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Unit- III- Industrial Productivity

Industrial Productivity

Productivity is a measure of the rate at which outputs of goods and services are produced per unit of input (labour, capital, raw materials, etc). It is calculated as the ratio of the amount of outputs produced to some measure of the amount of inputs used.

Productivity measures are used at the level of firms, industries and entire economies. Depending on the context and the selection of input and output measures, productivity calculations can have different interpretations. Improving productivity can have connotations of economising on the use of inputs — for example, adopting efficient production processes that minimise waste. Equally, improving productivity can have connotations of yielding more output — for example, using resources in activities or with technologies that generate more output. Conceptually, productivity is a 'supply-side' measure, capturing technical production relationships between inputs and outputs. But, implicitly, it is also about the production of goods and services that are desired, valued and in demand.

Types of productivity measures

Productivity = (1)

Productivity can be expressed as a physical measure (for example, number of cars produced per employee), a monetary measure (for example, thousands of dollars of output per hour worked), or an index (for example, output per unit of labour = 100 in 1997-98).

In principle, inputs can be broadly defined to cover people's time, their skills, land, raw materials, machinery and equipment, energy (for example, electricity) and so on. But, most commonly, inputs are defined in terms of: labour (number of employees or hours of work) and capital (buildings, machinery and equipment, etc).

Labour productivity (LP) is the ratio of output to the input of labour. Typically, it is measured as the amount of output produced per hour worked.

Multifactor productivity(MFP) is the ratio of output to the combined input of labour and capital. Sometimes this measure is referred to as total factor productivity.

Purposes of productivity measurement

Productivity is commonly defined as a ratio of a volume measure of output to a volume measure of input use. While there is no disagreement on this general notion, a look at the productivity literature and its various applications reveals very quickly that there is neither a unique purpose for, nor a single measure of, productivity. The objectives of productivity measurement include:

Technology- A frequently stated objective of measuring productivity growth is to trace technical change. Technology has been described as "the currently known ways of converting resources into outputs desired by the economy" (Griliches, 1987) and appears either in its disembodied form (such as new blueprints, scientific results, new organisational techniques) or embodied in new products (advances in the design and quality of new vintages of capital goods and intermediate inputs). In spite of the frequent explicit or implicit association of productivity measures with technical change, the link is not straightforward.

Efficiency- The quest for identifying changes in efficiency is conceptually different from identifying technical change. Full efficiency in an engineering sense means that a production process has achieved the maximum amount of output that is physically achievable with current technology, and given a fixed amount of inputs (Diewert and Lawrence, 1999).

Technical efficiency gains are thus a movement towards "best practice", or the elimination of technical and organisational inefficiencies. Not every form of technical efficiency makes, however, economic sense, and this is captured by the notion of allocative efficiency, which implies profit-maximising behaviour on the side of the firm.5 One notes that when productivity measurement concerns the industry level, efficiency gains can either be due to improved efficiency in individual establishments that make up the industry or to a shift of production towards more efficient establishments.

Real cost saving- A pragmatic way to describe the essence of measured productivity change. Although it is conceptually possible to isolate different types of efficiency changes, technical change and economies of scale, this remains a difficult task in practice. Productivity is typically measured residually and this residual captures not only the above-mentioned factors but also changes in capacity utilisation, learning-by-doing and measurement errors of all kinds. Harberger (1998) re-stated the point that there is a myriad of sources behind productivity growth and labelled it the real cost savings. In this sense, productivity measurement in practice could be seen as a quest to identify real cost savings in production.

(The distinction and identification of technical change and efficiency change is at the heart of "data envelopment analysis" – a mathematical programming approach towards productivity measurement that was pioneered by Rolf Färe. For a survey of DEA methodologies, see Seiford and Thrall (1990) and Charnes et al. (1994). Diewert and Mendoza (1995) also discuss the DEA approach and compare it to the more traditional index number and econometric approaches. A recent application can be found in Ball et al. (2001).)

Benchmarking production processe-. In the field of business economics, comparisons of productivity measures for specific production processes can help to identify inefficiencies. Typically, the relevant productivity measures are expressed in physical units (e.g. cars per day, passenger-miles per person)

and highly specific. This fulfils the purpose of factory-to factory comparisons, but has the disadvantage that the resulting productivity measures are difficult to combine or aggregate.

Living standards- Measurement of productivity is a key element towards assessing standards of living. A simple example is per capita income, probably the most common measure of living standards: income per person in an economy varies directly with one measure of labour productivity, value added per hour worked. In this sense, measuring labour productivity helps to better understand the development of living standards. Another example is the long-term trend in multifactor productivity (MFP). This indicator is useful in assessing an economy's underlying productive capacity ("potential output"), itself an important measure of the growth possibilities of economies and of inflationary pressures.

Interpretation of productivity measures--

Labour productivity should be interpreted carefully if used as a measure of efficiency. In particular, it reflects more than just the efficiency or productivity of workers. Labour productivity is the ratio of output to labour input; and output is influenced by many factors that are outside of workers' influence — including the nature and amount of capital equipment that is available, the introduction of new technologies, management practices and so on.

At a national level, labour productivity growth is sometimes used as an approximate indicator of the growth in prosperity. GDP measures both total output and total income generated. Unless there are dramatic changes in the average hours worked per person in the population (or the international terms of trade, or the proportion of income paid abroad), the growth in national labour productivity (output per hour worked) provides a close approximation to the growth in national income per person. In principle, multifactor productivity is a better indicator of efficiency. It measures how efficiently and effectively the main factors of production — labour and capital — combine to generate output.

Labour productivity and multifactor productivity both increase over the long term. Usually, the growth in labour productivity exceeds the growth in multifactor productivity (reflecting the influence of relatively rapid growth of capital on labour productivity).

What do productivity measures capture?

Productivity measures capture a number of effects in practice:---

technological change: technological advances that are embodied in capital equipment are reflected in improvements in LP (through capital deepening); disembodied technological change is reflected in MFP;

Human capital improvements- because improvements in human capital are not captured in the labour input, their contributions to productivity are captured in MFP1;

Reductions in inefficiency- if firms are operating inefficiently, movements toward best practice will be reflected in LP through capital deepening (if it involves investment in new capital) and especially in MFP;

Scale Economies- even though the measurement method assumes constant returns to scale, any increasing returns to scale are picked up in MFP growth; and

Composition effects- since the levels of productivity differ between industries (even if all firms are operating at their own maximums of efficiency), a shift of resources from low to high productivity (level) industries will raise average productivity and will therefore be reflected in aggregate LP and MFP *growth*.

These effects will be captured to the extent that changes in output and inputs of labour and capital are accurately measured. Accurate measurement will not always be the case, however. For example, it is difficult for statistical agencies to capture all improvements in the quality of services, which should be measured as increases in output.

Policy strategies to improve productivity

The prominent US economist, Paul Krugman, famously said, 'Productivity isn't everything. But in the long run, it is almost everything. To elaborate, productivity is not the ultimate economic objective, but it is a very important intermediate objective that serves to improve economic welfare and living standards. We have seen that, while growth in productivity and in labour utilisation are both sources of improvement in living standards, productivity growth has made by far the major contribution over the long term.

There is other dimension to Krugman's statement. In the short run, developments that bring productivity gains also involve costs. Costs must also be taken into account in the welfare calculation. But in the long run, the gains from productivity-enhancing developments are overwhelming and the short-term adjustment costs become a distant memory. For example, the widespread introduction of personal computers reduced the role and employment opportunities of specialist typists. But with time and adjustment in training, the adverse effects have diminished and the productivity gains have endured. Over the long haul, there is nothing as powerful as productivity in raising standards of living. And so, when it comes to formulating policy strategies to promote productivity growth, governments need to take account of costs, which are often short term and concentrated, but keep an eye on the enduring long-term gains.

A focus on productivity growth is even more of an imperative in view of the looming challenges many countries face—specifically, ageing populations and climate change.

Productivity growth provides the means to maintain growth in living standards as labour utilisation declines and as costs associated with environmental protection increase.

The ability of government policy strategies to promote productivity growth is conditioned by the fundamental factors of nature, history and geography. These may limit the ability of governments to influence productivity outcomes or may enhance it in some circumstances.

That said, there is a role for governments to foster a business environment that is conducive to productivity growth. This can include appropriate development of economic and social infrastructure, economic institutions, the national innovation system and so on. There are three touchstones that are particularly relevant to fostering productivity growth in the modern era:

Incentives. Allowing and indeed fostering competition is the central driver of productivity growth. Incentives to be innovative and productive are also affected by such factors as tax structures and regulatory regimes.

Capability. Development of skills is increasingly important. Specialised skills are needed to develop and apply technologies. Management and entrepreneurial skills are needed to seek new opportunities and manage change. Skills in ICT use are needed at the operational level. The education and training system and the innovation system have a major role in developing the skills and knowledge needed for productivity growth.

Flexibility. The flexibility to experiment, to innovate and to adapt to change is crucial. Flexibility is needed in labour and capital markets and needs to be a characteristic of regulation. Particularly in a fast-changing world, there is little role for interventions designed to insulate sections of the economy from competition or to promote the advancement of specific industries or activities.

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