



## METHODOLOGICAL EXPLANATION

Nataša Železnik Gorjan

# PRODUCTIVITY INDICATORS

This methodological explanation relates to the data releases:

- Productivity, Slovenia, annually (First Release)



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## 1 PURPOSE

The purpose of the publication is to show the different impacts of the use of labour and capital as factors of production on productivity in different industries, in the economy as a whole and in cohesion and statistical regions. Labour productivity indicators (LPI) and capital productivity indicators (CAPI) are a set of indicators that provide additional information for analysing the use of labour and capital in the production process.

## 2 LEGAL FRAMEWORK

- [Annual Programme of Statistical Surveys \(LPSR\) \(only in Slovene\)](#)
- [National Statistics Act \(OJ RS, No. 45/95 and 9/01\)](#)
- Regulation (EU) No. 549/2013 of 21 May 2013 on the European system of national and regional accounts in the European Union (CELEX: 32013R0549).
- Regulation (EC) No. 1059/2003 of 26 May 2003 on the establishment of a common classification of territorial units for statistics (NUTS) (CELEX: 32003R1059).
- Commission Regulation No. 1319/2013 of 9 December 2013 on amending annexes to Regulation (EC) No. 1059/2003 (CELEX: 32013R1319).

## 3 UNIT DESCRIBED BY THE PUBLISHED DATA

The units described by the published data are various indicators of labour productivity, capital productivity and multifactor productivity. Indicators are derived from the main aggregates of the national accounts.

Labour productivity indicators (LPI) are:

- Nominal unit labour cost based on hours worked (NULC\_HW)
- Real labour productivity per person employed (RLPR\_PER)
- Real labour productivity per hours worked (RLPR\_HW)
- Compensation per employees (D1\_SAL\_PER)
- Compensation of employees per hour worked (D1\_SAL\_HW)
- Nominal labour productivity per person employed (NLPR\_PER)
- Nominal labour productivity per hour worked (NLPR\_HW)

Capital productivity indicators (CAPI) are:

- Gross value added per unit of net fixed assets (GVA\_NCS)
- Net fixed assets to gross value added (NCS\_GVA)
- Net fixed assets per hours worked (NCS\_HW)
- Net fixed assets per employed persons (NCS\_EMP)

Multifactor productivity indicator (MFPI) is:

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- Multifactor productivity (MFP)

The data of the indicators are broken down by individual economic activity and by groups of economic activities according to NACE Rev. 2 and by statistical territorial units, i.e. statistical and cohesion regions.

## 4 SELECTION OF OBSERVATION UNIT

Observation units are all institutional units (economic entities) performing economic activity on the territory of the Republic of Slovenia in economic activities following the concept of production by the European System of National and Regional Accounts (ESA 2010).

Full coverage; the calculation covers all institutional units (economic entities) performing economic activity on the territory of the Republic of Slovenia in activities defined with the 2010 European System of National and Regional Accounts (ESA 2010) (i.e. the activities defined by NACE classification of economic activities (NACE Rev. 2) and its Slovenian counterpart SKD 2008).

## 5 SOURCES AND METHODS OF DATA COLLECTION

Data are collected annually.

The data source for calculating the productivity indicators is the annual data already published in the SI-STAT Database in the theme "GDP AND NATIONAL ACCOUNTS", sub-themes "GDP and economic growth", "Non-financial assets" and "Regional accounts".

Data for the survey are not obtained from administrative sources.

## 6 DEFINITIONS

**Compensation per employee (D1\_SAL\_PER)** is calculated by dividing compensation of employees at current prices (D.1) by the number of employees (SAL\_PER). The indicator represents the average income earned by each employee.

**Compensation of employees per hour worked (D1\_SAL\_HW)** is calculated by dividing compensation of employees (D.1) by total hours worked by employees (SAL\_HW). The indicator represents the average income of employees paid for each hour worked.

**Real labour productivity per person employed (RLPR\_PER)** is calculated by dividing gross value added (GVA) in volume terms (real) by total employment (employees and self-employed). The indicator to some extent indicates how

much gross value added over a period in real terms can be attributed to each employed person.

**Real labour productivity per hour worked (RLPR\_HW)** is calculated by dividing gross value added (GVA) in volume terms (real) by total hours worked by employees and self-employed (HW\_EMP). The indicator to some extent indicates how much gross value added over a given period in real terms can be attributed to each hour worked by each employed person and also how it changes.

**Nominal unit labour cost based on hour worked (NULC\_HW)** is the ratio between the indicator “compensation of employees per hour worked (D1\_SAL\_HW)” and “real labour productivity per hour worked (RLPR\_HW)”. The indicator represents the ratio of nominal labour cost to real labour productivity. It is usually considered as a measure of price competitiveness. In fact, it is a ratio of the average cost of hours worked over real productivity, which is interpreted as the average cost of labour per unit of output (real labour productivity). However, the numerator (compensation per hour worked) refers only to employees, while the denominator (real labour productivity, in terms of hour worked) refers to all employment (including the self-employed). The indicator implicitly assumes that the productivity of the self-employed is equal to employee productivity.

**Nominal labour productivity per person employed (NLPR\_EMP)** is calculated by dividing GDP at current prices by total employment (employees and self-employed (EMP)). This ratio is expressed in euro per person. It indicates to some extent how much total economic activity in nominal prices in a given period can be attributed to each employed person.

**Nominal labour productivity per hour worked (NLPR\_HW)** is calculated by dividing GDP at current prices by total hours worked by employees and self-employed (HW\_EMP). This ratio is expressed in euro per hour worked. It indicates to some extent how much economic production activity in nominal prices in a given period can be attributed to each hour worked.

**Gross value added per unit of net fixed assets (GVA\_NCS)** is calculated by dividing value added at constant prices base year divided by net fixed asset at constant prices base year. Indicator shows how many units of output are produced with a unit of capital stock (input), while other inputs remain constant. Capital productivity increases occur when the growth of output is higher than the growth of capital inputs.

**Net fixed assets to gross value added (NCS\_GVA)** is calculated by dividing net fixed asset at constant prices base year by value added at constant prices base year. The level of capital-output ratio shows how many units of capital stocks are required to produce a unit of output. An increase in this ratio indicates that more capital is needed per unit of output.

**Net fixed assets per hour worked (NCS\_HW)** is calculated by dividing net fixed asset in constant prices base year by hours worked of persons employed (employees and self-employed). It shows how intensively a specific asset type is used in an industry in relation to the use of labour input.

**Net fixed assets per employed person** (NCS\_EMP) is calculated by dividing net fixed asset in constant prices base year by persons employed (employees and self-employed). It shows how intensively a specific asset type is used in an industry in relation to the use of labour input.

**Multifactor productivity** (MFP) is a measure of economic performance that compares the amount of goods and services produced (output) to the amount of combined inputs used to produce those goods and services. A change in MFP can be described as the change in the volume of output (expressed in terms of gross value added at constant prices base year) that cannot be explained by changes in the quantity (and quality) of capital and labour inputs used to generate that output. The term crude is used to indicate that the indicator is based on the growth of capital stocks and total hours worked taken solely from ESA 2010 National Accounts Transmission Program. The measure is referred to as crude as it is based on growth rates of capital stocks (in real terms) and hours worked and not on capital and labour services that take into account changes in labour composition and in the quality of assets composing the capital stock. This is the reason why this indicator is experimental. The crude MFP does not include changes in labour composition (together with hours worked growth resulting in "labour services" growth) or change in the quality of assets composing the capital stock (i.e. capital services). The contributions to growth of value added are provided, for labour input (expressed in terms of hours worked) and for capital (expressed in terms of net capital stock in chain-linked volumes at replacement cost - 2015) are presented. These three components, contributions to growth of labour, capital and crude MFP, sum up to value added growth.

The growth accounting equation to calculate MFP growth, based on value added, (see the formula) is given by the difference between the real growth of value added ( $\ln V_t$ ), the growth of capital stock in chain-linked volumes ( $\ln K_t$ ) and the growth of hours worked ( $\ln H_t$ ). The growth of the two inputs is weighted with the respective income shares  $V_{L,t}$  for hours worked and  $V_{K,t} = (1 - V_{L,t})$  for capital stock. The income shares are calculated assuming hourly income of the self-employed equals the hourly compensation of employees. The equation for calculating MFP:

$$\Delta \ln MFP_t \equiv \Delta \ln V_t - avrV_{K,t} \Delta \ln K_t - avrV_{L,t} \Delta \ln H_t$$

## 7 EXPLANATIONS

### 7.1 CLASSIFICATIONS

Labour, capital and multifactor productivity indicators are calculated and published according to the:

- **NACE Rev. 2** at the A10 and A21 level as laid down in ESA2010.

- At the A10 level the economic activities are grouped into categories:
  - Total activities
  - A – Agriculture, forestry and fishing
  - B+C+D+E – Manufacturing, mining and quarrying and other industry
  - C – Manufacturing
  - F – Construction
  - G+H+I – Trade, accommodation, transport
  - J – Information and communication
  - K – Financial and insurance activities
  - L – Real estate activities
  - M+N – Professional, technical and other business activities
  - O+P+Q – Public administration and defence, education, health
  - R+S+T+U – Other activities
  
- At the A21 level the economic activities are grouped into categories:
  - Total Activities
  - A – Agriculture, forestry and fishing
  - B – Mining and quarrying
  - C – Manufacturing
  - D – Electricity, gas, steam and air conditioning supply
  - E – Water supply, sewerage, waste management and remediation activities
  - F – Construction
  - G – Wholesale and retail trade, repair of motor vehicles
  - H – Transportation and storage
  - I – Accommodation and food service activities
  - J – Information and communication
  - K – Financial and insurance activities
  - M – Professional, scientific and technical activities
  - N – Administrative and support service activities
  - R – Arts, entertainment and recreation
  - S – Other service activities

Some industry breakdowns are excluded from the set for methodological reasons. These activities are:

- L - Real estate activities
- O - Public administration and defence, compulsory social security
- P - Education
- Q - Human health services, Residential care and social work activities
- T - Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use

More information about the classification is available on [Classifications and code lists \(stat.si\)](#) in the field of Economic Classifications.

- **Nomenclature of Territorial Units for Statistics (NUTS)**. NUTS has three hierarchical levels – NUTS 1, NUTS 2 and NUTS 3. NUTS 1 level represents Slovenia as a whole country, at NUTS 2 level the country is

divided into two cohesion regions – Vzhodna Slovenija and Zahodna Slovenija – and at NUTS 3 level the country is broken down into 12 statistical regions – Pomurska, Podravska, Koroška, Savinjska, Zasavska, Posavska, Jugovzhodna Slovenija, Osrednjeslovenska, Gorenjska, Notranjsko-kraška, Goriška and Obalno-kraška region.

More information about the classification is available on [Classifications and code lists \(stat.si\)](#) in the field Territorial code list.

- **Classification of assets (A)**, as determined by the ESA 2010. Capital productivity indicators are published by the following categories of non-financial assets (AN):
  - N11N Fixed assets (AN.11) (net)
  - N11KN Total construction (AN.111+AN.112) (net)
  - N11MN Machinery and equipment (AN.113) (net)
  - N1132N ICT equipment (AN.1132) (net)
  - N115 Cultivated biological resources (AN.115) (net)
  - N117 Intellectual property products (AN.117) (net)

## 7.2 DATA PROCESSING

### DATA EDITING

Data editing was not performed.

### WEIGHTING

Weighting was not performed.

### SEASONAL ADJUSTMENT

Seasonal adjustment is not applicable.

## 7.3 INDICES

Most labour and capital productivity indicators are presented as time series indices with a fixed base, or base indices, and as chain indices. The constant base year for the calculation of the base indices is 2015, while for the chain indices the previous data in the time series is taken.

Calculation of base indices:

$$I_{t/0} = \frac{Y_t}{Y_0} * 100$$



Labour productivity indicators calculated as base indices are nominal unit labour cost based on hours worked (NULC\_HW), real labour productivity per hour worked (RLPR\_HW) and real labour productivity per person employed (RLPR\_PER). The capital productivity indicators, calculated as base indices, are net fixed assets per employed person (NCS\_EMP), Gross value added per unit of net fixed assets (GVA\_NCS), net fixed assets to gross value added (NCS\_GVA) and net fixed assets per hours worked (NCS\_HW).

Calculation of chain indices:

$$I_{\frac{t}{t-1}} = \frac{Y_t}{Y_{t-1}} * 100$$

Labour productivity indicators calculated as chain indices are nominal unit labour cost based on hours worked (NULC\_HW), real labour productivity per hour worked (RLPR\_HW) and real labour productivity per person employed (RLPR\_PER). The capital productivity indicators, calculated as chain indices, are net fixed assets per employed person (NCS\_EMP), gross value added per unit of net fixed assets (GVA\_NCS), net fixed assets to gross value added (NCS\_GVA) and net fixed assets per hours worked (NCS\_HW).

For more, see the general methodological explanations [Index numbers](#).

## 7.4 PRECISION

The precision is not calculated.

## 7.5 OTHER EXPLANATIONS

Due to comparability of productivity indicator data between market activities and activities L, O, P, Q, T and U, these activities are not included in the presentation of productivity indicators. In these activities, the data are based on imputed rents or on data from the non-market sector, so the comparability or relevance of productivity indicators, compared to data where activities are subject to market competition, is questionable.

For instance, for non-market activities, figures are often obtained by using the cost method. Similarly, regarding the rent of owner-occupied dwellings in the absence of a sufficiently large rental market, the ESA 2010 (par. 3.79) suggests using the user-cost approach. Hence, these data are not comparable with the data of regular market industries since value added or output in non-market activities is often measured through input methods. Given that market prices are not available, value added is calculated as the sum of compensation of employees, consumption of fixed capital and other taxes less subsidies on production, with compensation of employees being the highest component by far.

## 8 PUBLISHING

- SiStat Database: [GDP and national accounts](#) - GDP and economic growth - Productivity; data are published as growth rates, index, contribution to growth rate; classification used: SKD - A\*21 and A\*10, NUTS0, NUTS2, NUTS3, main groups of fixed assets).
- First Release (Gross domestic product and national accounts, Gross domestic product and economic growth): »Productivity, annually«.

## 9 REVISION OF THE DATA

### 9.1 PUBLISHING OF PRELIMINARY AND FINAL DATA

Revision policy of national accounts is defined by ESA 2010 and does not determine the status of preliminary or final data.

In the case of extraordinary revisions, a longer time series can be revised during the annual publications; the whole time series is usually revised due to methodological changes.

### 9.2 FACTORS INFLUENCING COMPARABILITY OVER TIME

There are no breaks in time series, so all points in time are comparable.

Since 2011, the data have been published according to the new version of the Standard Classification of Activities, SKD 2008. The data series were backwards revised.

Data are prepared in line with the new European System of National and Regional Accounts – ESA 2010, implemented as of September 2014. In line with the ESA 2010 requirements, the data for the 1995–2012 period were revised.

In 2015, the newer version of the classification of statistical territorial units, i.e. NUTS 2013, entered into force, which brought changes in the border of cohesion regions and in the borders of four statistical regions in Slovenia. With the requirements set out in ESA 2010, GDP and other aggregates of national accounts by region for the 2000–2014 period were calculated and published according to the NUTS 2013. More information about changes in statistical territorial units is available on the SURS website.

## 10 OTHER METHODOLOGICAL MATERIALS

Methodological materials on SURS's website are available at <https://www.stat.si/statweb/en/Methods/QuestionnairesMethodologicalExplanationsQualityReports>.

- Questionnaire:
  - SURS does not collect data for this survey by using a questionnaire.

The methodology for calculating productivity indicators was developed within the Eurostat Task Force on Productivity Indicators (2019–2021) in cooperation with external contractors. The methodological notes produced by the group can be found on Eurostat's website, namely:

1. Eurostat's Labour Productivity Indicators (LPIs)  
<https://ec.europa.eu/eurostat/documents/24987/13735645/LPI-methodological-note.pdf/22cd66e7-1230-d453-273b-b4b09ab7c7d3?t=1638286567962>
2. Eurostat's Capital Productivity Indicators (CAPIs)  
<https://ec.europa.eu/eurostat/documents/24987/13735645/CAPI-methodological-note.pdf/36da90b2-7adb-729a-ca69-2feb14df0ec6?t=1638286614469>
3. »Crude« Multi-factor Productivity (MFP)  
<https://ec.europa.eu/eurostat/documents/7894008/13933430/Methodological-note-crude-MFP.pdf/7e9cffb4-e309-83ae-7b64-6dbfc058b691?t=1639062145988>

Other literature:

[Measuring Productivity, OECD Manual](#)