social policy institute

Ministry of Labour, Social Affairs and Family of the Slovak Republic

Is Slovakia still converging to richer EU countries in GDP per capita at purchasing power parity?

A diagnosis of the unfavourable trend in official statistics 2010 – 2022

Marek Hlavac

October 2023

isp@employment.gov.sk

Abstract

According to official Eurostat statistics, **Slovakia's GDP per capita at purchasing power parity (PPP) has been declining compared to the EU-27 average since 2016**. Having achieved a convergence level of 79% of the EU average in 2015, it has fallen to 68% in 2022. Slovakia now occupies, along with Greece, the second-to-last place in the EU in this statistic, and ranks ahead only of Bulgaria.

The unfavorable evolution of Slovakia's official PPP statistics **is influenced by shortcomings in the input data to Eurostat calculations**. The most important factors are changes in the methodology for estimating expenditures on housing rentals in the national accounts after their benchmark revision in 2019, as well as a change in the reporting of the surface area of dwellings, and – in the past – not accounting for intermediate consumption in rentals expenditures.

Under the conservative alternative assumption that Slovakia had rental prices equal to their highest level from among the other post-communist EU Member States, **we estimate Slovakia's convergence level to be 73% of the EU-27 average in 2019, and only 71% in 2022**. Such results still indicate that the Slovak economy has been stagnating or even declining compared to the 74% level of convergence that it would have achieved in 2016. In terms of actual individual consumption per capita at PPP, Slovakia would have grown closer to the EU-27 average during this period, albeit at a slower pace than other Member States. **Our estimates are not very sensitive to changes in assumptions about the prices of rentals.** Compared to estimates of other Slovak institutions, ours are **less optimistic**.

Our estimates indicate that Slovakia is – contrary to what Eurostat reports – not in the last place among EU Member States when it comes to the net earnings of households. Compared to the rest of the EU, however, **net earnings in Slovakia have been among the lowest**. In 2022, only Croatia and the lowest-earning Bulgaria kept Slovakia from ranking last.

Please note that the official statistics of other EU countries may be affected by their own shortcomings. These, however, are not the subject of our analysis.

Acknowledgements

Table of contents

1   Executive summary

According to official Eurostat statistics, Slovakia's GDP per capita at purchasing power parity (PPP) has been declining compared to the EU-27 average since 2016. While in 2015 the country's convergence level was at 79% of the EU average, in 2022 it was only 68%. Slovakia thus occupied, along with Greece, a shared 25th and 26th place among the 27 EU Member States – ahead only of Bulgaria (59%). It has even been matched by Turkey in 2022, a country that is not a member of the European Union.

In recent years, Slovakia has plummeted to the **last place among the four Visegrad Group, or V4, countries (Czechia, Hungary, Poland and Slovakia)** in terms of GDP per capita at PPP, even though as recently as 2015 it occupied second place (after Czechia). Graph 1.1 depicts the convergence level of V4 countries to the EU-27 average.

Graph 1.1: GDP per capita at PPP as a percentage of EU-27 average in V4 countries, 2010 – 2022 (Eurostat)
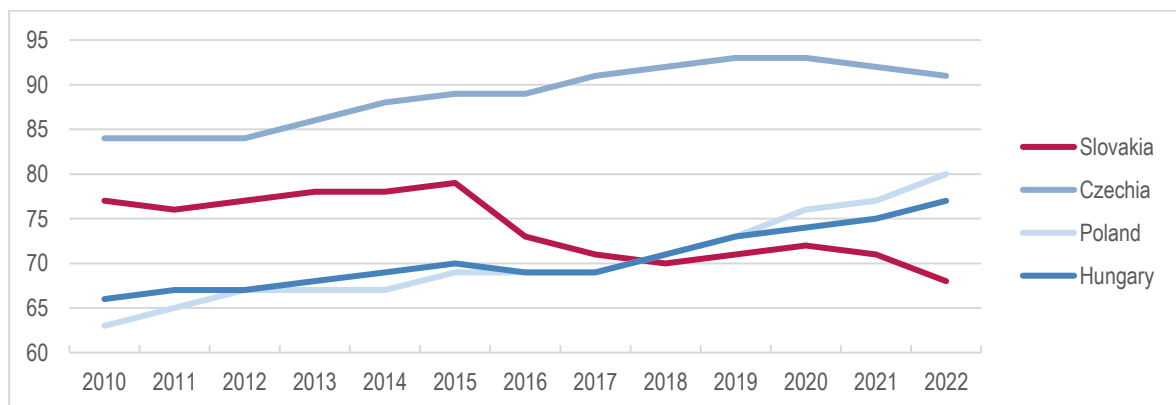
Source: Eurostat, [PRC_PPP_IND]

Slovakia is also lagging in the official statistics published by the World Bank, the International Monetary Fund (IMF) and the Organisation for Economic Cooperation and Development (OECD), as these are calculated using a similar method based on the same input data about prices and expenditures.

The fact that Slovakia has been lagging behind in PPP statistics means that the country achieves **unflattering results in many international comparisons**. According to official Eurostat statistics, Slovakia had the lowest net household earnings in the European Union in 2022 – even lower than Bulgaria, a country that often ranks last among EU Member States in international comparisons.

Statistics on the performance of the Slovak economy at PPP have an impact on the reputation of the country, on its perception by investors, as well as on the evaluation of the country by rating agencies. Worse ratings reduce the creditworthiness of the Slovak Republic as a borrower, which can increase the costs of financing the country's public debt. The amount of European Structural and Investment Funds (ESIF), to which Slovak regions and the country as a whole are entitled, as well as quotas in the International Monetary Fund, also depend on Slovak statistics at PPP.

The unfavourable trend in Slovakia's PPP statistics is influenced by changes that have resulted from the 2019 benchmark revision of the country's national accounts. This revision led to significant adjustments to the estimate of expenditures on rentals for housing, but also to expenditures related to health, construction, the informal economy, energy and foreign trade. Due to Eurostat's policy of allowing PPP time series to be revised no more than three years into the past, the benchmark revision affected purchasing power parity statistics from 2016 onwards, and led to a sudden jump in the time series.

Our analysis indicates that **the input data on rentals for housing, which are provided to Eurostat by the Statistical Office of the Slovak Republic for the purpose of calculating purchasing power parities, suffer from the following shortcomings:**

- **Missing intermediate consumption:** In the data for the years 2010 to 2015, which reflect expenditures as they were in the national accounts before the benchmark revision, there is an amount missing in expenditures on rentals for housing that corresponds to the amount of intermediate consumption.

- **Expenditures on rentals are too high:** Following the benchmark revision in 2019, there was a significant increase in the estimate of expenditures on rentals for housing in the Slovak national accounts. This increase led to a similarly significant rise in rental prices in the PPP data. These have, as a result, reached a level that is, by far, the highest among post-communist EU Member States.

- **Expenditures on rentals are growing too fast:** The benchmark revision not only led to very high estimates of rentals expenditures, but also significantly accelerated their growth rate. Since 2016, official statistics have shown that spending is growing at a rate similar to that of house prices. However, it is likely that, during this period, real estate prices in Slovakia grew faster than actual rentals for housing.

- **The number of square meters in the housing stock data has changed**: The number of reported square meters in the data on the quantity and quality of housing stock in Slovakia suddenly dropped by about a quarter between 2016 and 2017. This sharp decline was immediately reflected in a dramatic rise in housing rental prices in the input data.

  A detailed analysis of the housing stock data indicates that the drop in reported dwelling area could have resulted from a switch from reporting the useable surface area of flats and houses (in accordance with Eurostat guidelines) to reporting only the liveable area (not in accordance of the guidelines).

The consequence of these shortcomings was that expenditures on rentals and related prices were probably increasingly overestimated in the data used to calculate PPPs from 2016 onwards.

Following the approach set out in the *Eurostat-OECD Methodological Manual on Purchasing Power Parities*, we developed statistical software for calculating PPPs for economic aggregates (e.g. for GDP) and successfully replicated all published Eurostat statistics at purchasing power parity.

Using this software, we estimated **alternative scenarios in which we corrected several of the above-mentioned shortcomings and replaced the prices of housing rentals in the input data for Slovakia**.[1] In our conservative (pessimistic) scenario, we replaced them with the highest prices among the other post-communist Member States of the European Union.[2] Conversely, in the optimistic scenario, we used the lowest prices among the same group of countries.

In our **conservative (or pessimistic) alternative estimate**, GDP per capita at PPP in Slovakia as a percentage of the EU-27 average in the period since 2016 has been a level that was approximately 2 percentage points higher than the official statistics report for each year. In this period, however, **Slovakia's GDP per capita at PPP was still stagnant or even declining compared to the European average** – although at a higher level than in the statistics published by Eurostat:

- **In 2016 the convergence level of Slovak GDP per capita at PPP was at 74% of the EU average, but by 2022 it was down to 71%.** This meant 25th place among EU Member States, just ahead of Greece and the poorest Bulgaria. It also meant that neighbouring countries Poland and Hungary had caught up with, or even overtaken, Slovakia during this time period.

---

[1] Our analysis of Slovakia's convergence to the EU-27 average in GDP per capita at PPP is one of the first to directly adjust problematic components of the input data – imputed and actual rentals for housing – and to use the same methodology as Eurostat in its calculations. So far, the only other study to use a similar approach was "On Purchasing Parity", a policy brief by the Institute of Financial Policy (Dujava and Žúdel, 2023).

[2] We consider this scenario to be conservative (or pessimistic), because the prices of housing rentals typically rise with nominal GDP, and Slovakia's nominal GDP is not the highest among post-communist EU countries.

- In our optimistic estimate, Slovakia's convergence level was, after rounding to whole percentages, not higher by more than one percentage point in any year than it was in the conservative scenario. We conclude that our estimates are **not very sensitive to changes in assumptions about the level of rental prices**, and – as such – can be considered robust.

- Our estimates are **less optimistic** than estimates published by several other institutions, including the Institute for Financial Policy, the National Bank of Slovakia and the Slovenská sporiteľňa bank.

Graph 1.2 shows the evolution of Slovakia's GDP per capita at PPP as a percentage of the EU-27 average according to official Eurostat statistics and our alternative estimates. At the same time, it highlights which shortcomings in the input data on rentals for housing affect the official statistics for individual years.

Correcting the shortcomings in the data on rentals can explain about half of the 6 percentage point jump that we observe in official Eurostat statistics between 2015 and 2016. Another third of the decrease can be explained by changes in health and construction expenditures, which have also been affected by the benchmark revision.

Graph 1.2: Shortcomings in input data, and GDP per capita at PPP as a percentage of EU-27 average in Slovakia, 2010 – 2022
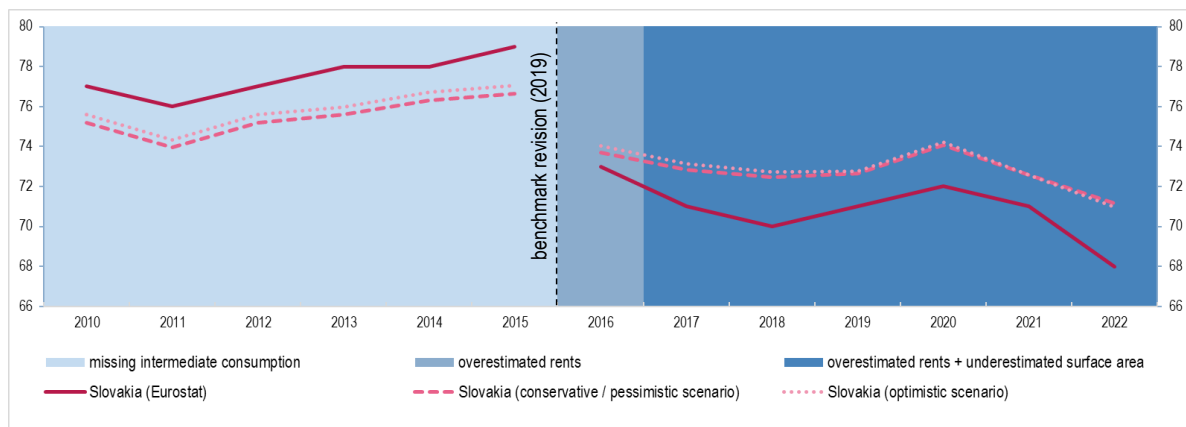
Source: Eurostat, [PRC_PPP_IND] and author's estimates

Actual individual consumption (AIC) per capita at PPP may, in certain contexts, be a more appropriate measure of household living standards than GDP. In our conservative alternative scenario, Slovakia has continued converging to the EU average in this statistic since 2016 – by 7 percentage points between 2016 and 2022, from 70% of the EU average to 77%. Despite this, during the same period, Slovakia fell several places in the ranking of EU Member States according to AIC per capita at PPP, as other Member States caught up to the European Union average faster than Slovakia.

Finally, using our alternative estimates, we compared the net earnings at PPP of different types of households in Slovakia (classified based on the number of adults and children, as well as on the wages that household members earned) with other countries of the European Union. In contrast to the official statistics published by Eurostat, we used a deflator that only takes into account households' final monetary consumption expenditures on goods and services.

According to our estimates, Slovakia did not rank last in the EU in net household earnings in 2022. However, **the level of net earnings was, after adjusting for price difference across countries, the third lowest among EU Member States**. Only two countries separated Slovakia from the last place in the ranking – Croatia and the lowest-earning Bulgaria. These countries have, moreover, closed the gap to Slovakia significantly since 2016.

Note that the official statistics of other EU Member States may be affected by their own shortcomings. Investigating the potential shortcomings of other countries' statistics is beyond the scope of our analysis.

2   Slovakia has stopped converging in GDP per capita at PPP

A comparison of nominal GDP per capita between EU-27 countries often does not accurately reflect differences in living standards and purchasing power, as it does not take into account differences in price levels. In international comparisons, therefore, **purchasing power parities (PPP)** are often used. These adjust the level of GDP based on the price level of comparable goods and services in different countries.

The decline of Slovakia's convergence level in GDP per capita at PPP from 79% of the EU-27 average in 2015 (17th place) to only 68% in 2022 (as low as 25th-26th place, shared with Greece and only ahead of Bulgaria in last place),[3] as indicated by official Eurostat statistics, would be a significant departure from the past. Until 2015, according to official statistics, Slovakia had been catching up with the EU-27 average. Lagging behind the EU average would also set the country apart from all other V4 countries, as these have continued converging to the EU-27 average. **According to Eurostat data, in 2022 Slovakia had the lowest GDP per capita at PPP within the V4**, although in 2015 it had been the second highest after Czechia.

Graph 2.1 and Table 2.1 present a comparison of the evolution of GDP per capita at PPP, expressed as a percentage of the average of the EU-27 countries, from 2010 to 2022. A significant turning point occurred between 2015 and 2016, when Slovakia's GDP per capita at PPP fell by as many as 6 percentage points year-on-year (from 79% of the EU-27 average in 2015 to 73% in 2016). After this sudden decline, according to Eurostat statistics, Slovakia continued to stagnate or even fell further behind the EU-27 average.

Graph 2.1: GDP per capita at PPP as a percentage of EU-27 average in V4 countries, 2010 - 2022 (official Eurostat statistics)
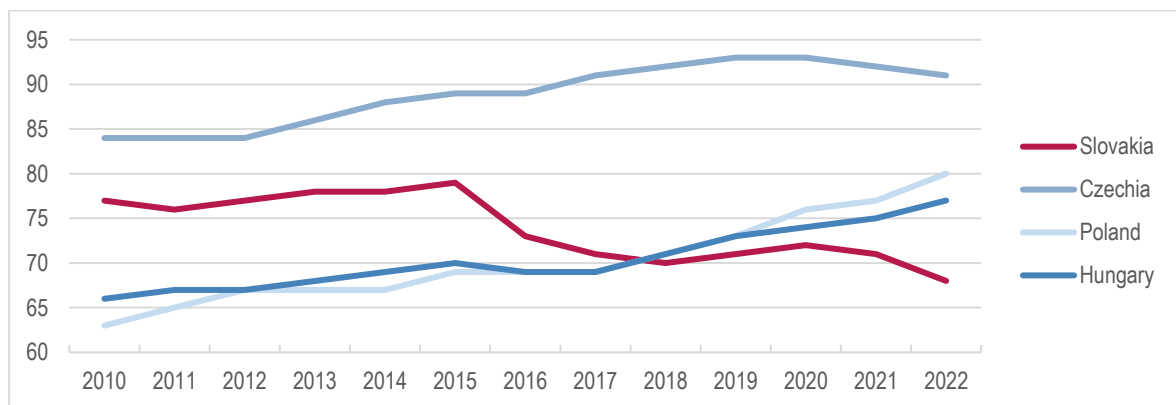
Source: Eurostat, [PRC_PPP_IND]

Table 2.1: GDP per capita at PPP as a percentage of EU-27 average in V4 countries, 2010 - 2022 (official Eurostat statistics)

V4 Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Slovakia	77	76	77	78	78	79	73	71	70	71	72	71	68
Czechia	84	84	84	86	88	89	89	91	92	93	93	92	91
Poland	63	65	67	67	67	69	69	69	71	73	76	77	80
Hungary	66	67	67	68	69	70	69	69	71	73	74	75	77
EU-27 Average	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: Eurostat, [PRC_PPP_IND]

Official data from the World Bank, the International Monetary Fund (IMF) and the Organisation for Economic Co-operation and Development (OECD) also indicate that Slovakia has been lagging behind. Their estimates of Slovakia's GDP per capita at PPP as a percentage of the EU-27 average are shown in Table 2.2. These institutions' calculations are based on the same underlying price and expenditure statistics and, in

---

[3] Eurostat, [PRC_PPP_IND]. Statistics for 2022 reflect a preliminary calculation from June 2023. The next calculation, which will happen in December 2023, can lead to their revision.

the case of Eurostat and the OECD, use an almost identical methodology.[4] According to the World Bank and the OECD, in 2015 Slovakia's convergence level was at 79% of the EU-27 average, but by 2022 it fell to 69% according to the World Bank[5] and to 68% according to the OECD.[6] IMF statistics indicate a drop from 78% of the EU-27 average in 2015 to 72% in 2022.[7] According to all three institutions, all other V4 countries have converged to the European average over the same period.

Table 2.2: Slovakia's GDP per capita at PPP as a percentage of EU-27 average, 2010 - 2022 (estimates by various institutions)

Institution	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Eurostat	77	76	77	78	78	79	73	71	70	71	72	71	68
World Bank	77	76	77	78	78	79	73	71	70	70	72	70	69
IMF	75	76	77	77	78	78	73	72	73	73	75	73	72
OECD	77	76	77	78	78	79	73	71	70	71	72	70	68

Source: Eurostat, World Bank, IMF, OECD

GDP per capita at PPP is calculated by dividing nominal GDP by purchasing power parities. From the purchasing power parities for each country in a given year, it is possible to calculate the Price Level Index (PLI) at PPP for each country. Such indices enable an approximate comparison of price levels in different countries.[8]

As shown in Graph 2.2, **in official Eurostat statistics, we see a turning point in Slovakia's Price Level Index at PPP in 2016, followed by a sharp increase in the price level until the end of the time period.** Although Slovakia had the highest price level among the V4 countries even before the sharp increase began – 68% of the EU-27 average in 2015 – in 2022 prices reached as much as 83% of the European average.[9]

Graph 2.2: Price Level Index at PPP in V4 countries, 2010 – 2022 (EU-27 average = 100; official Eurostat statistics)
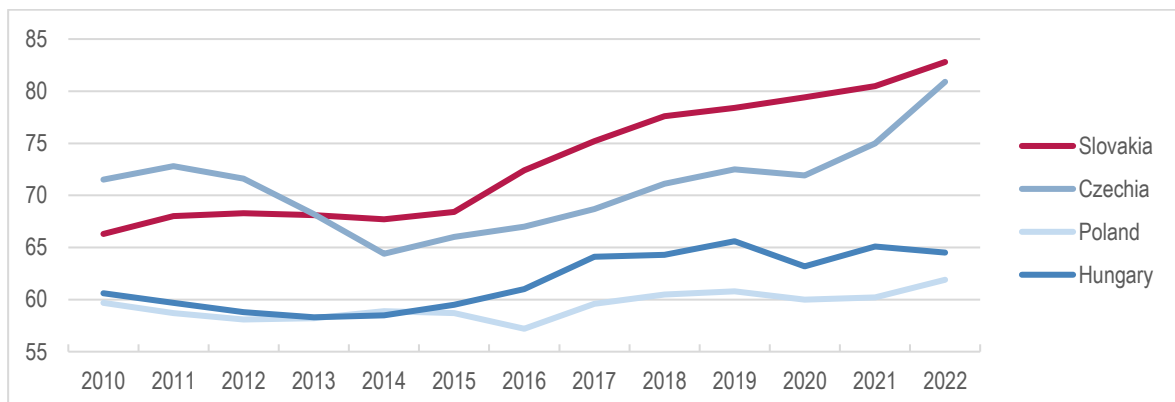
Source: Eurostat, [PRC_PPP_IND]

---

[4] Eurostat and OECD even use a common methodological manual for calculating purchasing power parities. The main relevant difference between the methodologies of these two institutions is that, when calculating purchasing power parities for European countries, they classify some goods and services into similar, but slightly different, basic headings – see Eurostat/OECD (2012), p. 387. The World Bank uses a different price aggregation method when calculating PPPs.

[5] World Bank, World Development Indicators, [NY.GDP.PCAP.PP.CD]

[6] OECD (2023), Purchasing Power Parities (PPP) (Indicator)

[7] International Monetary Fund, World Economic Outlook, April 2023 [PPPGDP]

[8] Because market exchange rates were used in the calculation, Price Level Indices are sensitive to fluctuations in exchange rates between the currencies of the countries being compared.

[9] Eurostat, [PRC_PPP_IND]

3   What are purchasing power parities and how are they calculated?[10]

Purchasing power parities (PPP) allow for the comparison of price levels across countries. They are *de facto* exchange rates that can be used to convert different currencies into an artificial common currency. Through this conversion, PPPs equalise the currencies' purchasing power by eliminating the differences between the price levels of individual countries.[11]

Purchasing power parities can therefore be used as **spatial price deflators**. If we convert nominal GDP or another expenditure aggregate (e.g. actual individual consumption) to a common currency using PPPs, the result will only reflect differences in the volumes of goods and services purchased in the compared countries.

Eurostat calls the artificial common currency, into which it converts the economic statistics it publishes, the purchasing power standard (PPS). Purchasing power standards are euros that are adjusted to have the same purchasing power throughout the European Union. As a result, they reflect the (weighted) average of the price levels of the EU Member States.

Other institutions that publish statistics at PPP use their own artificial common currencies:

- The OECD uses the OECD dollar, which represents the United States dollar (USD) adjusted to reflect a weighted average of price levels in OECD countries.

- The World Bank's International Comparison Programme (ICP) expresses PPPs in international dollars, which have the same purchasing power as one United States dollar (USD) within the United States of America.[12]

What are purchasing power parities used for?

International comparisons

PPPs are often used in international comparisons of living standards and purchasing power of the population. A thousand euros can buy more goods and services in Slovakia than, for example, in the more expensive Netherlands. When measuring the standard of living, the comparison of nominal consumption over the same period of time could be misleading. Conversion of consumption using PPPs enables apples-to-apples comparisons. As the price level is typically higher in richer countries,[13] the use of

---

[10] Most of the information in this chapter comes from the *Eurostat-OECD Methodological Manual on Purchasing Power Parities* (Eurostat/OECD, 2012) or from *Regulation (EC) No 1445/2007 of the European Parliament and of the Council of 11 December 2007 establishing common rules for the provision of basic information on Purchasing Power Parities and for their calculation and dissemination*.

[11] A comprehensive article by Deaton and Heston (2010) offers a thorough overview of possible areas in which purchasing power parities can be used. It also offers a description of various methodological approaches in their calculation, along with their potential limitations.

[12] International dollars are calculated using a different methodology from that used to calculate Eurostat's purchasing power standards and OECD dollars. Their basic interpretation and usefulness, however, remain the same. In the case of international dollars, the Geary-Khamis method is used. This method differs from the EKS (Ėltetò-Köves-Szulc) method used by Eurostat and the OECD. We describe the EKS method later in this chapter. Compared to the Eurostat and the OECD methods, the Geary-Khamis method used by the World Bank yields lower incomes for richer countries and higher incomes for poorer countries, thereby reducing perceived income differences between countries. The method used by Eurostat and the OECD may be more appropriate when comparing real wages or purchasing power in different countries, as it gives equal weight to all relevant countries. The World Bank method, by contrast, gives more weight to the price structure of richer countries. For a comparison of different PPP calculation methods, see, e.g. United Nations (1992).

[13] There are several possible explanations for this phenomenon. Harrod (1933), Balassa (1964), Samuelson (1964) and Samuelson (1994) draw attention to the fact that richer countries exhibit higher productivity in the tradable goods sector. Higher wages in the tradable sector necessitate an increase in the prices of non-tradable goods and services so that their producers can offer competitive wages. Kravis and Lipsey (1983) and Bhagwati (1984) argue that a similar phenomenon occurs when wealthier countries have a higher capital-labour ratio.

purchasing power parities will, in most international comparisons, reduce the variance between richer and poorer countries.

Purchasing power parities thus make possible a more meaningful comparison of wages, incomes, social benefits or pensions in countries with different price levels. For example, the OECD publishes international comparisons of wages for teachers, doctors and nurses, adjusted for price level differences using PPPs.[14]

Private companies and public institutions can use purchasing power parities to calculate wage compensation for differences in the price levels of countries in which their employees work.[15] Eurostat, for example, uses PPPs to calculate correction coefficients.[16] These are used to adjust the wages and pensions of employees of EU institutions operating outside Brussels or Luxembourg.[17]

It is also possible to express economic aggregates, such as GDP, at purchasing power parity. Doing so allows one to compare the performance and size of economies after taking into account price differences across countries. This very analysis is motivated by the observation that, in official GDP per capita at PPP statistics since 2016, Slovakia stopped converging to the EU-27 average and even moved away from it.

Evaluation of creditworthiness by investors and credit rating agencies

Purchasing power parity statistics affect the overall reputation of a country. A worse perception of the performance of the Slovak economy in PPP terms can discourage foreign investors, who may consider the Slovak market to be smaller, the Slovak population as having less purchasing power, or the costs to be higher.[18]

Less favourable results at PPP statistics may also affect the country's rating by credit rating agencies. Worse credit ratings reduce the creditworthiness of the Slovak Republic as a debtor. As a result, the costs of financing public debt may increase.[19] The state would only be able to borrow more expensively, and would have to spend more money on servicing the debt.

Allocation of European Structural and Investment Funds (ESIF)

In the European Union, GDP per capita at purchasing power parity is an important factor in the allocation of European Structural and Investment Funds (ESIF). These serves as instruments of the European Union's Cohesion Policy. This policy focuses on supporting less developed regions of the EU, and aims to reduce the social and economic differences between them and more developed parts of the Union.[20] Altogether, approximately one third of the EU's long-term budget for the years 2021 to 2027 is earmarked for this policy.[21]

The EU's Cohesion Policy is carried out, among other instruments, with the help of three ESIF funds:

---

[14] OECD (2022a) and OECD (2022b)

[15] Schreyer and Koechlin (2002)

[16] The methodology for calculating correction coefficients is described in detail in Eurostat (2020).

[17] Since they are aimed at the specific needs of employees of EU institutions and primarily reflect the relative price levels in European capitals (expressed in relation to Brussels and Luxembourg), correction coefficients are calculated using different data and a different methodology from the official Eurostat PPP statistics for the Member States. Eurostat publishes correction coefficients in the time series [PRC_COLC].

[18] Habrman, Habodászová and Šrámková (2022), p. 11

[19] Consider, for instance, the Bank of Canada's publicly available methodology for calculating country credit ratings (McDaniels, Palesch, Suri, Quiviger and Walsh, 2021). The Canadian central bank's methodology uses the level of GDP per capita at PPP as a proxy for the level of financial and non-financial wealth in the assessed country. This variable is used in the first step of assessing the creditworthiness of countries' sovereign debt, in which a preliminary credit score is assigned.

[20] *Consolidated version of the Treaty on European Union and the Treaty on the Functioning of the European Union, 2012/C 326/01*

[21] European Court of Auditors (2019), p. 12

- **European Regional Development Fund** (ERDF), which supports the balanced development in various regions of the European Union,

- **European Social Fund Plus** (ESF+), which supports projects related to employment, and invests in human capital,

- **Cohesion Fund** (CF), which supports investment into transport infrastructure and into improving the environment.[22]

Financial resources from these funds are allocated according to rules that depend, among other things, on EU Member States' or their regions' per capita gross domestic product, or gross national income, at PPP. Box 3.1 contains a brief description of the criteria used in the allocation of ESIF funding.

Quotas in the International Monetary Fund (IMF)

Slovakia is a member of the International Monetary Fund (IMF). As such, it must pay yearly member quotas in amounts that depend, in part, on Slovakia's GDP at purchasing power parity. Quotas represent the amount of funds that member countries must contribute to the IMF. This payment is not only significant from a fiscal point of view, but also has political significance. In the IMF, the voting power of individual member states depends on their share of quotas.[23]

The formula for calculating each member quota share includes four variables – GDP (50% weight), economic openness (30%), variability of capital inflows and outflows (15%) and the amount of official reserves (5%).[24] The GDP variable is itself a weighted average of GDP at market exchange rates (weight 60%) and GDP at PPP (40%).[25] Gross domestic product at purchasing power parity thus has an ultimate weight of 20% in the formula.[26]

In April 2022, Slovakia's quota in the IMF was 1 001 million Special Drawing Rights, an amount that entitled Slovakia to 0.23% of the total number of votes. Special Drawing Rights (SDR) are the accounting unit of the IMF, and are made up of a basket of five currencies: the United States dollar (USD; 43.4% weight from July 2022), the euro (29.4%), the Chinese yuan (12.3%), the Japanese yen (7.6%) and the British pound sterling (7.4%).[27]

---

[22] European Commission, *European Structural and Investment Funds 2014 – 2020*

[23] Silver (2010)

[24] In the final step, the weighted sum of these variables is multiplied by a compression factor of 0.95 to reduce the variance of the calculated quota shares.

[25] International Monetary Fund (2021)

[26] Possible changes in the calculation of the quota shares and their potential impact on the voting power of IMF members are a frequent subject of political and academic discussions. Since poorer countries have relatively low price levels, the dispersion of GDP at PPP is lower than the dispersion of GDP expressed at market exchange rates. Giving a greater weight to GDP in PPP would therefore give more voting power to poorer countries. See e.g. McLenaghan (2005).

[27] International Monetary Fund (2022)

Box 3.1: How are financial resources from European Structural and Investment Funds (ESIF) allocated?

Funding from the **ERDF and ESF+ for investments in employment and growth** is allocated according to a rule that takes into account, as one of the most important factors, GDP per capita at PPP in a given region and its difference from the EU average:[28]

- **Less developed regions (with GDP per capita at PPP below 75% of the EU average)** are entitled, for each budgeted year, to funding in the amount of the difference (prosperity gap) between their level of GDP per capita at PPP and the average value for the European Union as a whole, multiplied by the number of inhabitants living in the region. Poorer regions will therefore receive more money per inhabitant.

  The resulting value is then adjusted based on the Member State's gross national income (GNI) per capita at PPP. A poor region in a poor country will thus receive more money than an equally poor region in a less poor Member State.

  This amount is then further adjusted based on the country's overall unemployment rate and youth unemployment rate, as well as the amount of carbon dioxide emissions in the country as a whole.

- **Transition regions (with GDP per capita at PPP up to 100% of the EU average)** are entitled to per capita funding equal to the maximum amount of support they would have received if they had been less developed regions with GDP per capita at PPP at 75% of the EU average.

- **More developed regions (with GDP per capita at PPP above 100% of the EU average)** are entitled to funding according to their selected demographic and socio-economic indicators.

Funding from the **Cohesion Fund** to support transport and environmental projects is provided to Member States whose GNI per capita at PPP is below 90% of the EU average. The amount of allocated funding depends on the difference between the GNI per capita of a given Member State and the average for other EU countries that are entitled to financing from this fund.

Of the four regions in Slovakia defined at the NUTS 2 level, three were classified as less developed – Western, Central and Eastern Slovakia. The Bratislava region was classified as a more developed region.[29]

---

[28] Information on eligibility criteria and the amount of financing from the European Structural and Investment Funds comes from the following sources: European Court of Auditors (2019), p. 14-20; *Regulation (EU) 2021/1060 of the European Parliament and of the Council of 24 June 2021 laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, the Just Transition Fund and the European Maritime, Fisheries and Aquaculture Fund and financial rules for those and for the Asylum, Migration and Integration Fund, the Internal Security Fund and the Instrument for Financial Support for Border Management and Visa Policy*

[29] *Commission Implementing Decision (EU) 2021/1130 of 5 July 2021 setting out the list of regions eligible for funding from the European Regional Development Fund and the European Social Fund Plus and of Member States eligible for funding from the Cohesion Fund for the period 2021-2027*

How are purchasing power parities calculated?

The methodology that Eurostat and the OECD use is described in detail in their joint *Methodological Manual on Purchasing Power Parities*.[30]

The calculation of purchasing power parities is a three-stage process. National statistical institutes of individual EU Member States carry out the first stage, while the remaining two are carried out by Eurostat.

- **1st stage: Collection of prices for individual goods and services** from pre-defined basic headings within individual Member States. In Slovakia, the Statistical Office of the Slovak Republic collects these prices, and submits them to Eurostat.

- **2nd stage: Calculation of purchasing power parities (PPP) for basic headings** by taking the (usually unweighted) average of the relative prices of goods and services.

- **3rd stage: Calculation of purchasing power parities for economic aggregates** (e.g. for GDP, actual individual consumption, or final household consumption) by weighting and subsequently averaging PPPs for basic headings (obtained in the 2nd stage). Basic headings are weighted by the corresponding amounts of nominal expenditure.

Box 3.2: What properties should purchasing power parities have?

Eurostat's methodology ensures that PPPs have the following desirable characteristics:

- **They must not be sensitive to changes in the units of measurement.** In other words, PPPs must remain the same regardless of whether, for example, we express the price of gasoline in euros per litre or per gallon.

- **They must not be sensitive to a change in the base country.** Relative to one another, PPPs must remain the same regardless of whether they reflect the price level measured against the EU-27 average, the average of another group of Member States or against any particular Member State.

- **They must be transitive.** Transitivity occurs when PPPs between any pair of countries can be calculated indirectly using the PPP of other countries. Any bilateral PPP, say between Denmark and Romania, must also be calculable indirectly using, for instance, bilateral PPPs between Denmark and France, and between France and Romania.

- **When used to compare several countries, PPPs must be influenced by data from all the countries being compared.** PPPs must thus appropriately reflect all changes in the input data.

---

[30] Eurostat/OECD (2012)

1st stage: Collection of prices for individual goods and services

In the first stage of calculating purchasing power parities, Member States collect prices from samples of goods and services (henceforth referred to as "items" as per European legislation)[31] from each basic heading. Basic headings represent the lowest aggregation level of GDP components for which PPPs are calculated. Examples of basic headings include "rice", "books", "dental services" or "office machinery".[32]

These samples include items that are selected from the entire range of final goods and services which make up the gross domestic product. Member States thus collect prices not only for consumer goods and services, but also collect or estimate prices for government services (in selected public administration jobs) and capital goods (equipment goods and construction projects). However, prices for education and, in some countries, also for housing are not collected, as PPPs for these items are calculated indirectly from nominal expenditures and relevant volumes.[33]

Item prices that Member States collect must not only be representative in each country, but also comparable across countries:

- The **representativity** of an item relates to its relative importance within a basic heading. This importance is determined by the item's share of expenditure in the basic heading. An item is representative if, in a Member State, its share of expenditure within the basic heading is among the highest. As a result, in most cases, prices of representative items will be close to the average price of goods and services in their basic heading.

- **Comparability** requires Member States to collect prices of items that meet the same customer needs equally well. The pricing of comparable items ensures that PPP calculations are not distorted by differences in the quality of seemingly identical items in different Member States.

Prices of consumer goods and services can be collected in capital cities or nationally:

- If they are collected in capital cities, prices are converted to national prices using spatial adjustment factors, which Member States provide at least every 6 years.[34]

- Since item prices can be collected in different months, they are also adjusted using monthly temporal adjustment factors to produce average prices for the year.

For the purposes of price collection, consumer goods and services are divided into several product groups. Prices of products in each group are provided to Eurostat every three years on a rotating basis. Data on rentals for housing, as well as on the compensation of public administration employees, are provided annually. The prices of equipment goods are supplied by the national statistical institutes every two years, and the prices of construction projects every year.[35]

---

[31] *Regulation (EC) No 1445/2007 of the European Parliament and of the Council of 11 December 2007 establishing common rules for the provision of basic information on Purchasing Power Parities and for their calculation and dissemination*

[32] *Ibid.*

[33] Eurostat/OECD (2012), p. 16

[34] *Regulation (EC) No 1445/2007 of the European Parliament and of the Council*

[35] *Regulation (EC) No 1445/2007 of the European Parliament and of the Council*; Eurostat/OECD (2012), p. 50

2nd stage: Calculation of PPPs for basic headings

Basic headings represent the lowest level of aggregation for which Eurostat calculates purchasing power parities. The following procedure is used in the calculation of PPPs for each basic heading:

- For each pair of countries, Eurostat calculates two different PPPs from simple arithmetic means of the prices of individual representative items, adjusted using appropriate spatial and temporal adjustment factors.[36]

- These PPPs are calculated as geometric means of the price relatives for products representative of the first ("base") or the second ("partner") country.[37]

- The geometric mean of these two PPPs is then taken to derive a single PPP for each pair of countries. Finally, the parities are made transitive.

This procedure yields purchasing power parities for basic headings (e.g. for "rice" or "books") in each EU Member State. Box 3.3 contains the formulas used in the above calculations.

Box 3.3: Calculation of PPPs for basic headings

In the second stage, PPPs for each basic heading are calculated as follows:

- First, Eurostat calculates two bilateral PPPs as the geometric means of the price ratios of products that are representative of base country h or partner country j.

  The technical terms for the resulting PPPs are the Laspeyres type PPP ($Laspeyres_{j/h}$ below) and Paasche type PPP ($Paasche_{j/h}$):

$$Laspeyres_{j/h} = \left(\prod_{i=1}^{k} \frac{{}_{*h}P_j^i}{{}_{*h}P_h^i}\right)^{\frac{1}{k}} \qquad Paasche_{j/h} = \left(\prod_{l=1}^{m} \frac{{}_{*j}P_j^l}{{}_{*j}P_h^l}\right)^{\frac{1}{m}}$$

  where ${}_{*h}P_j^i$ and ${}_{*h}P_h^i$ in the first equation are simple arithmetic means of the prices of items i, which are representative of the base country h and were collected in countries j and h. Similarly, in the second equation, ${}_{*j}P_j^l$ and ${}_{*j}P_h^l$ are simple arithmetic means of items l, which are representative in partner country j. Letters k and m denote the number of items which are – within a particular basic heading – representative only in the base or partner country, or in both countries.

- The geometric mean of these two bilateral PPPs is then taken to create a single bilateral Fisher type PPP for each country pair: [38]

$$Fisher_{j/h} = \left(Laspeyres_{j/h} \times Paasche_{j/h}\right)^{\frac{1}{2}}$$

- In the last step, the Fisher type PPP is made transitive. Transitivity is achieved using the EKS method (*Èltetò-Köves-Szulc method)*, in which each bilateral Fisher type PPP is replaced by the

---

[36] National statistical institutes also collect prices of non-representative items. In PPP calculations, however, non-representative items receive a weight of 0, while representative items get weight of 1. Purchasing power parities therefore only reflect the prices of representative items, although the methodology is – at least in principle – more flexible.
[37] In PPP calculations, one country or a group of countries (e.g. the European Union as a whole) is designated as the "base" country. Purchasing power parities, purchasing power standards and Price Level Indices at PPP for other countries are calculated in relation to the base country.
[38] Eurostat refers to Laspeyres, Paasche or Fisher "type" parities because they differ from the standard Laspeyres, Paasche and Fisher price indices in that their purpose is to compare across space rather than over time. In addition, different formulas are used in their calculation. Eurostat uses arguably inaccurate terms to be consistent with the terminology that had been introduced earlier by the World Bank's *International Comparison Programme*.

geometric mean of its own square and of all corresponding indirect Fisher type PPPs that calculate it using a third country: [39]

$$PPP_{j/h}^{BH} = \left(Fisher_{j/h}^2 \prod_{t \neq j,h}^{N} \frac{Fisher_{j/t}}{Fisher_{j/t}} \right)^{\frac{1}{N}}$$

where *t* denotes third countries in indirect Fisher type PPPs, and N is the total number of countries.

The resulting parities $PPP_{j/h}^{BH}$ are then used in the third stage to calculate PPPs for economic aggregates.

3rd stage: Calculation of PPPs for economic aggregates

In the third stage, PPPs for basic headings are aggregated to create purchasing power parities for higher-level economic aggregates – for example, for GDP, household consumption or a specific economic sector, such as health, industry or public administration.

The calculation uses a procedure that is very similar to the PPP calculation in the previous stage. First, two different aggregate PPPs are calculated from the constituent basic heading PPPs for each pair of countries. Eurostat then takes the geometric mean of these parities, and finally ensures that the resulting PPPs are transitive. The formulas used are shown in Box 3.4.

This procedure yields purchasing power parities for economic aggregates (e.g. for GDP) for each Member State. These make it possible to convert Member State currencies to purchasing power standards.

Box 3.4: Calculation of PPPs for economic aggregates

The calculation of PPPs for economic aggregates involves the same procedure as the calculation of basic heading PPPs. The only difference is that the formulas used to calculate the Laspeyres and Paasche type PPPs differ from those used in the previous stage:

- Instead of using geometric means in the second stage, the third-stage Laspeyres type PPPs are calculated by taking a weighted arithmetic mean of the ratio of basic heading PPPs in countries *j* and *h*. Nominal expenditures on individual basic headings from the national accounts of base country *h* are used as weights.

$$Laspeyres_{j/h} = \frac{1}{\sum_{i=1}^{k} w_{i,h}} \sum_{i=1}^{k} \left[\frac{PPP_{i/j}^{BH}}{PPP_{i/h}^{BH}} \times w_{i,h} \right]$$

where $PPP_{i/h}^{BH}$ and $PPP_{i/j}^{BH}$ denote the purchasing power parities for basic heading *i* in the base country *h* and partner country *j*. The letter $w_{i,h}$ denotes the weight of basic heading *i* in the base country *h*. The total number of basic headings is denoted by the letter *k*.

- Paasche type PPPs for economic aggregates are the reciprocals of Laspeyres type PPP with the base and partner countries exchanged:

$$Paasche_{j/h} = \frac{1}{Laspeyres_{h/j}}$$

---

[39] Köves (1993)

- Calculating the Fisher type PPP and ensuring the transitivity of PPP using the EKS method is done in exactly the same way for economic aggregates as it was done for basic headings:

$$Fisher_{j/h} = \left(Laspeyres_{j/h} \times Paasche_{j/h}\right)^{\frac{1}{2}}$$

$$PPP_{j/h}^{AGGR} = \left(Fisher_{j/h}^{2} \prod_{t \neq j,h}^{N} \frac{Fisher_{j/t}}{Fisher_{h/t}}\right)^{\frac{1}{N}}$$

where *t* denotes third countries in indirect Fisher type PPPs, and *N* denotes the total number of countries.

- Finally, after making the parities transitive by applying the EKS method, the resulting PPPs are multiplied by a coefficient that ensures that the sum of nominal expenditures in euros and at PPP for the European Union as a whole are equal to each other.

  In this way, expenditures in PPP terms will be expressed in purchasing power standards – i.e. in euros adjusted to have the same purchasing power across the EU, and thus to reflect the weighted average of price levels of individual Member States.

How can one use PPPs to compare price levels across countries?

Dividing purchasing power parities by the exchange rate between the local currency and the euro allows one to calculate the **Price Level Index (PLI)** at PPP in each EU country. These indices make possible a direct comparison of average prices of goods and services in a country not only with the average prices in the EU-27 as a whole, but also between individual Member States.

Price level comparisons using PLIs, however, must be interpreted with caution. These indices are **sensitive to fluctuations in the exchange rates** of currencies used in their calculation:

- According to simple economic theories, exchange rates adjust to reflect the relative price levels between countries (*purchasing power parity theory*), since arbitrage ensures that the prices of goods are the same in all countries that trade in them (*law of one price*).[40]

- These theories assume that exchange rates depend only on international trade, that all goods and services are tradable, and that transaction costs (e.g. for transport, taxes or tariffs) are negligible.

In reality, however, these assumptions often do not hold true. The relationship between price levels and exchange rates is rather complex. Inflation not only causes exchange rate fluctuations, but also results from them. Many other factors can also have a significant impact on exchange rates, especially in the short run:[41]

- These influential factors include interest rates, speculation in foreign exchange markets, or various government and central bank policies.

---

[40] Cassel (1921; 1922), Dornbusch (1987)

[41] Rogoff (1996) notes that a consensus has emerged in the research literature that: (1) exchange rates between currencies tend to converge to relative price levels between countries; (2) this convergence takes place over a long time horizon and proceeds very slowly (Huizinga, 1987); and (3) in the short run, exchange rates are extremely volatile. Taylor and Taylor (2004) dispute the claim about long-run convergence.

- In addition, many goods and services do not trade on international markets. Non-tradable goods and services include, for example, real estate, almost all public sector services, and most services provided by the private sector.

- Transaction costs also play an important role.[42] For example, transport costs increase with the distance between the producer and the consumer. International borders create a trade barrier not only because of tariffs, but also in themselves.[43]

Price Level Indices at PPP are therefore a more useful tool for comparing relative prices in countries that use a common currency:

- In the case of PPPs provided by Eurostat for the EU-27, these indices are more reliable for comparisons within the euro area.

- If at least one of the countries being compared is outside the euro area, comparisons are likely to be more reliable over a longer time horizon, as changes in relative price levels will be more pronounced.

Exchange rates have an effect on Price Level Indices, but they do not affect the levels of GDP per capita at PPP, or the levels of other expenditure or production aggregates. They are not necessary for the calculation of such aggregates, as one can simply divide nominal expenditures in the local currency by the corresponding purchasing power parity, without using exchange rates. Exchange rates therefore **do not affect the convergence level to the EU-27 average in GDP per capita at PPP** or in other aggregates.

---

[42] Keynes (1923), p. 89-92
[43] Engel a Rogers (1996)

4   Why has Slovakia stopped converging in the official statistics?

Successful replication of Eurostat statistics means that the problem lies in the input data

As part of our analysis of the suspicious evolution of Slovakia's GDP at PPP in official statistics published by Eurostat, **the Social Policy Institute** (Slovak: *Inštitút sociálnej politiky*; abbr. *ISP*) **obtained from Eurostat detailed data, which are used to calculate official PPPs** (henceforth "our data" or "detailed PPP data"):

- Our data contain **official purchasing power parities for each basic heading, as well as all relevant nominal expenditures from the national accounts**. They cover all EU-27 Member States and the time period from 2010 to 2022.

- The data include all 276 basic headings that are used to calculate PPPs for economic aggregates.

- The level of detail is much greater than in the data that Eurostat makes available to the public on its website. Compared to the 276 basic headings in our data, Eurostat offers the public only 61 higher-level "analytical categories".

In addition to basic heading PPP and nominal expenditure data, Eurostat also provided us with **data on the housing stock of the Visegrad Group (V4) countries** – i.e. Czechia, Hungary, Poland and Slovakia.

- These data contain the number of flats and houses of various sizes (based on the number of rooms), their useable surface area, as well as information about their facilities (electricity, running water, indoor toilet, central heating).

- They also contain the number of useable square meters per capita in the V4 countries, as well as quality, quantity and volume measures, which are used to calculate purchasing power parities for housing rentals.

Box 4.1: High level of detail in the PPP data obtained from Eurostat

The following examples illustrate the high level of detail in the data that have been made available to us:

- Of the publicly available analytical categories, the category *A0101 – Food and non-alcoholic beverages* is divided into the greatest number of sub-categories on the Eurostat website. It contains two larger sub-categories *A010101 - Food* and *A010102 - Non-alcoholic beverages*. The former is further divided into 7 lower sub-categories (e.g. "Milk, cheese and eggs"), all of which are aggregated at a level higher than the basic heading level.

  - In our data, however, the analytical category *A0101 – Food and non-alcoholic beverages* is divided into as many as 61 basic headings. The most detailed publicly available analytical sub-category "Milk, cheese and eggs" is divided into 7 basic headings in our data (with "Milk" being further divided into three types, each with its own basic heading).

- Eurostat publishes only a single sub-category within the analytical category *A0109 – Recreation and culture*. By contrast, our data contains 37 basic headings that belong to this category.

- Later in our analysis of the evolution of prices in official Eurostat statistics for Slovakia, we will encounter data related to housing. Eurostat only makes the *A0104 – Housing, water, electricity, gas and other fuels* analytical group available on its website, and only publishes one sub-category that belongs to it.

  - Our data, however, contain 14 basic headings from this analytical category, including actual and imputed rentals for housing, as well as five different types of fuel.

Based on detailed information and examples from the *Eurostat-OECD Methodological Manual on Purchasing Power Parities*, we created a **computer program in the R statistical programming language that calculates purchasing power parities and can estimate alternative scenarios**. Since our input data already contain previously-calculated PPPs at the basic heading level, our program only calculates PPPs for economic aggregates.

Our program only needs data on PPPs and nominal expenditures at the basic heading level as inputs. From these input data, it can calculate not only purchasing power parities for economic aggregates, but also relevant Price Level Indices at PPP, volumes of economic aggregates at PPP (e.g. GDP at PPP) and comparisons of these volumes with the volume of a reference country or a group of countries (e.g. GDP at PPP as a percentage of the EU-27 average).

> **Box 4.2: Condition for using Eurostat's PPP data: Lower level of detail in the published results**
>
> As a condition for receiving access to the detailed PPP data, Eurostat required that we limit the level of detail at which we publish the results of our analysis. We have committed ourselves not to publish any results at a more detailed level than the 61 analytical categories, which are publicly available on the Eurostat website.
>
> We respect this requirement in the entirety of this document. Although we performed our analysis at the most detailed level of the 276 basic headings that were provided to us, we publish any results and conclusions at the less detailed level of publicly available analytical categories.

After we fed the above-described detailed PPP data from Eurostat for all EU-27 countries for the period from 2010 to 2022 into our computer program, we were able to successfully replicate all published official Eurostat statistics:[44]

- **Our successful replication confirms that Eurostat calculates its official statistics accurately and consistently in accordance with the methodology published in the *Methodological Manual*.** Eurostat uses the same formulas and procedures to calculate PPP statistics for all countries, including Slovakia.

- The suspicious evolution of Slovakia's GDP and other statistics at PPP cannot therefore have been caused by the use of a different procedure for calculating aggregate PPPs. **Any unusual trends in official statistics must have been the result of changes or differences in the input data.**

---

[44] Eurostat, [PRC_PPP_IND]

Benchmark revision of national accounts in 2019 affected official statistics from 2016 onwards

In 2019, a **benchmark revision** of Slovakia's national accounts was performed, and led to several significant methodological changes (especially in the estimation of expenditures on actual and imputed rental for housing) and to the incorporation of data from updated sources. Box 4.3 contains a summary of the most important changes brought about by this benchmark revision.[45]

Eurostat rules allow the revision of purchasing power parity time series up to three years back.[46] Therefore, the revision of the national accounts in 2019 for Slovakia **affected the official PPP statistics from 2016**, but did not change them in the preceding period. As a result, there are **jump changes in published values**, which are largely an **artefact of Eurostat's revision policy**.[47]

Box 4.3: Benchmark revision of Slovakia's national accounts in 2019

In accordance with the Harmonised European Revision Policy for Macroeconomic Statistics and the National Revision Policy, the Statistical Office of the Slovak Republic (SO SR) in 2019 carried out a major benchmark revision of national accounts data since 1995. The aim of the major revision was to **incorporate information from updated data sources and methodological clarifications for calculation of particular national accounts indicators**.

The incorporation of data from new sources had **the greatest impact on total GDP in these areas**:

- in the household sector, where the Statistical Office of the Slovak Republic used administrative data sources,
- estimates of the non-observed economy,
- **estimates of dwelling services**, where SO SR used information from the updated Infostat study:
  - **Before the benchmark revision:** Due to the insufficient size of the market for flat or house rentals, the user cost method was used to estimate expenditures on actual and imputed housing rentals for all dwellings.
  - **After the benchmark revision:** A hybrid method is used, in which the stratification method is applied to flats, while the user cost method continues to be used for houses.
  - Table 4.1 summarises the differences in methods used to estimate rental expenditures in national accounts before and after the benchmark revision, including relevant data sources.
- estimates of own-account construction production,
- estimates of household expenditures on energy,
- estimates of household expenditures on health,
- related to the revision of foreign trade statistics.

At the time of the benchmark revision, its overall impact on published GDP values in individual years ranged from -1.0 to 0.6 per cent at current prices.

---

[45] The box summarises the description of benchmark revision published by the Statistical Office of the Slovak Republic on its website. See Statistical Office (2023). We have included some additional information about the methodological changes in the estimation of dwelling services.

[46] Eurostat/OECD (2012), p. 271. PPPs published by Eurostat can be revised only three years into the past. Nominal expenditures from national accounts can be retrospectively revised over a longer period, but only in a limited way – at the level of higher aggregates (e.g. final household consumption), while the structure of expenditures at basic heading level is not revised (except for rescaling to ensure the correctness of totals for economic aggregates).

[47] Eurostat does not mark the break in the time series on its website in any way – in contrast to many other publicly available statistics, where such breaks are generally marked. This may be due to the fact that a change in the PPP data for one country usually leads to changes in the PPP statistics for all other countries. A break in the time series of one EU Member State would therefore, in most cases, also lead to breaks in the time series of other countries.

Ministry of Labour, Social Affairs and Family of the Slovak Republic

Table 4.1: Methodology for estimating expenditures on rentals for housing in Slovakia's national accounts

Benchmark revision:	before the 2019 revision	after the 2019 revision
Methodological document:	GNI Inventory – SK, ESA 2010	GNI Inventory – SK, ESA 2010
Institution and year of publication:	Statistical Office of the Slovak Republic (2016)	Statistical Office of the Slovak Republic (2021)
Stratification method:	**not used**	**only for flats**
stratification criteria:	-	location – 79 districts number of rooms – 5 categories flat older than 3 years – 2 categories
average rental prices:	-	Infostat study of market rentals in 2016 based on data from the National Association of Real Estate Agencies in Slovakia
User cost method:	**flats and houses**	**only for houses**
– **intermediate consumption, of which :**		
routine maintenance and repair:	survey by the Ministry of Construction and Regional Development of the Slovak Republic about housing costs in rental flats (1997 - 1999); adjustment for major repairs from Household Budget Survey	routine maintenance and repair from the Household Budget Survey (HBS) statistics; part of the value of repairs and maintenance fund from Infostat study
FISIM:	administrative data from the National Bank of Slovakia (NBS)	administrative data from the National Bank of Slovakia (NBS)
insurance services:	administrative data from the National Bank of Slovakia (NBS)	NBS reports about property insurance
– **consumption of fixed capital:**	perpetual inventory method (PIM) based on the reproduction value of dwellings; 55-year service life	perpetual inventory method (PIM) based on the reproduction value of dwellings
– **gross operating surplus:**	2,5 % of net value of dwelling stock; 55-year service life	2,5 % of net value of dwelling stock and land
– **other taxes (less subsidies):**	equal to zero (unreliable data); expert estimate: tax on dwellings + tax on land ≈ housing subsidies	included, but not described

Source: Statistical Office of the Slovak Republic

isp@employment.gov.sk

Revision of national accounts led to a much higher estimate of expenditures on rentals

The benchmark revision resulted in a significant increase in the estimate of household expenditures on actual and imputed rentals for housing. This increase stems from the following methodological changes:

- The **stratification method** (see Box 4.5) was introduced to estimate expenditures on rentals **for flats**. This method uses a survey to collect rental prices for various types of flats, and therefore relies on actually observed prices in its calculations.

- Even after the benchmark revision, **the user cost method** (see Box 4.6) continued to be used to estimate expenditures on rentals **for houses**. This method estimates expenditures indirectly as the sum of all relevant costs that owners would have to consider when determining the amount of rent they could charge if they were to rent out their homes.

- The estimate of rental expenditures for both flats and houses was also **adjusted based on the results of Infostat studies**[48], which established what data sources were available for calculating the production of dwellings services, and subsequently estimated this production.

Table 4.2 presents expenditures on imputed and actual rentals for housing in Slovakia's national accounts before and after the 2019 benchmark revision. The benchmark revision led to a doubling of estimates of imputed rentals spending and an increase in estimates of spending on actual rentals to 1.5 – 2 times the pre-revision values.

Table 4.2: Expenditures on rentals for housing in national accounts, millions of EUR

Imputed rentals for housing:	2010	2011	2012	2013	2014	2015	2016	2017
before benchmark revision	3 098	3 086	3 113	3 100	3 185	3 240	3 355	3 476
after benchmark revision	6 230	6 318	6 272	6 287	6 379	6 439	6 761	7 105
Increase (%):	101%	105%	101%	103%	100%	99%	102%	104%
	2018	2019	2020	2021	2022			
before benchmark revision	-	-	-	-	-			
after benchmark revision	7 610	8 219	8 962	9 998	11 400			

Actual rentals for housing:	2010	2011	2012	2013	2014	2015	2016	2017
before benchmark revision	381	402	409	388	406	406	408	424
after benchmark revision	626	658	607	626	691	773	842	813
Increase (%):	64%	64%	48%	61%	70%	90%	107%	92%
	2018	2019	2020	2021	2022			
before benchmark revision	-	-	-	-	-			
after benchmark revision	871	995	1 053	1 052	1 129			

Source: OECD, Final Consumption Expenditure of Households

Eurostat calculates purchasing power parities for housing rentals differently from other basic headings. Boxes 4.4, 4.5 and 4.6 provide a detailed description of the methods used to calculate expenditures on rentals for housing and the corresponding PPPs.

Due to Eurostat's revision policy, the benchmark revision led to **much higher nominal expenditures on rentals being recorded in Eurostat's PPP input data since 2016**:

- Higher spending resulted in higher PPPs and Price Level Indices for imputed and actual rentals.

---

[48] Hajnovičová and Horecká (2018), Hajnovičová and Horecká (2019). Infostat is a contribution organisation of the Statistical Office of the Slovak Republic whose mission is to perform research and development tasks, and to improve the state statistical system of the Slovak Republic.

- These subsequently led to higher Price Level Indices for economic aggregates (e.g. for GDP), because more expensive rentals received a greater weight in the calculations.

- In addition, more expensive rentals in the input data led to an increase in the prices of basic headings for which purchasing power parities are calculated indirectly using the PPPs for rentals.[49]

Such a significant change in estimated expenditures on rentals and in the relative prices calculated from these expenditures naturally leads one to ask which of these estimates in the national accounts are more accurate:

- Most of the previous analyses of the Slovakia's PPP statistics assumed that the statistics for years until 2015 were reliable.

- However, our analysis casts a critical eye both on the statistics from before the benchmark revision, as well as from the post-revision period. **We find shortcomings in the data used to calculate PPPs both in the pre-revision years 2010 to 2015, and in the post-revision years since 2016.**

Box 4.4: How are expenditures and PPPs for actual and imputed rentals for housing estimated?

Household expenditures on actual and imputed rentals for housing are part of household final consumption expenditure in the national accounts. In Eurostat's detailed data, each of these two types of rentals has their own basic heading: *A.04.1.0.0* for *Actual Rentals for Housing* and *A.04.2.0.0* for *Imputed Rentals for Housing*.

- **Actual rentals include cash payments for the use of the dwelling, including any garage or parking space.** If the dwelling is furnished, the rent also includes payments for the use of furniture and other equipment. However, actual rentals do not include payments for maintenance and repair of the dwelling, water supply, waste collection or sewage disposal. They also do not include payments for electricity, gas, heating or hot water. The rentals, furthermore, do not include payments for the management or maintenance of common areas or for electricity that is spent in them.

- **Imputed rentals represent the estimated value of dwelling services used by households that live in houses and flats they own.** They correspond to the estimated rentals that such households would pay for renting the same unfurnished dwelling (*rental equivalent*), taking into account factors such as the type of dwelling, its size, quality or location. Although not an actual payment, the inclusion of imputed rentals in national accounts allows for better comparisons of the economies of countries with different shares of rented and owner-occupied housing.[50] It is recorded as an expenditure that the household pays to itself for the dwelling services it consumes.

EU-27 Member States calculate household expenditures on rentals in their national accounts according to the ESA 2010 methodology.[51] If possible, Member States should use the **stratification method**, which relies on actual rental prices that have been collected using surveys. This method is suitable if there is a sufficiently large and representative market for rental flats or houses in the country. PPPs for housing rentals is then calculated directly using the **price approach**.

If such a market does not exist in the country, or if it is not sufficiently large or representative, Member States can apply the **user cost method** to estimate rental expenditures. In this method, imputed rentals equal the sum of all costs that the owners of dwellings would have to take into account when determining the amount of market rent if they were to rent out their flat or house. In this case, PPPs are calculated indirectly using the **quantity approach**.

---

[49] Purchasing power parities for some difficult-to-estimate basic headings are calculated indirectly using reference PPPs. See Eurostat/OECD (2012), p. 246.

[50] A detailed explanation can be found, for example, in *Commission Implementing Regulation (EU) 2022/2094 of 28 October 2022 specifying the technical items of data sets, establishing the technical formats for transmission of information and specifying the detailed arrangements and content of the quality reports on the organisation of a sample survey in the consumption domain pursuant to Regulation (EU) 2019/1700 of the European Parliament and of the Council*.

[51] Eurostat (2013), p. 66; Eurostat (2016), p. 110

Box 4.5: Stratification method in the national accounts → Price approach in PPP calculations

In the **stratification method**, dwellings are first divided into strata (groups or categories) according to type, size, quality and location. **Rental prices for flats and houses in each stratum are then collected, usually through a survey.** The number of dwellings in each stratum is multiplied by the average rental price in the same stratum, and the results are summed up to obtain total household expenditure on rentals for housing.

When the stratification method is used, purchasing power parities are calculated **directly** using the **price approach**, which is based on the collected rental prices. In this approach, PPPs are calculated separately for actual and imputed rentals for housing.

PPPs for rentals are calculated differently from the standard procedure for calculating basic heading PPPs (in the second stage of PPP calculations), in which unweighted geometric averages are usually taken. When calculating PPPs for housing rentals, nominal expenditures on rentals are used as weights. This approach is similar to the procedure used in the calculation of PPPs for economic aggregates (in the third stage).

First, Laspeyres and Paasche type PPPs are calculated:

$$Laspeyres_{j/h} = \frac{1}{\sum_{i=1}^{k} w_{i,h}} \sum_{i=1}^{k} \left[\frac{P_{i/j}}{P_{i/h}} \times w_{i,h} \right]$$

$$Paasche_{j/h} = \frac{1}{Laspeyres_{h/j}}$$

where $P_{i/h}$ and $P_{i/j}$ denote average prices for rentals in stratum i in the base country h and the partner country j, respectively. The letter $w_{i,h}$ denotes the weight of rental expenditures in stratum i in the base country h, calculated as a share of the total expenditure on actual or imputed rentals for housing. The total number of strata is denoted by the letter k.

Fisher type PPPs for actual and imputed rentals are then calculated in the standard way by taking the geometric mean. Finally, these PPPs are made into the final, transitive purchasing power parities by applying the EKS method.

Box 4.6: User cost method in the national accounts → Quantity approach in PPP calculations

In the **user cost method**, rents are calculated as the **sum of all costs that the owners of dwellings would have to take into account when setting the rent if they wanted to rent out their flat or house at the market price**. The resulting total should provide a realistic estimate of the expenditure on rentals. These costs include:

- **Intermediate consumption**, which consists mainly of spending on routine maintenance and repairs, FISIM and insurance services. FISIM stands for *Financial Intermediation Services Indirectly Measured*, and represents interest payments for mortgage and construction loans.
- **Consumption of fixed capital**, which captures the depreciation of owned fixed assets (in this case, housing) due to normal wear and tear, as well as obsolescence.
- **Net operating surplus** is the nominal rate of return on the capital invested in the dwelling and in the land on which it is located.
- **Other taxes (minus subsidies) on production**, such as the real estate tax.

Consumption of fixed capital and net operating surplus depend, among other things, on the reproduction price of the property, i.e. the price for which it would be possible to acquire the property at the given moment.

When the user cost method is used, purchasing power parities are calculated **indirectly** using the **quantity approach**.

National statistical institutes provide Eurostat with data on the total housing stock in individual Member States. These data include the number of flats and houses and their surface area (quantity data), as well as the number of flats and houses that have electricity, running water, an indoor toilet and central heating (quality data). Data are provided for all flats and houses without distinguishing whether they are rented or owner-occupied.

The following measures are calculated from these data:

- the **quantity measure** is the ratio between the useable surface areas of flats and houses per capita in countries j and h
- the **quality measure** is the ratio between percentage of flats and houses with the facilities listed above in countries j and h
- the **volume measure** is the product of the quantity measure and the quality measure

The volume measure thus expresses the relative quantity of dwellings in country j compared to country h, adjusted for their quality.

The purchasing power parities between countries j and h for housing rentals are calculated indirectly. The following formula is used:

$$PPP_{j/h} = \frac{\frac{E_j}{E_h}}{V_{j/h}}$$

where E_j and E_h denote the per capita final expenditure on housing in the national currency of country j and h, respectively. $V_{j/h}$ is the volume measure as described above.

In the quantity approach, E_j and E_h include all final housing expenditures in a Member State. These consist of the sum of expenditures on the following four basic headings: household expenditure on actual rentals, household expenditure on imputed rentals, expenditure on housing by non-profit institutions serving households (NPISH), and general government expenditure on housing. The indirect PPPs for housing therefore refer to all housing in the Member State.

Shortcomings in the input data used for calculating PPPs

2010 – 2015: Intermediate consumption is missing from expenditures on rentals

The nominal expenditures on rentals for housing used to calculate PPP statistics in years 2010 to 2015 correspond to the expenditures reported in Slovakia's national accounts before the benchmark revision.

A comparison of nominal expenditures in 2010 in the pre-revision national accounts with data for the same year in the *GNI Inventory* (2016), however, strongly suggests that **intermediate consumption was not included in rental expenditures in the national accounts**.[52] The *GNI Inventory* is a manual published by the Statistical Office of the Slovak Republic in 2016, which describes in detail the methodology used to compile the country's national accounts, and illustrates relevant calculations using specific figures from 2010.

As Table 4.3 shows, nominal expenditures on imputed and actual rentals for housing in the national accounts match the difference between the expenditure and intermediate consumption reported by the *GNI Inventory* almost exactly.

Table 4.3: Expenditures on rentals for housing in *GNI Inventory* (2016) and national accounts before benchmark revision

	Rentals for housing, 2010, millions of EUR	
	Imputed	**Actual**
Source: GNI Inventory		
Production / Expenditure	4 588	537
Intermediate consumption	1 491	164
Share (%)	32.5%	30.6%
Difference	3 098	373
Source: National accounts before benchmark revision, OECD		
Reported production / Reported expenditure	3 098	381

Source: Statistical Office of the Slovak Republic; OECD, Final Consumption Expenditure of Households

Intermediate consumption for housing rentals includes expenditures on routine repairs and maintenance of the dwelling, interest payments on mortgage or construction loans, as well as insurance and some other services related to housing. In the detailed data from Eurostat, we observe a significant decrease in nominal expenditures on basic headings associated with these types of spending (see Table 4.4) between 2015 (not yet affected by the benchmark revision) and 2016 (already affected).

Such a decrease, along with its size, suggests that intermediate consumption had indeed not been included in the pre-revised national accounts. At the same time, it also suggests that the error was corrected in the benchmark revision, which led to a reclassification of spending on intermediate consumption into the appropriate basic headings.

Table 4.4: Basic headings which may have included intermediate consumption for rentals before the benchmark revision

A.04.3.1.0	Materials for the maintenance and repair of the dwelling
A.04.3.2.0	Services for the maintenance and repair of the dwelling
A.04.4.4.0	Other services relating to the dwelling n.e.c.
A.12.5.2.0	Insurance connected with the dwelling
A.12.6.1.0	FISIM

Source: Eurostat

---

[52] Statistical Office of the Slovak Republic (2016)

2016 – 2022: Expenditures on rentals are too high

Graph 4.1 shows the relationship between nominal GDP per capita in post-communist EU Member States and nominal per capita expenditure on rentals for housing (total – both imputed and actual[53]) in these countries' national accounts in 2016 and 2021:[54]

- **In both 2016 and 2021, Slovakia had the highest per capita expenditure on rentals of all post-communist EU countries.** This was also true in each year from 2016 to 2021, with the exception of two: In 2018 and 2019, the per capita expenditure on rentals was slightly higher in Czechia.

The dotted blue line indicates the expected per capita amount of expenditures on rentals for the corresponding level of nominal GDP per capita, estimated using a simple linear regression:

- **In both 2016 and 2021, per capita expenditures on rentals in Slovakia's national accounts were significantly higher than expected given the country's nominal GDP per capita.**

- In both years, **Slovakia shows the largest gap between per capita expenditures on rentals and their expected amount** of all post-communist EU countries**.**

- Of the countries with relatively high per capita expenditures on rentals, Czechia and Latvia have higher than expected expenditures, while Slovenia and Estonia spend approximately the expected amounts.

Based on the aforementioned facts, one may reasonably conclude that expenditures on rentals in Slovakia's national accounts were <u>overestimated</u> after 2016, and thus also in the input data for PPP calculations. Without additional information, however, it is difficult to adjust these expenditures to a more realistic level.

Box 4.7: How are expenditures on rentals estimated in national accounts?

In the base year, expenditures on imputed and actual rentals are estimated from collected data:

- Studies by Infostat, on which adjustments to national accounts were based in the benchmark revision, estimated the production of dwelling services for 2015 and 2016 from available data.[55]

In the case of Slovakia, the following methods are used:

- the **stratification method for flats**, in which market prices for rentals are obtained from a survey
- the **user cost method for houses**, which relies on assumptions about the depreciation of real estate and on estimated reproduction prices of the housing stock

As we do not have access to any underlying or alternative data for these calculations, we cannot adjust the overestimated rental expenditures to their "correct" levels when estimating alternative scenarios. Instead, we will replace these expenditures by more realistic values from other post-communist EU countries.

For years other than the base year, expenditures are extrapolated using an appropriate price index and the evolution of the housing stock:

- The sizeable difference between expenditures in the national accounts and their expected values in 2021 (see Graph 4.1) may have resulted from the use of a price index that lead to an excessively fast growth of spending estimates.

---

[53] The graph shows the sum of imputed and actual housing rentals to allow for a comparison of countries with different shares of rented and owner-occupied dwellings.

[54] At the time of writing, 2021 was the last year for which Eurostat had published the per capita expenditures on rentals for all post-communist EU countries.

[55] Hajnovičová and Horecká (2018), Hajnovičová and Horecká (2019)

Graph 4.1: Rentals for housing (imputed + actual) – Expenditures per capita in post-communist EU Member States in 2016 and 2021, in EUR
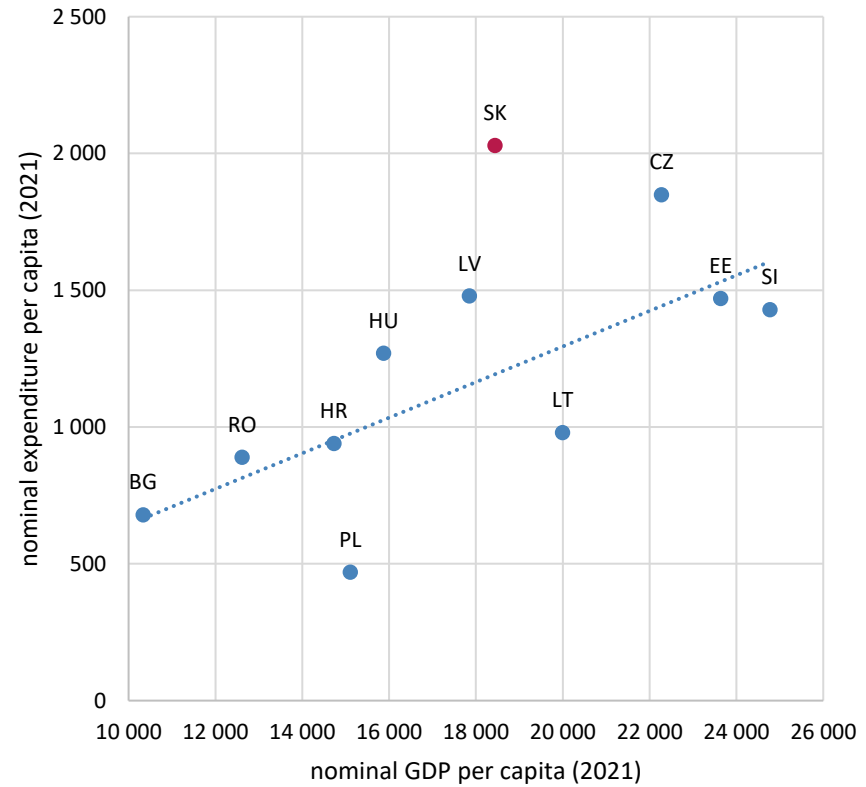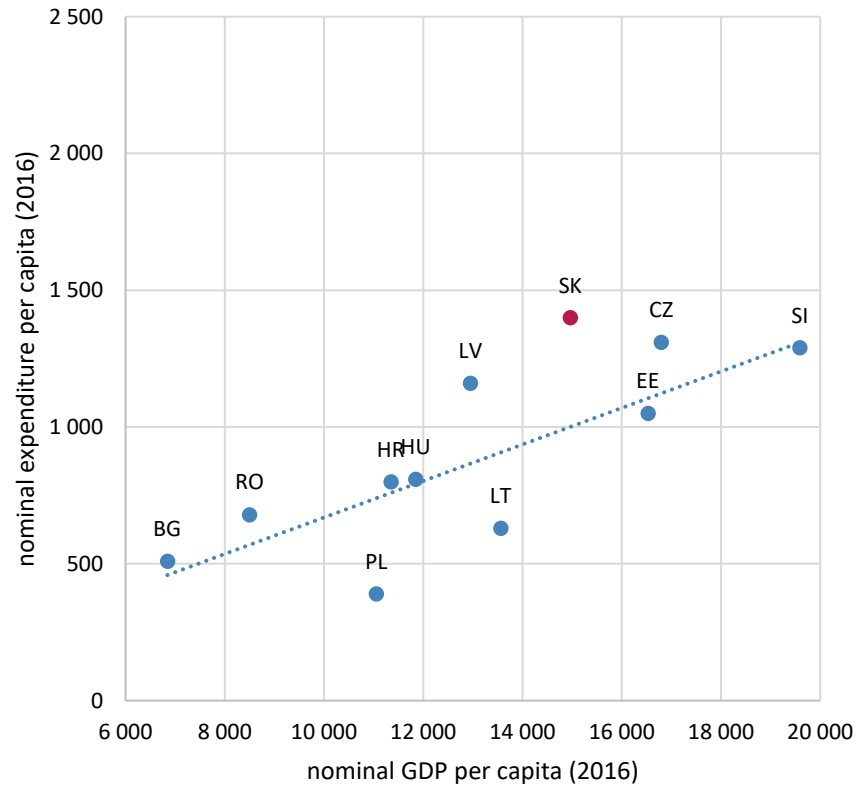
Source: Eurostat, [PRC_PPP_IND]; Eurostat, [NAMA_10_CO3_P3]

29

2016 – 2022: Expenditures on rentals are growing too fast

Since national statistical institutes of EU countries have limited capabilities, expenditures on rentals for housing in national accounts are usually calculated from data that were collected only for the base year (e.g. 2015). Amounts for other years are then extrapolated using the evolution of the housing stock and an appropriate price index.

Eurostat's *Handbook on Price and Volume Measures in National Accounts* **recommends the use of a consumer price index for privately rented dwellings that takes full account of changes in the quality of dwellings.**[56] It refers to the Harmonised Index of Consumer Prices (HICP) for actual rentals for housing as a "potentially useful" series. Box 4.8 describes which extrapolation (or deflation) methods Eurostat's handbook regards as appropriate.

Graph 4.2 shows the evolution of expenditures on imputed rentals for housing in Slovakia's national accounts, as well as of the HICP for actual rentals and of the **House Price Index (HPI)**. The HPI measures the change in market prices of all residential properties that are purchased by households.[57]

Graph 4.2: Expenditure on *Imputed Rentals for Housing*; HICP for *Actual Rentals for Housing*; **House Price Index (HPI); Slovakia in 2016 = 100**
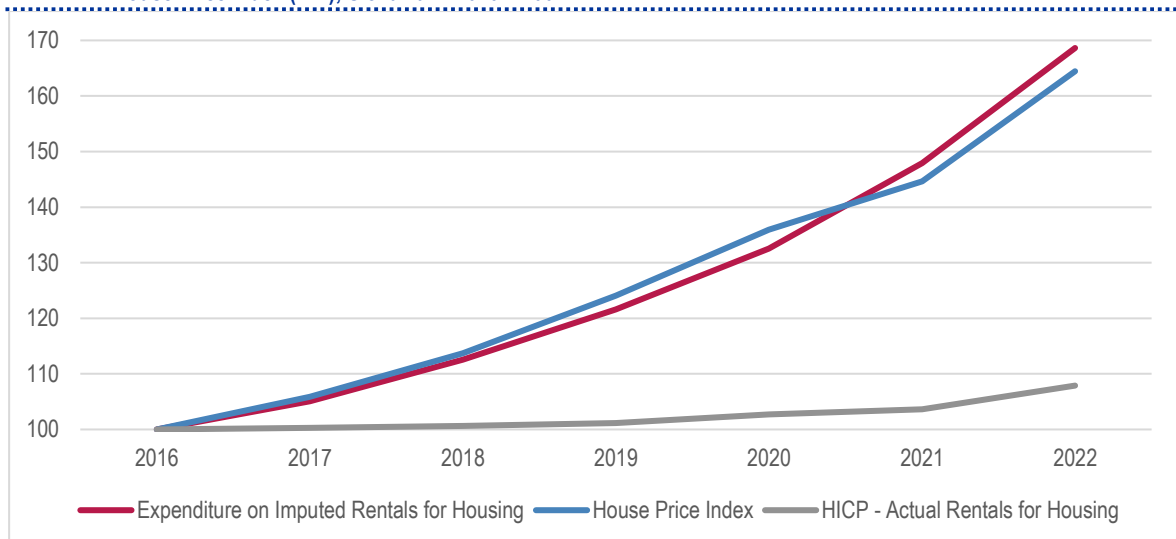
Source: Eurostat, [PRC_HICP_AIND]; Eurostat, [PRC_HPI_A]; OECD, Final Consumption Expenditure of Households

In the graph, we can see that expenditures on imputed rentals in the national accounts are growing much faster in Slovakia than the HICP for actual rentals. These expenditures, however, exhibit a growth rate that is nearly identical to that of the HPI index of real estate acquisition prices.

- According to Eurostat reports on the quality of the Harmonised Index of Consumer Prices during this period, **Slovakia's HICP for actual rentals for housing only captured changes in the rental prices for flats and houses rented out by municipalities.**

  - Privately rented dwellings were not covered by this price index in Slovakia due to the lack of reliable data.[58]

  - Slovakia's HICP for actual rentals for housing is therefore not suitable for extrapolating expenditures on imputed rentals in the national accounts.

---

[56] Eurostat (2016), p. 110-111
[57] Eurostat (2017)
[58] Eurostat (2018), p. 4

- **Extrapolation of expenditures on imputed rentals with the House Price Index would, however, involve the use of a price index, which – according to the *Handbook on Price and Volume Measures in National Accounts* – is unsuitable for this purpose.**[59]

    - Eurostat regards the use of acquisition prices of new dwellings in extrapolation/deflation of national accounts as a "C method" – that is, an inappropriate method that should not be used – because such prices do not relate to the rental income of the dwelling.

Graph 4.3 compares the evolution of the HICP for actual rentals for housing and the HPI in the Visegrad Group (V4) countries since 2016:

- Slovakia's HICP for actual rentals clearly grew at the slowest rate among the V4 countries, and also more slowly than the same index for the EU as a whole.

    Given that **Slovakia's HICP only captures rental prices in municipal dwellings, which are often regulated**, such evolution is not surprising. A price index reflecting market rents for privately rented dwellings would likely grow at a faster rate.

- The House Price Index (HPI) grew faster in Slovakia than for the EU-27 as a whole, and at a pace similar to that seen in Poland.

According to the HPI index, real estate prices in all V4 countries, as well as in the European Union as a whole, grew faster than housing rents.

If real estate prices in Slovakia also grew faster than rental prices, the expenditure on imputed rentals in Slovakia – which has grown at approximately the same rate as the HPI in the country's national accounts – is <u>overestimated</u> in the input data for PPP calculations beginning in 2016.

Graph 4.3: HICP for *Actual Rentals for Housing* and House Price Index (HPI); 2016 = 100
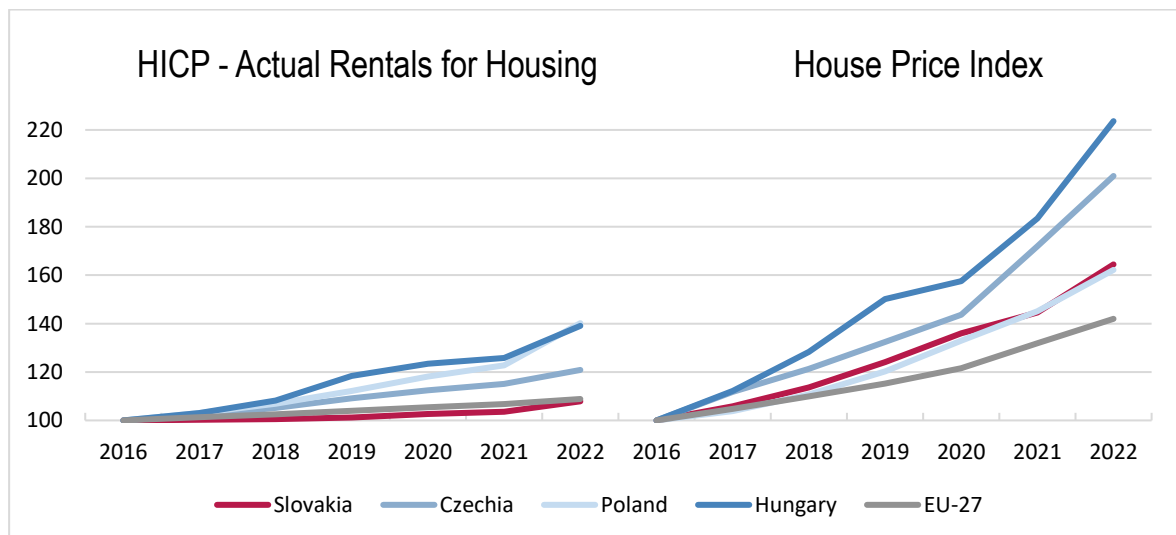
Source: Eurostat, [PRC_HICP_AIND]; Eurostat, [PRC_HPI_A]

---

[59] Eurostat (2016), p. 110-111

Box 4.8: Which methods are (in)appropriate for extrapolating expenditures on rentals in the national accounts?

The *Handbook on Price and Volume Measures in National Accounts* is a Eurostat methodological document that describes which methods the national statistical institutes of EU Member States ought to use when compiling their national accounts. Its purpose is to ensure that production, expenditure, and income in current prices can be decomposed into a price component, which is only affected by changes in prices, and a volume component, which reflects changes in quantity or quality.[60]

The *Handbook* divides methods into three categories according to the extent to which they are appropriate for use in the compilation of national accounts:[61]

• **A methods** – The most appropriate methods that approximate the ideal as closely as possible.

• **B methods** – Acceptable alternatives that can be used if an A method cannot be used.

• **C methods** – Inappropriate methods that should not be used. These methods are too far away from the ideal approach, or would simply measure the wrong thing. Their use in national accounts would generate too great a bias.

EU Member States compile their own Consumer Price Indices (CPI). However, the *Handbook* notes that there is a EU-wide harmonised standard in the form of the Harmonised Index of Consumer Prices (HICP). Eurostat therefore recommends using the relevant component of the HICP, if available, when compiling national accounts.[62]

Expenditures on **imputed rentals** are estimated in the national accounts via the stratification or user cost method for a base year. Most Member States, however, do not have the means to carry out such estimates every year. Expenditure estimates for other years are therefore typically carried out by national statistical institutes with the help of price indices, which are used to extrapolate from the base year.

The Eurostat classifies possible extrapolation methods for imputed rentals as follows:[63]

• **A method** – The most appropriate price index is **a consumer price index for privately rented dwellings** that takes full account of changes in the quality of dwellings.

• **B method** – An acceptable alternative is **a consumer price index with a coverage that is wider than private rents**, or which does not fully take into account changes in quality. A **volume indicator based on the stock of owner-occupied dwellings**, broken down in sufficient detail, is also permissible.

• **C method** – Eurostat considers the use of **acquisition prices of new dwellings** to be an *inappropriate* method, because these prices do not relate to the rental income of the dwelling.

The *Handbook* identifies the HICP component for actual rentals as "potentially useful" for estimating expenditures on imputed rentals. At the same time, it notes that the weighting and survey methods used in the HICP may differ from those set down in the relevant EU regulations.[64]

---

[60] *Ibid.*, p. 6

[61] *Ibid.*, p. 8

[62] *Ibid.*, p. 43

[63] *Ibid.*, p. 110-111

[64] *Commission Decision of 18 July 1995 specifying the principles for estimating dwelling services for the purpose of implementing Article 1 of Council Directive 89/130/EEC, Euratom on the harmonization of the compilation of gross national product at market prices; later replaced by Commission Implementing Regulation (EU) 2021/1949 of 10 November 2021 on the principles for estimating dwelling services for the purposes of Regulation (EU) 2019/516 of the European Parliament and of the Council on the harmonisation of gross national income at market prices (GNI Regulation) and repealing Commission Decision 95/309/EC, Euratom and Commission Regulation (EC) No 1722/2005*

2017 – 2022: Slovakia began to report an underestimated surface area of flats and houses

Between 2016 and 2017, there was yet another sizeable increase in the Price Level Indices of imputed and actual rentals for housing in the Eurostat time series used in the PPP calculations for Slovakia. This increase was significantly larger than one would have expected as a result of the rapidly growing nominal expenditures on rentals.

Eurostat uses the quantity approach when calculating PPPs for housing rentals in Slovakia (see Box 4.9). The observed increase in Price Level Indices may thus be the result of a change in the reporting of total useable surface area per capita of dwellings in Slovakia.

Box 4.9: Methodology for Slovakia: Calculation of PPPs for housing rentals (Eurostat)

Despite the fact that a hybrid method (stratification method for flats; user cost method for houses) is used to estimate expenditures on rentals in Slovakia's national accounts, Eurostat applies the quantity approach when calculating purchasing power parities for imputed and actual rentals in the country. This approach was described in detail in Box 4.6.

Purchasing power parities for housing rentals are thus calculated by dividing the ratio of final housing expenditures by the volume measure. The volume measure can be thought of as the share of useable surface areas per capita, adjusted for the quality of flats and houses.

The use of the quantity approach in calculating PPPs for Slovakia has the following consequences:

- PPPs and the associated Price Level Indices for housing rentals are **directly proportional to the amount of final housing expenditures** in Slovakia.

- PPP and Price Level Indices for housing rentals are **inversely proportional to the total useable surface area of flats and houses per capita** in Slovakia.

Data on the useable surface area of flats and houses is provided to Eurostat by the Statistical Office of the Slovak Republic on a special form that is submitted independently of national accounts data.

We see the following developments in the detailed data, obtained from Eurostat, on the housing stock in Slovakia:

- **Between 2016 and 2017, there was a significant drop – by approximately a quarter – in the surface area of dwellings** reported to Eurostat by the Statistical Office of the Slovak Republic.

- This decline can be seen not only in the total surface area of flats and houses in Slovakia, but **also for each type of dwelling separately** in the data on the average area of flats and houses with different numbers of rooms.

- Until 2016 **the surface area of dwellings per capita** in Slovakia was comparable to other Visegrad Group countries. Since 2017, however, this number has been lower by a significant margin.

The decrease in the reported area of dwellings by about a quarter – especially as the data showed decreases in the average area of flats and houses of all sizes at the same time – suggests that there may have been **a change from reporting the useable (or floor) surface area to reporting only the liveable surface area**. See Table 4.5, which contains comparisons of the total liveable and useable (or floor) area of selected types of flats and houses in Slovakia in 2016.[65]

---

[65] These data come from tables in the Infostat study (Hajnovičová and Horecká, 2018) that was used, as part of the benchmark revision, to adjust estimates of expenditures on housing rentals. Liveable areas for different types of flats and houses used in the Infostat study come from the 2011 Population and Housing Census.

Table 4.5: Liveable and floor area of selected types of flats and houses, 2016

	Total area in Slovakia, m^2		
	Liveable	Floor	Share
Owner-occupied flats	38 278 759	51 814 192	73.9%
Rented municipal and state flats	2 091 170	2 947 405	70.9%
Rented flats in NPISH sector	147 178	222 350	66.2%
Cooperative flats	1 787 621	2 321 923	77.0%
Cooperative houses	35 936	48 384	74.3%

Source: Infostat – Hajnovičová and Horecká (2019)

Unlike the useable/floor area, the liveable area of dwellings does not include, for example, corridors or bathrooms. **However, the *Eurostat/OECD Methodological Manual* requires national statistical institutes to report the useable surface area.** Stairs, balconies, terraces, cellars and attics are not included in the useable area. However, it still includes corridors, bathrooms, toilets and the like.[66]

As a result of the incorrect reporting of the surface area of flats and houses, the prices of rentals for housing in Slovakia have likely been overestimated by approximately a third since 2017.

Revision of national accounts also significantly affected expenditures on construction and health

The 2019 benchmark revision of Slovakia's national accounts led to a significant change not only in the reported expenditures on rentals for housing, but also on other categories of goods and services. Due to Eurostat's revision policy, which allows retrospective revisions only three years into the past, we observe jumps in the nominal expenditures on these goods in the input data for PPP calculations between 2015 and 2016 as well.

Table 4.6 presents a comparison of nominal expenditures and Price Level Indices in 2015 and 2016 for analytical categories in the input data. The data for 2015 represent the original data from before the benchmark revision, whereas those for 2016 already reflect changes brought about by the revision.

After the revision, the most notable increase in expenditures and a dramatic increase in the Price Level Index was recorded in the analytical category *Housing, water, electricity, gas and other fuels*, primarily due to the significantly higher estimate of expenditures on housing rentals. *Alcoholic beverages, tobacco and narcotics* is another category that recorded a sizeable increase in nominal expenditures.

However, the benchmark revision also led to a significant decrease in reported expenditures on construction and health, as spending on each of these two categories was more than one thousand million euros lower in the input data for PPPs calculations in the post-revision year 2016 compared to the pre-revision year 2015.

These changes in reported expenditures are in line with claims by the Statistical Office of the Slovak Republic, according to which the benchmark revision had the most significant impact on estimates of dwelling services, the non-observed economy (which includes narcotics), construction and household expenditures on health (see Box 4.3).

---

[66] Eurostat/OECD (2012), str. 141

Table 4.6: Nominal expenditures and Price Level Indices at PPP for analytical categories, 2015 and 2016

Analytical category	Nominal expenditures			Nominal expenditures (% of GDP)			Price Level Index in PPP (EU-27 average = 100)		
	2015	2016	Difference (mil. EUR)	2015	2016	Difference (pp)	2015	2016	Difference
Housing, water, electricity, gas and other fuels	10 321	13 196	2 875	12.9%	16.2%	3.3 pp	51.8	75.2	23.4
Alcoholic beverages, tobacco and narcotics	2 109	2 520	411	2.6%	3.1%	0.5 pp	76.7	77.6	0.9
Household furnishings, equipment and maintenance	2 431	2 659	228	3.0%	3.3%	0.3 pp	81.7	82.9	1.2
Clothing and footwear	1 630	1 772	142	2.0%	2.2%	0.2 pp	99.6	99.6	0.0
Restaurants and hotels	2 374	2 467	93	3.0%	3.0%	0.0 pp	75.7	75.8	0.1
Education	3 228	3 248	20	4.0%	4.0%	0.0 pp	55.9	53.3	-2.6
Communication	1 410	1 416	6	1.8%	1.7%	-0.1 pp	82.3	83.7	1.4
Food and non-alcoholic beverages	7 331	7 284	-47	9.1%	9.0%	-0.1 pp	90.1	88.0	-2.1
Transport	3 095	2 950	-145	3.9%	3.6%	-0.3 pp	74.3	77.8	3.5
Machinery and equipment	9 016	8 419	-597	11.3%	10.4%	-0.9 pp	96.4	96.4	0.0
Miscellaneous goods and services	5 398	4 632	-766	6.7%	5.7%	-1.0 pp	68.1	72.9	4.8
Health	6 312	5 301	-1 011	7.9%	6.5%	-1.4 pp	50.9	51.3	0.4
Construction	8 348	6 899	-1 449	10.4%	8.5%	-1.9 pp	70.8	68.7	-2.1
Software	-	-	-	-	-	-	93.1	95.1	2.0

Source: Eurostat, [PRC_PPP_IND]

We do not possess data or information that would allow us to evaluate whether the pre- or post-revision estimates of the aforementioned analytical categories are more credible. Thus, in the remainder of our analysis, we focus mainly on correcting the known shortcomings in estimates of rentals for housing, while leaving other expenditures untouched.

isp@employment.gov.sk

5   Alternative scenarios: How would the correction of shortcomings affect Slovak statistics?

Our analysis is among the first in Slovakia to examine and adjust the input data on the level of detailed basic headings.[67] As such, it offers a surgical approach to the estimation of alternative scenarios. We replace only the problematic parts of the input data, but leave all other basic headings and purchasing power parities intact.[68] We then use our software to calculate new PPP statistics, following the published Eurostat methodology.

We estimate two alternative scenarios for the evolution of PPP statistics between 2010 and 2022:

- A **conservative (pessimistic) scenario**, labelled **SK-H**, in which we assume that prices of rentals for housing in Slovakia are equal to the *highest* prices among other post-communist EU countries. This means that:
  - We replace Slovak prices of actual rentals for housing by those from Slovenia from 2010 to 2021, and from Estonia in 2022.
  - We replace Slovak prices of imputed rentals for housing by those from Slovenia from 2010 to 2017, and from Czechia from 2018 onwards.

  We regard this scenario as conservative (or pessimistic). The prices of housing rentals rise with a country's nominal GDP – see Graph 4.1. Slovakia does not have the highest nominal GDP among the post-communist countries of the European Union. We may therefore assume that **the highest rental prices among this group represent an upper limit to what prices are plausible for Slovakia**.

- An **optimistic scenario**, labelled **SK-L**, in which we assume that prices of rentals for housing are, on the contrary, equal to the *lowest* prices among other post-communist EU countries:
  - We replace Slovak prices of actual rentals for housing by those from Poland throughout the 2010 – 2022 time period.
  - We replace Slovak prices of imputed rentals for housing by those from Poland from 2010 to 2013 and later from 2017 to 2022, and by those from Bulgaria from 2014 to 2016.

  This scenario serves as **a sensitivity check that allow us to test whether different assumptions about the price of rentals significantly affect our estimates**.[69]

After estimating the above alternative scenarios, we also calculate the approximate impact of the revision of construction and health spending. In this way, we get an indicative overview of how much of the sudden decrease in Slovakia's convergence level to the EU-27 average can be explained by the significant downward revision of these analytical categories.

Note that our analysis only focuses on adjusting the input data for Slovakia, but does not make any changes to the data for other countries. Slovakia is not the only country that shows a suspicious level or evolution of PPP statistics during the analysed period. The estimation of alternative scenarios for other countries, however, is beyond the scope of our analysis. We offer a brief discussion of selected unusual findings in the official PPP statistics in the other EU Member States later in this chapter.

---

[67] Until now, the only other publication that used a similar approach was "On Purchasing Parity", a policy brief by the Institute of Financial Policy (Dujava and Žúdel, 2023). When estimating an alternative path for Slovakia's GDP per capita in PPP, its authors replaced the prices of rentals in Slovakia by those from Czechia.

[68] Of course, our software also adjusts basic headings whose purchasing power parities depend on reference parities – i.e. indirectly on the PPPs of other basic headings.

[69] Other sources of data on rents or housing costs in Slovakia and other post-communist EU countries are either unavailable or have limited usefulness. Data on housing rents used in the calculation of correction coefficients for wages and pensions of EU institution employees (Eurostat, 2020; time series [PRC_COLC]) are not representative of Member States as a whole, as they only cover selected regions (usually the capitals). Internet sites with information for people interested in living or working abroad also usually do not provide complete or representative data.

How do we estimate alternative scenarios?

When estimating the evolution of PPP statistics in our alternative scenarios, we adjust the input expenditure and purchasing power parity data for the relevant basic headings. We proceed as follows:

1. In the data for the years 2010 to 2015, which have not yet been affected by the benchmark revision, **we adjust expenditures for basic headings into which intermediate consumption was classified in the original Eurostat data**.[70]

    We do not have sufficient information about what shares of intermediate consumption were classified in particular basic headings. We therefore adjust the nominal expenditures on all of them so that the expenditure on each of these basic headings, as a proportion of the total expenditure in the Slovak economy (with the exception of expenditures on rentals and the adjusted basic headings themselves), is equal to its post-revision average from the period since 2016. Such an adjustment will prevent any sudden jumps in spending on the adjusted basic headings.

2. In the data for years from 2017 onwards, which were affected by changes in the reporting of the surface area of houses and flats in Slovakia, **we adjust the PPPs for imputed and actual rentals for housing in each year based on the ratio of the reported total surface area from 2017** (which probably represents only the liveable area) **to the reported total surface area from of 2016** (which probably corresponds to the useable area, in accordance with the Eurostat methodology).

    We obtain the relevant surface areas from Eurostat's detailed data on the housing stock in Slovakia. This adjustment has no effect on nominal expenditures in the input data, as it refers to values that the Member States' national statistical institutes provide to Eurostat on a special questionnaire, independently of the national accounts.

3. In each year from 2010 to 2022, **we replace the Price Level Indices for imputed and actual rentals**. In the conservative (pessimistic) scenario, we replace them with the highest prices of rentals among other post-communist EU countries. On the contrary, in the optimistic scenario we use the lowest prices of rentals from among the same group of Member States.

4. **We adjust the purchasing power parities for imputed and actual rentals in the input data based on the replaced Price Level Indices**. We subsequently **adjust the nominal expenditures for imputed and actual rentals** so that they are in line with the total useable surface area of houses and flats in Slovakia.

    Please note that **total nominal GDP changes in this step**, as the choice of higher Price Level Indices for housing rentals also leads to an increase in the corresponding nominal expenditures, and vice versa.

5. The above steps will yield adjusted input data, in which shortcomings related to incorrectly classified intermediate consumption in the data from 2010 to 2015, as well as changes in the reporting of the surface area of dwellings from 2017 onwards, are corrected. The expenditures on actual and imputed rentals in the adjusted data are modified to be in accordance not only with the adjusted purchasing power parities, but also with the total useable surface area in Slovakia.

6. We use our software to calculate purchasing power parities for economic aggregates from the adjusted input data.

---

[70] In this way, we adjust the basic headings listed in Table 4.4.

> **Box 5.1: Changes in the input data for Slovakia only have a miniscule effect on other countries' statistics**
>
> Since purchasing power parity statistics reflect differences in *relative* price levels across countries, changes in the input data for Slovakia will affect the statistics of *all* other EU 27 member states as well.
>
> Expenditures on rentals in Slovakia are, however, only a small part of the total EU-27 expenditures. Changes in the input data for Slovakia therefore only have a minimal impact on the statistics of other Member States:[71]
>
> - In all our scenarios, the PPPs of other countries change by very small amounts that are almost imperceptible in the final statistics.
> - For ease of interpretation and communication of our results, we therefore present values from the publicly available official Eurostat statistics for other EU-27 countries in all comparisons.

> **Box 5.2: Why does our discussion focus only on the period from 2016 onwards?**
>
> The discussion in our analysis is limited only to the period since 2016, as during that time Slovakia's national accounts incorporated information from updated data sources and methodological refinements associated with the benchmark revision.
>
> However, in the graphs and tables we present statistics both for the period from 2010 to 2015, which reflect expenditures from before the 2019 benchmark revision, as well as for the period from 2016 to 2022, which reflect post-revision expenditures.
>
> Due to methodological differences, statistics from the period before and since 2016 are not directly comparable. For this reason, we present them in separate panels in graphs and tables. These periods are separated by a vertical dashed black line, and the lines shown in graphs are not connected between 2015 (reflecting data from before the benchmark revision) and 2016 (after the revision).

How high would the prices of housing, water, electricity, gas and other fuels be?

Eurostat requirements do not allow us to publish Price Level Indices at the level of the basic headings *Imputed rentals for housing* and *Actual rentals for housing*. Instead, we illustrate their evolution indirectly using the publicly available analytical category *Housing, water, electricity, gas and other fuels*. The basic headings for imputed and actual rentals have a significant weight in this category, as – in the adjusted data for 2016 – they account for slightly more than 50 per cent together.

Table 5.1: Basic headings contained in the analytical category *Housing, water, electricity, gas and other fuels*

A0104 - **Housing, water, electricity, gas and other fuels**	
	A010405 - **Electricity, gas and other fuels**
A.04.1.0.0 Actual rentals for housing	A.04.5.1.0 Electricity
A.04.2.0.0 Imputerd rentals for housing	A.04.5.2.1 Natural gas and town gas
A.04.3.1.0 Materials for the maintenance and repair of the dwe	A.04.5.2.2 Liquefied hydrocarbons (butane, propane, etc.)
A.04.3.2.0 Services for the maintenance and repair of the dwell	A.04.5.3.0 Liquid fuels
A.04.4.1.0 Water supply	A.04.5.4.0 Solid fuels
A.04.4.2.0 Refuse collection	A.04.5.5.0 Heat energy
A.04.4.3.0 Sewage collection	
A.04.4.4.0 Other services relating to the dwelling n.e.c.	

Source: Eurostat

---

[71] For the same reason, changes in the input data for Slovakia will also affect purchasing power parities and Price Level Indices at the basic heading level. Given the fact that Slovakia's expenditure on individual basic headings is very small compared to total spending in the European Union, this impact will also be negligible.

In the conservative (pessimistic) alternative scenario, the price level of the analytical category *Housing, water, electricity, gas and other fuels* was, from 2016 to 2022, relatively stable at the level of approximately three quarters of the EU-27 average. Until 2021, the price level in Slovakia was the highest among the Visegrad Group countries. However, in 2022, Czechia became the most expensive V4 country when it comes to this analytical category.

In the optimistic scenario, the price level of this analytical category was also relatively stable, but at a significantly lower level. It reached only slightly more than 40 per cent of the European Union average, corresponding to the second lowest housing prices among the V4 countries during the period since 2016 (after the cheapest Poland).

Table 5.2: Alternative scenarios – Price Level Index for *Housing, water, electricity, gas and other fuels*; EU-27 average = 100

V4 Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Slovakia													
- SK-E: Eurostat	56.1	55.2	55.5	54.1	52.4	51.8	75.2	88.8	91.2	92.6	97.3	98.9	97.4
- SK-H: most expensive rentals	81.1	78.6	75.8	70.9	73.4	74.7	74.0	73.6	73.8	75.6	75.1	75.2	77.4
- SK-L: least expensive rentals	51.0	50.2	49.4	48.1	45.8	45.4	43.7	43.2	42.5	41.8	41.7	41.4	41.5
Czechia	68.2	69.2	67.0	64.5	59.1	60.5	62.7	65.6	70.7	72.7	72.5	74.6	85.9
Poland	43.9	42.6	40.5	40.3	40.0	39.4	38.5	39.4	39.2	37.0	37.2	38.4	40.0
Hungary	52.8	50.2	48.6	45.9	44.0	43.8	44.1	49.7	52.0	54.5	52.6	56.2	53.2
EU-27 Average	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: Eurostat, [PRC_PPP_IND] and author's estimates

Graph 5.1: Alternative scenarios – Price Level Index at PPP for *Housing, water, electricity, gas and other fuels*; EU-27 average = 100
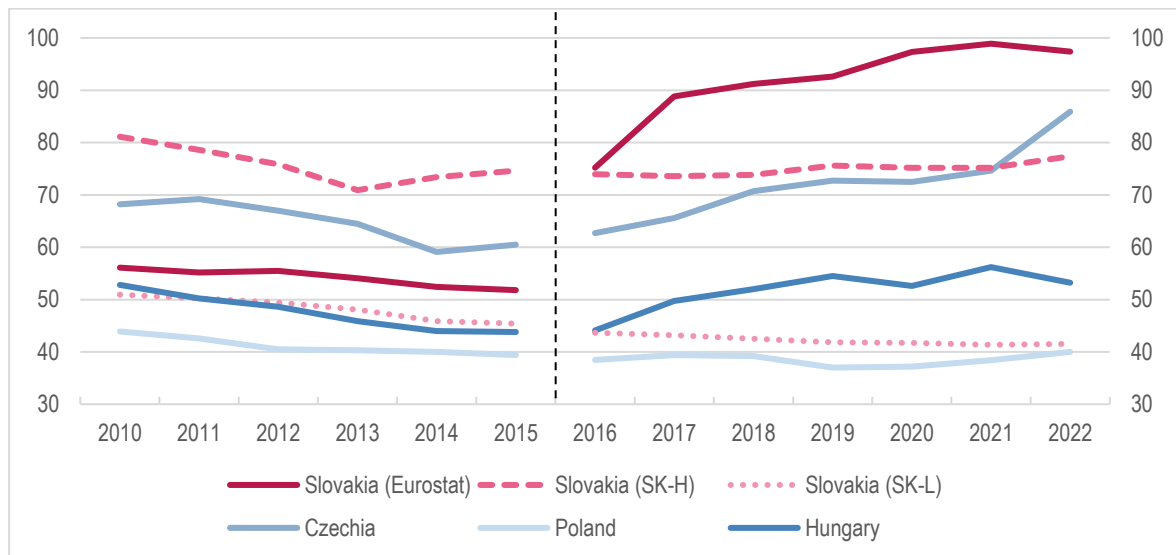
Source: Eurostat, [PRC_PPP_IND] and author's estimates

How high would the price level be in the Slovak economy as a whole?

In the conservative (pessimistic) scenario *SK-H*, in which prices for housing rentals in Slovakia are equal to the highest prices among other post-communist EU countries, Slovakia's economy-wide price level in 2016 was at 72.3% of the EU-27 average. In 2019, the last year before the COVID pandemic, the price level in Slovakia reached 76.1% of the EU-27 average, and in 2022 it reached 79.4%.

In the optimistic scenario *SK-L*, with housing rentals prices at the lowest level from among other post-communist Member States, the price level in the Slovak economy was several percentage points lower. It was at 71.2% of the EU average in 2019, and at 73.5% in 2022.

Table 5.3: Alternative scenarios – Price Level Index for GDP; EU-27 average = 100

V4 Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Slovakia													
- SK-E: Eurostat	66.3	68.0	68.3	68.1	67.7	68.4	72.4	75.2	77.6	78.4	79.4	80.5	82.8
- SK-H: most expensive rentals	**70.5**	**72.2**	**72.3**	**71.0**	**71.3**	**72.4**	**72.3**	**73.1**	**75.1**	**76.1**	**75.8**	**76.8**	**79.4**
- SK-L: least expensive rentals	**66.2**	**68.0**	**68.4**	**67.6**	**67.2**	**68.1**	**67.9**	**68.6**	**70.6**	**71.2**	**70.6**	**71.7**	**73.5**
Czechia	71.5	72.8	71.6	68.2	64.4	66.0	67.0	68.7	71.1	72.5	71.9	75.0	80.9
Poland	59.7	58.7	58.1	58.2	58.9	58.7	57.2	59.6	60.5	60.8	60.0	60.2	61.9
Hungary	60.6	59.7	58.8	58.3	58.5	59.5	61.0	64.1	64.3	65.6	63.2	65.1	64.5
EU-27 Average	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: Eurostat, [PRC_PPP_IND] and author's estimates

Graph 5.2: Alternative scenarios – Price Level Index at PPP for GDP; EU-27 average = 100
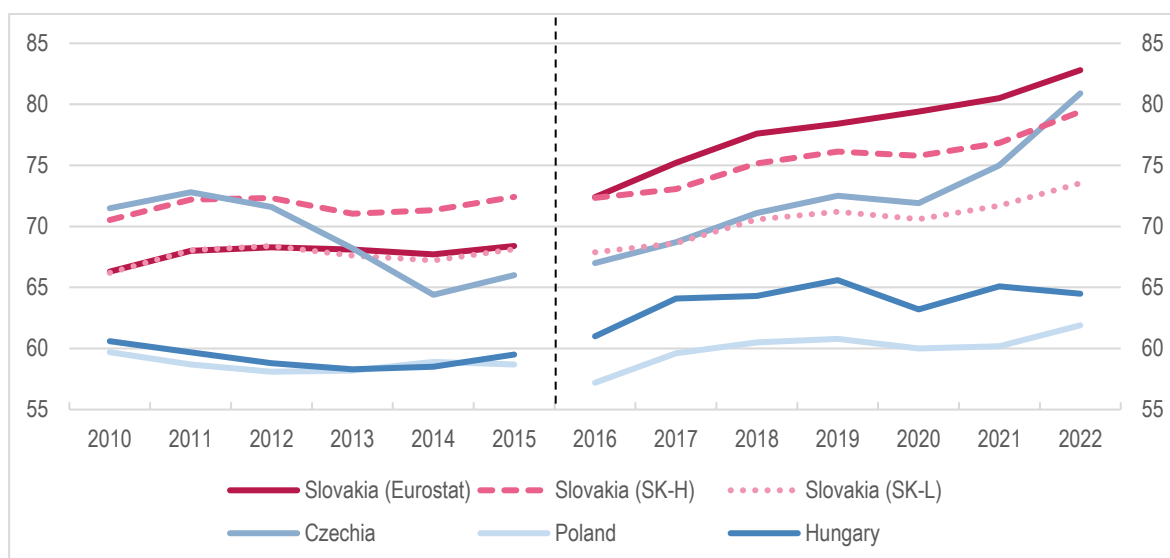
Source: Eurostat, [PRC_PPP_IND] and author's estimates

Would Slovakia be converging to the EU average in GDP per capita at PPP?

Despite the difference in the estimated price levels, however, **Slovakia's GDP per capita at PPP exhibits a similar convergence level to the EU-27 average in both alternative scenarios**:

- In 2016, Slovakia's convergence level was at 74% of the EU average (compared to 73% in official Eurostat statistics), which meant that Slovakia ranked 20th in the European Union (the same position as in official Eurostat statistics).[72]

- **In the pre-pandemic year 2019, Slovakia's convergence level was at 73% of the EU average** (compared to 71%), which corresponded to 20th-22nd place within the EU (compared to 22nd place according to Eurostat). In that year, both Poland and Hungary overtook Slovakia in GDP per capita at PPP – a year later than in the official statistics.

- **In 2022, Slovakia's GDP per capita at PPP was only equal to 71% of the EU-27 average** (compared to 68%) – a drop of three percentage points compared to 2016. This would mean a poor 25th place among the EU Member States (compared to 25th-26th place according to official statistics), just ahead of Greece (68% of the EU-27 average) and Bulgaria (59%).

According to our alternative estimates, GDP per capita at PPP in Slovakia as a percentage of the EU-27 average during the period from 2016 to 2022 was approximately 2 percentage points higher in each year than official statistics indicate. **However, in this period Slovakia still saw stagnation, or even a decline, in GDP per capita at PPP compared to the EU average, and was caught up or even overtaken by Poland and Hungary.**

If spending on construction and health had remained at the same level in 2016 as in the pre-revision data for 2015, Slovakia's convergence level to the EU-27 average in 2016 would have been around 1.6 percentage points higher than what is indicated in our conservative estimate.

Shortcomings in the estimate of rental expenditures can explain around half of the sudden downward jump in the convergence level that we see in the official statistics between 2015 and 2016. Revisions to construction and health spending can explain around a third of the total jump.

Table 5.4: Alternative scenarios – GDP per capita at PPP as a percentage of EU-27 average

V4 Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Slovakia													
- SK-E: Eurostat	77	76	77	78	78	79	73	71	70	71	72	71	68
- SK-H: most expensive rentals	75.2	74.0	75.2	75.6	76.3	76.6	73.7	72.9	72.5	72.6	74.1	72.6	71.2
- SK-L: least expensive rentals	75.6	74.3	75.6	76.0	76.7	77.0	74.0	73.1	72.7	72.8	74.2	72.6	71.0
Czechia	84	84	84	86	88	89	89	91	92	93	93	92	91
Poland	63	65	67	67	67	69	69	69	71	73	76	77	80
Hungary	66	67	67	68	69	70	69	69	71	73	74	75	77
EU-27 Average	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: Eurostat, [PRC_PPP_IND] and author's estimates

---

[72] We round the convergence level to the EU-27 average to whole percentages – just as Eurostat reports it in the published time series [TEC00114]. We also rank Member States based on these rounded values. In tables and graphs, we present other V4 countries' convergence levels to the EU average with the same precision. Slovakia's convergence level to the EU average is the only exception to the aforementioned rules, as we present it rounded to one decimal place to be able to compare our estimates in the alternative scenarios *SK-H* and *SK-L*.

Graph 5.3: Alternative scenarios – GDP per capita at PPP as a percentage of EU-27 average
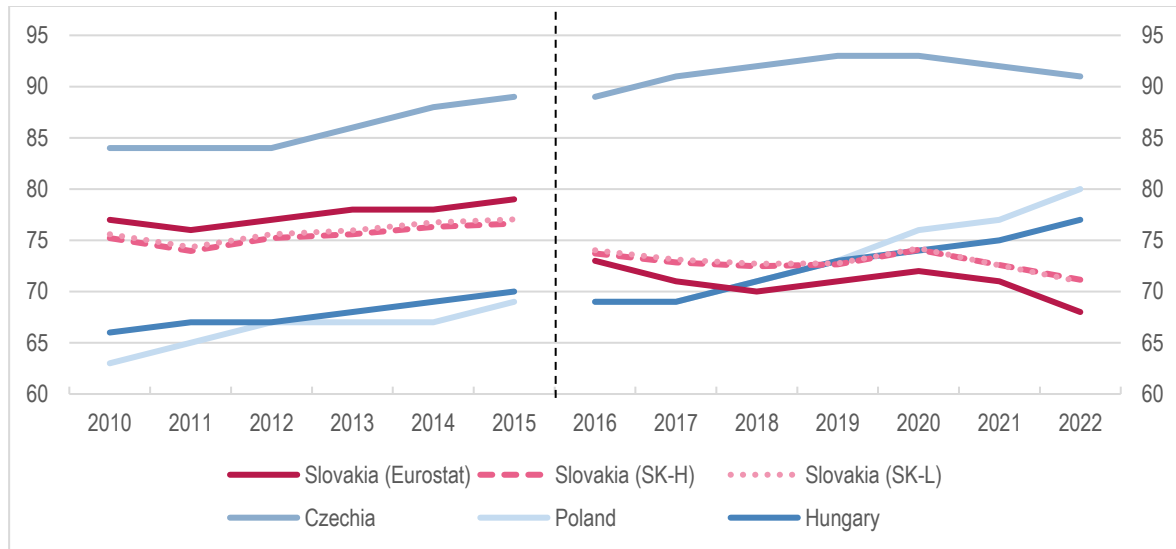
Source: Eurostat, [PRC_PPP_IND] and author's estimates

Table 5.5: Alternative scenarios – Country ranking (2016, 2019 and 2022):
GDP per capita at PPP as a percentage of EU-27 average

	EU-27 Member State	2016		EU-27 Member State	2019		EU-27 Member State	2022
1	Luxembourg	278	1	Luxembourg	251	1	Luxembourg	261
2	Ireland	177	2	Ireland	189	2	Ireland	233
3	Austria	130	3	Netherlands	127	3	Denmark	137
4	Netherlands	129	4	Denmark	126	4	Netherlands	129
5	Denmark	128	4	Austria	126	5	Austria	125
6	Germany	125	6	Germany	121	6	Belgium	120
7	Sweden	124	7	Sweden	119	6	Sweden	120
8	Belgium	120	8	Belgium	118	8	Germany	117
9	Finland	111	9	Finland	109	9	Finland	109
10	France	106	10	France	106	10	France	102
11	Italy	99	11	Malta	104	10	Malta	102
12	Malta	98	12	Italy	97	12	Italy	96
13	Spain	92	13	Czechia	93	13	Cyprus	92
14	Czechia	89	13	Cyprus	93	13	Slovenia	92
15	Cyprus	88	15	Spain	91	15	Czechia	91
16	Slovenia	84	16	Slovenia	89	16	Lithuania	89
17	Portugal	78	17	Lithuania	84	17	Estonia	87
18	Estonia	77	18	Estonia	82	18	Spain	85
19	Lithuania	76	19	Portugal	79	19	Poland	80
20	**Slovakia (SK-L)**	**74.0**	20	**Slovakia (SK-L)**	**72.8**	20	Hungary	77
20	**Slovakia (SK-H)**	**73.7**	20	**Slovakia (SK-H)**	**72.6**	20	Portugal	77
20	**Slovakia (Eurostat)**	**73**	20	Hungary	73	20	Romania	77
21	Hungary	69	20	Poland	73	23	Latvia	74
21	Poland	69	22	**Slovakia (Eurostat)**	**71**	24	Croatia	73
23	Greece	68	23	Romania	70	25	**Slovakia (SK-H)**	**71.2**
24	Latvia	66	24	Latvia	69	25	**Slovakia (SK-L)**	**71.0**
25	Croatia	62	25	Croatia	67	25	**Slovakia (Eurostat)**	**68**
26	Romania	59	26	Greece	66	25	Greece	68
27	Bulgaria	49	27	Bulgaria	53	27	Bulgaria	59

Source: Eurostat, [PRC_PPP_IND] and author's estimates

Our estimates are not very sensitive to changes in assumptions about the price of rentals

Our methodology for estimating alternative scenarios adjusts nominal expenditures based on the assumed level of rental prices. This approach has implications for the sensitivity of the resulting statistics to changes in assumptions about prices:

- **Slovakia's convergence level to the EU-27 average in GDP per capita at PPP is not very sensitive to changes in assumptions about the prices of actual and imputed rentals in Slovakia.** An increase in prices will also cause an increase in nominal expenditures, and these two phenomena have countervailing effects on the convergence level.

  Our estimates differ from official Eurostat statistics mainly due to the correction of intermediate consumption misclassification (until 2015) and of the reported surface area of dwellings (from 2017). They depend only to a very limited extent on our assumptions about the price rentals relative to other post-communist countries.

  Slovakia's estimated convergence levels to the EU-27 average in GDP per capita at PPP in the conservative (pessimistic) *SK-H* scenario and in the optimistic *SK-L* scenario differ by a maximum of 0.3 percentage points in the period since 2016.

- However, changes in assumptions about rental prices have **a potentially significant impact on Price Level Indices for GDP or other aggregates** in our methodology, as we explain in Box 5.3.[73]

  These indices can be used as deflators, e.g. in international comparisons of incomes, pensions or social welfare benefits. Any comparisons that emerge from them can thus be significantly influenced by the assumptions used in alternative scenarios – especially if these deflators include imputed rentals, which account for a significant portion of household consumption.

Box 5.3: How do changes in the price of rentals affect Price Level Indices for economic aggregates?

The Price Level Index for an economic aggregate is a weighted average of the Price Level Indices for the constituent basic headings, with weights equal to the corresponding amounts of nominal expenditures from the national accounts.

An increase in the price of rentals then leads to an increase in the Price Level Index for an economic aggregate through the following three channels:

- **Higher prices:** Replacing the original Price Level Indices for actual and imputed rentals with higher values means that, in the weighted average, higher prices will be weighted by given nominal expenditures.

- **Greater weights:** In our methodology, higher Price Level Indices for rentals will lead to an increase in the associated nominal expenditures. These serve as weights in the calculation of the overall price level. Higher prices will thus receive a greater weight in the calculation of the weighted average, thus pushing the overall Price Level Index even higher.

- **Impact on reference PPPs**: The purchasing power parities for some basic headings depend on the PPPs for actual and imputed rentals.[74] Higher prices, and consequently higher purchasing power parities, for rentals thus lead to an increase in the Price Level Indices for PPPs of several other basic headings.

---

[73] Higher prices of rentals for housing lead to a higher price level for GDP. However, they do not necessarily lead to a lower convergence level to the EU average, as we can see in our alternative scenario estimated for 2022. This is due to the combination of the facts that (1) changes in rental prices affect the weight that rentals receive in the calculations, and (2) the convergence level also depends on the prices of other goods and services.
[74] The list of reference PPPs can be found in Eurostat/OECD (2012), p. 248.

How high would actual individual consumption be?

Our discussion has so far focused on the gross domestic product (GDP) per capita. This is an understandable choice, as – of all macroeconomic indicators – GDP attracts the most attention.

Gross domestic product captures expenditures on all final goods and services produced in the economy, including spending on investment and on services provided by the government. **GDP per capita at PPP reflects the relative purchasing power in the economy as a whole, but does not necessarily reflect household living standards.** Similarly, the Price Level Index at PPP for GDP similarly captures the relative price level in the entire economy, but may not be a good measure of prices faced by consumers.

For this reason, our analysis also estimates the same two alternative scenarios for the evolution of **Actual Individual Consumption** (AIC) per capita.[75] According to Eurostat, it is a **more appropriate measure of the standard of living and purchasing power of the population** in the EU-27 countries than GDP per capita:

- Actual individual consumption includes consumer goods and services that households purchase directly, as well as services for household consumption provided to them by non-profit institutions or by the government (e.g. health or education).

- Actual individual consumption also includes actual and imputed housing rentals, which receive an even greater weight in AIC than in GDP. It should come as no surprise, then, that in the official time series of AIC per capita at PPP published by Eurostat, we see a sharp drop between 2015 and 2016, followed by stagnation or only weak growth.

- **AIC also captures the consumption of imported goods and services.** Actual individual consumption does not include expenditures on exported goods and, unlike GDP, does not require the deduction of expenditures on imports. It does not include the basic heading that reflects the net balance of international trade. As a result, the estimation of PPP statistics is not affected by the non-consideration of the relative prices of exports and imports in Eurostat's methodology when calculating PPPs for the net trade balance. Instead, it assumes the same terms of trade (i.e. the ratio of average prices of exports and imports) in all Member States.

Table 5.6: Alternative scenarios – AIC per capita at PPP as a percentage of EU-27 average

V4 Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Slovakia													
- SK-E: Eurostat	76	74	76	76	76	76	70	68	68	70	72	71	73
- SK-H: most expensive rentals	**73.2**	**71.0**	**72.4**	**72.8**	**72.1**	**72.3**	**70.1**	**71.3**	**70.8**	**72.8**	**75.6**	**74.3**	**76.6**
- SK-L: least expensive rentals	**74.0**	**71.6**	**73.0**	**73.4**	**72.8**	**72.9**	**70.7**	**71.8**	**71.4**	**73.2**	**76.2**	**74.6**	**76.9**
Czechia	77	76	76	79	81	81	81	83	84	85	85	85	83
Poland	70	72	75	75	75	77	76	77	78	80	83	84	86
Hungary	63	64	64	64	64	64	64	64	65	67	70	69	72
EU-27 Average	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: Eurostat, [PRC_PPP_IND] and author's estimates

---

[75] We use the purchasing power parities calculated for actual individual consumption (AIC) as the deflator.

Ministry of Labour, Social Affairs and Family of the Slovak Republic

Graph 5.4: Alternative scenarios – AIC per capita PPP as a percentage of EU-27 average
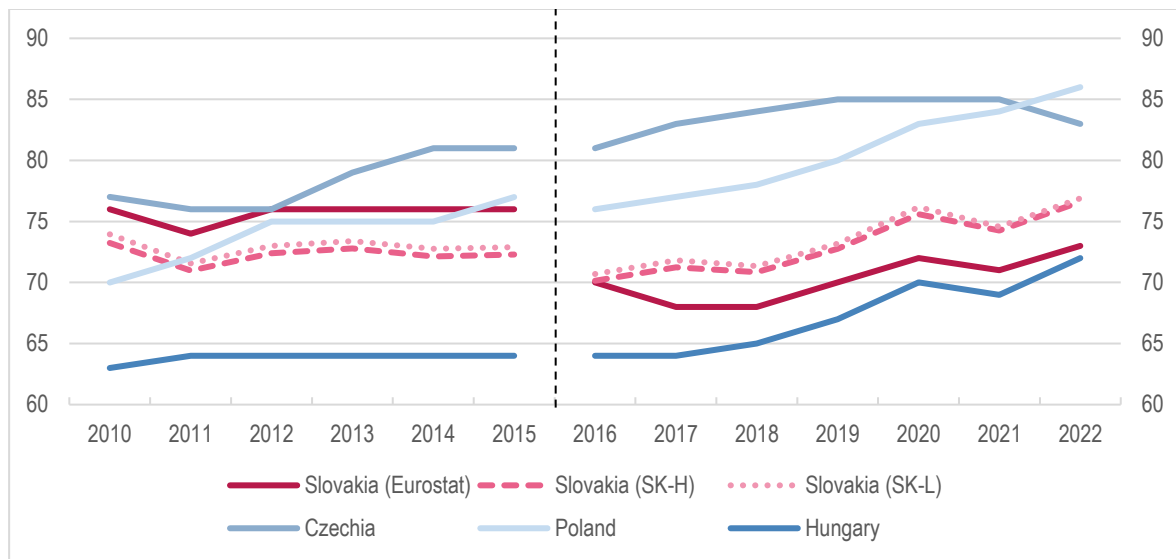
Source: Eurostat, [PRC_PPP_IND] and author's estimates

In our conservative (pessimistic) alternative scenario *SK-H*, in which we use the highest prices of housing rentals from among other post-communist countries, the convergence level to the EU-27 average in actual individual consumption per capita at PPP in Slovakia was, in each year during the period from 2017 to 2022, approximately 3 to 4 percentage points higher than in the official statistics.[76]

In contrast to GDP per capita at PPP, actual individual consumption has grown in the years since 2016 – by 7 percentage points from 70% of the EU average in 2016, through 73% in the last pre-pandemic year 2019, to 77% of the EU-27 average in 2022.[77]

Despite converging to the European Union average, in the ranking of countries by their AIC per capita at PPP, Slovakia slipped from 22nd place in the EU-27 (the same position as in official Eurostat statistics) to 24th place in 2022 (compared to 25th place according to Eurostat). During the period from 2016 to 2022, Slovakia was overtaken in the ranking by Romania (which saw an increase by as many as 24 percentage points) and Latvia (increase by 12 percentage points).

Actual individual consumption grew more slowly than in Poland (increase by 10 pp over the same period) or in Hungary (increase by 8 pp), but faster than in Czechia (increase by only 2 pp). When it comes to the country's convergence level to the EU-27 average, Slovakia remained, in this conservative scenario, in third place within the Visegrad Group (after Poland and Czechia), while Hungary caught up with it somewhat (as it got closer by 1 pp in the period since 2016).

In the case of AIC, almost two thirds of the downward jump of Slovakia's convergence level to the EU-27 average between 2015 and 2016 can be explained by the shortcomings in the rental estimates. The revision of health expenditures can explain approximately one tenth of the total jump.[78]

---

[76] Rounded to whole percentages, it was just as high (70% of the EU average) in 2016.

[77] As in the case of GDP, the convergence level to the EU-27 average in AIC per capita in PPP is not very sensitive to changes in assumptions about the price of rentals. Using the lowest rental prices from among other post-communist countries would change the convergence level in each year from 2010 to 2022 by no more than 0.6 percentage points.

[78] Construction is not included in actual individual consumption, as it represents investment (formation of fixed capital).

Table 5.7: Alternative scenarios – Country ranking (2016, 2019 and 2022): AIC per capita at PPP as a percentage of EU-27 average

	EU-27 Member State	2016		EU-27 Member State	2019		EU-27 Member State	2022
1	Luxembourg	151	1	Luxembourg	146	1	Luxembourg	138
2	Germany	124	2	Germany	122	2	Germany	119
3	Austria	122	3	Austria	117	3	Austria	118
4	Belgium	116	4	Denmark	115	4	Netherlands	116
4	Denmark	116	4	Belgium	114	5	Belgium	115
6	Finland	115	6	Netherlands	113	6	Denmark	111
6	Sweden	115	7	Finland	111	7	France	109
8	Netherlands	114	8	France	109	7	Finland	109
9	France	112	8	Sweden	109	9	Sweden	108
10	Italy	101	10	Italy	100	10	Italy	99
11	Ireland	97	11	Cyprus	97	11	Cyprus	98
12	Cyprus	94	12	Ireland	94	12	Lithuania	95
13	Spain	91	13	Lithuania	93	13	Slovenia	90
14	Lithuania	86	14	Spain	91	14	Romania	88
15	Malta	84	15	Malta	87	15	Ireland	87
15	Portugal	84	16	Portugal	86	16	Poland	86
17	Czechia	81	17	Czechia	85	17	Spain	85
18	Slovenia	79	18	Slovenia	83	17	Malta	85
19	Greece	77	19	Poland	80	17	Portugal	85
20	Poland	76	20	Romania	78	20	Czechia	83
21	Estonia	73	21	Greece	77	21	Latvia	80
22	**Slovakia (SK-L)**	**70.7**	22	Estonia	76	22	Estonia	79
22	**Slovakia (SK-H)**	**70.1**	**23**	**Slovakia (SK-L)**	**73.2**	23	Greece	78
22	**Slovakia (Eurostat)**	**70**	**23**	**Slovakia (SK-H)**	**72.8**	**24**	**Slovakia (SK-L)**	**76.9**
23	Latvia	68	23	Latvia	71	**24**	**Slovakia (SK-H)**	**76.6**
24	Hungary	64	**24**	**Slovakia (Eurostat)**	**70**	24	Croatia	75
24	Romania	64	25	Croatia	67	**25**	**Slovakia (Eurostat)**	**73**
26	Croatia	63	26	Hungary	67	26	Hungary	72
27	Bulgaria	55	27	Bulgaria	58	27	Bulgaria	67

Source: Eurostat, [PRC_PPP_IND] and author's estimates

Our estimates are less optimistic than those of other institutions

In the conservative (pessimistic) alternative scenario, with prices of housing rentals in Slovakia assumed to be at the highest level from among other post-communist EU countries, we estimated that in 2022 Slovakia's GDP per capita at PPP would have been at 71% of the European Union average (25th place among the EU-27 countries). In the last pre-pandemic year 2019, per capita GDP at PPP would have been at 73% (20th-22nd place). In our methodology, if we instead assume that rental prices were at the level of cheaper post-communist EU countries, the resulting impact on the convergence level will be minimal.

Our alternative estimates are more pessimistic than those published by several other institutions:

- In March 2023, the Institute for Financial Policy (IFP) of the Ministry of Finance of the Slovak Republic published the policy brief *On Purchasing Parity*,[79] in which it draws attention to prices in the *Housing, water, electricity, gas and other fuels* analytical category. The policy brief also acknowledges that methodological differences could have an upward influence on prices in Slovakia in components other than housing as well. If housing prices in Slovakia had been at the level of those in Czechia, the IFP's policy brief estimates that, in 2021, Slovakia would have been at 72% of the EU average in GDP per capita at PPP (1 pp less than our estimate for the same year).

---

[79] Dujava and Žúdel (2023)

The *On Purchasing Parity* policy brief, unlike most other analyses, correctly points out that Slovakia's PPP statistics since 2016 have been affected by the 2019 benchmark revision of the country's national accounts. Other institutions' estimates generally assume that the statistics up until 2015 were reliable, and use the growth rate of real GDP to extrapolate their evolution from that year:

- In its analysis *Reform Compass of the Slovak Economy* from August 2022, the IFP notes that official Eurostat figures, which show a "sharp decline in 2016 and 2017 and subsequent stagnation" for Slovakia, are "un-intuitive and do not correspond to the development of real GDP in the country". The analysis points to the rapid rise of the Price Level Index at PPP for *Housing, water, electricity, gas and other fuels* after 2015, but also points to "unpredictable price developments in other categories, especially in actual collective consumption".[80] According to the IFP, Slovakia's GDP per capita at PPP could have been at 74% to 84% of the EU-27 average in 2020. Our analysis estimates 74% for 2020, a convergence level that corresponds to the lower bound of the IFP estimate.

- An older policy brief by the IFP, *Are we or are we not catching up to the West?* from January 2018[81], relies on calculations by the World Bank, which extrapolate from the price level at PPP in 2011 using the growth rate of real GDP. In this approach, Slovakia was at an estimated 80% of the EU-27 average in 2016 – a higher convergence level compared to official Eurostat statistics, which at the time indicated 76%.[82] Our estimate for 2016 shows a convergence level of 74%. The IFP's policy brief is based on statistics on purchasing power parities that predate the benchmark revision of Slovakia's national accounts in 2019.[83]

- In the document *Structural Challenges* from July 2022, the National Bank of Slovakia (NBS) points out that "the evolution of GDP per capita at purchasing power parity (PPP) has since 2015 been greatly affected by problematic estimation; however, even an analytical adjustment of the indicator, using GDP per capita at constant prices, confirms the slowdown in convergence with the EU."[84] After this analytical adjustment, the NBS estimates that Slovakia's GDP per capita at PPP in 2021 was at 81% of the EU-27 average, compared to 73% in our estimate. The NBS gives the same estimate in the analytical commentary *Slovakia 30 Years Ago and Today* from December 2022.[85]

- A more recent edition of the NBS *Structural Challenges* document from July 2023 points out that "methodological problems surround the estimation of the evolution of per capita GDP at purchasing power parity." It notes, however, that analytical adjustments to the indicator based not only on the evolution of GDP per capita in constant prices, but also based on the Harmonised Index of Consumer Prices (HICP), suggest that "convergence was already slowing significantly even in the pre-pandemic period." In a footnote, this document admits the possibility that "the assumption of the correctness of per capita GDP at purchasing power parity in 2015 may not necessarily be valid."[86]

- In the analysis *30 Years of Slovakia's Independence* from December 2022, the bank Slovenská sporiteľňa (SLSP) recalculates the evolution of the country's GDP per capita at PPP since 2015 using

---

[80] Habrman, Habodászová and Šrámková (2022), p. 10-11

[81] Habrman (2018)

[82] The policy brief was written before the United Kingdom left the European Union. It therefore reports an 81% convergence level to the EU-28 average in the World Bank's calculation and 77% according to official Eurostat PPP statistics. For ease of comparison, we have converted these values so that they relate to the EU-27 average instead.

[83] Haluška and Dolinič (2018) published a study that is also based on the pre-revision statistics. It finds that the performance of the Slovak economy had already slowed down between 2010 and 2017, mainly due to the slower growth in domestic demand.

[84] National Bank of Slovakia (2022), p. 11

[85] Novák, Reľovský, Štulrajterová and Vaňko (2022), p. 4

[86] National Bank of Slovakia (2023), p. 12-13

the growth rate of real GDP per capita.[87] According to the SLSP analysis, the Slovak economy reached approximately 81% of the performance of the EU-27 countries in 2021, compared to 73% in our estimate. The SLSP estimate of the convergence level matches the NBS estimate from July 2022, an unsurprising result given that SLSP and the NBS used the same method to estimate the trajectory of GDP per capita at PPP.

However, by relying on real GDP growth rates to extrapolate from the base year estimate, the above-mentioned studies use an **approach that overestimates Slovakia's convergence level to the EU-27 average** in GDP per capita at PPP. Box 9.1 explains the reasons.

Box 9.1: Extrapolating using the growth rate of real GDP overestimates our convergence level to the EU average

GDP at purchasing power parity and real GDP **do not reflect the same concept of economic performance**:[88]

- **GDP at PPP measures the overall purchasing power in the economy.** Purchasing power in the economy can increase even when domestic production does not change. That can happen, for instance, when the prices of imported goods or services decrease, allowing a country's inhabitants to buy more with the same income. Alternatively, an increase in the prices of exported goods would lead to an increase in the inhabitants' incomes.

  The methodology that Eurostat and the OECD employ when calculating GDP at PPP **does not take into account differences in the terms of trade** (relative prices of exports and imports) between countries. This concept of measuring the gross domestic product reflects the real incomes of inhabitants, which can increase thanks to either lower export prices or increased production in the economy.

- **Real GDP captures the total physical volume of goods and services produced in the economy.** To calculate it, it is crucial to be able to disaggregate the evolution of export and import prices from that of their physical volume. The growth rate of real GDP thus **also reflects the changes in the terms of trade**.

  If a country has favourable terms of trade – that is, if it exports goods and services at relatively high prices compared to the prices at which it imports goods and services – its PPP GDP (reflecting purchasing power) will be higher than its real GDP (reflecting production). The opposite will be true if the country imports relatively expensively and exports relatively cheaply.

As stated in the IFP policy brief *On Purchasing Parity* from March 2023, **the prices of Slovak exports have long been growing more slowly than the prices of imports**.[89] These unfavourable terms of trade mean that real GDP growth in Slovakia is faster than GDP growth in PPP terms. The use of the real GDP growth rate as a substitute deflator for extrapolation in published studies of other institutions thus overestimates the speed and level at which Slovakia is (or is not) converging to the EU average in GDP per capita at PPP.

---

[87] Horňák and Valachyová (2022)
[88] Feenstra, Inklaar and Timmer (2013)
[89] Dujava and Žúdel (2023)

Purchasing power parity statistics only have a limited comparability across countries

Because the relevant methodology cannot always be implemented consistently across all EU Member States, the quality and interpretation of individual countries' statistics can differ when compiling national accounts[90], collecting prices or calculating purchasing power parities.[91]

For this reason, it may not always be possible to estimate PPP statistics accurately or consistently. One should therefore not give much weight to small differences in the price or convergence levels. Even small changes in these values can lead to significant shifts in country rankings.

One might reasonably suspect that the following countries' official statistics do not reflect the actual standard of living or purchasing power accurately:

- GDP per capita at PPP in Luxembourg and Ireland is significantly overestimated.

    - A significant part of Luxembourg's gross domestic product is created by workers who commute from neighbouring countries.[92] When calculating GDP per capita, the gross domestic product that these workers help to create is divided by the population of Luxembourg, which is much smaller. The result is an overestimated level of per capita GDP. For the same reason, actual individual consumption is also overestimated in Luxembourg.

    - Ireland is home to many large multinational corporations whose profits and capital assets (e.g. intellectual property) contribute to GDP.[93] This factor's enormous influence is apparent when we compare Irish GDP with the country's actual individual consumption. GDP per capita at PPP for 2022 in Ireland was as high as 233% of the EU-27 average – the second highest value in the European Union, after the overestimated Luxembourg. However, Ireland's actual individual consumption in the same year was only 87% of the EU average (15th in the EU-27).

- According to Eurostat, Lithuania has the highest actual individual consumption per capita at PPP of all the post-communist economies in the European Union. In 2022, its AIC per capita at PPP was at 95% of the EU-27 average.

    - This value is significantly higher than the convergence level of Slovenia (90%) and Czechia (83%), both of which are usually considered to be more vibrant economies. It is also higher than the convergence level of the other Baltic countries – Estonia (79%) and Latvia (80%).

        Within the Baltic region, Lithuania's high per capita consumption is surprising, given the fact that the residents of Estonia earn significantly higher wages than the residents of Lithuania and Latvia.[94] According to a study by the Swedish bank Swedbank, the main reasons that consumption at PPP overestimates the living standards in Lithuania include high unofficial incomes and a low savings rate.[95]

- In recent years, Romania has ranked unexpectedly highly in actual individual consumption per capita at PPP. Its convergence level to the EU-27 average in 2022 (88%; 14th place) was comparable to that of Slovenia (90%) or Ireland (87%).

    - Romania's swift convergence is difficult to believe considering the fact that, in 2016, the country's per capita AIC was only at 64% of the EU-27 average (24th-25th place). Recent years' results are a consequence of the low price level (only 52% of the EU-27 average

[90] Eurostat (2013)

[91] Eurostat/OECD (2012)

[92] OECD (2008)

[93] Montornès and Khder (2021)

[94] Swedbank Macro Research (2019)

[95] *Ibid.*

in 2022) as well as of very low price growth compared to the EU-27 average (an increase of only 3 percentage points since 2016) in the input data to PPP calculations.

Graph 5.5 shows the evolution of Romania's convergence level to the EU-27 average relative to the Visegrad Group countries and to other post-communist EU Member States.

▪ According to the overall Harmonised Index of Consumer Prices (HICP), Romania's consumer prices in 2022 were 30.5% higher than in 2016. The same price index for the EU-27 as a whole shows inflation of 18.6% over the same time period.[96] According to the HICP, then, consumer prices in Romania grew significantly faster than in the rest of Europe. This development should be reflected in Romania's Price Level Index at PPP, but this is not the case in the official statistics published by Eurostat.

Graph 5.5: GDP per capita at PPP as a percentage of EU-27 average – Romania and other post-communist EU countries
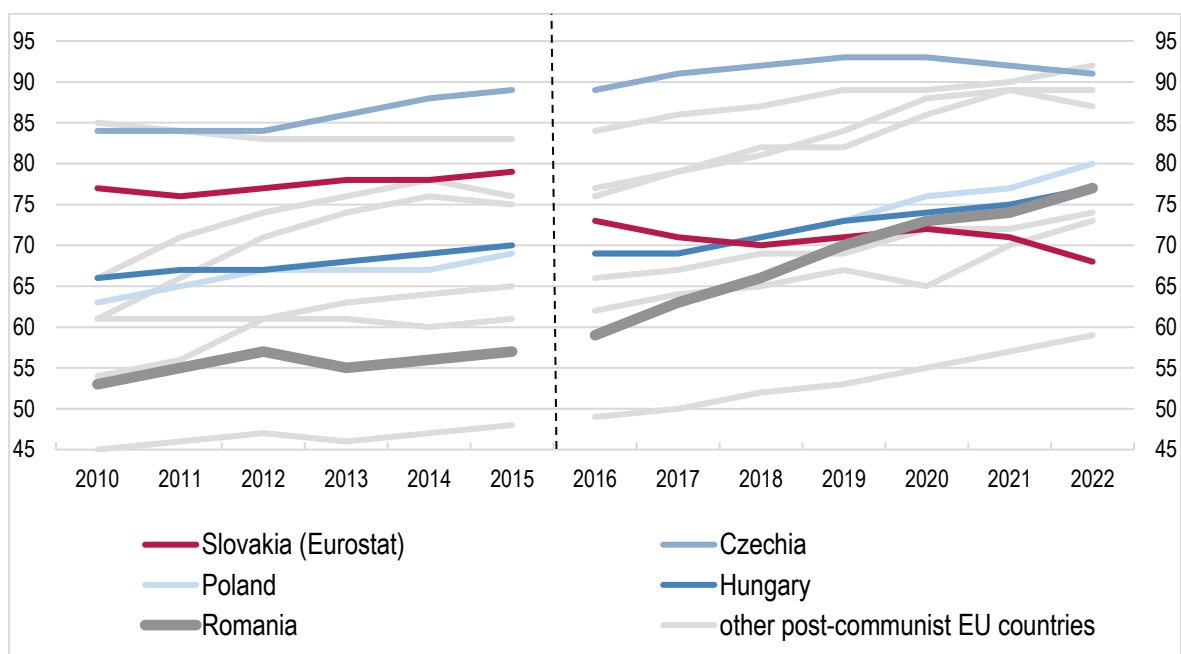
Source: Eurostat, [PRC_PPP_IND] and author's estimates

---

[96] Eurostat, [PRC_HICP_AIND]

6   How high (or low) are Slovak earnings in comparison with other EU Member States?

Since 2016, Slovakia has achieved only very unflattering results in international comparisons of indicators at purchasing power parity – i.e. adjusted to reflect differences in price levels across countries. In 2022, for example, Slovakia had the lowest net household earnings at PPP in the European Union according to official Eurostat statistics. It even lagged behind Bulgaria, a country which often finds itself at the tail end of international comparisons among EU-27 countries.

However, the values of these indicators have been calculated from the official purchasing power parity statistics published by Eurostat or other international organisations. As we have seen, these statistics have, in the case of Slovakia, been problematic in recent years – mainly due to overestimated expenditures on rentals for housing. It is therefore likely that they underestimate the level of earnings, income and pensions in Slovakia compared to other EU Member States.

In this chapter, **we estimate net household earnings at PPP in Slovakia** since 2016 in our two alternative scenarios – *SK-H* (conservative/pessimistic), in which Slovak prices of housing rentals were equal to the highest prices from among other post-communist EU countries, and *SK- L* (optimistic) with the lowest rental prices from among the same group of Member States.

After comparing PPP-adjusted earnings with those in other EU countries, we reach the following conclusions:

- If we use **a more appropriate deflator for comparisons that only takes into account households' monetary expenditures on their final consumption**, Slovakia was not in the very last place among EU countries in net household earnings at PPP during the period from 2016 onwards.

- **Nevertheless, the net earnings of various types of households in Slovakia are very low compared to other EU countries.** From the already low level in 2016, Slovakia deteriorated in the rankings by 2019 or 2022, and has been overtaken by Hungary and Romania. For several types of households, only Bulgaria and Croatia separate Slovakia from the last place in the ranking of EU countries in 2022. In the pre-pandemic year 2019, net earnings were also lower in Latvia.

We only take into account actual monetary transactions

When comparing the net earnings of households internationally, we use the Price Level Index at PPP for household final monetary consumption expenditure (HFMCE) as the deflator. Final monetary consumption of households includes consumer goods and services that households purchase directly through monetary transactions.

This deflator does not include imputed rentals for housing, as spending on this item does not represent an actual monetary transaction. As a result, the over- or underestimation of imputed rentals will not affect international earnings comparisons. Actual rentals for housing remain included in the deflator because they involve the outlay of actual monetary funds.

Table 6.1 and Graph 6.1 show the evolution of the Price Level Index in the alternative scenarios *SK-H* and *SK-L*, compared to calculations based on unchanged data from Eurostat (marked *SK-E*). Since 2016, the price level in Slovakia has been rising in both scenarios. We estimate that, in 2022, the price level of households' final monetary consumption was at 86% of the EU-27 average in the pessimistic *SK-H* scenario, not even 2 percentage points more than in the optimistic *SK-L* scenario. As a result, we do not expect large differences in relative earnings depending on the assumptions about the price of rentals in Slovakia.

Table 6.1: Alternative scenarios – Price Level Index at PPP for household final monetary consumption expenditure (HFMCE), EU-27 average = 100

V4 Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Slovakia													
- SK-E: Eurostat	76.1	77.4	78.2	76.3	76.6	77.3	78.5	79.8	81.8	83.3	84.7	85.0	87.0
- SK-H: most expensive rentals	77.1	78.4	79.1	77.1	77.6	78.4	78.3	78.9	80.8	82.2	83.3	83.6	86.0
- SK-L: least expensive rentals	75.7	77.0	77.8	76.0	76.3	77.0	76.7	77.4	79.3	80.6	81.6	82.1	84.1
Czechia	74.3	76.6	75.9	72.0	67.3	69.1	69.9	71.7	74.6	75.5	76.4	79.3	88.0
Poland	66.1	64.2	63.1	62.3	63.6	63.4	61.2	64.4	65.6	66.1	65.8	66.2	67.3
Hungary	69.4	68.1	67.7	65.5	64.7	66.4	67.2	69.8	69.0	69.7	68.6	69.6	68.0
EU-27 Average	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: Eurostat, [PRC_PPP_IND] and author's estimates

Graf 6.1: Alternative scenarios – Price Level Index at PPP for household final monetary consumption expenditure (HFMCE), EU-27 average = 100
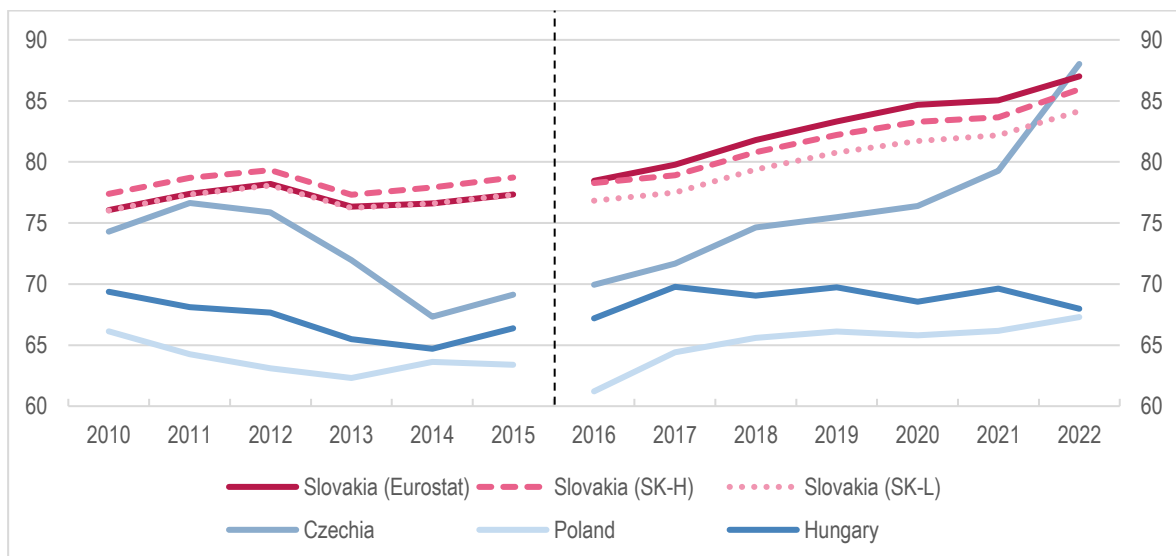
Source: Eurostat, [PRC_PPP_IND] and author's estimates

Net household earnings are very low in both the optimistic and pessimistic scenarios

Table 6.2 presents the ranking of European Union countries according to the level of net earnings of various types of households at PPP in 2016, 2019 and 2022.[97] The table also shows these net earnings at PPP expressed as a percentage of their level in Slovakia in the conservative (pessimistic) scenario *SK-H*. We also present levels calculated for the optimistic *SK-L* scenario, as well as levels calculated from unchanged detailed PPP data from Eurostat (marked as *SK-E*).

The table includes the following types of households:

- one adult without children who earns 50% of the average wage

- one adult earning the average wage, without children

- two adults earning average wages, without children

- two adults earning average wages, with two children

According to our estimates, in the conservative (pessimistic) scenario *SK-H*, most of the above household types had higher net earnings in PPP terms in Slovakia in 2016 than in Bulgaria, Latvia, Romania, Lithuania and, in some cases, Hungary. A household with two average-earning adults and two children in Bulgaria earned only 72% of what it would have earned in Slovakia in that year.

However, in 2019, all of the above types of households already had higher earnings at PPP in Hungary than in Slovakia. The same could be said for most household types in Romania and Lithuania. In 2022, only Croatia and Bulgaria separated Slovakia from the very bottom of the ranking, while a Bulgarian household with two average-earnings adults and two children already reached 90% of the net earnings in Slovakia. Within the Visegrad Group, the net household earnings of households in Czechia and Poland in 2022 were approximately one third higher than those in Slovakia.

We estimate that, in each of the years 2016, 2019 and 2022, households in Slovakia earned only about 2 per cent more than in the optimistic *SK-L* scenario than in the conservative scenario *SK-H*. The difference between our two estimated scenarios is relatively small because household final monetary consumption does not include imputed rentals for housing (which would otherwise have a significant weight in household final consumption).

It is the inclusion of imputed rentals in the household final consumption expenditure (HFCE) deflator, which Eurostat uses when calculating published statistics on net earnings at PPP, that causes Slovakia to fall to last place in the EU in official statistics.

---

[97] When interpreting the results presented in Table 6.2, it is important to keep in mind that Eurostat does not report statistics for identical groups of countries in each year. Changes in the ranking could therefore occur not only due to changes in the relative amounts of net earnings in PPP, but also due to the inclusion or exclusion of countries from the ranking.

Ministry of Labour, Social Affairs and Family of the Slovak Republic

Table 6.2: Country ranking (2016, 2019 and 2022): Net earnings at PPP for various types of households

1+0, earning 50 % of average wage			1+0, earning average wage			2+0, both earning average wages			2+2, both earning average wages		
2016	2019	2022	2016	2019	2022	2016	2019	2022	2016	2019	2022
1 LU 316	1 LU 327	1 LU 319	1 LU 293	1 LU 287	1 LU 278	1 LU 300	1 LU 293	1 LU 284	1 LU 309	1 LU 302	1 LU 280
2 NL 308	2 NL 304	2 NL 303	2 NL 281	2 NL 271	2 NL 270	2 NL 281	2 NL 271	2 NL 270	2 NL 282	2 NL 274	2 NL 261
3 BE 268	3 BE 272	3 AT 275	3 AT 247	3 DE 243	3 AT 237	3 AT 247	3 DE 243	3 AT 235	3 AT 254	3 DE 251	3 AT 246
4 IE 259	4 DE 257	4 BE 266	4 DE 245	4 IE 233	4 DE 233	4 DE 245	4 IE 233	4 DE 233	4 DE 252	4 AT 248	4 DE 232
5 AT 258	5 IE 256	5 DE 247	5 IE 241	5 AT 232	5 IE 218	5 IE 241	5 AT 232	5 IE 218	5 IE 238	5 IE 231	5 BE 215
6 DE 254	6 AT 254	6 IE 243	6 SE 230	6 DK 223	6 DK 217	6 SE 230	6 DK 223	6 DK 217	6 BE 229	6 BE 227	6 IE 208
7 FI 239	7 FI 234	7 FI 230	7 FI 224	7 BE 220	7 BE 215	7 FI 224	7 BE 220	7 BE 216	7 DK 220	7 DK 221	7 DK 207
8 FR 230	8 DK 223	8 DK 216	8 BE 223	8 SE 218	8 SE 209	8 BE 223	8 SE 218	8 SE 209	8 FR 219	8 FR 207	8 FR 196
9 SE 222	9 SE 215	9 SE 211	9 DK 222	9 FI 214	9 FI 208	9 DK 222	9 FI 214	9 FI 208	9 ES 189	9 ES 178	9 IT 160
10 DK 217	10 FR 211	10 FR 206	10 FR 220	10 FR 207	10 FR 203	10 FR 220	10 FR 207	10 FR 203	10 IT 178	10 IT 171	10 ES 159
11 ES 204	11 ES 203	11 IT 197	11 ES 196	11 ES 184	11 IT 175	11 ES 196	11 ES 184	11 IT 175	11 MT 165	11 CY 167	11 CY 155
12 IT 200	12 IT 196	12 ES 188	12 IT 181	12 CY 173	12 ES 170	12 IT 181	12 CY 173	12 ES 170	12 EL 151	11 MT 167	12 MT 140
13 MT 172	13 MT 177	13 CY 159	13 MT 168	12 IT 173	13 CY 166	13 MT 168	12 IT 173	13 CY 166	13 CZ 127	13 EL 140	13 PL 134
14 EL 150	14 CY 162	14 MT 153	14 EL 147	14 MT 169	14 MT 145	14 EL 160	14 MT 169	14 MT 145	13 EE 127	14 PL 137	14 CZ 126
15 PT 141	15 PT 146	15 SI 131	15 EE 126	15 EL 136	15 PL 131	15 EE 126	15 EL 147	15 EL 132	13 SI 127	15 CZ 134	15 EL 122
16 SI 128	16 EL 142	16 CZ 129	15 PT 126	16 EE 132	16 CZ 129	15 PT 126	16 EE 132	16 PL 131	16 PT 125	16 EE 133	16 SI 121
17 EE 125	17 EE 135	16 PL 129	17 SI 122	17 CZ 131	17 EE 124	17 SI 122	17 CZ 131	17 CZ 129	16 PL 125	17 PT 127	17 EE 119
18 CZ 122	18 CZ 131	18 EE 128	17 CZ 122	18 PT 129	18 SI 123	17 CZ 122	18 PT 129	18 EE 124	18 HU 103	18 SI 124	18 PT 116
19 PL 112	19 SI 130	19 PT 127	19 PL 121	19 PL 127	18 PT 123	19 PL 121	19 PL 127	19 SI 123	**19 SK-L 102**	19 HU 119	19 HU 116
20 SK-L 102	20 PL 121	19 EL 127	**20 SK-L 102**	20 SI 122	20 EL 122	**20 SK-L 102**	20 SI 122	19 PT 123	19 HR 101	20 LT 110	20 LT 111
20 HR 102	21 LT 111	21 LT 121	20 HR 101	21 HU 111	21 HU 116	20 HR 101	21 HU 111	21 HU 116	**20 SK-H 100**	21 HR 103	21 RO 106
21 SK-H 100	22 HR 104	22 HU 108	**21 SK-H 100**	22 LT 110	22 LT 113	**21 SK-H 100**	22 LT 110	22 LT 113	**20 SK-E 100**	**22 SK-L 102**	22 LV 103
21 SK-E 100	23 HU 103	23 LV 106	**21 SK-E 100**	23 RO 104	23 RO 109	**21 SK-E 100**	23 RO 104	23 RO 109	21 LT 90	22 RO 101	**23 SK-L 102**
22 LT 91	**24 SK-L 102**	24 HR 105	22 HU 96	**24 SK-L 102**	**24 SK-L 102**	22 HU 96	**24 SK-L 102**	**24 SK-L 102**	**23 SK-H 100**	**23 SK-H 100**	**23 SK-H 100**
23 HU 87	**24 SK-H 100**	**25 SK-L 102**	23 LT 93	**24 SK-H 100**	24 LV 102	23 LT 93	**24 SK-H 100**	24 LV 102	**23 SK-E 99**	**23 SK-E 99**	**23 SK-E 99**
24 RO 84	**24 SK-E 99**	25 RO 102	24 RO 89	**24 SK-E 99**	**25 SK-H 100**	24 RO 89	**24 SK-E 99**	**25 SK-H 100**	23 LV 86	24 LV 95	24 HR 98
25 LV 79	24 RO 99	**26 SK-H 100**	25 LV 84	25 HR 99	25 HR 100	25 LV 84	25 HR 99	25 HR 100	24 BG 72	25 BG 81	25 BG 90
26 BG 69	26 LV 94	**27 SK-E 99**	26 BG 76	26 LV 92	**26 SK-E 99**	26 BG 76	26 LV 92	**26 SK-E 99**			
	27 BG 79	27 BG 87		27 BG 85	27 BG 94		27 BG 85	27 BG 94			

Source: Eurostat, [PRC_PPP_IND], [EARN_NT_NET] and author's estimates; HFMCE (household final monetary consumption expenditure) used as deflator

isp@employment.gov.sk

7   Recommendations

We hope that our analysis will help to improve discussions about the performance of the Slovak economy, the purchasing power of households in Slovakia, as well as the level of wages, benefits, income and pensions in Slovakia compared to other Member States of the European Union:

- **The results of our analysis can be useful in further analytical work.** Additional studies could, for example, use our methodology or the Price Level Indices at PPP that we have estimated to compare the pensions, or doctors', nurses' and teachers' salaries in Slovakia and in other EU and OECD countries more reliably.[98]

- In addition, the simple methodology and low data requirements of our analysis mean that **our alternative scenarios can be re-estimated after each new release of purchasing power parity statistics, until the shortcomings in the input data are corrected.** All the above-mentioned analyses and possible extensions can thus be regularly estimated with the help of our software from newly published data.

- **Our findings highlight the need to fix any shortcomings in Slovakia's national accounts as soon as possible, as well as to correct the reporting of housing stock data to Eurostat to be fully in line with all methodological requirements.** Until the shortcomings are eliminated, we recommend interpreting any PPP statistics related to Slovakia with a measure of caution.

  Please note that – due to Eurostat's revision policy, which allows the PPP time series to be revised only three years into the past – another break in the time series will occur after the above-mentioned shortcomings in the input data are corrected.

- **We also recommend the swift implementation of the recommendations laid out in Eurostat reports on the quality of the Harmonised Index of Consumer Prices (HICP) for Slovakia.** The monitoring report from February 2021, for example, recommended that the Statistical Office of the Slovak Republic "continue investigating the data availability on dwellings rented out by private landlords" in order to improve the quality of the HICP for actual rentals for housing.[99]

- PPP statistics in some other EU Member States also exhibit values or trends that raise questions about their quality or suitability for use in international comparisons. We hope that our analysis helps to motivate the relevant European Union and Member State institutions to contribute more actively to the improvement of the quality of their statistical data, methodology and implementation.

Please note that the overestimation of expenditures on rentals for housing since 2016 would also lead to an overestimation of the nominal GDP for the entire Slovak economy, with possible consequences for the dynamics of economic growth, among other things.

---

[98] Relevant statistics are compiled by the OECD, for example, in OECD (2022a), *Education at a Glance 2022*, or in OECD (2022b), *OECD Health Statistics 2022 – Remuneration of Health Professionals*.
[99] Eurostat (2021)

References

Balassa, B. (1964). The Purchasing Power Parity Doctrine: A Reappraisal. Journal of Political Economy, 72(6), 584-596.

Bhagwati, J. (1984). Why Are Services Cheaper in Poor Countries? Economic Journal. 94(374), 279-286.

Cassel, G. (1921). The world's money problems. New York: E.P. Dutton and Co.

Cassel, G. (1922). Money and foreign exchange after 1914. New York: MacMillan.

Deaton, A. & Heston, A. (2010). Understanding PPPs and PPP-based National Accounts. American Economic Journal: Macroeconomics, 2(4), 1-35.

Dornbusch, R. (1987). Purchasing Power Parity. Published in: Eatwell, J., Milgate, M., & Newman, P. The New Palgave. A Dictionary of Economics. London: MacMillan; New York: Stockton Press.

Dujava, D., & Žúdel, B. (2023). O parite. (On Purchasing Parity.) Inštitút finančnej politiky (Institute for Financial Policy). Policy Brief 2023/6.

Engel, C., & Rogers, J. (1996). How Wide Is the Border? American Economic Review, 86(5), 1112-1125.

European Court of Auditors. (2019). Allocation of Cohesion Policy Funding to Member States for 2021-2027. Rapid Case Review. Luxembourg: European Court of Auditors.

Eurostat. (2013). ESA 2010 – European System of Accounts. Luxembourg: Publications Office of the European Union.

Eurostat. (2016). Handbook on Prices and Volume Measures in National Accounts. Luxembourg: Publications Office of the European Union.

Eurostat. (2017). Technical Manual on Owner-Occupied Housing and House Price Indices.

Eurostat. (2018). HICP Compliance Monitoring Report – Slovakia.

Eurostat. (2020). Remuneration and Pensions: Calculation of the Joint Index in accordance with Annex XI of the EU Staff Regulations. Methodology Manual.

Eurostat. (2021). HICP Compliance Monitoring Follow-Up Report – Slovakia.

Eurostat/OECD. (2012). Eurostat-OECD Methodological Manual on Purchasing Power Parities. Eurostat Methodologies and Working Papers. Luxembourg: Publications Office of the European Union.

Feenstra, R. C., Inklaar, R., & Timmer, M. (2013). The Next Generation of the Penn World Table. American Economic Review, 105(10), 3150-3182.

Habrman, M. (2018). Dobiehame alebo nedobiehame ten Západ? (Are we or are we not catching up to the West?) Inštitút finančnej politiky (Institute for Financial Policy). Policy Brief 2018/02.

Habrman, M., Habodászová, Ľ., & Šrámková, L. (2022). Reformný kompas slovenskej ekonomiky. (Reform Compass of the Slovak Economy.) Inštitút finančnej politiky (Institute for Financial Policy). Economic analysis – Policy paper 59.

Hajnovičová, V., & Horecká, J. (2018). Analýza dostupných zdrojov údajov pre výpočet produkcie bytových služieb. (Analysis of data source availability for the calculation of dwelling services production.) Infostat: Inštitút informatiky a štatistiky.

Hajnovičová, V., & Horecká, J. (2019). Odhad produkcie bytových služieb. (Estimate of dwelling services production.) Infostat: Inštitút informatiky a štatistiky.

Haluška, J., & Dolinič, J. (2018). Makroekonomická výkonnosť slovenskej ekonomiky v rokoch 1995 – 2017. (Macroeconomic Performance of the Slovak Economy in 1995 – 2017.) Slovenská štatistika a demografia (Slovak Statistics and Demography), 3, 57-76.

Harrod, R. (1933). International Economics. London: Nisbet and Cambridge University Press.

Horňák, M., & Valachyová, M. (2022). 30 rokov samostatnosti Slovenska. (30 Years of Slovakia's Independence.) Slovenská sporiteľňa. Analýza.

Huizinga, J. (1987). An Empirical Investigation of the Long-Run Behavior of Real Exchange Rates. Carnegie-Rochester Conference Series on Public Policy, 27, 149-215.

International Monetary Fund (IMF). (2021). Fifteenth General Review of Quotas – Quota Formula and Realigning Shares. IMF Policy Paper.

International Monetary Fund (IMF). (2022). Review of the Method of Valuation of the SDR – Amendment to Rule O-1 (July 2022). IMF Policy Paper.

Keynes, J. M. (1923). A Tract on Monetary Reform. London: Macmillan.

Köves, P. (1993). EKS Index and International Comparisons. Hungarian Statistical Review, 77 (SN3), 3-14.

Kravis, I., & Lipsey, Robert. (1983). Toward an explanation of national price levels. Princeton Studies in International Finance, 52. Princeton University, Department of Economics.

McDaniels, K., Palesch, N., Suri, S., Quiviger, Z., & Walsh, J. (2021). Updated Methodology for Assigning Credit Ratings to Sovereigns. Bank of Canada / Banque du Canada. Staff Discussion Paper / Document d'analyse du personnel – 2021-16.

McLenaghan, J. (2005). Purchasing Power Parities and Comparisons of GDP in IMF Quota Calculations. G24 Technical Group Meeting. Manila, Philippines.

Montornès, J., & Khder, M.-B. (2021). The Impact of Multinationals' Transfers on Irish GDP. Banque de France, Eco Notepad Post No. 202.

National Bank of Slovakia. (2022). Structural Challenges – 2022.

National Bank of Slovakia. (2023). Structural Challenges – 2023.

Novák, V., Reľovský, B., Štulrajterová, E., & Vaňko, M. (2022). Slovensko pred 30 rokmi a dnes. (Slovakia 30 Years Ago and Today.) National Bank of Slovakia. Analytical commentary 126.

OECD. (2008). OECD Factbook 2008 – Macroeconomic Trends – Gross Domestic Product, Size of GDP.

OECD. (2022a). Education at a Glance 2022: OECD Indicators. OECD Publishing, Paris.

OECD. (2022b). OECD Health Statistics 2022 – Remuneration of Health Professionals. OECD Publishing, Paris.

Rogoff, K. (1996). The Purchasing Power Parity Puzzle. Journal of Economic Literature, 34, 647-668.

Schreyer, P., & Koechlin, F. (2002). Purchasing power parities – measurement and uses. OECD Statistics Brief.

Samuelson, P. A. (1964). Theoretical Notes on Trade Problems. Review of Economics and Statistics, 46(2), 145-154.

Samuelson, P. A. (1994). Facets of Balassa-Samuelson Thirty Years Later. Review of International Economics, 2(3), 201-226.

Silver, Mick. (2010). IMF Applications of Purchasing Power Parity Estimates. IMF Working Papers. IMF WP/10/253.

Swedbank Macro Research. (2019). The Curious Case of Household Consumption in the Baltic Countries.

Statistical Office of the Slovak Republic. (2016). GNI Inventory – SK, ESA 2010.

Statistical Office of the Slovak Republic. (2021). GNI Inventory – SK, ESA 2010.

Statistical Office of the Slovak Republic. (2023). Metodické vysvetlivky – ročné účty. (Methodological Notes – Annual Accounts.) Available at: *https://www.statistics.sk*

Taylor, A., & Taylor, M. (2004). The Purchasing Power Parity Debate. Journal of Economic Perspectives, 18(4), 135-158.

United Nations (UN). (1992). Handbook of the International Comparison Programme. United Nations Department of Economic and Social Development, Statistical Division, Sales No. E.92.XVII.12.