KILM 16. Labour productivity

Introduction

This chapter presents information on labour productivity for the aggregate economy with labour productivity defined as output per unit of labour input (persons engaged or hours worked). Labour productivity measures the efficiency of a country with which inputs are used in an economy to produce goods and services and it offers a measure of economic growth, competitiveness, and living standards within a country.

Use of the indicator

Economic growth in a country can be ascribed either to increased employment or to more effective work by those who are employed. The latter effect can be described through statistics on labour productivity. Labour productivity therefore is a key measure of economic performance. The understanding of the driving forces behind it, in particular the accumulation of machinery and equipment, improvements in organization as well as physical and institutional infrastructures, improved health and skills of workers ("human capital") and the generation of new technology, is important for formulating policies to support economic growth. Such policies may focus on regulations on industries and trade, institutional innovations, government investment programmes in infrastructure as well as human capital, technology or any combination of these.

Labour productivity estimates can support the formulation of labour market policies and monitor their effects. For example, high labour productivity is often associated with high levels or particular types of human capital, indicating priorities for specific education and training policies. Likewise, trends in productivity estimates can be used to understand the effects of wage settlements on rates of inflation or to ensure that such settlements will compensate workers for (part of) realized productivity improvements.

Finally, productivity measures can contribute to the understanding of how labour market performance affects living standards. When the intensity of labour utilization − the average number of annual working hours per head of the population − is low, the creation of employment opportunities is an important means of raising per capita income in addition to productivity growth.[1] In Europe, for example, with productivity levels relatively close to the United States but lower per capita income levels, living standards can be improved by increasing labour utilization. This can be achieved by encouraging a higher labour force participation rate or by encouraging workers to work more hours, e.g. by creating more decent and productive employment opportunities for economic activity. In contrast, when labour intensity is already high, for example in East Asia, increasing productivity is essential to improving living standards. In any case, increasing labour force participation is at best a transitional source of growth depending on the rate of population growth and the age structure of the population. In the long run, it

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[1] It is clear that living standards do not equal per capita income, but the latter can still be viewed as a reasonably good proxy of the former, even though the link is not automatic. For example, the United Nations Development Programme (UNDP) *Human Development Report 2014* reveals that, out of 186 economies with information on both the human development index (HDI) and GNI per capita in 2012, 107 rank higher in HDI than in GDP, two rank the same and 77 rank higher in GDP than in HDI.

is the productivity of labour which determines the rise in per capita income.

Definitions and sources

Productivity represents the amount of output per unit of input. In KILM 16, output is measured as gross domestic product (GDP) for the aggregate economy expressed at purchasing power parities (PPP) to account for price differences in countries; as well as at market exchange rates for table 16a, which reflect the market value of the output produced.

Labour productivity growth may be due to either increased efficiency in the use of labour, without more of other inputs, or because each worker works with more of the other inputs, such as physical capital, human capital or intermediate inputs. More sophisticated measures, such as "total factor productivity", which is the output per combined unit of all inputs, are not included in KILM 16.[2] Estimated labour productivity may also show an increase if the mix of activities in the economy or in an industry has shifted from activities with low levels of productivity to activities with higher levels, even if none of the activities have become more productive by themselves.

For a constant "mix" of activities, the best measure of labour input to be used in the productivity equation would be "total number of annual hours actually worked by all persons employed". In many cases, however, this labour input measure is difficult to obtain or to estimate reliably. For this reason, two series for labour productivity are shown in table 16b, GDP per person engaged and GDP per hour

worked; and one series in table 16a, GDP per worker.

To compare labour productivity levels across economies, it is necessary to convert output to US dollars on the basis of purchasing power parity (PPP). A PPP represents the amount of a country's currency that is required to purchase a standard set of goods and services worth one US dollar. Through the use of PPPs one takes account of differences in relative prices between countries. Had official currency exchange rates been used instead, the implicit assumption would be that there are no differences in relative prices across countries. The labour productivity estimates in table 16b are expressed in terms of 1990 US dollars converted at PPPs (as the 1990 PPP made it possible to compare the largest set of countries − see details below) and in table 16a in terms of 2005 international dollars converted at PPPs as well as constant 2005 US dollars.

The labour productivity estimates in table 16b are derived from the Total Economy Database of The Conference Board and are available for 123 economies. This database also includes measures of labour compensation to obtain unit labour cost. A full documentation of sources and methods by country and underlying documentation on the use of PPPs, etc. can be downloaded from the database website.[3]

In table 16b, GDP estimates for OECD countries after 1990, , are mostly obtained from the OECD *National Accounts*, Volumes I and II (annual issues) and the Eurostat New Cronos database. The series up to 1990 are mostly derived from Maddison (1995).[4]

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[2] For recent estimates of total factor productivity growth, please refer to The Conference Board *Total Economy Database™*, May 2015, http://www.conference-board.org/data/economydatabase/". Estimates at the industry level can be obtained from the EU KLEMS Growth and Productivity Accounts (http://www.euklems.net).

[3] The Total Economy Database is maintained at: http://www.conference-board.org/data/productivity.cfm. The database was previously housed at the Groningen Growth and Development Centre of the University of Groningen, Netherlands. This research centre still undertakes research on comparative analysis of levels of economic performance and differences in growth rates. See http://www.ggdc.net/index.htm for the latest publications.

[4] A. Maddison, database on "Historical statistics", available at Maddison's homepage: http://www.ggdc.net/maddison/.

To compute labour productivity per person engaged in table 16b, GDP is divided by total employment. These employment estimates are primarily taken from OECD: *Labour Force Statistics* (annual issues); Eurostat's New Cronos database; the ILO estimates on employment; and the Vienna Institute for Comparative Economic Studies (WIIW). To compute labour productivity per hour worked, estimates on annual hours worked are based on a variety of sources deemed to be most appropriate source of the preferred concept of "actual hours worked per person employed" in each individual country. National sources are used as well as collections such as that of the OECD Growth Project, which are updated by Scarpetta et al. (2000).[5] In later years, the trend of the OECD *Employment Outlook* has been used. Full details on sources used for each variable – GDP, employment and hours – are available on the Total Economy Database website and displayed in the notes sections of the KILM data tables.

For countries outside of the OECD, the national accounts and labour statistics which were assembled from national sources by international organizations such as the World Bank, the Asian Development Bank, the Food and Agriculture Organization (FAO), the ILO and the United Nations Statistical Office were used as the point of departure.[6] These series were complemented by the series from Maddison (1995) in particular to cover the period 1980-90. Maddison (1995) also provides benchmark estimates of annual hours worked for a significant number of non-OECD economies.[7] In some cases, use has also been

made of national accounts statistics for individual countries.

Whenever data for employment is unavailable, The Conference Board supplements employment data with data of the total labour force, which happens in about one third of all cases – primarily in developing countries. Since labour force is not necessarily a sufficient proxy for employment, indicators on labour productivity by The Conference Board (table 16b) are supplemented with a table on labour productivity (16a), utilizing employment data from the ILO Trends Econometric Models (see KILM 2).

Labour productivity in table 16a is calculated using data on GDP in constant 2005 international dollars in PPP, derived from the World Development Indicators database of the World Bank.[8] To compute labour productivity as GDP per person engaged, ILO estimates for total employment are used.[9] Countries for which no real data on employment exist (meaning that all data points are estimates rather than reported data) in and after the year 2000 were excluded. Furthermore, table 16a is complemented by a series of GDP at market exchange rates (rather than PPPs) to get a better idea of labour productivity estimates when used for the purpose of competitiveness indicators. GDP figures (at constant 2005 US dollars) are also derived from the World Development Indicators database. Table 16a is available for 140 economies with coverage extending to all KILM regional groupings.

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[5] See Scarpetta, S. et al.: *Economic growth in the OECD area: Recent trends at the aggregate and sectoral level*, Economics Department Working Papers, No. 248, (Paris, OECD, 2003), Table A.13.

[6] World Bank: *World Development Indicators* (various issues); Asian Development Bank: *Key Indicators of Developing Asian and Pacific Countries* (annual issues); ILO: *Yearbook of Labour Statistics* (annual issues); United Nations: *National Account Statistics: Main Aggregates and Detailed Tables* (annual issues).

[7] Maddison, A.: *Monitoring the World Economy 1820-1992* (Paris, OECD Development Centre, 1995).

[8] For more detail, please refer to the website of the World Development Indicators database at http://data.worldbank.org/data-catalog/world-development-indicators

[9] For more details, please see KILM 2a.

Limitations to comparability

The limitations to the international and historical comparability of the estimates are summarized under the following headings: Output measures in national currencies, employment, and working hours.

Output measures in national currencies

Output measures are obtained from national accounts and represent, as much as possible, GDP at market prices for the aggregate economy. However, despite common principles that are mostly based on the United Nations System of National Accounts, there are still significant problems in international consistency of national accounts estimates, in particular for economies outside the OECD. Such factors include:

(a) *different treatment of output in services sectors*. In a considerable number of economies, especially for non-market services, output is often estimated on the basis of inputs, such as total labour compensation, or on an implicit assumption concerning productivity growth; in other cases – where output measures were available – quality changes are often insufficiently reflected in the measures of output volume.

(b) *different procedures in correcting output measures for price changes, in particular the use of different weighting systems in obtaining deflators*. Traditionally output trends in constant prices have been weighted at values that are kept fixed for several years. Fixed weights usually imply an overestimation of volume growth rates, creating a bias that increases the further one moves away from the base year. Most economies therefore change weights every five or ten years. Over the past year an increasing number of OECD countries are shifting to using annual chain weights.[10]

Another important source of methodological difference between countries is the use of deflators for ICT products. Price declines of these goods are often insufficiently chosen with traditional price measurement methods. The United States has introduced a range of hedonic price deflators for ICT goods, which measure the price change of a commodity on the basis of changes in the major characteristics that impact the price. Many other countries are introducing this type of price measures in their national accounts, but at a much slower pace than the United States. In the estimates for the manufacturing sector the latter problem has been tackled by using harmonized deflators for ICT industries, based on hedonic deflators for the United States, for those countries that have no adequate ICT deflator themselves.

(c) *different degree of coverage of informal economic activities in developing economies and of the underground economy in developed (industrialized) economies in national accounts*. Some economies use data from special surveys for "unregistered activities", or indirect estimates from population censuses or other sources to estimate these activities, and large differences in coverage between economies remain.[11]

In addition to such inconsistencies there are significant differences in scope and quality of the primary national statistics and the staff resources available for the preparation of the relevant national estimates.

Employment

Estimates of employment are, as much as possible, for the average number of persons with one or more paid jobs during the year. Particularly for low- and middle-income economies in Asia and Latin America, statistics on the number of self-employed and family workers in agricultural and informal

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[10] The method of using chain weights allows for the use of different weights at different segments of a time series which are then "chained together".

[11] For an overview of methods, see, for example, OECD: *Measuring the Non-Observed Economy. A Handbook* (Paris, 2002).

manufacturing activities are probably less reliable than those for paid employees. As in the case of output estimates, the employment estimates are sensitive to under-coverage of informal or underground activities, which harbour a substantial part of labour input. In some cases, informal activities are not included in the production and employment statistics at all. In agriculture the labour force estimates include a substantial part of (part-time and seasonal) family workers. However, the estimates presented for the economies in this data set are meant to cover all economic activity. Furthermore, limitations to comparability of ILO employment estimates discussed in KILM 2 apply.

Working hours[12]

Estimates of annual working hours are often unavailable or are relatively unreliable. Even for developed economies, annual working hours are not consistently defined. For example, statistics on working hours often refer to paid hours rather than to hours actually worked, implying that no adjustments are made for paid hours that are not worked, such as hours for paid vacation or sickness, or for hours worked that are not paid for. Moreover, statistics on working hours often are only available for a single category of the workforce (in many cases, only employees), or only for a particular industry (such as manufacturing), or for particular types of establishments (for example, those above a certain size or in the formal sector). As always, these problems are particularly serious for a substantial number of low-income economies. Whether and how the estimates of annual hours worked have been adjusted for such weaknesses in the primary statistics is often undocumented.

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[12] Readers may wish to review the corresponding section relating to comparability issue for working hours in KILM 7.