly from 1967 to 1989 reaching about the same level as in the early 1950s. Moreover, since federal capital stock is a small fraction of the total stock of public capital, relatively large changes in the pace of federal capital formation would have little effect on the trend in the total amount of capital per worker. Therefore, if the decline in public capital per worker indicates that there is a problem with public capital formation, its source is not at the federal level, but rather at the state and local level.

¹²The capital stock is measured relative to the civilian labor force instead of employment to remove transitory variations in capital per worker associated with the business cy-

cle. Removing cyclical variations smooths out the resulting series for capital per worker.

Figure 2
Real Nonmilitary Government Capital Stock per Person
in the Civilian Labor Force



It could be argued that a decline in federal financing might account for a decline in state and local capital per worker. But this ignores the evidence of substitutability between federal and state and local financing of state and local government spending.¹³ Moreover, despite federal funding, the decision to invest in federally assisted spending (e.g., highways) depends on the willingness of state and/or local governments to meet federal matching requirements. Also, the decline in federal grants to state and local governments relative to overall state and

local spending did not begin until 1979, well past the time when the growth of capital per worker began to decline.¹⁴

Public Capital Stock Per Person

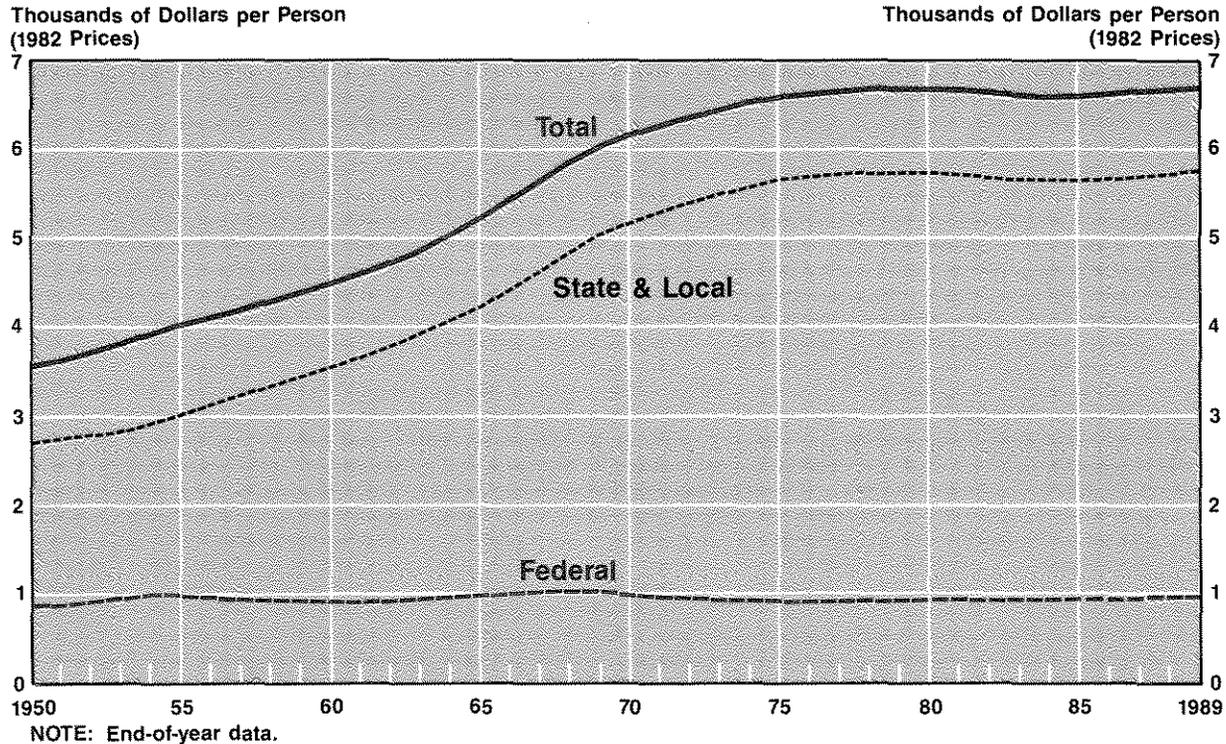
The trend in public capital relative to the labor force measures the relative availability of capital for both private production and final goods and services only if the population and labor force grew at about the same pace. However, the baby boom created a disparity between the growth of the labor force and the popula-

¹³See CBO (1988) or Eberts (1990) for a discussion of these issues. The CBO (1986), p. 81-83, reviews 11 studies that show a large degree of substitutability between federal investment grants and state and/or local spending. It is shown below that much of the decline in capital growth is concentrated in highways. Even in this case, CBO (1986) shows evidence of substitution between federal and state spending.

¹⁴Peterson (1991) notes that the matching rate on what are referred to as non-interstate federal aid highways rose

from 50 percent to 70 percent in 1970 and to 75 percent in 1978. He also argues that, despite relatively high matching rates (the interstate highway matching rate is 90 percent), "at the margin, states and localities are paying the full costs of investment" because federal capital programs are "closed-end" matching grants where sharing occurs up to a maximum dollar amount which is generally less than almost all state and local governments spend. Also see Gramlich (1990).

Figure 3
Real Nonmilitary Government Capital Stock per Person



tion. In the 15 years following World War II, U.S. population growth was quite rapid relative to the growth of the labor force. As the baby-boom generation matured and entered the labor force, the growth rate of the latter accelerated sharply, while population growth slowed. Finally, after the baby-boomers had fully entered the labor-force, growth of the labor force slowed sharply. These movements in the size of the labor force relative to the general population imply that the public capital stock per person will show a different pattern than public capital measured relative to actual or potential employment.

Figure 3 shows the nonmilitary real net stock of capital and its components when measured

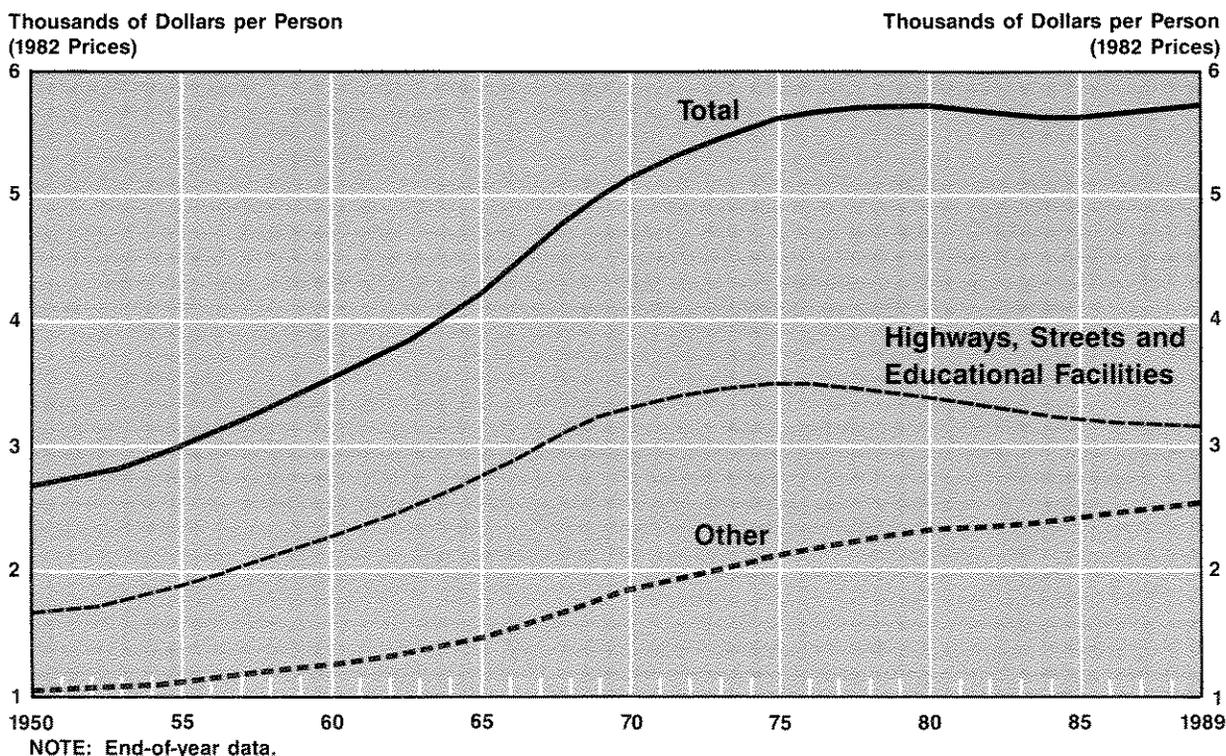
relative to population.¹⁵ While the trend growth for both the state and local stock and the total stock per capita slowed after 1970 (similar to the measures in figure 2), the stock available per person at each level of government did not decline. Instead, the per capita stock rose until about 1975 and then leveled off. The public capital stock per person has remained nearly unchanged for about 15 years.¹⁶ The patterns in figures 2 and 3 differ because of differences in the growth of the labor force relative to that of the population. Since the early 1970s, these differences reflect the faster growth in the labor force relative to the population due, in part, to the aging of baby boomers. The slowdown in population growth associated with the end of

¹⁵End-of-year population and capital stock data are used for each year. Thus, the data shown are comparable to the data plotted one year later in figure 2, because beginning-of-the-year capital stocks are measured relative to the annual average level of the civilian labor force in figure 2.

¹⁶If government capital or infrastructure were considered "social overhead capital," so that a fixed quantity is required for virtually any size population, then the quantity of such capital per person, like other overhead measures,

would be inversely related to the number of persons with access to these public facilities. In this case, the capital stock per person should fall over time as the population grows.

Figure 4
State & Local Net Capital Stock per Person



the baby boom is also one reason for the slower pace of capital formation shown in figure 1.

Trends in Components of State and Local Capital Stocks

Further insight into the changing trends of state and local government capital can be obtained by a closer inspection of the stocks' components. Table 1 indicates that nearly half of this capital consists of highways, streets and educational buildings. These two types of capital goods have been influenced by demographic factors and trends in transportation.

Figure 4 shows the state and local government capital stock per person, its two major components, (highways and streets, and educational buildings) and the total excluding these two components (labeled "other"). The break in

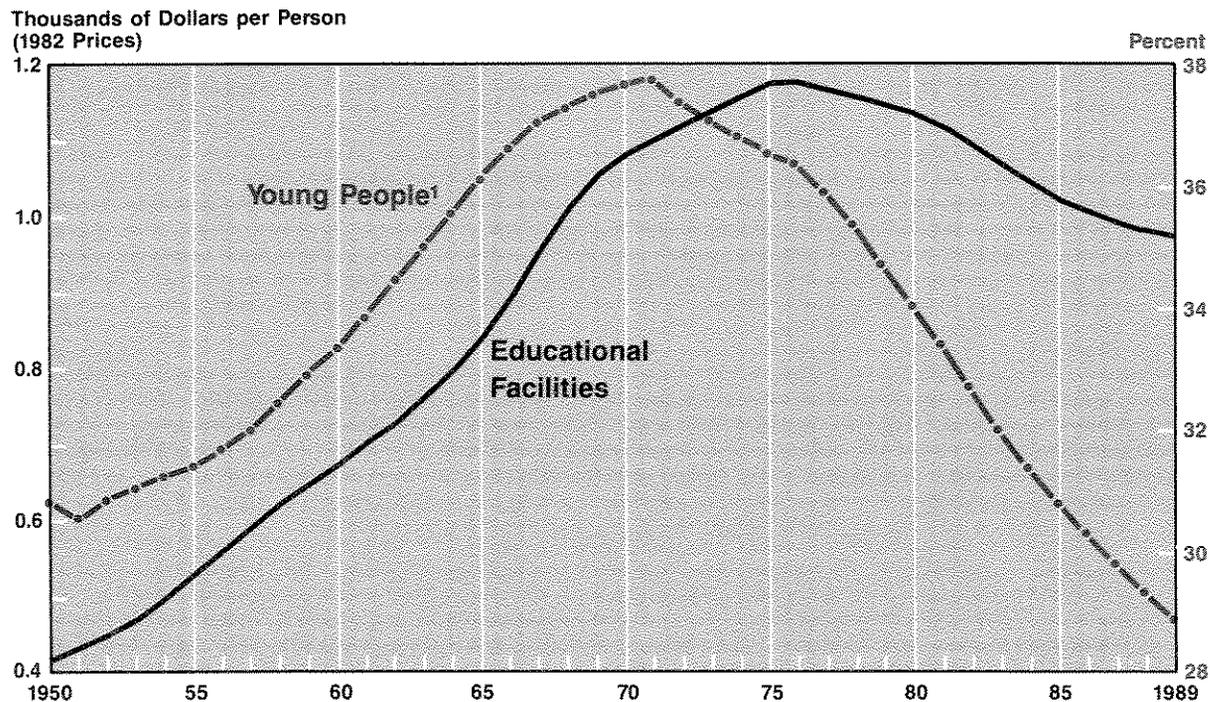
the trend shown in figures 2 and 3 is heavily concentrated in these two sectors. As shown in figure 4, the growth in the rest of the capital stock per capita (labeled "other") slowed after 1970, but remained positive. From 1970 to 1989 this category grew at a 1.7 percent rate. While this growth was down from its 3 percent rate from 1950 to 1970, it nearly matched the 1.8 percent growth rate of real GNP per capita over the period. Thus, the slowdown in growth for real non-military public capital stock is largely concentrated in the quantities of highways, streets and educational facilities per person.

Demographics have played a role in the decline in the stock of per capita state and local educational facilities. Figure 5 shows the stock of these facilities per person and the share of the school-age population (aged 5 to 24) in the total population.¹⁷ Due to the baby boom, the

¹⁷Rubin (1990) has also noted the relationship between the decline in school-age population and the slowdown in the growth of public capital. She uses movements in the population aged 5 to 15 to measure the demographic variable and indicates that it fits movements in productivity

growth about as well as those in the public capital stock. She argues that this use of the demographic variable has no conceptual basis, however, and suggests that either relation is spurious.

Figure 5
Stock of Educational Facilities per Person and the
Share of Young People in the Total Population



¹Young people are those ages 5-24.

NOTE: Capital stock is end-of-year data. Population is mid-year data.

proportion of the population in that group rose rapidly, as did the stock of educational facilities per person. The share of youth in the population peaked in 1971 and has declined sharply since then. The occurrence of this peak matches that of total government real nonmilitary capital stock per person in the labor force (figure 2) and leads by five years the outright decline in the stock of educational facilities per person.¹⁸

The baby boom and its associated population trends influenced the demand for other capital goods, including highways and streets. The

growth rate of the population was relatively rapid in the 1950s and began to slow sharply in the 1960s. From 1955 to 1960, the population grew at a 1.7 percent rate, and then slowed steadily to a 1.1 percent rate from 1965 to 1970. The population growth rate subsequently fluctuated between about 1.0 and 1.1 percent for five-year intervals.

Other factors also slowed the growth of highway and street capital per person.¹⁹ The interstate highway system program, funded beginning in 1956 and which was largely built between 1963 and 1975, led to a sharp rise in

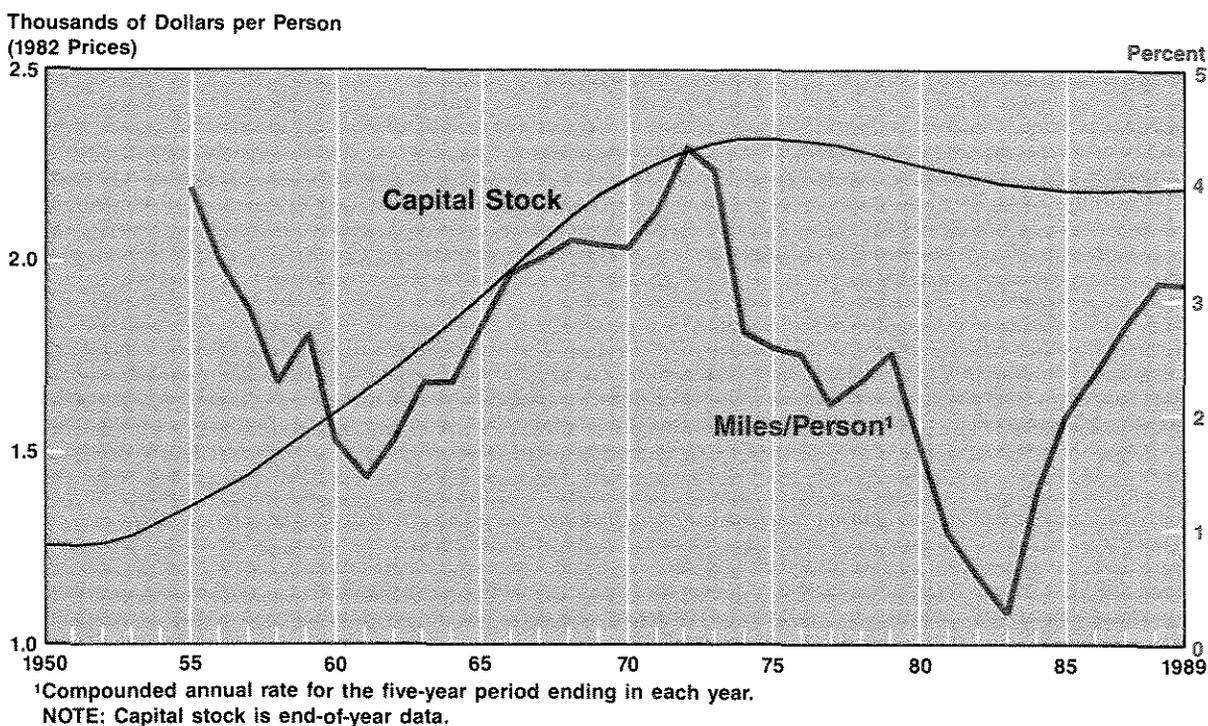
¹⁸Private sector educational facilities per person have also declined. Such facilities peaked in 1972 at \$217 per person after growing at a 3.7 percent rate from 1950 to 1972. From 1972 to its lowest subsequent level, the per-capita stock of private educational facilities declined at a 1.6 percent rate. From 1986 to 1989, this measure rose about 1 percent.

The stock of public educational facilities per school-aged person (5-24) rose at a 3.5 percent rate from 1947 to 1969, a 2.6 percent rate from 1969 to 1976 and a 0.4 percent rate from 1976 to 1989. Thus, the decline in the level of

educational facilities per person in figure 5 did not arise from a decline in this specific public capital stock per young person. The latter did not decline, only its growth rate fell.

¹⁹A CBO study of the nation's public works (1988) indicates that "the capacity of the existing major network is broadly sufficient for its traffic" (p. 5). The study does indicate that some regions have relatively high urban traffic congestion, but suggests that this is matched by a relatively large excess capacity elsewhere.

Figure 6
State and Local Stock of Highways and Streets per Person and the Growth of Miles per Person



highways and roads per person. As the program neared completion, highway spending slowed sharply. Changes in the price of fuel also influenced the demand for highways and streets by reducing the growth in road usage. Sharp increases in fuel costs in 1974 and 1979-80 reduced the total miles driven per person. The number of miles driven per capita grew at a 4.1 percent rate from 1968 to 1973 (figure 6).²⁰ The 5 year growth rate subsequently declined to a 0.3 percent rate from 1978 to 1983. When oil prices began to decline in 1981, this trend was reversed and miles per person grew at a 3.1 percent rate from 1983 to 1989. Highway and street capital per capita bottomed out in 1986.

While demographic and driving patterns may not fully explain the slower growth of government capital, they suggest that the decline in the growth of public capital was not inexplicably

capricious, unplanned, or completely induced by the federal budget deficit. The decline was at the state and local level, where government is considered to be more responsive to voter demands, and was largely due to reductions in the stock of highways, streets and educational facilities per person. The latter reductions were consistent with changes in demographics and driving patterns.

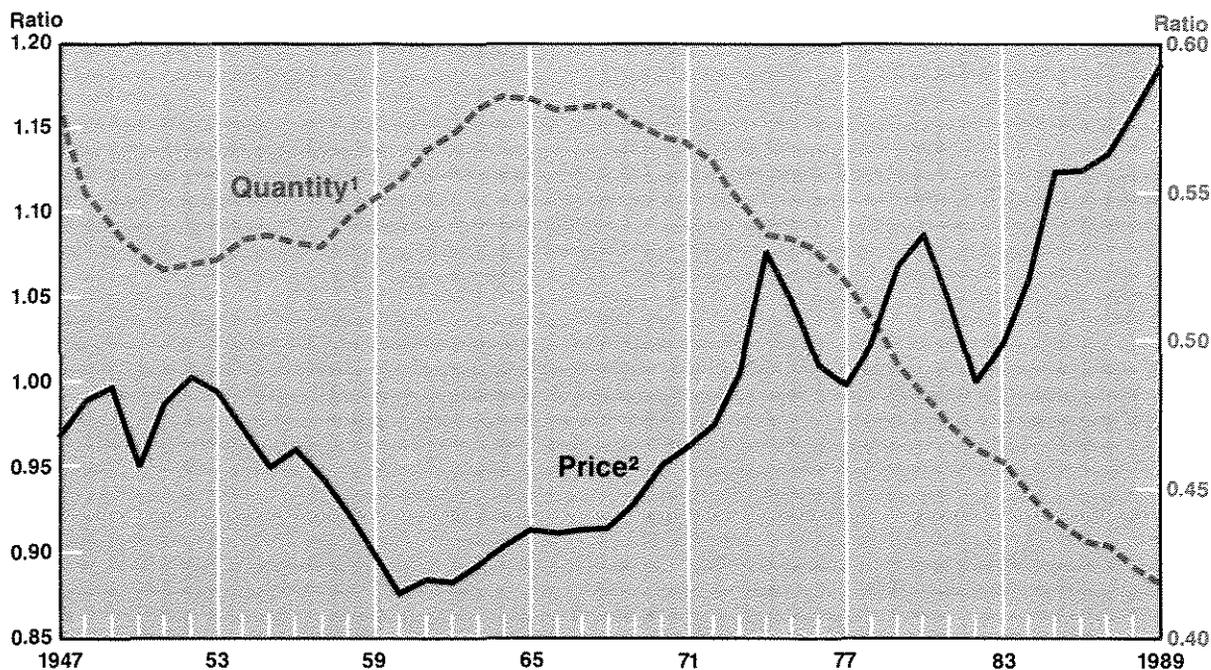
The Relative Price of Public Capital Goods

The supply price of public capital goods also is important when determining the optimal quantity of public goods. Given the demand for public capital, a rise in the price of public capital goods and their services will reduce the optimal quantity of such goods and services.

²⁰The mileage data are prepared by the U.S. Federal Highway Administration and published in their "Highway Statistics, Summary to 1985." These and subsequent un-

published data were obtained from the U.S. Federal Highway Administration.

Figure 7
Price and Quantity of Public Capital Relative to Private Capital



¹Ratio of the constant dollar net stocks of public nonmilitary capital and private nonresidential fixed capital stocks.

²Ratio of the implicit price deflators for public nonmilitary investment and for private nonresidential fixed investment. (1982=1.0)

Figure 7 shows the ratio of the implicit price deflator for gross investment in non-military public capital to the implicit price deflator for private non-residential fixed investment and the ratio of the non-military public capital stock to the private non-residential capital stock from 1948 to 1989.²¹ The relative quantity of non-military public capital provides another indicator of the declining trend in non-military public capital. When assessed relative to private capital, the decline began in 1965 and accelerated after 1972. This decline followed a general rise

in the relative price of public capital goods that began in 1961 and became especially sharp after 1968. There were declines in this price in 1975-77 and in 1981-82, however. A sharp decline in the relative price of public capital from 1952 to 1960 also was associated with a rise in the relative quantity of the public capital stock. While this rise began in 1952, it was largest from 1957 to 1964.

The relative stock of public capital is strongly and inversely related to the relative price of public capital.²² The correlation coefficient for

²¹The price ratio (1982 = 1.00) measures the price of fixed capital goods purchased by governments relative to the fixed capital goods purchased by the private sector. The deflator for government capital is constructed as the ratio of current dollar non-military public gross fixed investment to its constant dollar (1982 prices) counterpart.

²²The patterns shown in figure 7 are nearly identical for the relative quantity and price of state and local highways,

streets and educational buildings. The correlation between the relative quantity of non-military public capital and the ratio of state and local highways, streets and educational buildings to private capital is 0.92, while the correlation for the relative price of all public capital and that of only the highways, streets and educational buildings is 0.88. Both correlation coefficients are statistically significantly different from zero at a 95 percent confidence level.

this relative stock and relative price is -0.88 (statistically significantly different from zero at the 95 percent confidence level). The year-to-year changes in the relative price and the relative quantities are also statistically significantly and negatively correlated; their correlation coefficient is -0.37 (which also is significant at a 95 percent confidence level).²³ Thus, the slowing growth of the public capital stock has also been associated with a rise in the price of such goods relative to the price of private capital goods.

CONCLUSION

An increasing number of people advocate additional government capital spending as a means of returning private sector output, productivity and capital formation to former trend levels.²⁴ Even if public capital would have such effects, the decline in the growth of public capital would not provide a rationale for increasing the pace of government capital formation. Most components of public capital yield direct benefits to consumers as final users. Slower growth of such capital can be justified in a variety of circumstances, including the reduced growth of consumer demand for such capital or higher prices for such capital goods.

Upon closer inspection, it is difficult to argue that the decline in public capital growth per worker has been unwarranted and adverse, or that it should be reversed, simply because of its occurrence or because it may have imposed some costs on other sectors of the economy. The decline in the quantity of public capital per worker has been associated with a rise in the labor force relative to the population and is largely due to a decline, on a per capita basis, in the two largest components of public capital: highways and streets and educational facilities. The reductions in these two components have occurred for demographic reasons. The decline in public capital growth has also been associated with a rise in the prices of public capital goods relative to private capital goods.

The view that federal policy should redress the purported adverse effects of the decline in the public capital stock per worker is misleading, at best. The decline in the public capital stock

per person has not been the result of changing trends in federal spending, but rather reflects decisions by a multitude of state and local governments, principally in response to increased relative prices and to reduced demand for highways, streets and public educational facilities.

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²³For just the highways, streets and educational buildings components, the correlation coefficient for the level of relative prices and relative quantities is -0.74 and that for their first-differences is -0.30 ; again, both of these are statistically significant at a 95 percent confidence level.

²⁴Tatom (1991) examines the shortcomings of existing production function estimates that find a statistically significant relationship between public capital and private output and shows that the significant effect vanishes when the relationship is appropriately estimated.

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