Measuring EU-Wide Inequality

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Key Points

- EU-wide inequality is higher than official figures by Eurostat suggest. With a Gini coefficient of 0.35 and a quintile ratio of 8.4 in 2018 (5.8 at purchasing power parity), it reaches the level of US inequality.
- This is a major driver of migration and relocation of production within the European Union (EU), both of which have led to a rise of nativist votes and Brexit.
- Relative inequality has been declining owing to catch-up growth of the poorer economies in central and eastern Europe, while within-country inequality has remained stable or increased. However, absolute inequality is likely not to decline for many years.

EU-wide inequality matters. On 31 January 2020, the United Kingdom (UK) left the European Union (EU) after a referendum in favour of Brexit in 2016. One of the main drivers of the discontent behind that vote was immigration, primarily from poorer EU member states. When these countries joined the EU in 2004 or 2007, their citizens benefitted from the free movement of labour within the Single Market. The huge disparities between wages in the rich north-west of the EU (e.g. the UK) and the poor east/south-east led to migration (as soon as this was possible) and also to the relocation of some manufacturing jobs from high-wage to low-wage countries. Both developments affected less-skilled workers and specific regions in the richer member states, leading to disgruntlement and a rise of nativist parties. In this article we analyse the development of income disparities in the EU.

EU-Wide Inequality: Concepts, Data, Indicators

Measuring the income distribution of multicountry entities is tricky. In his classical analysis *Worlds Apart. Measuring International and Global Inequality*, Branko Milanovic (2005) differentiates between three concepts of international inequality, the unweighted, the population-weighted and 'true' global inequality. The first compares average per capita incomes of different countries regardless of their size. The second takes their different populations into account. But only the third gives an appropriate picture of the total income distribution among all the people living in a multicountry space (be it the world or, in this article, Europe).

The EU is an entity with 28 (now 27) member states.[1] Thus, its income distribution can and must be decomposed into within-country and between-country elements. In practice, the Statistical Office of the EU (Eurostat) and most research based on its data work from the bottom up, starting from the national income distribution and constructing the EU-wide income distribution. Eurostat itself provides values for the whole EU by calculating averages weighted (by population) of the national values of certain indicators (see Table 3, top row, or Figure 2, bottom curve). This method delivers incorrect estimates as it neglects the big income disparities between countries.[2] The present analysis intends to correct that mistake by providing estimates of the 'true' EU-wide inequality combining both dimensions.

Before presenting the available literature on the subject and our findings, some aspects and technical details have to be clarified.

First, this article focuses on income inequality. We do not consider other dimensions such as inequality of wealth or life expectancy. We focus on the inequality between people (or households) following Milanovic (2005) and neglect, with some exceptions, inequality between countries, regions or other groups (production factors, age cohorts or gender).

Second, the income we consider here is disposable income; that is, market income minus taxes plus transfers received (e.g. pensions). Usually, the

[1] This analysis uses the latest available statistical data from Eurostat. The last year considered is 2018, when the UK was still a member state.
[2] Several studies (including some by the author) have pointed out this problem, e.g. Atkinson et al. (2010), p.109 or Darvas (2016) p. 10 and p. 35.

distribution of disposable income is less unequal than the distribution of market income as the state redistributes income from the rich to poor households. These incomes are adjusted for household type and size, thus becoming 'equivalised disposable income'. These are the income definition and data we mostly use in this article. Sometimes, gross domestic product (GDP) per capita is also used in this article.

Third, the income data used here come from come from Eurostat, more precisely from household surveys (EU-SILC = Survey of Income and Living Conditions). These surveys cover all EU member states since 2005 and are based on surveys of approximately 130,000 households with 270,000 persons. As household surveys are notoriously unreliable and patchy at the top and the bottom of the income distribution, all findings based on them are likely to underestimate the true inequality. GDP data come from National Accounts and can only be used to analyse the distribution of income between countries and, within countries, between production factors (wage and profit share) or, possibly, regions.

Fourth, the comparison of incomes of people living in different countries can be based on nominal incomes converted at exchange rates or on real incomes converted at purchasing power parities (PPP). Incomes in poorer countries are usually higher at PPP as price levels there are lower (in particular for non-tradable items such as services and rents).

Fifth, the indicators of inequality we use here are primarily the quintile or S80/S20 ratio, which gives the relation between the income of the richest quintile (20%) of the population and the poorest quintile; the Gini index, which ranges from zero for perfect equality to one (or 100) for maximum inequality (i.e. all income goes to one person or household); and occasionally some other indicators such as the Palma ratio, the poverty ratio or the Theil index. The Palma ratio (Palma, 2019) compares the income of the top decile to that of the bottom 40%. Palma's most important finding is that the share of the middle 50% (between these two quantiles) of the total income is relatively equal in all countries, indicating that the variance between countries results mainly from the distribution between the top and the bottom. The poverty ratio is the share of the population with an income below 60% of median income. The Theil index has the advantage that it can

be decomposed to determine how much specific subgroups contribute to the total inequality. In the present context, for instance, one can differentiate by how much EU-wide inequality is caused by within-country inequality and by between-country inequality.

The choice of indicators is charged by value judgements (see Nino-Zarazua et al., 2016). While the quantile ratios represent relative inequality, the Gini coefficient or standard deviation are measures of absolute inequality. In static comparison, both types of indicator provide the same ranking (if, for instance, applied to countries). But in a dynamic perspective the same change of income can result in different changes of the respective indicator. Relative inequality can decline while absolute inequality increases. The following example of two countries with different income levels and growth rates (Table 1) illustrates this effect.

Table 1: Beta convergence and indicators of absolute and relative inequality

Years	GDP/cap country A (5% growth)	GDP/cap country R (2% growth)	Absolute difference R–A	Relative ratio R/A
0	1,000	5,000	4,000	5
1	1,050	5,100	4,050	4.9
9	1,551	5,975	4,424	3.9
23	3,072	7,884	4,813	2.6
55	14,636	14,859	223	1

The example given in Table 1 is not far from reality in the EU where average income per person in rich countries is often five times that in poor countries while growth rates of poor countries are substantially higher. In such a case one speaks of beta convergence—in contrast to sigma convergence, which implies a decline of the standard deviation. Beta convergence is a necessary but not a sufficient condition of sigma convergence as Table 1 shows. In our example, absolute inequality continues to increase for 23 years while relative inequality starts to decline

immediately; and it takes 55 years to achieve income equality (for a more general analysis see the mathematical annex). Thus, indicators of relative inequality tend to overestimate the decline of inequality.

Literature Review

While the distributions of income both within EU member states and between EU member states are relatively well documented and researched,[3] there is little or no analysis of 'true' EU-wide inequality before 2007. We list below the studies that, to our knowledge, dealt with EU-wide inequality in chronological order, apart from our own research, which is presented in the next section.

Brandolini (2007) presented one of the first studies. In it he determined some key features of EU-wide inequality: it is significantly higher than the inequality within member states and therefore higher than the (population-weighted) average of these national values, which underestimates the 'true' EU-wide inequality. The value for EU-wide inequality is lower when measured at PPP than at exchange rates. With the eastern enlargement of the Union EU-wide inequality jumped as much poorer countries joined it. Brandolini could not yet use EU-SILC data. His estimates for the Gini coefficient and the S80/S20 ratio are lower than those of later studies.

In 2012 the Organisation for Economic Co-operation and Development (OECD) published a study by K. Bonesmo Frederiksen. This paper did not cover all member states. Bonesmo Frederiksen used OECD data and found a rising inequality. She determined a Gini coefficient of 0.35 at exchange rates for 2008.

Using EU-SILC data, Bönke and Schröder (2015) of the German economic research institute DIW (Deutsches Institut für Wirtschaftsforschung) presented an analysis that found that the Gini (at PPP)

[3] For within-country inequality see OECD (2011) and https://fsolt.org/swiid/ or https://wid.world/; for between-country inequality see Barro and Sala-i-Martin (1992), Kaitila (2013) and Dauderstädt (2014). The EU Commission regularly publishes cohesion reports on regional disparities within the EU (https://ec.europa.eu/regional_policy/en/information/cohesion-report/).

for the EU-22 (excluding Belgium, Ireland and Malta) declined from 0.327 to 0.311 between 2004 and 2011, albeit stagnating after the crisis of 2009.

In 2016, the Brussels think tank bruegel published a paper by C. Darvas. His paper analysed global inequality and the income distribution of various other countries and the EU. His estimations delivered values showing that the Gini of the EU-27 decreased from 0.37 (2007) to 0.35 (2009). Afterwards it rose slightly and then stagnated.

In 2017 Eurofound presented a study by C. Vacas-Soriano and E. Fernández-Maciás. They analysed the distribution of different forms of income (wages, household income) and determined a Gini that declined from 0.355 in 2005 to 0.33 in 2009. According to their findings, EU-wide inequality increased after 2009 slightly.

Also in 2017, the EU Commission published a study (Benzcúr et al., 2017) that focused on different types of income and households. For the EU-wide distribution of disposable income without adjusting for PPP the authors found a Gini of 0.43 that fell until 2008, increased afterwards and then stagnated.

In 2018, the EU Commission presented another study by Filauro. He calculated Gini values for the EU and for the Euro zone for the years 2005–14 and focused on decomposition of the EU-wide inequality within and between countries. As was to be expected, the inequality of the Euro zone was lower than that in the EU-28. He also compared the EU with the USA (see Box 1).

The most recent and most comprehensive study was presented in 2019 by T. Blanchet et al. The authors combined various data sources and found that inequality has been rising since 1980. Income disparities increased substantially until 1995, and somewhat more slowly afterwards. However, they provided estimates neither for the Gini coefficient nor for the S80/S20 ratio. Instead, they presented values for the income shares of the top 10% and the bottom 50% of countries. Using the Theil index, they showed that EU-wide inequality is caused primarily by within-country inequality (about 80%).

Box 1: Comparing EU and USA

As a federation of states and an integrated market, the EU is similar to the USA. Within the Euro zone there is even a common currency. Accordingly, many authors (Milanovic, 2011, p.176 (Vignette 3.3); Filauro and Parolin, 2018; and some of the papers mentioned in this section) have compared the income distribution in these two big economies.

They all show that within-state inequality is contributing much more to American inequality than to European inequality. Inequality within US federal states has increased substantially since 1980. This is true for the inequality within most EU member states, too. But between-countries inequality has declined much more in the EU than in the USA.

The EU-wide inequality (not applying PPP) is comparable to US inequality if measured by the Gini coefficient. If one uses PPP, the EU value is somewhat below the US level. Measured by the S80/S20 ratio, EU-wide inequality (without PPP) was higher than US inequality before 2008 and at about the same level between 2010 and 2016, if one assumes for the USA the S80/S20 value given by the Human Development Report of the UNDP (http://hdr.undp.org).

In the following section we present the results of our own research, which started in 2007, and include the most recent data by Eurostat referring to the year 2018.

Estimating EU-Wide Inequality with the Quintile Method

To a large extent, the findings of the papers listed in the previous section were anticipated (as most of the studies reviewed above acknowledge) and confirmed by a series of studies by Dauderstädt (2008), Dauderstädt and Keltek (2011) and nine annual updates (2012–20)[4] using a much less demanding approach, which estimates EU-wide inequality based on national quintiles (of which there are $5 \times 28 = 140$). This approach takes both within- and between-country inequality into account, but neglects the distribution

[4] These annual updates are available at www.fes.de or www.dauderstaedt.de. The latest is Dauderstädt, 2020.

within each national quintile as it uses its average income per person. Taking these quintiles, one can construct European quintiles that each cover a fifth of the EU population (= approx. 100 million people). Table 2 shows the 140 national quintiles with the respective average income per capita at PPP (2a) and exchange rates (2b) for the year 2018 (latest available data).

Table 2a: Average income per person (at PPP) by national quintile 2018

Country	Q1	Q2	Q3	Q4	Q5
BG	2,800 €	5,148 €	7,258 €	10,151 €	21,445 €
RO	2,043 €	4,357 €	6,324 €	8,880 €	14,736 €
HR	4,052 €	7,401 €	9,959 €	12,987 €	20,267 €
LV	3,707 €	7,009 €	10,135 €	14,082 €	25,089 €
LT	3,981 €	7,414 €	10,725 €	14,869 €	28,172 €
PL	5,588 €	9,041 €	11,612 €	14,771 €	23,734 €
EE	5,604 €	9,476 €	13,469 €	18,245 €	28,390 €
HU	4,187 €	6,684 €	8,583 €	10,932 €	18,184 €
SK	5,768 €	9,015 €	10,907 €	13,194 €	17,500 €
CZ	7,688 €	10,885 €	13,360 €	16,533 €	25,545 €
PT	4,949 €	8,240 €	10,893 €	14,416 €	25,834 €
EL	3,782 €	6,846 €	9,201 €	12,186 €	20,839 €
MT	8,983 €	13,692 €	18,142 €	23,319 €	38,360 €
ES	6,036 €	11,425 €	16,018 €	21,713 €	36,404 €
SI	8,368 €	12,697 €	15,781 €	19,281 €	28,192 €
IT	6,257 €	12,084 €	16,730 €	22,007 €	38,111 €
CY	8,754 €	13,004 €	17,115 €	21,890 €	37,447 €
DE	9,541 €	16,809 €	21,765 €	27,918 €	48,337 €
FR	10,345 €	16,238 €	20,343 €	25,240 €	43,757 €
BE	10,420 €	16,230 €	21,387 €	26,590 €	39,280 €
UK	8,355 €	13,790 €	18,373 €	24,738 €	45,057 €
AT	11,374 €	18,296 €	23,299 €	29,160 €	45,880 €
FI	10,985 €	15,885 €	20,030 €	24,954 €	40,011 €
NL	10,758 €	16,942 €	21,472 €	26,981 €	43,603 €
SE	9,500 €	15,647 €	20,396 €	25,649 €	39,171 €
IE	9,784 €	14,904 €	19,715 €	26,218 €	45,296 €
DK	10,886 €	17,211 €	21,670 €	27,016 €	44,761 €
LU	13,450 €	23,739 €	32,092 €	44,008 €	76,787 €

Table 2b: Average income per person (at exchange rates) by national quintile 2018

Country	Q1	Q2	Q3	Q4	Q5
BG	1,389 €	2,554 €	3,600 €	5,035 €	10,637 €
RO	1,075 €	2,293 €	3,328 €	4,672 €	7,754 €
HR	2,732 €	4,989 €	6,714 €	8,755 €	13,663 €
LV	2,698 €	5,101 €	7,376 €	10,249 €	18,259 €
LT	2,569 €	4,785 €	6,922 €	9,596 €	18,182 €
PL	3,166 €	5,122 €	6,578 €	8,368 €	13,446 €
EE	4,377 €	7,401 €	10,520 €	14,251 €	22,174 €
HU	2,639 €	4,213 €	5,409 €	6,890 €	11,460 €
SK	4,025 €	6,290 €	7,611 €	9,207 €	12,211 €
CZ	5,244 €	7,425 €	9,113 €	11,278 €	17,425 €
PT	4,254 €	7,084 €	9,365 €	12,394 €	22,210 €
EL	3,232 €	5,850 €	7,862 €	10,412 €	17,806 €
MT	7,337 €	11,184 €	14,818 €	19,047 €	31,333 €
ES	5,580 €	10,563 €	14,809 €	20,073 €	33,655 €
SI	7,009 €	10,634 €	13,218 €	16,149 €	23,613 €
IT	6,313 €	12,191 €	16,879 €	22,203 €	38,450 €
CY	7,833 €	11,637 €	15,315 €	19,588 €	33,509 €
DE	9,926 €	17,488 €	22,645 €	29,046 €	50,291 €
FR	11,324 €	17,773 €	22,267 €	27,628 €	47,896 €
BE	11,545 €	17,983 €	23,697 €	29,462 €	43,522 €
UK	9,722 €	16,046 €	21,380 €	28,787 €	52,431 €
AT	12,348 €	19,864 €	25,296 €	31,659 €	49,811 €
FI	13,447 €	19,444 €	24,518 €	30,546 €	48,976 €
NL	12,059 €	18,990 €	24,068 €	30,243 €	48,874 €
SE	11,922 €	19,635 €	25,595 €	32,186 €	49,156 €
IE	12,308 €	18,749 €	24,802 €	32,983 €	56,983 €
DK	15,115 €	23,898 €	30,090 €	37,512 €	62,153 €
LU	16,929 €	29,878 €	40,391 €	55,389 €	96,645 €

Source: Eurostat and calculations by the author

Starting with the quintiles for the poorest nations from below (with the richest from above) and adding as many national quintiles as necessary to reach 100 million people, one can get the poorest and the richest EU quintile. The shading shows the aggregated European quintiles (dark grey for the poorest EU quintile, light grey for the richest). In each table, only part of two national quintiles, DE Q1 and BE Q4 in table 2a, and EL Q3 and DE Q4 in

table 2b, is included in the respective EU quintiles EUQ1 and EUQ5 in order to arrive at the exact number of people. The corresponding accumulated income of these national quintiles adds up to the total income of the respective EU quintile. The ratio of the income of the richest to the poorest EU quintile is the S80/S20 ratio of the EU-wide inequality.

In Figure 1 overleaf, the 140 national quintiles are ordered by their average income per person (at exchange rates) on the horizontal axis, starting left with the poorest national quintile ROQ1 and ending right with the richest LUQ5. The two lines represent the accumulated population (upper curve) and income (lower curve) with the total population (approx. 503 million) and income (approx. €10 trillion) normalised to 1. As is to be expected, the population curve grows faster than the income curve. The curves are not smooth as quintiles of large and rich countries contribute more to the accumulated population income than those of smaller and poorer countries.

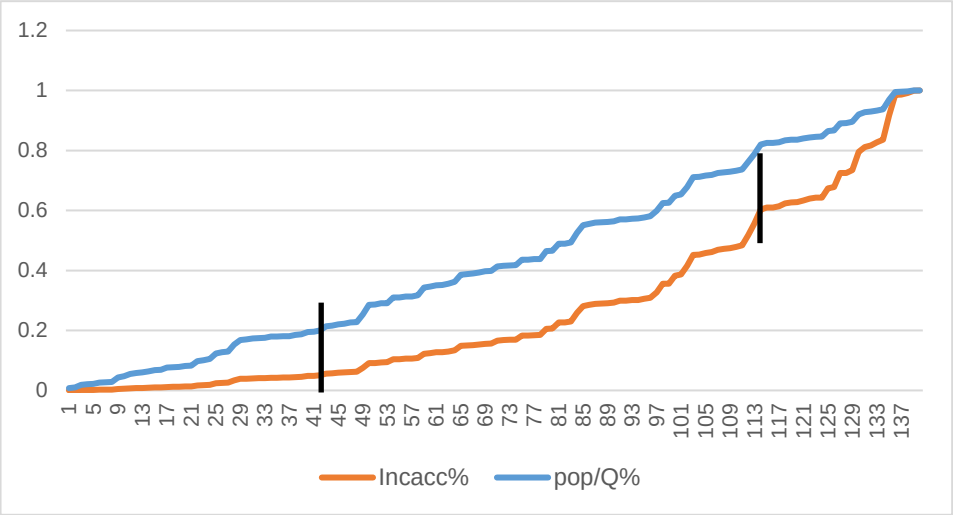
From Figure 1, the values of two indicators of inequality can be deduced: a) the S80/S20 or quintile ratio and b) the Gini coefficient.

At a): If we identify the point where the (upper) population curve reaches 20% (= 0.2) and look at the share of total accumulated income at that point (marked by the left black vertical line in Figure 1) we find that the poorest fifth of the EU receives about 0.05 (5%) of the total income. The 41 national quintiles involved are the ones shaded dark grey in table 2b (plus sufficient of cell ELQ3 to take the coverage to 100 million citizens). In a similar way, we start at the point where the population curve reaches 0.8 and find (by following the right-hand black vertical line in Figure1) that the income curve has a value of 0.6, implying that the richest European quintile receives 0.4 (or 40%) of the total income. The 26 national quintiles making up the richest EU quintile (plus part of cell DE Q4) are shaded light grey in Table 2b. The ratio of these two income shares is the S80/S20 indicator (or quintile ratio), and has a value of 8.45. This means that, measured at exchange rates, the richest EU quintile earns 8.45 times as much as the poorest quintile.

At b): The income curve (lower curve) is known as the Lorenz curve. The Gini coefficient is defined as half the area between the Lorenz curve and the

diagonal (line of perfect equality). Its value is 0.35 (at exchange rates without PPP).

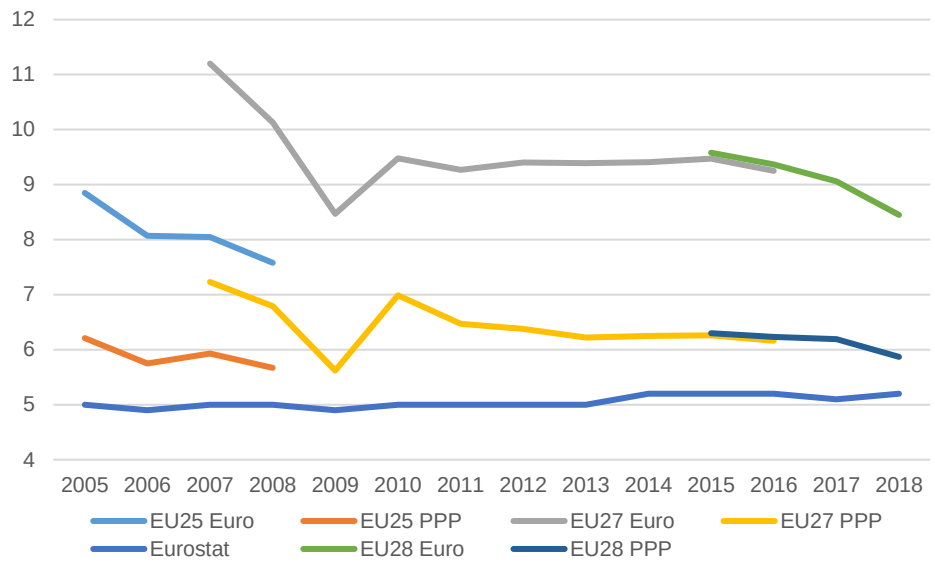
Figure 1: Accumulated population and income (at exchange rates) of the national quintiles (ordered from poorest to richest and normalised between 0 and 1)



Source: Eurostat and calculations by the author

How did the EU-wide inequality develop over time? Figure 2 below shows the development of the quintile ratio from 2005 until 2018 (latest Eurostat/EU-SILC data available). The different curves represent the inequality measured at exchange rates and PPP for the EU as it has enlarged from 25 to 28 member states. The lowest curve shows the wrongly constructed official value, which is the population-weighted average of the national values (see also Table 3, top row). Its error lies in assuming that the poorest EU quintile consists of the poorest quintile of each of the 28 member states (and likewise the richest, in a corresponding way). Obviously, neither do the poorest quintiles of rich member states like Luxembourg or Denmark belong in the poorest EU quintile nor do the richest quintiles of Balkan or Baltic countries belong in the richest EU quintile (see Table 2).

Figure 2: The development of EU-wide inequality 2005–18 (S80/S20 ratio)



Source: Eurostat and calculations by the author

The level of EU-wide inequality is similar to that of very unequal member states when measured at PPP and substantially higher at exchange rates. It declined between 2005 and 2007, but jumped substantially with the EU enlargement by Romania and Bulgaria (two large, poor countries). Afterwards it continued to decrease until 2009 when the crisis affected the global economy. After a short revival, EU-wide inequality remained almost constant and resumed its decline only in 2017. In 2018 it eventually managed to regain the level of 2009. Meanwhile, a decade has been lost without reducing EU-wide inequality. Catching-up growth had continued too weakly to compensate for the concurrent rise of within-country inequality (compare the last two columns in Table 3).

How much do within-country and between-country inequality respectively contribute to EU-wide inequality? To answer that question, one needs an indicator of inequality that is decomposable. Such an indicator is

the Theil index (the quintile ratio and the Gini cannot be decomposed). Several studies (most recently: Filauro, 2018; Blanchet et al., 2019) provide estimates that show that between-country inequality is responsible for about 20% of total EU-wide inequality. That share declined between 2005 (from approx. 25% in that year) and 2010, and stagnated afterwards. To sum up: while within-country inequality has much more effect (80%) on the level of EU-wide inequality, it is the change in between-country inequality that has been more relevant for its development.

In a similar way, one can use the quintile method to calculate an EU-wide poverty rate. Poverty (or risk of poverty) is usually defined as having an income below 60% of the median income. The poverty rate is the percentage of people with such a low income. Eurostat provides (again) an erroneous figure of approx. 17%, which neglects the income disparities between countries and calculates the EU poverty rate as the weighted average of national poverty rates. Determining the EU-wide median income in 2018 with the quintile method gives a value of approx. €17,450, resulting in a poverty threshold of approx. €10,470. The percentage of EU citizens with an income below that value (i.e. the poverty rate) is approx. 29%, or 23% if based on PPP.

The Two Main Drivers of European Inequality

As has been shown above, the development of EU-wide inequality depends on the evolution of inequality both within and between countries. In this section, we will show briefly how these two inequalities developed over time.

Within the EU, the inequality within countries varies strongly between member states. As Table 3 shows, the most equal countries are some central European countries (e.g. the Czech Republic, Slovakia and Slovenia), and the Scandinavian countries. The most unequal member states are Bulgaria, Romania, some Baltic states and some Mediterranean countries.

Table 3: Income quintile share ratios (S80/S20) 2005–18

Region/country	2005	2010	2018
European Union—28	5.03	4.94	5.17
Euro area	4.65	4.90	5.07
Belgium	4.04	3.92	3.78
Bulgaria	n/a	5.86	7.66
Czech Republic	3.67	3.47	3.32
Denmark	3.50	4.41	4.11
Germany	3.79	4.49	5.07
Estonia	5.93	5.01	5.07
Ireland	5.01	4.70	4.23
Greece	5.79	5.61	5.51
Spain	5.55	6.16	6.03
France	4.02	4.43	4.23
Croatia	n/a	5.54	5.00
Italy	5.57	5.38	6.09
Cyprus	4.34	4.54	4.29
Latvia	6.69	6.84	6.78
Lithuania	6.95	7.35	7.09
Luxembourg	3.87	4.10	5.72
Hungary	4.04	3.41	4.35
Malta	3.95	4.33	4.28
Netherlands	3.99	3.65	4.05
Austria	3.81	4.34	4.04
Poland	6.64	4.98	4.25
Portugal	6.96	5.56	5.22
Romania	n/a	6.11	7.21
Slovenia	3.43	3.42	3.38
Slovakia	3.92	3.80	3.03
Finland	3.64	3.61	3.65
Sweden	3.33	3.85	4.13
United Kingdom	5.87	5.35	5.95

Source: Eurostat (tessi180)

In most countries, income inequality has increased over recent decades. Between 1980 and 2017, the income shares of the richest decile (10%) have increased in all countries except Belgium (Blanchet et al., 2019, Fig. 7, p. 29).

Most of the increase of inequality within countries happened before 2005. Since 2005 (when Eurostat data start being available), this trend continued with some fluctuation (see Table 3). Eurostat's weighted average of all national S80/S20 indicators has hardly moved since 2005 (oscillating between 4.9 and 5.2; see Table 3 first row and Figure 2 lowest curve). The development of national inequality is driven by politics (adopting neoliberal labour market reforms, cutting welfare), system change from socialism to capitalism in central and eastern Europe (CEE), globalisation (increased competition from migrants and low-wage locations), technology (substituting capital for labour), growing regional disparities and some social changes (rise of single households, assortative mating, etc.). The rise of inequality in formerly egalitarian societies such as Sweden or Germany is particularly remarkable. Atkinson (2015) provides a wealth of suggestions how to reduce national inequality.

Income disparities between the member states and regions have gained importance with the accession of poorer countries: Ireland in 1972, Greece in 1981, Portugal and Spain in 1986 and—by far the biggest challenge—the post-communist countries of CEE after 2004. The income disparities between the poor new member states and the old EU were very high. In 2000, average national GDP per capita in CEE was below €10,000 while in the old member states it was above €25,000, when measured in PPP. PPP measurement delivers higher values for GDP in poor countries because prices are lower there. At exchange rates, GDP per capita in CEE turns out to be much lower (often less than €5,000).

Reducing income disparities between the member states and regions has been an official goal of the EU, which is anchored in its governing treaties. The EU has tried to foster catch-up growth and regional cohesion by various policies and institutions, in particular through the regional and structural funds. The success has been mixed. Ireland started to catch up only in the 1990s, long after becoming a member state. Greece's per capita income fell as a percentage of the EU average after accession. Portugal and Spain fared better thanks to a more favourable global economic context (declining oil prices, stronger global growth). The most surprising success story has been

the new post-communist member states of CEE. After the transition crisis in the early 1990s they started to grow relatively fast.

Table 4: Nominal growth (in percent) between 2000 and 2017

Period	2000–2008	2008–2017	2008–2013	2013–2017
Centre	25.8	22	7.6	13.4
Periphery, east	129.8	23.6	2.5	20.6
Periphery, south	47.1	3.2	-5.9	9.6
GPS	67.5	0.3	-10.4	12

Remarks: Centre = old EU-9 + European Free Trade Association; Periphery, east = new member states; Periphery, south = Italy + GPS + Cyprus + Malta; GPS = Greece + Portugal + Spain.
Sources: Eurostat, calculation by the author

As one can see in Table 4, the eastern periphery grew much faster than the centre between 2000 and 2008 and continued to do so, albeit no longer that much stronger, after 2008. Poorer Eurozone members (mainly in southern Europe) benefitted after 1998 from declining real interest rates and subsequent debt-driven consumption and investment booms. They managed to grow faster than the centre until 2008, but since then have fallen back. The decline was absolute between 2008 and 2013 owing to the sovereign debt panic and the disastrous austerity policies forced upon them by the Troika. Even after 2013, their growth was weaker than that of the richer member states. The EU thus achieved beta convergence for CEE, but failed to achieve it for the southern periphery after 2008. As the Mediterranean countries have a middle-income level within the EU, their relative decline did not strongly affect EU-wide inequality.

Conclusion and Outlook

With a Gini coefficient of 0.35 and a quintile ratio of 8.4 (5.8 at PPP) in 2018, EU-wide inequality is about as high as US inequality and higher than within

all EU member states (see Table 3). After almost a decade, EU-wide inequality finally regained the low level it had reached in 2009. This achievement was driven by the relatively strong growth in the poorer member states between the Baltic and the Balkans. The second driver of EU-wide inequality, within-country inequality, has not made much contribution to this development, as it has remained relatively stable or even increased.

The EU could and should do more to promote catch-up growth and to encourage redistributive policies within member states. Further enlargement (including Albania and/or Northern Macedonia) will only slightly increase EU-wide inequality as these countries are poor but small. Brexit, on the other hand, is likely to reduce it somewhat because Great Britain contributes to the richest EU quintile with its national top quintile (UKQ5), which will be replaced by the French Q4 with a substantially lower average income per person (see Table 2).

The corona crisis will affect both, within-country and between-country inequality. Within member states the incomes of employers and employees suffer by degrees determined, among others, by state aid policies. Politics will also decide how the higher public debt should be dealt with (cutting welfare or taxing high incomes and wealth) with corresponding effects on disposable income. Between member states beta convergence could decline as less labor migration and weaker stimulus programs reduce incomes in poorer countries while generous state aid in less indebted member states will protect incomes and enterprises there. The rise of EU-wide inequality in 2009 after the financial crisis and Great Recession (and stagnation afterwards) bodes ill. Hard evidence (data from EU-SILC) will be available but in autumn 2021.

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Mathematical Annex on Catch-up Growth

We compare two countries A and R with different initial levels of income per person and different growth rates (for a concrete numerical example see Table 1).

$A_t = A_0 * G_a^t$, where A_t is the income per person in (poor) country A at timepoint t, A_0 initial income (t = 0) and G_a the growth factor. The growth factor is G = 1+g (g is the growth rate). If, as in Table 1, the growth rate is 5% pa, the growth factor is 1.05.

$R_t = R_0 * G_r^t$, where R_t is the income per person in rich country R at timepoint t, R_0 initial income (t = 0) and G_r the growth factor.

The year at which A's income catches up with R's is timepoint t, when $A_t = R_t$ is true, and so: $A_0 * G_a^t = R_0 * G_r^t$. Resolved in accordance with t, we get this: $T_{parity} = \ln(R_0/A_0)/\ln(G_a/G_r)$.

The timepoint of the biggest gap, after which the gap starts to diminish, is timepoint T_{max}, when the gap $D_t = R_t - A_t$ reaches its maximum.

It is calculated using the following derivation:
$d/d_t\ D_t = d/d_t\ (R_0 * G_r^t - A_0 * G_a^t) = R_0 * \ln G_r * G_r^t - A_0 * \ln G_a * G_a^t = 0.$
$T_{max} = \ln(R_0 * \ln G_r/A_0 * \ln G_a)/\ln(G_a/G_r).$