Appendix

This appendix contains additional information on capital productivity data used in the *Annual productivity bulletin – 2026*. It summarises relevant materials taken from the Australian Bureau of Statistics (ABS 2026) and the Organisation for Economic Co-operation and Development (OECD 2021) websites.

What is capital?

In economics, capital refers to 'produced assets' that are used repeatedly as inputs in further production processes. This definition has three conditions that distinguish capital from other types of assets and inputs.

First, capital must be a 'produced asset'. This means it must come into existence as an output of a production process. This distinguishes capital from non-produced assets like unimproved land or natural resources. This also differentiates capital goods from financial assets like money, bonds or shares because these are contractual claims that entitle their owners to compensation and do not result from production.

Second, capital goods are different to consumption goods because they are employed as inputs in production. Consumption goods are final goods purchased by households to directly satisfy their needs and preferences, for example an item of clothing or a gaming console. Some goods can be both consumption goods and capital goods depending on who purchases them and how they are used. A computer that is bought and used for a business would be considered a capital asset, but if it was bought by a family and used for entertainment then it would be categorised as a consumption good.

Third, capital goods must be used repeatedly in the production process, which distinguishes them from intermediate inputs that are materials completely used up during production. A semiconductor is a good example of a produced intermediate input – it is not used on its own to produce multiple products, and the entire semiconductor is used up in the production process as one constituent part of a single electronic good. For consistency, the ABS defines the repeated use of a capital asset as occurring more than once or continuously over periods of time longer than one year.

Using these characteristics, the ABS identifies the following types of assets as capital:

- non-dwelling construction – including industrial buildings, roads and bridges
- machinery and equipment – including commercial vehicles, electrical appliances and tools
- cultivated biological resources – including animals and plants grown for repeated production like dairy cattle and fruit orchards
- weapons systems – including warships and military aircraft
- intellectual property products – including research and ICT software.

How is capital measured?

Even with a clear definition of what counts as a capital asset, figuring out how to accurately measure the quantity of capital in an economically relevant way is quite difficult. Capital measurement has long been a subject of uncertainty among economists (Robinson 1953, Champernowne 1953, Solow 1955,

Harcourt 1972). Today, statistical agencies like the ABS and the OECD follow a standard set of internationally agreed recommendations on how to measure capital in different ways (EC et al. 2008). This approach generally uses the monetary value of the capital assets in existence to construct the following three measures for the quantity of capital.

Gross fixed capital formation

The first measure of capital relevant to the analysis in this bulletin is gross fixed capital formation (GFCF) – an estimate of the total value of new capital assets acquired by producers in a given period. The ABS releases quarterly and annual estimates of GFCF using current prices, which are then deflated into real or chain-volume values using price indexes. GFCF is the main measure of capital investment.

This method also allows for some aspects of quality improvements in new capital assets to be captured. Competitive market prices can be used to show changes in the quality of goods and services being produced – better quality products generally fetch a higher price than lower quality ones. Applying deflators to GFCF removes the effects of inflation on price, leaving only the price increases deriving from improved quality. This means that improvements in the quality of new capital assets will be captured as an increase in the total value, and therefore quantity, of real GFCF.

Productive capital stock

The second relevant measure of capital is the productive capital stock (PKS) – an estimate of the total quantity of capital in use. This measure is adjusted for the decline in efficiency of capital assets due to age.

The PKS is calculated by first compiling the total amount of real GFCF that has occurred over time and breaking this down into the total existing stock of each type of capital asset. A unique age-efficiency function is then applied to each type of asset, which adjusts the value of the capital stock based on the average age of the assets. As capital assets get older, they become less efficient and their productive value declines – age-efficiency functions therefore capture the decrease in the quality of existing capital assets over their lifetimes. The stock of age-adjusted assets is then recompiled to generate the total quantity of the PKS.

Capital services

Productivity is calculated as the quantity of output produced divided by the quantity of inputs used in the production process. The total value of the PKS is not an appropriate measure of capital input because only a small amount of a capital asset's full value gets used up during a production period. The ABS therefore constructs a measure of capital services flowing from the capital stock to use as an input in productivity measures.

The quantity of capital services is estimated by multiplying the PKS by a capacity utilisation rate that represents the hours in a day during which a capital asset is used to produce things. Imputed prices for renting each asset are then applied to weight the flow of capital services across different asset types and industries, because certain types of capital assets can provide more services in particular industries.

The ABS only releases the quantity of capital services as an index, meaning we can only use their data to calculate the growth rates of capital services and capital productivity. However, the OECD releases the numerical values for the quantity of capital services each year, which was central to the analysis in this bulletin because it enabled us to calculate and compare the levels of capital productivity across different countries.

References

ABS (Australian Bureau of Statistics) 2026, *Australian System of National Accounts: Concepts, Sources and Methods, Edition 8*, https://www.abs.gov.au/statistics/detailed-methodology-information/concepts-sources-methods/australian-system-national-accounts-concepts-sources-and-methods/edition-8 (accessed 21 January 2026).

Champernowne, D 1953, 'The production function and the theory of capital: A comment', *Review of Economic Studies*, vol. 21, no. 2, pp. 112–135.

EC (European Commission), International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and the World Bank 2008, *System of National Accounts 2008.*

Harcourt, G 1972, *Some Cambridge controversies in the theory of capital*, Cambridge University Press.

OECD (Organisation for Economic Co-operation and Development) 2021, *OECD Productivity Statistics database Methodological Notes,* https://www.oecd.org/content/dam/oecd/en/data/methods/OECD-Productivity-Statistics-Methodological-note.pdf (accessed 22 October 2025).

Robinson, J 1953, 'The production function and the theory of capital', *Review of Economic Studies*, vol. 21, no. 2, pp. 81–106.

Solow, R 1955, 'The production function and the theory of capital', *Review of Economic Studies,* vol. 23, no. 2, pp. 101–108.

Publication enquiries: phone 03 9653 2244 | email publications@pc.gov.au

www.pc.gov.au