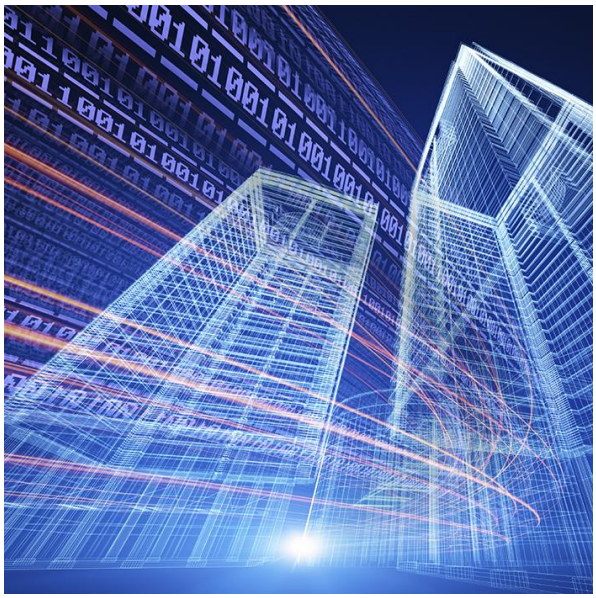
Estimating the stock of public capital in 170 countries

Jan 2017 update



What is in the database?

Public investment can be a catalyst for growth. As part of the IMF's work on public investment, the Fiscal Affairs Department has compiled a comprehensive database on public, private, and public-private-partnerships (PPP) investment flows for 170 countries. The database also includes estimates of real public capital stocks, between 1960 and 2015. This note provides a brief overview of the data sources, methods, and main trends, and is accompanied by an update of the Investment and Capital Stock Dataset (since last release of September 2015), and a detailed Manual and FAQ of the database construction.

Why is it important to have a stock series?

It is important to look at the public capital stock, and not only the annual inflows of public investment, for two reasons. First, public investment is a key input in the creation of a network of physical assets over time, including economic infrastructure (roads, airports, electric utilities, etc.) and social infrastructure (public schools, hospitals, prisons, etc.). It is the volume of the existing network not only additions to it that provide productive services. In theoretical models of economic growth, the public capital stock is a direct input factor of the production function, contributing to higher productivity growth and living standards. Second, infrastructure assets are subject to wear and tear, hence the need to examine the stock of public capital net of depreciation. As for PPPs, while they are increasingly being used to finance investment projects in infrastructure, comprehensive information on the PPP stock of capital is still lacking.

How is the capital stock typically measured?

Estimating measures of public capital stocks comparable across countries is a complicated task. Ideally, these stock series would be directly observed and measured, but this is not the case in practice. A few national estimates exist—based on detailed information and assumptions at the asset level and a variant of the perpetual inventory method, but these are not directly comparable across countries.[1] As for internationally comparable data, there are some estimates in the literature—e.g. Kamps (2006) and Gupta et al. (2014)—but they only cover a subset of countries.[2]

How do we estimate the capital stock?

We also rely on the perpetual inventory method to construct capital stocks series for 170 countries. Specifically, we utilize various databases to compile a comprehensive series for public, private, and PPP investments.[3] We transform raw investment data into "real cost" (constant 2011 $US). We then make assumptions on depreciation rates and on the initial capital stock series to derive the net "real cost" stocks (constant 2011 $US). The depreciation rates are time varying and depend on country income grouping, while the initial capital stock is derived using the synthetic time series approach. The benefit of our approach is that it relies on a unified and standardized framework easily comparable across countries, while the drawback is that the estimates and do not rely on detailed asset-level investment information.

What has changed since the last data publication?

Since the 2015 data publication, two main changes have been made to the database: (i) the raw data sources have been updated (OECD, PWT, WEO, World Bank, EIB); and (ii) country coverage has been expanded using alternative sources (Haver, World Bank). The PWT Version 9.0 update implies major changes in certain country cases, but little average change for emerging market and low-income country groupings. As for advanced economies, public investment has increased on average relative to the last update due to the move of these countries to the 2008 System of National Accounts, with R&D spending now being classified as capital formation (see Manual for more detail).

Main trends in the capital stock series

Below is a summary of the main trends over time and across group of countries resulting from the recent update of the database.

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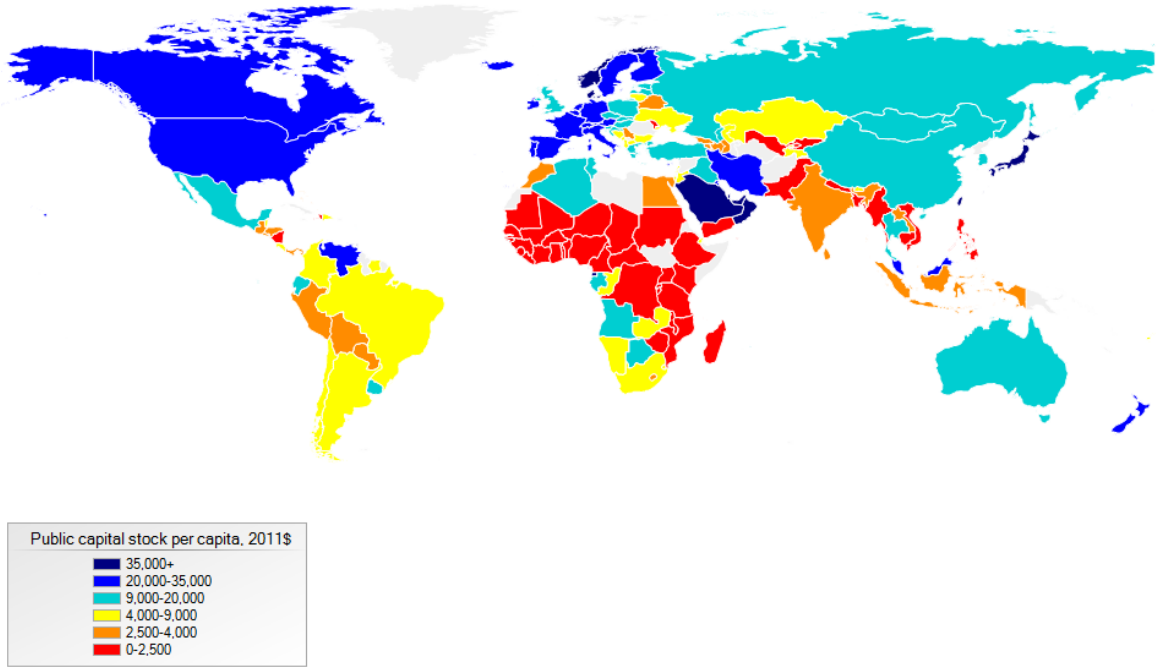
[1] For example, the United States Bureau of Economic Analysis (BEA) estimates of the capital stock are based on the perpetual inventory estimation method, rather than direct measurement.

[2] The estimates for public capital stock series are for 22 OECD countries in Kamps (2006), and 71 middle- and low-income countries in Gupta et al. (2014). The Penn World Tables, Version 9.0 produces internationally comparable data on the aggregate capital stock but not on the breakdown of public, private, and PPPs.

[3] These are: The Organization for Economic Cooperation and Development OECD Analytical Database, the Penn World Tables PWT, The IMF World Economic Outlook WEO, The World Bank, and the European Investment Bank

1. Public capital stock per capita or per employee remains unequal across countries

Figure 1 shows a map of the public capital stock per capita for 2011, in constant 2011 international dollars. While the real value of the accumulated public capital stock has risen steadily on a per capita basis across countries (nearly tripled since 1960), it remains highly unequal, with a picture closely mirroring the global distribution of GDP per capita.

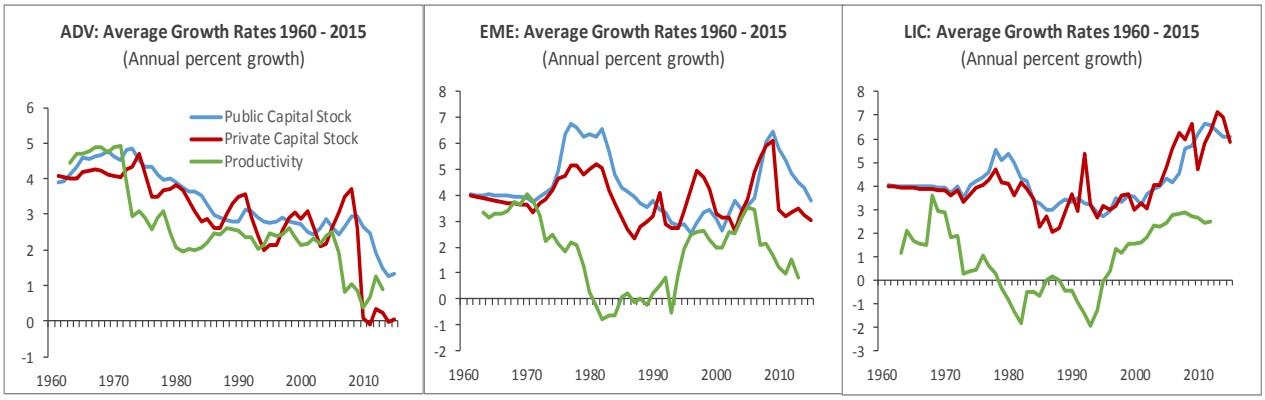


2. Real public capital stock growth continues to fall in advanced economies, and remains highest in low-income countries

Figure 2 plots the average annual growth rates in real public capital stock, real private capital stock, and real labor productivity (defined as real GDP divided by employment and in 5-year averages) across three WEO country groupings (advanced, emerging, and low-income and developing).

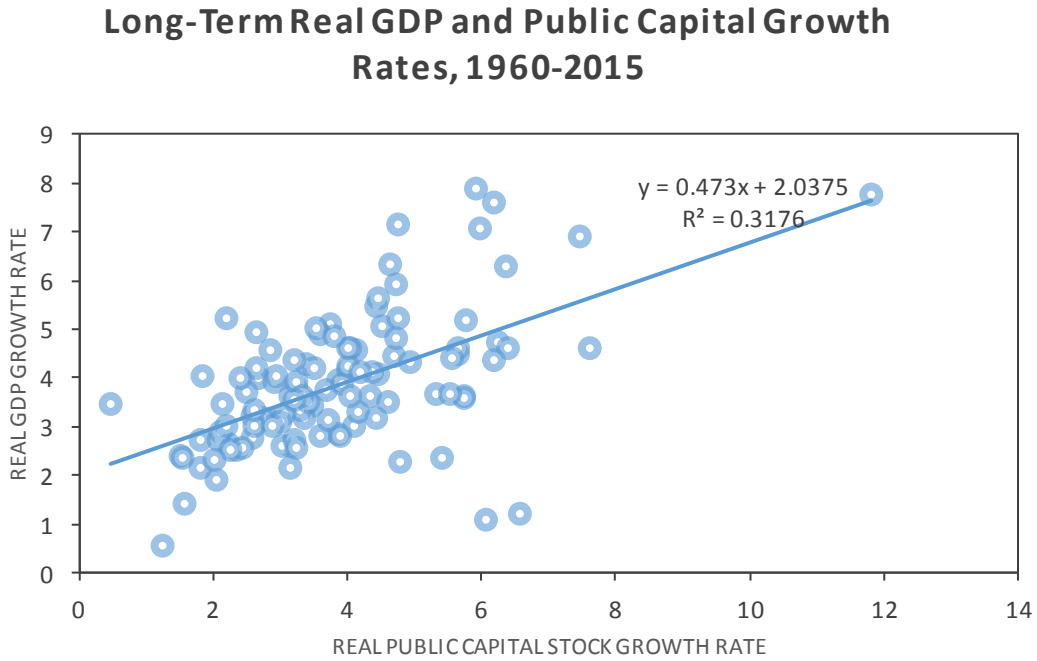
Real public capital growth varies significantly across the three groups. In advanced economies, it has been steadily falling from a high of 4 percent in 1960 and experienced a sharp decline following the financial crisis to as low as 1.3 percent in 2015, on the account of declining public investment rates. In emerging economies, it has recently fallen from a high of 6 percent back to the average 4 percent long-term growth rate. Finally, in low-income and developing economies, real public capital growth remains highest at about 6 percent although it has recently started to fall. In terms of nominal shares, the public capital stock to GDP is

highest on average in low-income countries (about 120 percent of GDP), followed by emerging markets (90 percent), and advanced economies (60 percent).



3. Real public capital stock growth is highly correlated with real labor productivity growth and real GDP growth

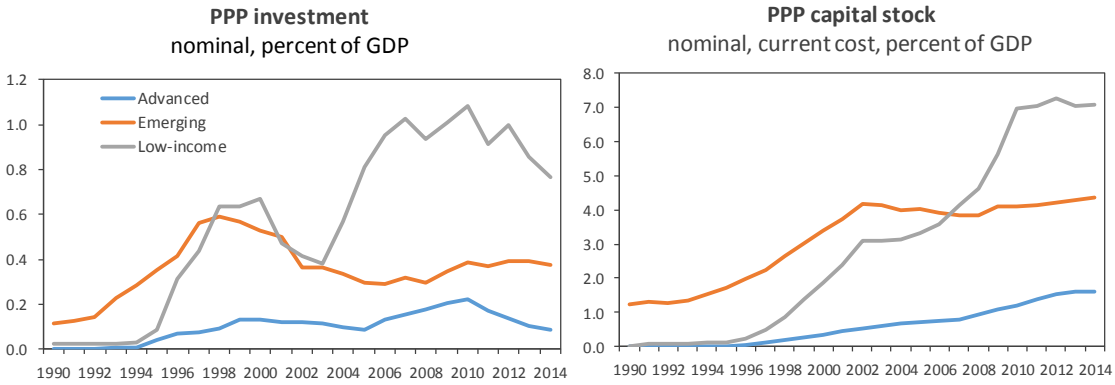
As shown in figure 2, the trend in the growth rates of real public capital is highly correlated with labor productivity growth especially in the advanced and low-income countries. Figure 3 plots long-term real GDP growth rates (between 1960-2015) and long-term real public capital stock growth rates, and shows a strong positive correlation. However, this should not be interpreted to measure directly the impact of public capital on growth as real private capital stock growth rates also correlate with GDP growth and labor productivity (Figure 2) and the direction of causality most likely runs both ways.



Note: Growth rates are calculated in logs and derived as an annual average.

4. PPP investment flows remain highest in low-income countries on average, but have fallen since the financial crisis in all countries

Figure 3 plots PPP investments and the associated capital stock (current cost, as a share of GDP) in advanced, emerging, and low-income countries from 1990 until 2014. These investments cover spending on various infrastructure services, including energy, water, transport, and telecoms. PPP investments have steadily risen over time in all country groups since 1990 and are highest in low-income countries (peaked at 1 percent of GDP) but have started to fall since the financial crisis. The PPP capital stock, on the other hand, continues to rise as a share of GDP, and is highest in low-income countries at 7 percent.



Conclusion and future releases of the database

This database is a comprehensive source of information which can be used to analyze cross-country and trend variations in different sources of investment and capital stock (public, private, public-private). The database can be used for future research on the links between public and private capital and growth as well as links between public capital (input) and infrastructure outcomes (output).

We plan to publish an update of the Investment and Capital Stock Database on an annual basis, reflecting updates in the raw data sources, as well as continuous methodological improvements.

References

Kamps, C., 2006, "New Estimates of Government Net Capital Stocks for 22 OECD Countries, 1960–2001," *Staff Papers*, International Monetary Fund, Vol. 53, No. 1, pp. 120–50.

Gupta, S., et al., 2014, "Efficiency-Adjusted Public Capital and Growth," *World Economic Development,* Vol. 57, Issue C: pp. 164–78.