



**Economic** and Social **Research Council** 

# Productivity Primer

Why productivity matters for the economy, business, and places.



# What is productivity and why does it matter?

Productivity is about how we turn our resources into outcomes for firms, people and places. The resources are associated with workers and the hours they work but also includes investments in skills, machines, infrastructure, digital capabilities, and organisational knowledge.

If we use our resources more efficiently and effectively to create better outcomes, organisations will be more successful in what they do, people will experience higher living standards and well-being, and places will become more attractive to live, work and do business in, in turn creating inclusive growth (see Exhibit 1).

This primer aims to define productivity, how it is measured, what it means in the context of the economy and production of goods and services, how it can be best understood for firms and places and how it contributes to inclusive growth. Examples and details are provided in separate boxes.

The measure of productivity that is most widely cited is the value of domestically produced products and services relative to the total hours of the workforce used for its production. This is known as labour productivity.

Economy-wide labour productivity has increased about 10-fold since the start of the Industrial Revolution, some 250 years ago, which helped to dramatically improve people's wages and household incomes.

The subsequent vast improvements in transportation, manufacturing and communications, made possible by the inventions of the steam and internalcombustion engines, the telephone and wireless communications respectively, led to a major expansion of trade. Innovation and invention continued, businesses expanded, and educational levels rose along with a more mobile workforce throughout the 1800s and 1900s.

Productivity is not just important for a country but is also critical to building successful firms. Higher productivity contributes to a firm's ability to grow market share or become more profitable. Businesses can use productivity gains to pass them on to the consumer through lower prices or by developing higher quality products and services. Productive firms can pay workers better, reward investors more, or innovate and invest faster in new productivity-enhancing activities.

Higher incomes and revenues also enable households and firms to pay more taxes, which makes it possible for governments to deliver better public services – such as health care, education, and infrastructure. Joined-up public and private sector productivity makes our towns, cities, regions, and nations more prosperous.

While productivity is primarily a positive notion, there can also be a more negative side to it. Budget cuts and efficiency drives are often focused on using fewer resources to do as much or even more than before. This may create concerns about jobs and workforce wellbeing as well as depletion of other resources, including nature and the environment.

Such negative effects from productivity growth often arise in the short-term and need to be well-managed by policy makers and business leaders and be weighed against the long-term gains.





Exhibit 1: How Productivity can deliver Inclusive Growth

# The many facets of productivity

Productivity is a multi-faceted phenomenon. The simple measure of the average Gross Domestic Product (GDP) per working hour is widely used by economists, policy makers and the media feeding the policy debate on the productivity slowdown.

Productivity provides a powerful way to capture the vitality of an economy.

However, this macroeconomic measure does not reveal the details on how productivity matters for firms, people and local communities.

Only when we better understand the subtleties of productivity for different uses, can we have an informed national and wider debate on how the UK's productivity performance can be improved to the benefit of all and become a key driver of inclusive growth.



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### Productivity at the start of the Industrial Revolution

Scottish philosopher and economist Adam Smith is often dubbed the father of modern economics. In his book *The Wealth of Nations*, written in 1776, he offers one of the world's first connected accounts of what builds a nation's wealth, reflecting upon economics at the start of the Industrial Revolution, which started in 1760.



"There is one sort of labor which adds to the value of the subject upon which it is bestowed; there is another which has no such effect. The former, as it produces a value, may be called productive; the latter, unproductive labor. Thus the labor of a manufacturer adds, generally, to the value of the materials which he works upon, that of his own maintenance, and of his master's profit. The labor of a menial servant, on the contrary, adds to the value of nothing ... A man grows rich by employing a multitude of manufacturers; he grows poor by maintaining a multitude of menial servants. The labor of the latter, however, has its value, and deserves its reward as well."

The Business School at the University of Glasgow, where Adam Smith studied, bears his name and celebrated his tercentenary year in 2023. Former U.S. President Benjamin Franklin was a contemporary of Adam Smith and a pioneer in the area of personal productivity, creating what's believed to be the first to-do list, with the mantra: 'start the day asking what good shall be done, and at the end of the day evaluate based on what was accomplished'.



# Productivity of the economy

Productivity is a relatively easy concept to understand when it's about the production of a single good. Box A provides a stylised example for the production of chocolate bars. It shows the output can be expressed in terms of the produced quantity, revenue or value added of chocolate bars.

Value added measures the monetary value of revenue excluding the cost of materials, business services, energy inputs and change in inventories of the output.

The productivity of produced services is often more difficult to grasp because the output cannot always be easily defined. Services are the non-physical, intangible parts of the economy such as banking, education, medical treatment, and transportation.

For example:

- For a privately-owned airline, should you measure the output by the number of flights, the number of passengers, the number of connections it serves, total flight time, customer satisfaction or a combination of all?
- For a public service such as a hospital, while the number of patients that are seen and the number of medical procedures per hour are important output measures, what ultimately matters is the health outcome of the patient.

Improvements in the quality of goods and services are an important ingredient of productivity growth. Quality changes are often small and gradual, but can play a very large role for specific outputs, such as digital products.

For example, a laptop produced today has significantly more computing power and capacity than one produced five years ago. So, if we count produced laptops as quantity units, we hugely understate the true productivity improvement. Statisticians have a range of methods at their disposal to take such quality improvements properly into account (see Box B).



# Box A - Primer on the productivity of one or multiple goods

#### Physical labour productivity

A worker in a chocolate factory is employed in producing chocolate bars. The worker produces 2,000 chocolate bars during a 40-hour work week. Hence the physical labour productivity of the worker can be calculated as:



This method can be applied to any type of production which can be easily quantified in terms of physical units (number of units, volumes, etc.)

#### Revenue labour productivity

While the productivity of a specific worker can be compared with that of other workers producing the same chocolate bars, it cannot be compared to workers in the same firm who produce chocolate biscuits instead of bars.

To make this possible, the output of chocolate bars can also be expressed as a revenue measure in terms of  $\pounds$ . If the price of a chocolate bar is  $\pounds$ 2, total revenue of that worker's chocolate bars is  $\pounds$ 4,000 (2,000 bars x  $\pounds$ 2 each), and revenue productivity can be calculated as:



This measure can be then be compared to, or combined with revenue productivity of chocolate biscuits. As different firms rarely produce exactly the same good or product, the use of revenue productivity also allows for comparisons between firms or to aggregate the results for different firms to industry level.

#### Value Added-based labour productivity

As some of a firm's inputs are being produced by (and purchased from) other firms it is common to focus on the value added created by the firm itself.

To measure the value created by the firm from its labour and capital, the purchases of materials, business services and energy inputs (called intermediate inputs) need to be deducted from the value of gross output. The gross output is the total revenue corrected for changes in inventories of the product. If the intermediate purchases for our chocolate bar worker amount to £700, value added-based productivity is calculated as:



Value Added-based productivity is also required when productivity is aggregated to sector and total economy level. This avoids double counting as the output of one firm (or industry) may be used as an input by other firms (or industries). A country's GDP is the sum of the value added across all producing units and industries.

#### Real Value Added-based labour productivity

When comparing productivity at different points in time, the growth rate of revenue or gross output reflects changes in quantities as well as prices of the outputs produced. When measuring value added it also reflects changes in quantities and prices of intermediate inputs purchased.

Price increases can be due to general inflation, specific pricing strategies of the firm or quality improvements in the product or service produced. While the quality improvement should be treated as part of productivity, the other price increases should be removed from the productivity measure (see also Box C).

If the prices of chocolate bars has increased by 12% compared to a previous period, of which just 2% is due to a quality improvement of the bars, an adjustment needs to be made for the remaining 10% of the increase in price:



We can now compare productivity between the two time periods. If productivity in the first period was  $\pounds70$ , real value added-based productivity has increased to  $\pounds75$  - about 7% - by the next period.

Real Value Added-based labour productivity is the closest to the measures of economic productivity reported in national statistics such as those of the Office for National Statistics. However such measures are mostly not available for firms on a regular basis. Hence, the ONS needs to make its own calculations of economic productivity based on a variety of different data sources.

The first two examples provided here are derived from the Productivity Commission Australia, A Productivity Primer. The last two examples are based on expansion by authors.

The way we think about inputs also matters for better understanding productivity.

Labour productivity measures the average output per worker hour, mostly with the help of machine power. Machinery and other capital inputs (like vehicles or roads) should therefore also be treated as inputs in the production process and the productivity measure should be adjusted for that.

This measurement is known as Total Factor Productivity (TFP) - the part of output growth that can't be explained by the inputs from labour or physical capital. TFP growth may be referred to as the growth in output resulting from efficiency gains and technological change (see Box B).

There is also a need to take account of the changes in the quality of inputs. For example, workers today are better educated than in the past. Similarly, machines embody increasingly more digital features.

The more complex an economy becomes, because it produces more services, digital and other intangible outputs, the harder it is to measure productivity well. Some may argue that productivity is becoming an increasingly difficult measure to capture the state of health of the economy. Box B describes some of those measurement issues. While most research suggests that measurement bias, causing a systematic understatement productivity growth, is probably small, economists and statisticians are continuously working to improve measurement of productivity to ensure it doesn't fall too far behind reality.

Productivity measures are also developed for analysis of different sectors and industries, which can inform industrial strategy and other policy-making purposes. For example, it helps to know which manufacturing sectors grow their productivity fastest, or to what extent service industries benefit from digital technology applications to raise their productivity.

Finally, when considering the cost of labour, productivity measures can also provide a measure of cost per unit of output, and therefore provide an insight in the cost competitiveness of a sector or an industry.



# Box B - Is productivity well measured?

There are many variables going into the measure of productivity (See Exhibit B.1). Challenges to adequately measure each of those variables have intensified with the economy undergoing rapid technological and structural change.

As more outputs (e.g. services) and inputs (e.g. digital inputs) have become intangible, direct observations of quantities and quality-adjusted prices are becoming more complicated.





- <sup>1</sup> GDP value of all outputs minus intermediate inputs, and adjusted for price increases
- <sup>2</sup> Labour productivity increase in real GDP per worker or per worker hour
- <sup>3</sup> Increase in contribution of physical capital machinery, equipment and structures
- <sup>4</sup> Increase in contribution of human capital formal school qualifications
- <sup>5</sup> Total Factor Productivity residual growth in real GDP after adjusting for increases of labour and capital input

Some key measurement issues include:

- Mismeasurement The growth of economic productivity is measured in "real" terms to
  reflect the increase in the volume of total output produced rather than the change in
  "nominal" value (cash terms). As shown by the chocolate bars example in Box A, this
  means that the change in the monetary ("nominal") value of output needs to be adjusted
  ("deflated") for the change in the prices of all goods and services included in that output.
  It is often difficult to obtain measures of quantities and prices of multiple products and
  services, properly adjusted for change in quality of each item. Economists and statisticians
  have developed ingenious methods to deal with these challenges, but in a rapidly changing
  economy the risk of mismeasurement remains a continual challenge.
- Free digital content One specific challenge is the increase in free or cross-subsidised digital content and services. This output would remain unmeasured if no value was attached to it. Economists and statisticians are developing methods to value free digital content by making imputations of intangible benefits that are not directly observable from the data. For example, one can proxy the value of free content by finding out how much compensation a user requires to forgo some specific free content, like access to WhatsApp or email, for a period of time.
- **Multi-national firms** Aggregate measures of productivity refer to what is being produced domestically. However, multi-national firms, which are among the most productive firms in the world, produce in different locations across countries. It is often difficult to assign part of a firm's internal supply chain or portfolio of activities to one specific country.
- Labour and capital composition Measurement issues also arise on the input side of the productivity equation. For example, treating total hours worked as a single homogeneous measure does not reflect that there are differences in productive value per hour from workers at different skill levels. The measurement of what physical capital contributes to output in a specific year requires a detailed breakdown of different types of assets (machines, computers, buildings, etc.), and measures of usage and depreciation. For intangible inputs, such as software or intellectual property, it is equally difficult to separate quantities, quality, and prices as it is for output.

Not all measurement errors go in the same direction, and so they might offset each other to some extent. For example, while an understatement of output would bias down measured productivity, if that output is also used as an input elsewhere in the economy, it means inputs are also understated, and have the opposite effect on measured productivity. Also, while the rise of digital goods and services may cause some understatement of productivity growth, the failure to include the cost of unmeasured effects from, for example, pollution or climate change may lead to biases in the other direction.

#### Notes on measurement

- OECD (2001) OECD Manual: Measurement of Aggregate and Industry-level Productivity Growth; Paris.
- D. Coyle (2014), GDP: A Brief but Affectionate History, Princeton University Press.
- J. Martin, R. Riley (2023) *Productivity measurement: Reassessing the production function from micro to macro* Working Paper No. 33, The Productivity Institute.

# The productivity of firms

While the importance of productivity for business is widely acknowledged, firms often do not consider productivity as a specific target or Key Performance Indicator (KPI).

Firms that do measure productivity often use specific physical efficiency measures, for example, for a product line's throughput per machine hour or the number of minutes per call in a customer services department.

When firms attempt to measure productivity at an organisation-wide level, they commonly use basic monetary measures, such as sales revenue over expenditures or sales revenue per employee (See Box A). These simple metrics proxy the productivity concept for the national economy, but they also differ in important respects.

A poll survey of UK managers in 2022 suggested at least 60% of managers indicated that their organisations collect key performance indicators related to productivity in more than half of the sectors surveyed.

Measures of sales revenue, sales minus current expenses, or economic value added vis-à-vis employment are frequently cited. Operating rates or capacity utilisation and return on capital are other measures commonly used.

On the flip side, 60% of small and medium-sized enterprises do not formally monitor productivity. Complexity and not seeing the relevance of the metric are cited as common reasons.

K. Penney and J. Pendrill (2022), *Strategic Productivity for the Leadership Team*, Briefing Paper, 2022, The Productivity Institute.



One reason for the limited focus on productivity within many organisations, is that it is often seen as the hardest way for a firm to raise profits, grow market shares or create more value. Box C describes how a firm's choice of activities and pricing strategies are other powerful drivers of business performance.

Productivity is the difficult part because it is about how the firm can use its resources more efficiently and driving future growth through technology and innovation.

There is also a need for boardroom consensus on what matters to raise productivity. It can be challenging aligning leaders in different functions in an organisation to decide what matters most for productivity. For example, the Human Resources function may be focused on training and employee engagement, while the Business Operations Manager may be mostly interested in innovation processes, and the Chief Financial Officer in cost-saving measures.

While all perspectives are important, it is critical to understand the complementarities and trade-offs and to think about productivity strategically and not just as short-term gains.

# Box C - How productivity relates to better business performance

There are three determinants of business performance, (see Exhibit C.1):

- The activity effect is about business decisions relating to "what you do" as a firm. It concerns the choice of markets in which the firm wants to sell its products or services, for example, specific places or countries. It may also involve selling in specific market segments or varieties, or by creating specific delivery processes. The activity effects also relates to strategic decisions about where to recruit staff or access the financial capital to invest in machines, technologies, etc. And it involves decisions about size and scale, for example, selling at a premium in small niche markets or simplifying offerings so that the firm can scale up through larger production runs or streamlined delivery processes.
- The **price effect** refers to decisions on "the price at which you do things". This involves both the price that can be charged for a product or services, as well as the cost of obtaining materials or energy, recruiting workers, the interest paid on loans or other capital cost. The margin, reflecting the difference between prices and cost per unit of output, is obviously an important source of value creation and profitability.
- Productivity is then essentially about "how you do things". It is largely about managing two types of innovation, (a) namely closing the gap between the firm's technology and innovation performance vis-a-vis the frontier of the best firms in the sector or industry; and (b) pushing out the innovation frontier by being the best. Both factors are at the heart of business performance, namely how quickly a firm can adopt and absorb new innovations and how it invents new processes, products, or services to bring to market.





Source: based on E. Grifell-Tatje and C.A.K. Lovell, "Profits and Productivity", Management Science, Vol. 45, No. 9, 1999.

While it is difficult to precisely measure the contributions of the activity, price, and productivity effects to business performance, it is important for firms to recognise that productivity needs to be understood in relation to the other drivers.

Despite it being unusual for firms to measure productivity at the level of the entire organisation, it is quite common for firms to produce a range of KPIs which may reflect improved productivity performance, such as profitability and return on capital, innovation outcomes, employee engagement and retention, or customer satisfaction.

In fact, productive firms continuously manage and track activities which are known to be key drivers of productivity, including the creation of worker skills and management competencies, innovation, access to finance, and internal and external collaboration (See Exhibit 2). Good management of productivity is about bringing together those different drivers and metrics and to join them up strategically to improve an organisation's performance.

Exhibit 2: Five Key Drivers of Productivity in Business

- R&D and technical change
- Digital Transformation
- Knowledge Diffusion



K. Penney and J. Pendrill (2022), *Strategic Productivity for the Leadership Team*, Briefing Paper, 2022, The Productivity Institute.

# The productivity of places

Productivity is also critical to a better performance of regions, cities and towns. While productivity at the regional level can be measured in a similar way to national GDP per hour, this represents a rather narrow performance measure means for physical places. Places deliver business opportunities to invest in, create jobs for people to earn a living, and help improve living conditions for the entire community.

To assess those broader productivity effects, a broader concept of outputs and inputs is needed – one that recognises the need for growth and development to be inclusive at place-based level. Fortunately, since the early 2000s, researchers have undertaken major efforts to improve metrics on outputs and inputs as part of a worldwide movement to go "Beyond GDP" and develop broader measures of welfare and well-being (See Exhibit 3).

Exhibit 3 - Productivity as outcomes relative to resources

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Source: The Productivity Institute, based on Heys, Martin and Mkandawire, *GDP and Welfare: a spectrum of opportunity*, ESCoE Discussion Paper 2019-16

Source: The Productivity Institute, based on International Integrated Reporting Council and HMG, *Levelling Up the United Kingdom*, 2022

**OUTCOMES** 

WELFARE

WELL

BEING

BROAD

GDP

NARROW

GDP

- **Resources** The economic inputs such as labour (augmented by skills to represent human capital) and physical capital (augmented by embodied technologies, such as digital, as well as public infrastructure) can be expanded to a broader range of inputs including the flow (investment) and stock (assets) of social, intellectual, and natural capital (See Exhibit 3, left panel).
- Outcomes The existing concept of economic output (measured as GDP) can be expanded by measures of the environmental sustainability of growth and welfare improvements. GDP may also be complemented with indicators reflecting the well-being of the populations, by including measures of better health, education, housing, transport and access to green space and culture. (See Exhibit 3, right panel).

On distributional aspects of place-based productivity, it is important that new metrics do not only shed light on who benefits from productivity growth in terms of higher incomes, but also on how the access to the sources of productivity growth can be improved. Wider access to the broad-based capitals is an effective way for society to achieve better distributional outcomes.

# Productivity for inclusive growth

The applications of productivity for the economy, firms and places helps to make better use of productivity metrics for economic research and policy, business strategy, and regional and local development. Together, productivity for the economy, firms and places should help to make economic growth and development more inclusive (See Exhibit 4).





Productivity needs a long-term focus, using a broader concept of resources, outputs and inputs that also consider welfare, well-being, and environmental resources. This also allows for the negative effects of productivity to be better managed.

In today's modern economy, growth also needs to be inclusive. This means providing access to those resources for all, so they can be transformed into outcomes in an efficient and sustainable way and the gains distributed widely across society. Cite as Productivity Primer: Why productivity matters for the economy, business and places, The Productivity Institute (2024)

Based on the premise that the long-term underperformance of productivity in the United Kingdom threatens a future of global excellence in economic performance and shared prosperity across the nation, **The Productivity Institute**'s mission is to lay the foundations for an era of sustained and inclusive productivity growth.

Our broad-based interdisciplinary research programme focuses on identifying the causes of the stagnation in UK productivity and making proposals for solutions and with strong regional engagement with stakeholders across the whole country.

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