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# Global Inequality in Context: Exploring the Interactions between Macro-Regional and Income Dynamics

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## Abstract

This paper examines the global dynamics of income inequality, focusing on the interaction of inequalities within and between countries. Using data from the World Inequality Database, the World Bank, and the United Nations, the analysis reveals that global income disparities remain high, despite recent improvements driven by the economic growth in emerging economies. The paper introduces and applies the Rich-to-Poor Ratio (RTP) as a refined metric for assessing extreme income gaps. The findings demonstrate a strong and statistically significant correlation between within-country inequality and between-country inequality, particularly at higher levels of development, forming a U-shaped relationship. This co-movement is not monotonic, suggesting that countries with lower external gaps may converge further to the advanced top only at the expense of greater internal income inequalities. Overall, the results highlight the need for a holistic approach to inequality that addresses both national and global dimensions.

## Keywords

Global Income Inequalities, Within Countries, Between Countries, Processes of Globalisation

## 1. Introduction

Inequality is a central issue in research and policy agendas. Two of the Sustainable Development Goals (SDGs) of the United Nations (UN) mention gender and economic inequality within and between countries (United Nations, 2023a). The goal to reduce inequalities is a major part of the European Pillar of Social Rights Action Plan, aiming to provide equal opportunities to all and "leaving no-one behind" by

2030 (European Commission, 2023). Cohesion Policy is also addressing social and spatial inequalities and territorial cohesion by channeling investments into regions with lower levels of development and/or specific vulnerabilities (European Commission, 2024).

Global income inequality has always been very high, mainly depicting the hierarchical structure of the world economic system (Chancel & Piketty, 2021). Most OECD countries face a high level of income inequality with the richest 10% of the population earning 9.5 times more than the poorest 10% (Cingano, 2014). In general, middle-income countries are shown to be the most unequal (Ortiz & Cummins, 2011).

Global inequality levels both between and within countries have been influenced by China's and India's economic transformation and growth. In general, the winners of the past 30 years have shown to be either the very rich or the middle classes of emerging economies such as China, India, Brazil and Indonesia (Milanovic, 2013). However, the decline of global inequality between countries may come to a halt when China's average income exceeds the average global level. Beyond that level, inequality is expected to increase again unless other high population countries take China's position in the economic transformation (United Nations University, 2021). Global wealth inequalities are even more prominent than income inequalities with the poorest half barely possessing wealth at all, only 2% of the total (Chancel et al., 2022; Davies & Shorroks, 2021).

This paper intends to further explore income inequalities worldwide, in order to assess their evolution and interaction between and within countries. With the use of World Bank (WB) data inequality between countries is studied, in order to explore the main trends and patterns of change at the global level and across geographical regions and income groups. At the same time using data from the World Inequality Database (WID), the WB and the UN the evolution and current status of global income inequalities worldwide is analysed taking into consideration the major crises that have affected the global landscape. This research provides valuable insights regarding the relationship between within- and between countries inequalities, showing that there is indeed a positive relationship, which should be taken into account for policy design and implementation. The paper is structured as follows: Section 2 reviews global income inequalities within and between countries. Section 3 discusses the methodology employed, while Section 4 presents the research results. Finally, Section 5 presents the conclusions and policy implications.

## 2. Literature Review

### 2.1. Evolution of Global Income Inequalities

Global income inequalities include both inequalities between countries as well as inequalities within countries, which are affected by market dynamics, but also by waves of ideological change and shifting policy doctrines, such as the Reagan reforms in the United States (US), the transition from plan to market in China and the former Soviet Union countries and the deregulation in India (Alvaredo et al.,

2020).

There are various indicators and methodologies to measure inequalities. The Gini coefficient is the most widely used index that counts what percentage of a country's income each percentile of the population possesses and is converted into an index of 0 to 1, with 0 implying complete equality and 1 implying complete inequality (European Commission, 2023). The Theil index, on the other hand, is a measure of the discrepancy between the distribution of income and the distribution of population between groups (Conceição & Ferreira, 2000) and varies between zero and ∞, with zero meaning an equal distribution and higher values a higher level of inequality (OECD, 2016).

More recent estimations include the S80/S20 income quintile share ratio that measures the ratio between the share in total national income of the incomes of the richest 20% (the top quintile) against the share in total national income of the incomes of the poorest 20% (the bottom quintile) (European Commission, 2023), the S40 ratio that counts the share in total national income of the poorest 40% and is used also with the United Nations Agenda 2030 and SDG 10 (European Commission, 2023), or the Mean Log Deviation (MLD), which is a measure of income inequality as well; when it is zero everyone has the same income and when it has larger positive value incomes become more unequal (Haughton & Khandker, 2009).

As it is evident, using different indicators provides slightly differentiated results. The Gini coefficient has been criticised as being too sensitive to changes in the middle class, therefore a fairly new indicator has been proposed, the Palma ratio (Cobham & Sumner, 2014). What is important about this indicator is that it captures both the lower and upper ends of the income distribution and is calculated dividing the richest 10% of the population's share of income by the poorest 40% share (Palma & Stiglitz, 2016; Osakwe & Solleder, 2023). One criticism of the Palma ratio is that it implies a relative stability in the middle class, which, however, has been reaffirmed by further research with data on both developed and developing countries (Cobham et al., 2016).

Despite the existence of several inequality indicators, most SDGs goals are not likely to be met, such as the Goal of alleviating extreme poverty by 2030, while at the same time the COVID-19 pandemic is expected to increase poverty as well as inequality worldwide (Hujo, 2021). The existence of inequalities is not economically efficient and concentrates consumption in the top income quintile (Ortiz & Cummins, 2011), affecting at the same time the use of resources like labor and capital (Peterson, 2017). As a result, several papers have identified a negative impact of income inequality on economic growth (Caraballo et al., 2017; Vo et al., 2019; Seo et al., 2020).

Some researchers predict a decrease of global income inequality by 2030 as the young generation from developing countries becomes more educated (Ahmed et al., 2020). On the other hand, Piketty (2014) states that the basic forces in a capitalist economy tend to increase inequality, unless unexpected disasters such as

wars occur.

Figure 1 presents the share of inequality between countries and the share of inequality within countries estimated with the Theil index by Chancel and Piketty (2021). The index is estimated for the period of two centuries (1820-2020) and shows the shift in importance in different sub-periods between the two components of global inequality. At the end of the period, between country inequality is about 30% of total inequality due to the rapid growth of emerging economies like China and India. This growth has led to a smaller development gap, but has also widened the urban-rural divide within those countries, leading to increasing levels of within country inequality (Bhandari et al., 2006)

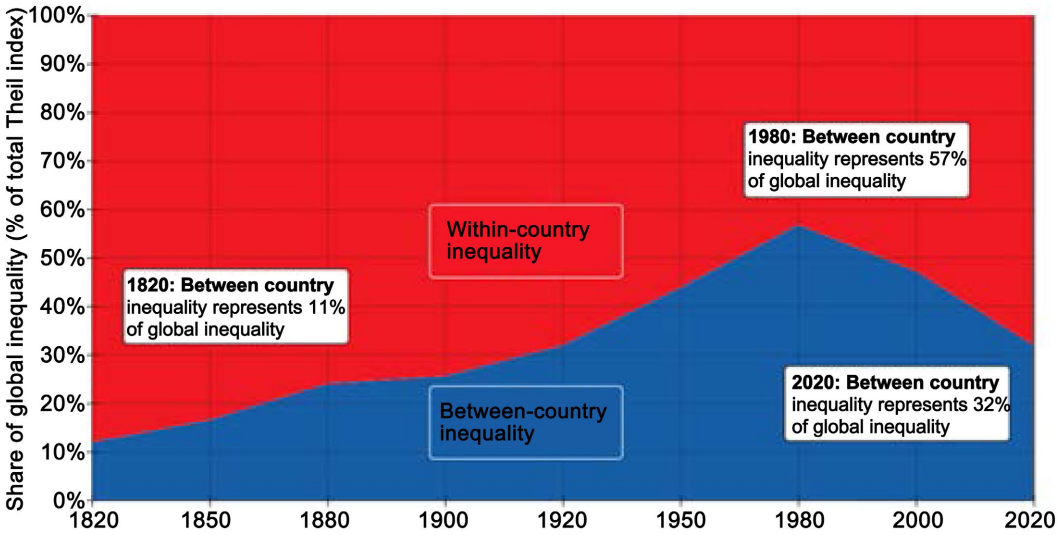



**Figure 1.** Global income inequality composition, 1820-2020 (Chancel et al., 2022).

## 2.2. Global Inequalities between Countries

Inequality has varied across countries over the years. In the early 20th century, most of the inequality observed was attributed to within countries inequality (about 70%), whereas in the early 21st century within countries inequality was about 50% and rose again to 68% in 2020 (Milanovic, 2011; Chancel & Piketty, 2021; Chancel et al., 2022). Therefore inequality between countries is decreasing (Bosmans et al., 2014), due to the strong economic growth in China and other emerging economies (Kanbur, 2019). However, the gap between countries remains remarkable, as for instance, the average income of people in North America is 16 times higher than that of people in Sub-Saharan Africa (United Nations, 2020).

The economic growth of China and a few other countries has moved people out of poverty and towards the middle class, but in reality this only affects a small number of countries with a large population, thus inequalities still continue to exist to a large extent (Fleurbaey & Klasen, 2016). At the same time the increasing number of countries that have been added to the world since 1950, has affected the between countries inequality as well (Milanovic, 2022).

Distinguishing between these two types of income inequality is essential as different drivers are involved and different policies are needed to address them. However, differences in economic growth are highly related to between country inequality and imply that poorer regions or countries would need to grow at a faster rate than the richer ones (Klasen, 2016). Inequality between countries is still very high in absolute terms and reducing average income disparities between countries is equally important (Chancel et al., 2022). The majority of projections predict that between countries inequality will continue to decrease, but they do not take into account climate change, which could reverse the situation (Taconet et al., 2020). For instance the pandemic caused the largest rise in income inequality between countries over the past three decades (United Nations, 2023b), indicating that unexpected shocks may affect the actual evolution of between countries inequality.

In this section, inequality between countries is analysed with the use of World Bank (WB) data, using diagrammatic analysis in order to explore the main trends and patterns of change at the global level and across geographical regions and income groups. Data for 159 countries have been used representing 96.9% of the global population and comprising of all income categories as follows: 53 (33.3%) high income, 42 (26.4%) upper middle-income, 42 (26.4%) lower middle-income and 22 (13.9%) low income countries. Also all geographic areas are represented as well, 18 countries from East Asia (11.3%), 45 from Europe & Central Asia (28.3%), 25 from Latin America (15.7%), 18 from Middle East & North Africa (11.3%), 2 from North America (1.3%), 7 from South Asia (4.4%) and 44 from Sub-Saharan Africa (27.7%). Both these classifications come from the World Bank[1] and are calculated using the WB Atlas method.

Using the above data, **Figure 2** and **Figure 3**[2] present the evolution of the Coefficient of Variation (CV), the weighted Coefficient of Variation (CVw), the top10/bottom10 and top10/bottom50 ratios for every 5 years from 1990 to 2022 using WB data. At the global level, inequalities measured by the CV and the CVw tend to slowly decrease[3], but stabilize in the 2015-22 period. The top10/bottom10 ratio is following some fluctuations, increasing, decreasing and then increasing again in the 2015-22 period, ending up with a higher figure in 2022 compared to 1990. The top10/bottom50 ratio is slowly decreasing but it stabilizes in the latest period. The figures at the global level are shocking, whereas the top10/bottom10 figure for 2022 indicates that the 17 more advanced countries have an average income per capita that is 109 times higher than the per capita income of the 17 poorer countries in the world and 26 times higher than the poorer 50% of the planet.

[1] https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups#:~:text=For%20the%20current%202024%20fiscal,those%20with%20a%20GNI%20pe.

[2]The countries are classified in the relevant income category for the year 2022, according to the latest classification from the World Bank, 2024.

[3]The Weighted Coefficient of Variation is lower, because a number of countries with large populations, like China, India, Brazil, Indonesia, etc., have modest levels of development, while many advanced countries have relatively small population size.

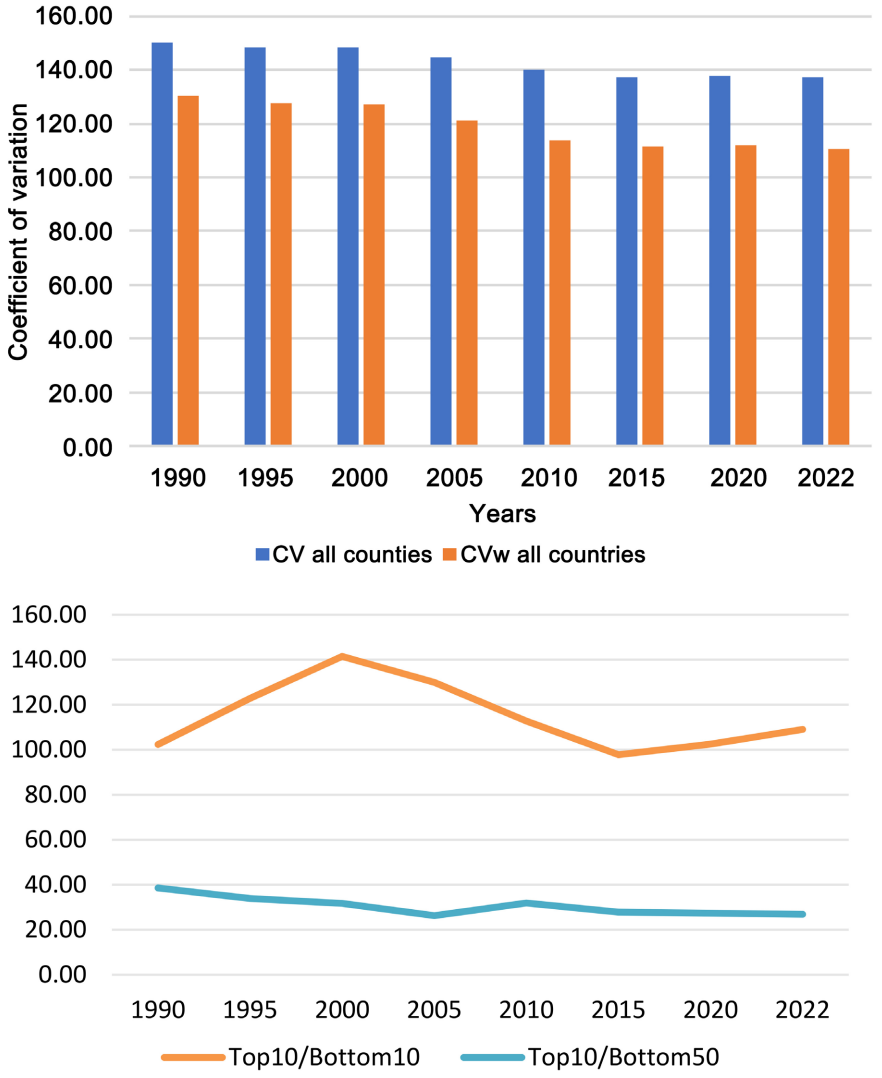



**Figure 2.** Between countries levels of inequality at the global level, 1990-2022.

The geographical regions with the higher between countries income inequalities in 2022 are the Middle East and North Africa and South Asia. All areas experience declining figures of the CVw, with the exception of North America, which, however has the lowest level of inequalities. Inequalities between countries in 2022 are higher in the low-middle income group and lower in the low income group. During the first two decades the low income group had the second highest level of inequalities. All income groups have experienced a decline of between countries inequality, with the exception of the high income group that has about the same level of between countries inequality in the entire period.

Overall, inequalities between countries are extremely high and are an important contributor to global income inequality. Inequalities have overall declined during the last three decades (the CVw dropped from 130.5 to 110), as a number of lower-middle and low income countries have improved their growth performance significantly. However, the gap between the advanced Global North and the Global

South is enormous and triggers massive migration movements and instability in both the origin and destination countries (Crawley et al., 2022).

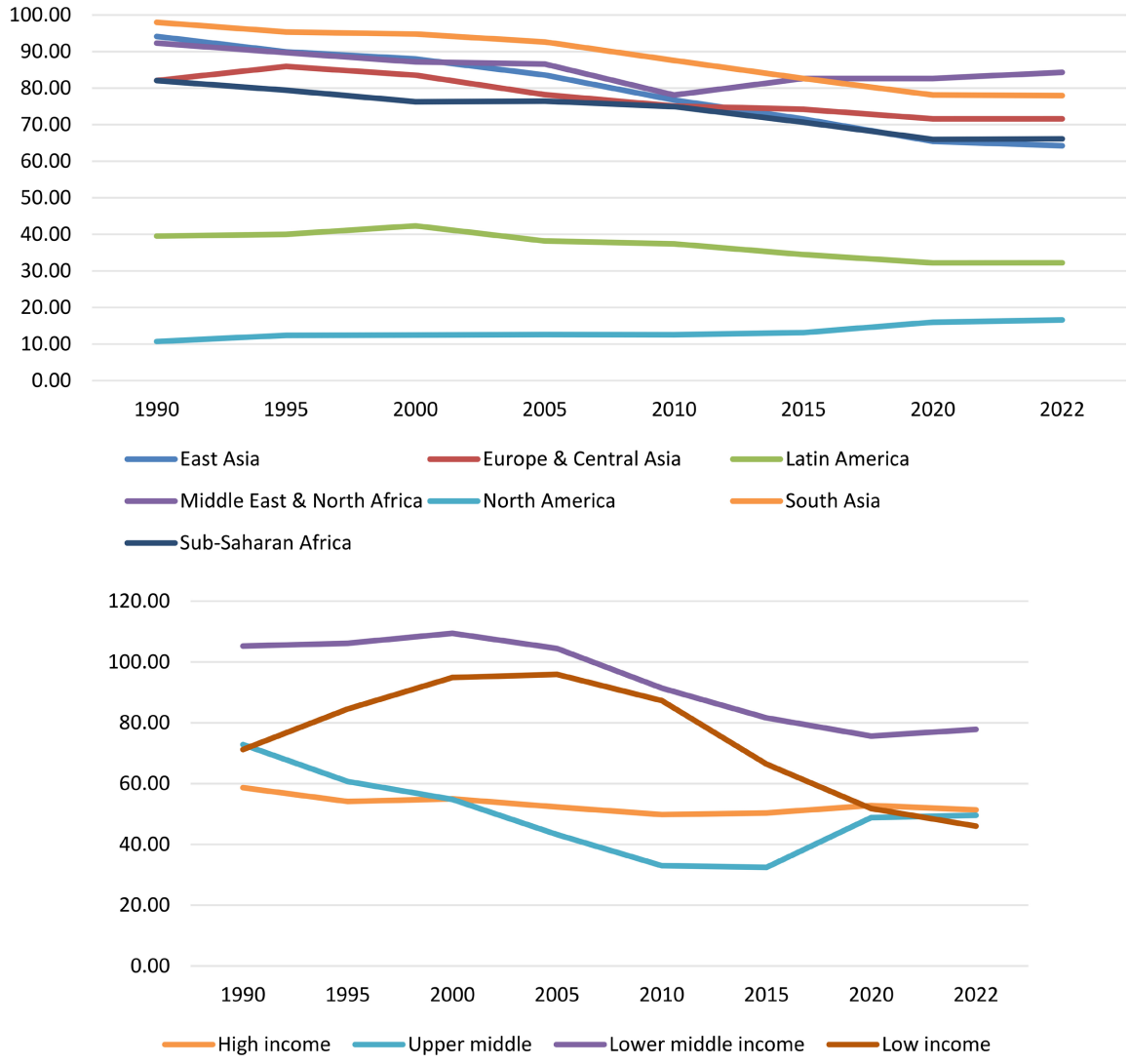



**Figure 3.** Inequalities between countries by geographical regions and income groups, 1990-2022.

The existing pace of declining inequalities at the global scale may require half a century, or even more before they reach the level of inequality of the more homogeneous advanced income group (CVw equal to 60), which is still high, but tolerable. Even if existing trends will continue, which is not a sure bet given the fluctuation of the top10/bottom10 index, the challenging question is, if the global economy with the existing demographic and geopolitical balances has the luxury to wait for another 50 or more years with these or similar levels of inequality.

## 2.3. Global Income Inequality within Countries

Within countries inequality still holds a prominent position, as 71% of the population lives in countries where inequality has increased (United Nations, 2023b).

OECD (2022) reports that between 2005 and 2012 a great increase in within country inequality was noticed, but since then, inequality has remained fairly constant. Other studies suggest that around 60% of the developing countries are experiencing an increase in within-country inequality (Bourguignon, 2021), which tends to increase partly due to the fact that the declining incomes of India were not offset by the rising incomes in China (Deaton, 2021).

The main factors that appear to have a negative impact on within-country income inequality include the share of industry in GDP, access to electricity, low investment costs, trade globalisation, financial globalisation, higher age dependency ratio, higher mortality rate, while unemployment seems to have a positive effect (Osakwe & Solleder, 2023). Especially regarding financial development, some evidence indicates that it contributes to economic development and benefits the poor (Abbas et al., 2022), while other studies show that financial development, financial liberalisation and banking crises lead to higher income inequality (de Haan & Sturm, 2017). A meta-analysis conducted by Heimberger (2020) shows that financial globalisation increases inequality in both developed and developing countries. In terms of globalization, the Stolper-Samuelson mechanism predicts that global integration increases income inequality within developed countries and decreases inequality within developing countries (Dorn et al., 2017; Tica et al., 2021).

Using data from the World Inequality Database (WID)[4], the WB and the UN the evolution and current status of global income inequalities worldwide is mapped, taking into consideration the major crises that have affected the global landscape. In this analysis 175 countries are examined, for years 1980-2022, which represent 99.4% of the global population and are comprised of all income categories as follows: 55 (32%) high income, 45 (25.7%) upper middle-income, 49 (28%) lower middle-income and 25 (14%) low income countries. With regards to their location, 22 countries from East Asia (12.6%), 50 from Europe and Central Asia (28.6%), 26 from Latin America and Caribbean (14.9%), 20 from Middle East and North Africa (11.4%), 2 from North America (1.1%), 8 from South Asia (4.6%) and 47 from Sub-Saharan Africa (26.8%) are included. **Figure 4** presents the income shares of the top 1%, top 10% and bottom 50% for 2022 at the global, income and regional level.

It can be noticed that in all income groups in 2022 the top 10% of population holds almost 50% of the total income, apart from the high income group, where the top10% holds almost 40%. On the other hand, the share of income of the bottom 50% of the population, is about 14%, with Upper middle income countries having the lowest figure (12%) and high income countries having the highest (17%). In terms of geographic regions the top 10% of the population with the highest income share is located in Latin America & Caribbean, Sub-Saharan Africa and the MiddleEast and North Africa regions. On the other hand the bottom 50% of the population with the lowest income share are in Latin America & Car-

[4]https://wid.world/data/.

ibbean, while those with the highest income share are in Europe & Central Asia. Table A1 and Table A2 in the **Appendix** provide the relevant figures for each income or regional group.

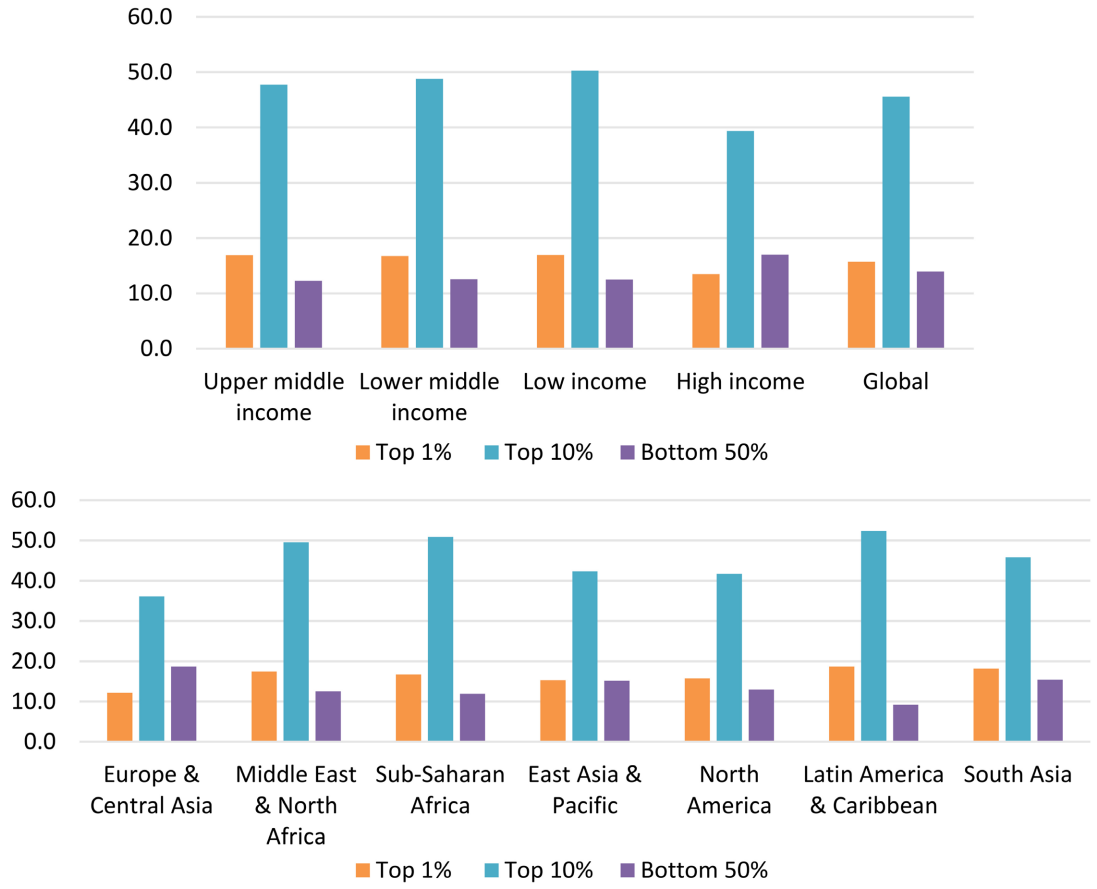



**Figure 4.** Income shares of different income and geographic groups worldwide, 2022 (Data from WID).

Figure 5 presents the evolution of top and bottom shares at a global level for a period of 43 years. The share of the top 1% and top 10% income groups rose until 2006, but dropped after that period and has been declining ever since. The diagram tends to suggest that in periods of high GDP growth, the income share of top 1% and top 10% increased[5], whereas in times of recession the bottom 50% share increased slightly. In any case, the income shares of the top1 or top10 income groups are moving in the opposite direction than that of the bottom50. In doing so, we acknowledge that with development, structural adjustments tend to favor capital and high-skill clusters at the direct expense of the lower-income majority part of the population.

[5]By adopting a linear functional form, the analysis aligns with the standard methodology of modern inequality research, such as Alvaredo et al. (2018) who highlight that for cross-country comparisons, linear trends are the most robust method to filter out "noise" from short-term business cycles as well as research by Piketty et al. (2018) who use linear regressions to describe the "mirrored" relationship between the rising Top 1% and the falling Bottom 50%, providing a benchmark for using linear slopes to quantify the average annual rate of divergence.

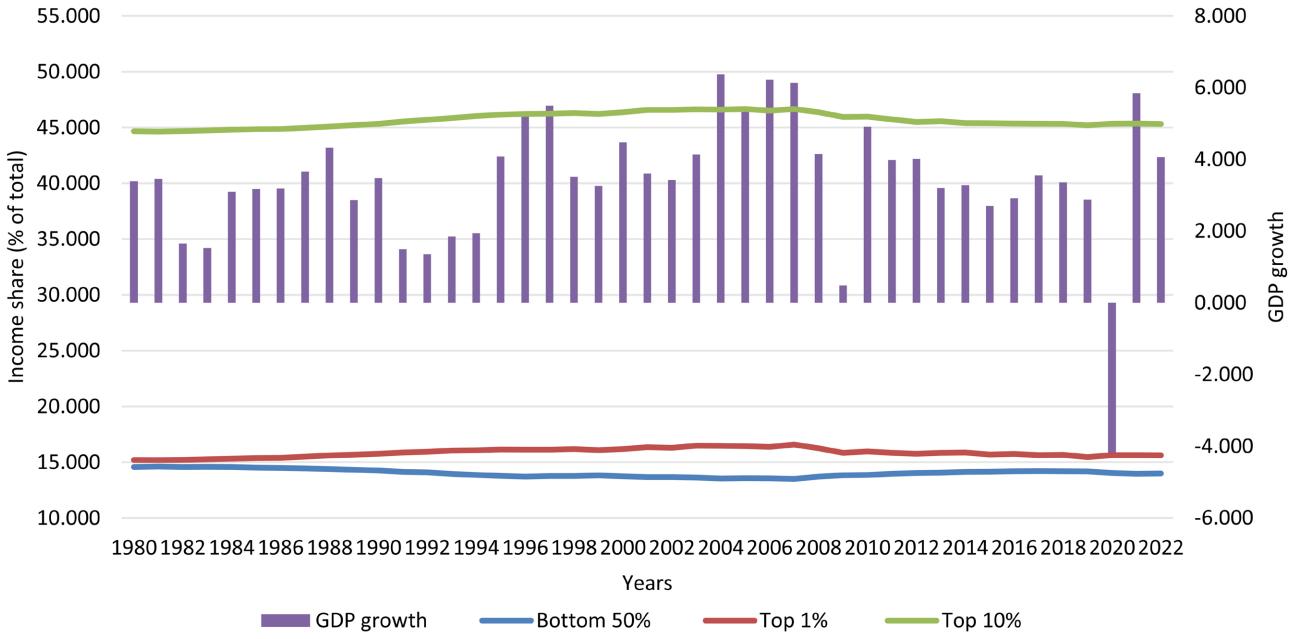



**Figure 5.** Evolution of GDP growth, top 1%, top 10% and bottom 50% income share worldwide, 1980-2022.

As already mentioned Gini is the most widely used inequality indicator. **Figure 6** presents the evolution of Gini worldwide (green line) from 1980 until 2022 for the same WID data as previously presented. Gini has fluctuated throughout these years, with a high peak in 2005, a decline after that and an increase again from 2015. The biggest contributors to that increase are shown to be upper middle- and high-income countries in terms of income category; East Asia and Pacific, Europe and Central Asia, North America (especially this region) and South Asia are the main contributors in terms of regions. The highest Gini values in 2022 are noticed in low income and Latin America and Caribbean countries, while the lowest values are located in high income and Europe and Central Asia. **Table A3** in the **Appendix** presents the relevant data.

To further investigate within country income inequalities, the Rich-to-Poor Ratio (RTP) is constructed which is a new indicator representing the ratio of the relative share of income per capita allocated to the top and bottom groups and is more suitable to measure extreme inequality. **Figure 7** presents the RTP ratio estimated for the top richest 1% of the population over the bottom poorest 50% of the population (top1%/bottom50%), as well as for the top richest 10% of the population over the bottom poorest 50% of the population (top10%/bottom50%).

$$RTP_{1/50} = [\text{per capita income of the top 1\% group}]/[\text{per capita income of the bottom 50\% group}] \quad (1)$$

$$RTP_{10/50} = [\text{per capita income of the top 10\% group}]/[\text{per capita income of the bottom 50\% group}] \quad (2)$$

It can be noticed that $RTP_{1/50}$ has only slightly fluctuated and its value in 2022 is almost the same as in 1990. Its lowest value was noticed in 2019 and its highest

in 1991. On the other hand $RTP_{10/50}$ has dropped about 12 points from 1980 to 2022 reaching its lowest value in 2017 and highest in 1991 as well.

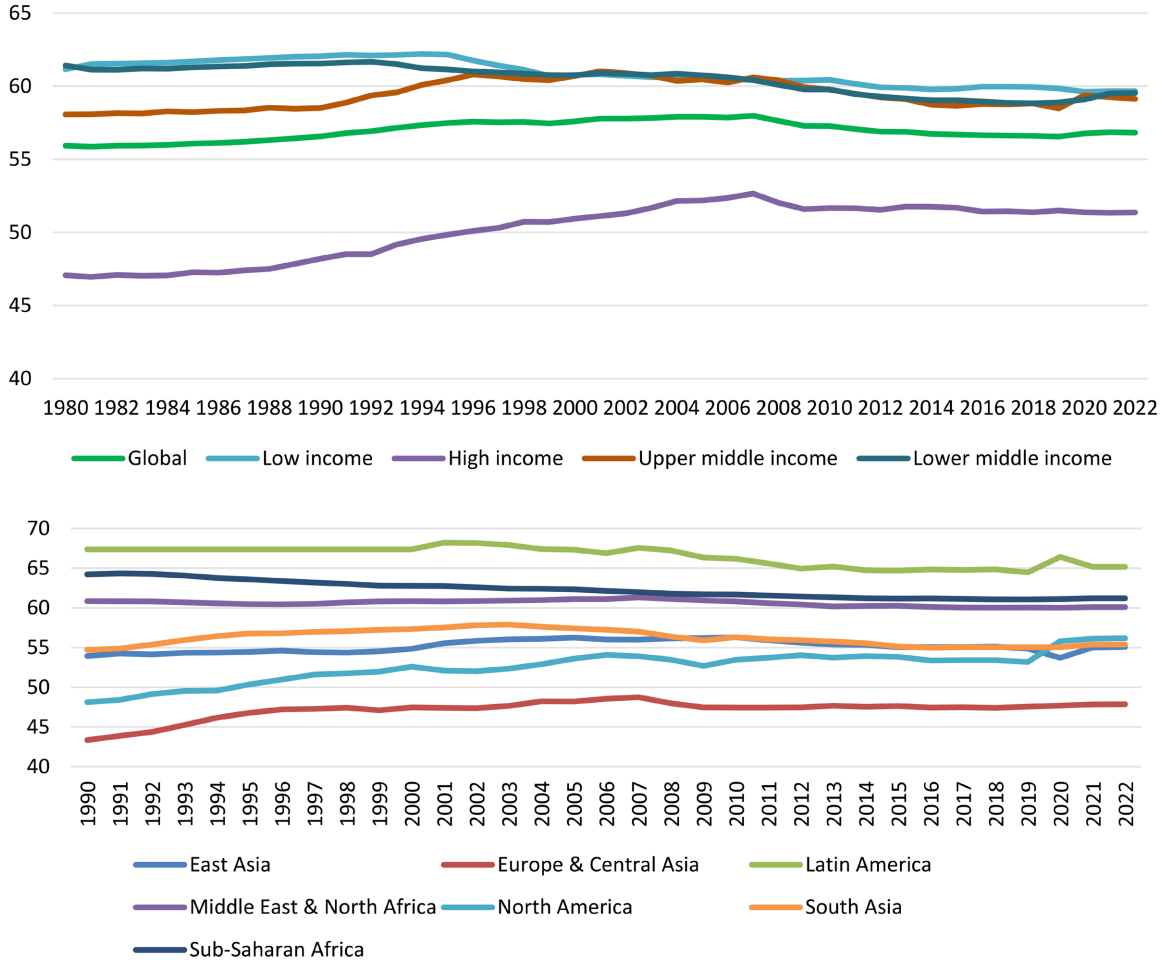



**Figure 6.** Evolution of Gini according to income and geographic categories, 1980-2022.

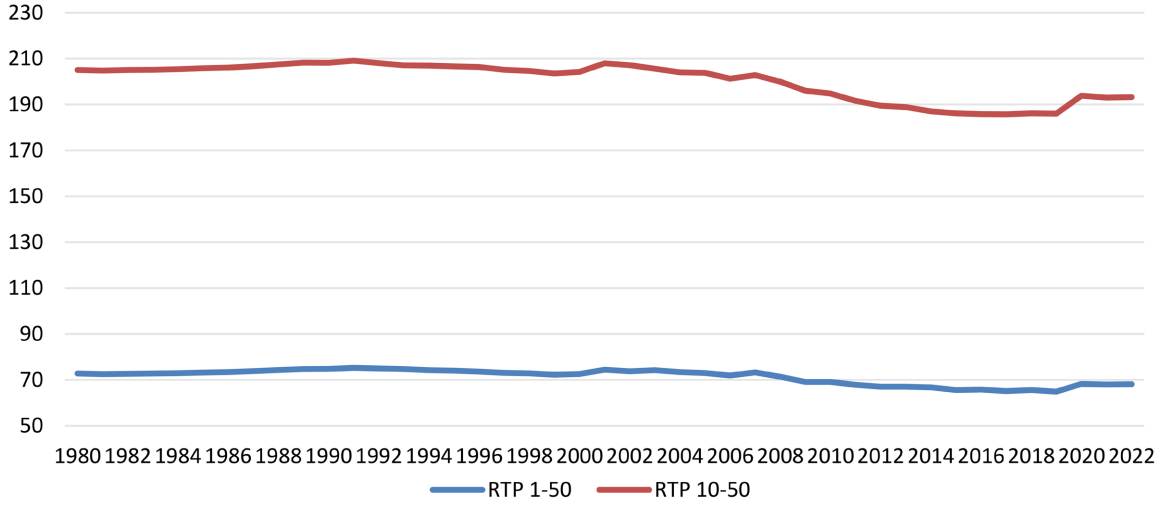



**Figure 7.** Evolution of $RTP_{1/50}$ and $RTP_{10/50}$, 1980-2022.

Table 1 summarises the $RTP_{1/50}$[6] ratio. The RTP ratio specifically focuses on the "super-rich" thus better capturing the drivers of wealth inequality rather than just income disparity; at the same time it focuses on the bottom 50% of the population, providing a clearer metric for social cohesion. In those regards it is superior to similar indices such as the Palma ratio, as it constitutes a precise measurement of how the gains from growth are exploited by the few at the top at the expense of the many (bottom 50%). A value of RTP equal to 72.8 in 1980 at the global level indicates that the average household in the top1% income group has an income that is 72 times the average household income of the bottom50% of the population.

The figures show that RTP has increased globally since 1980, reaching its peak in 1990. After that it declined for more than a decade, increasing again during the last years. The highest RTP values in 2022 are noticed in Upper middle income and South Asi (highlighted in red), while the lowest values are located in low income countries and North America.

**Table 1.** Rich to poor ratio globally ($RTP_{1/50}$), 1980-2022.

| | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|
| World | 72.8 | 73.2 | 74.8 | 74.0 | 72.6 | 73.0 | 69.1 | 65.6 | 68.3 | 68.1 |
| Income categories | | | | | | | | | | |
| Low income | 65.7 | 66.2 | 68.1 | 65.8 | 67.1 | 70.0 | 68.0 | 60.8 | 64.1 | 59.7 |
| High income | 76.0 | 76.5 | 78.9 | 83.3 | 80.2 | 76.3 | 70.1 | 64.9 | 70.5 | 71.1 |
| Upper middle income | 75.4 | 75.5 | 74.4 | 69.4 | 70.3 | 72.8 | 70.9 | 69.7 | 70.5 | 71.2 |
| Lower middle income | 70.3 | 70.9 | 73.8 | 71.7 | 68.8 | 70.9 | 67.0 | 65.2 | 65.7 | 66.3 |
| Geographic area categories | | | | | | | | | | |
| Europe & Central Asia | 78.3 | 79.2 | 80.6 | 82.4 | 79.5 | 78.3 | 73.0 | 66.2 | 71.5 | 70.4 |
| Middle East & North Africa | 73.4 | 73.8 | 78.7 | 77.6 | 75.0 | 75.9 | 71.3 | 71.0 | 68.3 | 77.4 |
| Sub-Saharan Africa | 72.7 | 72.8 | 71.9 | 67.6 | 68.4 | 71.1 | 69.2 | 68.1 | 69.0 | 69.5 |
| East Asia & Pacific | 65.3 | 65.7 | 69.5 | 74.5 | 72.8 | 68.1 | 63.5 | 60.9 | 65.0 | 64.6 |
| North America | 15.5 | 16.0 | 12.5 | 20.7 | 25.3 | 25.0 | 25.3 | 22.5 | 18.2 | 26.9 |
| Latin America & Caribbean | 63.6 | 65.6 | 67.9 | 62.7 | 60.1 | 63.1 | 60.5 | 56.1 | 55.7 | 54.5 |
| South Asia | 98.0 | 98.0 | 98.6 | 100.0 | 100.1 | 103.2 | 94.8 | 89.5 | 106.5 | 86.1 |

Source: Own estimates from World Inequality Database (WID).

As previously mentioned, the Gini coefficient is the most commonly used indicator for inequality which comes with its strengths and weaknesses. By utilising the same data from WID for the period of 1980-2022, the evolution of inequalities worldwide alongside the relevant GDP growth are examined. Figure 8 presents the overall picture at a global level evaluating the evolution of RTP and Gini to

[6]Hereafter, focus will be on the $RTP_{1/50}$ ratio to better capture extreme income inequality. This ratio will be reffered to for simplicity as RTP.

GDP growth. RTP decreased dramatically since the 2008 financial crisis and on the rise again since 2020. Gini has remained fairly stable throughout this period, potentially due to its sensitivity to changes in the income of the middle class, whereas RTP captures the upper and lower tails.

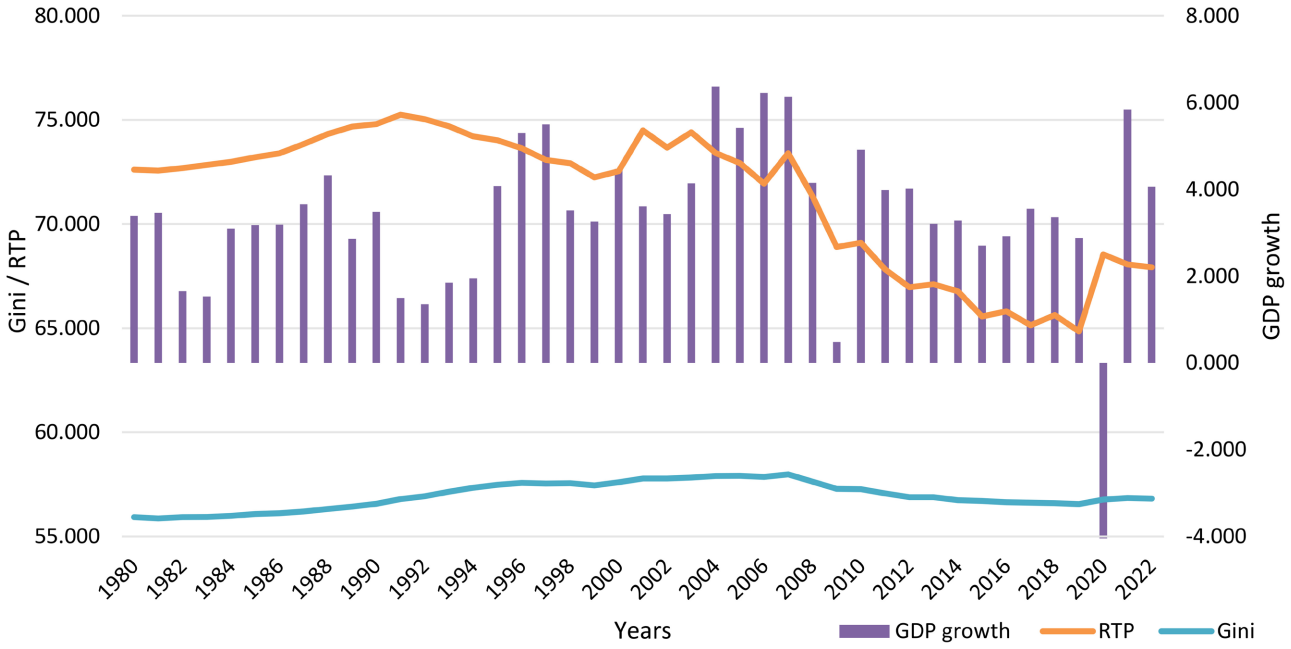



**Figure 8.** Evolution of GDP growth, Gini and RTP, 1980-2022.

Figures A1-A11 in the **Appendix** depict the same variables in the regional and income level. What can easily be noticed is that the RTP index is higher in Upper Middle income countries, followed by lower middle income ones. In terms of regions, Latin America, Sub-Saharan Africa and the Middle East and North Africa seem to be the most unequal ones. In high income countries RTP increased dramatically until 2008, whereas Gini also increased overall but with smaller fluctuations. On the other hand, RTP is at higher levels overall in Upper middle income countries, showing an increase until the early 2000s and a decrease after that with a high peak in 2019 and decreasing after 2020; Gini has remained fairly stable throughout this period. In Lower middle income countries again Gini is stable overall, whereas RTP decreases by about 20 points and showing a slight increase since 2020. Finally in low income countries RTP decreases by about 20 points as well and does not show a trend to increase in recent years. As Gini does not seem to fluctuate much, due to its construction limitations, it comes forward that RTP is a better indicator of inequality as it better captures the upper and lower quantiles.

Accordingly regional differences are also noticed especially in the evolution of RTP and its level. Countries in Latin America and Caribbean and Sub-Saharan Africa have the highest RTP globally. In all cases the COVID-19 pandemic led to a decrease in RTP, but since 2021 RTP has been increasing again. The most no-

ticeable change in RTP can be noticed in Europe & Central Asia and North America, especially in the latter whereas RTP increased very sharply. On the contrary RTP decreased by about 25 points in Sub-Saharan African countries. Gini has remained more or less the same with marginal fluctuations during this 43-year period.

## 3. Methodology

One critical question is to what extent the different types of inequality are related to each other and in which direction. Assuming that a reduction in global inequalities between countries is associated with better growth performance in the lower end of the global distribution or a slower growth in the upper end of the distribution, how does that affect inequalities within countries and between people?

If we follow Piketty (2014) and others, income inequality is an ingredient of capitalist development and as a result, higher income levels are typically allocated more unequally between the rich and the poor. In order to examine the relation of within- to between countries inequalities at the global level, we assume that the share of income of the top 1% richest population group is a positive function of income and the share of the poorest 50% a negative function:

$$\text{Top01}_{nt} = \lambda_0 + \lambda_1 Y_{nt} \quad \lambda_0 > 0\,,\ \ \lambda_1 > 0\,,\ \ n = 1,\cdots,N \ \text{ global regions}$$

$$\text{Low50}_{nt} = \mu_0 + \mu_1 Y_{nt} \quad \mu_0 > 0\,,\ \ \mu_1 < 0\,,\ \ n = 1,\cdots,N \ \text{ global regions}$$

The first relation indicates that the income of the top 1% in each country is a certain constant share and also a positive function of national income. The second relation indicates that the low 50% in each country is a certain constant share and also a negative function of national income. This is based on the evidence provided above, as well as in Petrakos et al. (2024) that inequalities increase with growth and if the $\text{Top01}_n$ share is summed over all countries, then

$$\text{Top01} = \sum_{r=1}^{N}\left(\text{Top01}_r\right) = \lambda_0 N + \lambda_1 \sum_{r=1}^{N} Y_N$$

$$\text{Top01}N = \lambda_0 N + \lambda_1 \sum_{r=1}^{N} Y_n + \lambda_1 NY - \lambda_1 NY$$

$$\text{Top01}N = \lambda_0 N + \lambda_1 \sum_{r=1}^{N}\left(Y_n - Y\right) + \lambda_1 NY$$

$$\text{Top01} = \lambda_0 + \lambda_1 \sum_{r=1}^{N}\left(Y_n - Y\right)/N + \lambda_1 Y$$

$$\text{Top01} = \lambda_0 + \lambda_1 \text{CV}^2 + \lambda_1 Y \tag{3}$$

In a similar way:

$$\text{Low50} = \mu_0 + \mu_1 \text{CV}^2 + \mu_1 Y \tag{4}$$

Given that:

$$\text{RTP} = \text{Top01}/\text{Low50} \tag{5}$$

From (3), (4) and (5):

$$\text{RTP} = \left(\lambda_0 + \lambda_1 \text{CV}^2 + \lambda_1 Y\right)/\left(\mu_0 + \mu_1 \text{CV}^2 + \mu_1 Y\right)$$

The first derivative of RTP with respect to CV is:

$$\theta\mathrm{RTP}/\theta\mathrm{CV} = \frac{2\lambda_1\mathrm{CV}\left(\mu_0+\mu_1\mathrm{CV}^2+\mu_1 Y\right)-2\mu_1\mathrm{CV}\left(\lambda_0+\lambda_1\mathrm{CV}^2+\lambda_1 Y\right)}{\left(\mu_0+\mu_1\mathrm{CV}^2+\mu_1 Y\right)^2}$$

$$\theta\mathrm{RTP}/\theta\mathrm{CV} = \mathrm{CV}\left[2\lambda_1\left(\mathrm{Low50}\right)-2\mu_1\left(\mathrm{Top01}\right)\right]\Big/\left(\mu_0+\mu_1\mathrm{CV}^2+\mu_1 Y\right)^2 \quad (6)$$

which is positive, since the coefficient $\mu_1$ is negative by definition ( $\mu_1 < 0$ ).

The results of this analysis indicate that within global regions extreme income inequality is positively related to income inequality between countries in these regions. Rescaling the analysis, inequality between income groups at the national level is positively related to inequality between the regions of each country.

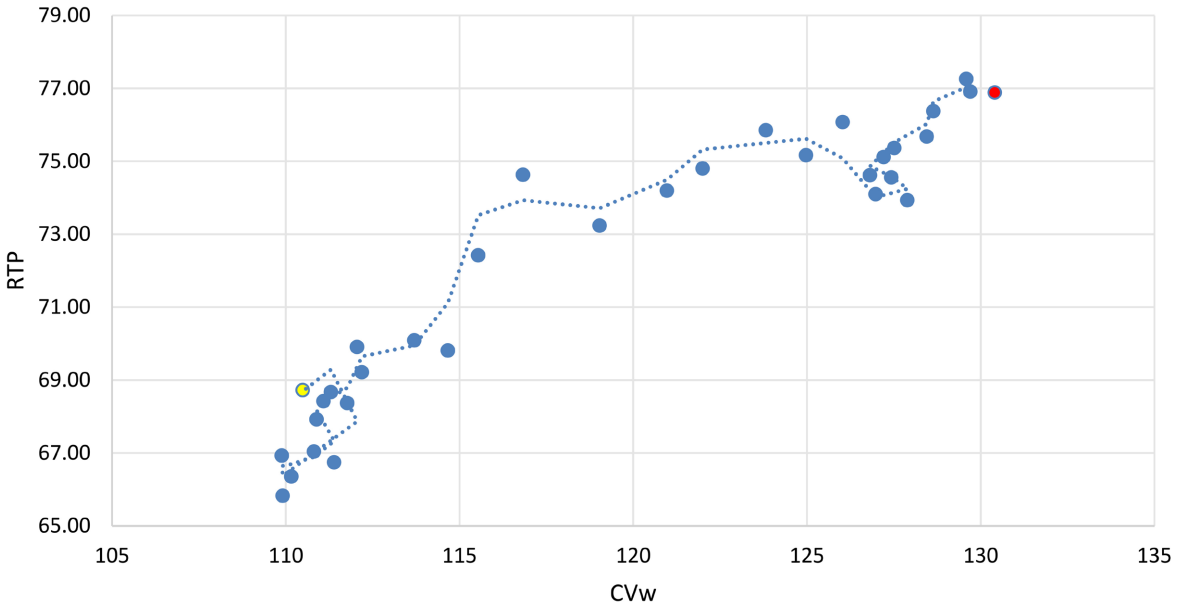



**Figure 9.** Relationship between RTP and CVw at the global level, 1990-2022 (with red year 1990 is marked, with yellow 2022).

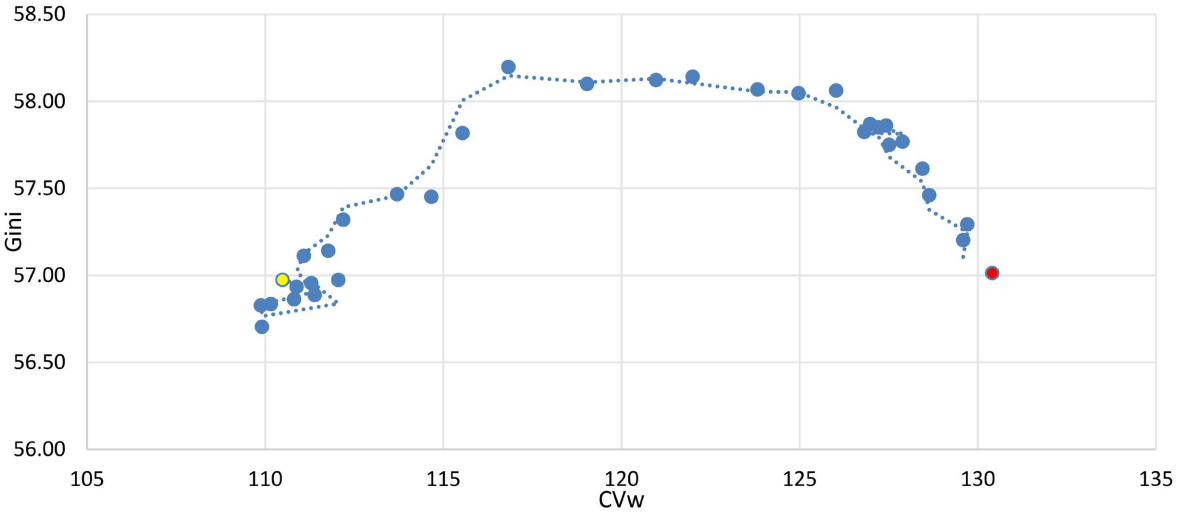



**Figure 10.** Relation between Gini and CVw at the global level, 1990-2022 (with red year 1990 is marked, with yellow 2022).

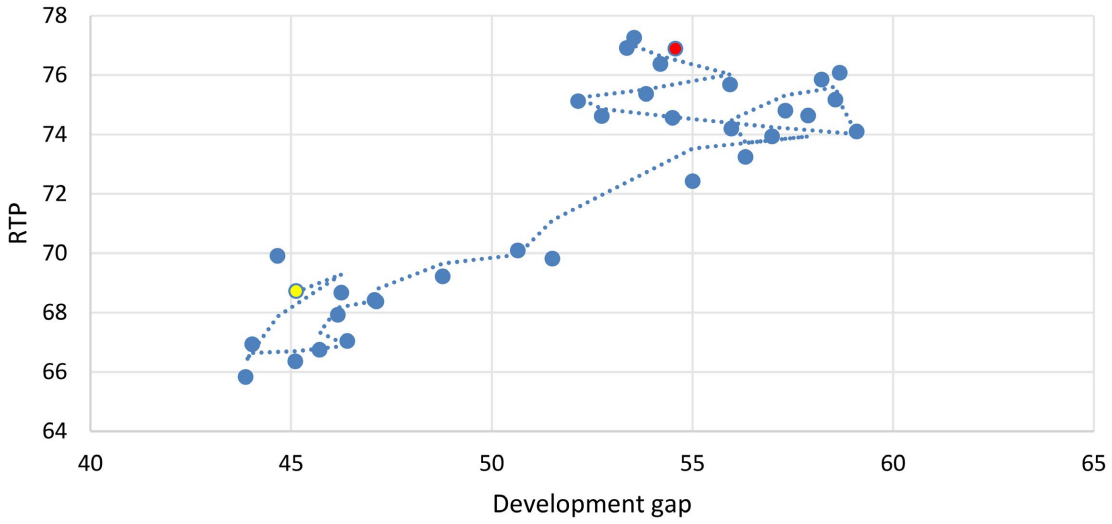



**Figure 11.** Relationship between RTP and development gap at the global level, 1990-2022 (with red year 1990 is marked, with yellow 2022).

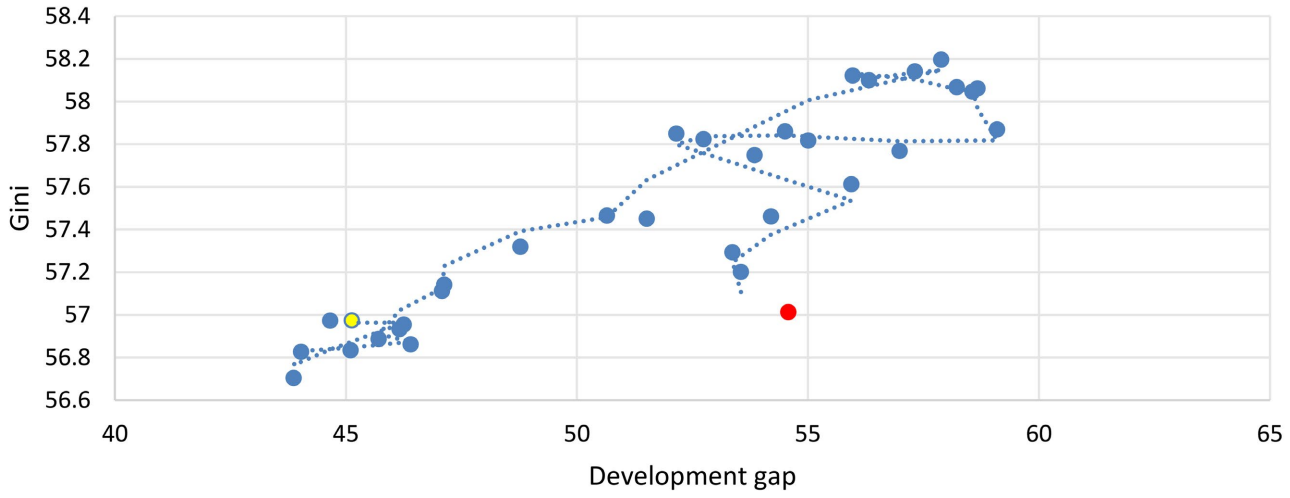



**Figure 12.** Relationship between Gini and development gap at the global level, 1990-2022 (with red year 1990 is marked, with yellow 2022).

The relation between inequality among income groups and inequality among countries is examined in the following Figures (Figures 9-12). Inequality among income groups is measured with the RTP and Gini coefficients as the weighted global average of national indices. Inequality between countries is measured as the weighted Coefficient of Variation and the Development Gap (from the top income country at the global level, Switzerland was used as the top income country), which is the relative distance between the GDP per capita between each country from the most developed one. All indices are measured at the global level for the period 1990-2022.

Although changes in CVw are more significant than changes in RTP and Gini, the relationship appears to be monotonic and positive. An increase (decline) of inequality across income groups is associated also with an increase (decline) in

inequalities among countries. This is an indication that the two aspects of the phenomenon are related to each other and require a holistic policy approach.

The preceding analysis highlighted the multifaceted nature of global inequalities and the fact that between and within countries inequalities are interconnected. A simple econometric model has been developed which aims to establish the strength and direction of this relationship. The basic model to be estimated is as follows:

$$\begin{aligned}&\text{Within regions income inequalities}_{i,t}\\&= a + \beta_1 \text{Between regions inequalities}_{i,t} + \beta_2 \text{Development gap}_{i,t}\\&\quad + \beta_3 \text{Development gap square}_{i,t} + e_{i,t}\text{RTP}_{i,t}\\&= a + \beta_1 \text{CVw}_{i,t} + \beta_2 \text{YGAP}_{i,t} + \beta_3 \text{YGAP}_{i,t}^2 + e_{i,t}\end{aligned}$$

where:

$i = 1, \cdots, N$ The number of the regions

$t = 1, \cdots, N$ Number of years

Within regions inequalities = Gini and RTP

Between countries inequalities = CVw and Development gap[7]

In this model and in order to establish the above stated relationship, countries were examined according to their geographic location, therefore in total 7 regions are examined for the period 1990-2022. Initial diagnostic tests were performed in order to assess stationarity of the variables. Levin et al. (2002) and Im et al. (2003) unit root tests show that all variables are stationary, rejecting the unit root assumption, because the calculated probabilities are less than 0.05 (**Table 2**).

**Table 2.** Levin-Lin-Chu unit-root test.

| Variable | Statistic | Probability |
|---|---|---|
| **RTP** | −6.56 | 0.000 |
| **CVw** | −0.08 | 0.009 |
| **Gini** | −5.53 | 0.000 |
| **Dev Gap** | −4.74 | 0.0016 |

The application of the models was preceded by tests for heteroskedasticity and autocorrelation in order to select the most appropriate form. The Generalised Least Square (GLS) estimator was preferred which allows estimation in the presence of autocorrelation within panels and cross-sectional correlation and heteroskedasticity across panels (Greene, 2018). The GLS estimator is unbiased, consistent, efficient, and asymptotically normal (Greene, 2018).

## 4. Research Results

**Table 3** presents the results of the econometric analysis. The analysis was performed with Driscoll and Kraay standard errors both with fixed and random ef-

[7]Development gap has been calculated as the distance of each region from the top country in terms of their GDP growth.

fects and the results obtained are identical in terms of the signs and significance.

**Table 3.** The impact of the between-countries inequalities on within-countries inequality: panel FE model, period 1990-2022.

| VARIABLES | (1) RTP | (2) RTP | (3) RTP | (4) RTP | (5) GINI | (6) GINI | (7) GINI | (8) GINI |
|---|---|---|---|---|---|---|---|---|
| CVw | 47.09*** | | 20.49 | 76.05*** | 3.97* | | 4.36 | 13.49*** |
| | (0.000) | | (0.161) | (0.000) | (0.095) | | (0.108) | (0.000) |
| GAP | | 0.29*** | 0.19*** | −0.94*** | | 0.018 | −0.03 | −0.19*** |
| | | (0.000) | (0.000) | (0.000) | | (0.218) | (0.854) | (0.000) |
| GAP SQ | | | | 0.006*** | | | | 0.001*** |
| | | | | (0.000) | | | | (0.000) |
| Constant | 39.26*** | 59.13*** | 49.38*** | 39.14*** | 54.62*** | 56.55*** | 54.48*** | 52.79*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Observations | 231 | 231 | 231 | 231 | 231 | 231 | 231 | 231 |
| Number of groups | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| R SQ | 0.15 | 0.16 | 0.17 | 0.28 | 0.03 | 0.02 | 0.03 | 0.13 |
| Region FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Time FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Threshold GAP | | | | 75.3 | | | | 95 |

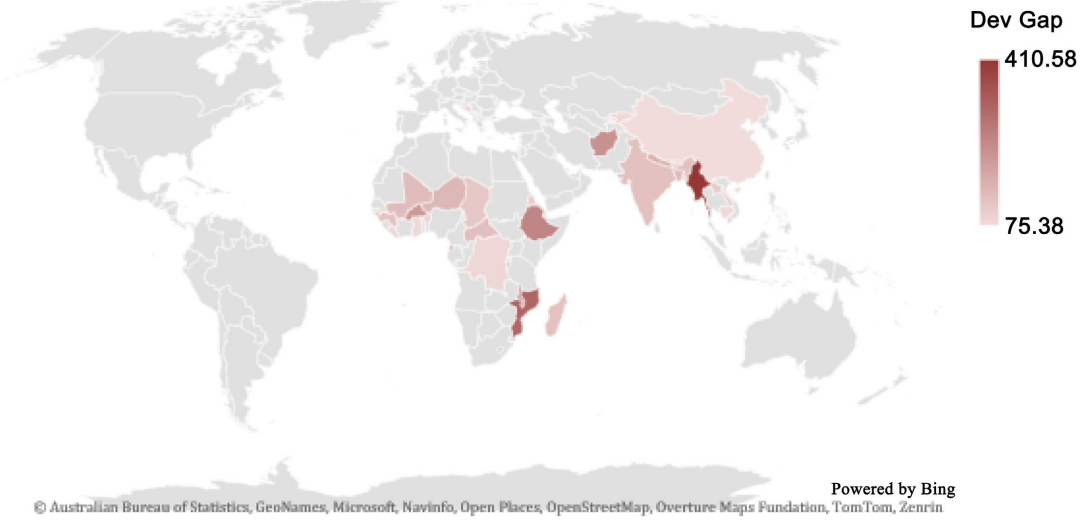
*p*-values in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

As it can be noticed a positive and significant impact of CVw on both RTP and Gini is verified in the simple models (1) and (5), as well as the more fully developed ones (4) and (8), indicating that higher inequalities between global regions in terms of GDP per capita level tend to increase internal income inequalities within global regions. This is an important finding suggesting that the different levels and dimensions of inequality are related and that the external gaps or asymmetries affect the allocation of income between social groups in each region[8].

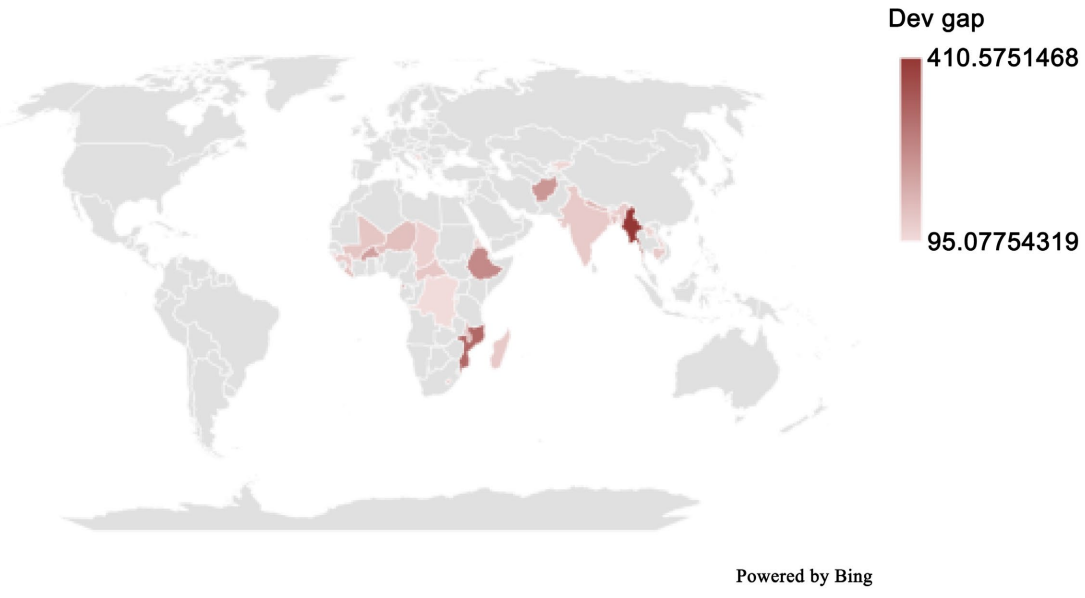
At the same time, the development gap (the distance of each global region from the most advanced country) appears with a positive impact on extreme inequality (RTP) in models (2) and (3), but a U-shaped impact in model (4). The latter indicates that as the distance from the top performing countries increases, income inequality within regions initially may decline, but increases again after a threshold GAP value equal to 75.3 in the case of RTP (13.8% of observations and 17.7% of the countries are above that level) and 95 in the case of Gini (11.15% of observations and 14.3% of the countries) are above that level. In both cases the countries that are above these thresholds are located in South Asia and Sub-Saharan Africa.

[8]The analysis can go one level down and examine at the national level the impact of spatial inequalities on income distributions. A poor allocation of resources at the regional level does not only increase regional inequalities, but it also increases income and social inequalities at the national level, as the weakest groups in the declining regions are those that are exposed and suffer more.

In those countries policy makers should consider that traditional strategies may start deteriorating inequality unless redistributive and institutional reforms are established; thus implying that becoming more advanced does not mean becoming more equal. How can we rationalize this threshold? In fact the figure shows that beyond a threshold level in the gap from the top country in terms of development level, a higher distance from the global top leads to higher levels of income inequalities within macro-regional areas. In this case, external divergence leads to internal divergence as well.




(a)




(b)

**Figure 13.** Countries located above the development gap turning point (TP), (a) RTP and (b) Gini. (a) Countries above threshold in RTP models; (b) Countries above threshold in Gini models.

In a different reading of the results, if the macro-regions that are below the

threshold tend to converge towards the advanced countries and close their development gap, then they will also tend to experience an increase in internal income inequalities. As the map in Figure 13 shows, the poorer countries, located in Sub-Saharan Africa and South East Asia, that are above the threshold may be able to combine external (to the global top) and internal (in terms of personal income) convergence for some time, before the balance of external opportunities and threats increases internal inequality. All other countries bellow the threshold will face a trade-off between internal and external convergence from the beginning.

Although the coefficient of variation (CVw) measuring inequalities in the level of development between countries tends to fuel income inequalities within macro-regional areas, the distance from the global top variable (GAP) has a slightly different story to tell. Falling behind in the global scale tends to increase internal income inequalities only for the regions or countries beyond the threshold.

Those that have a GAP level lower than the threshold may see internal income inequalities decline as they move further away from the global top. Or they may see income inequalities increase as they move closer to the global top.

As a result, income inequalities at the macro-regional level, measured either in their extreme (RTP) or in their more standardized (Gini) form, are affected in a different way from between-countries inequalities that are related to their geographical area and in a different way from between-countries inequalities at the global scale. The combined effect depends on the internal divides of each geographical area and its distance from the global top.

## 5. Conclusion and Policy Implications

This paper examines global income inequalities between and within countries utilizing the WID, WB and other international databases. The main research questions are related to the evolution and interrelation of inequalities. Inequalities between countries appear to be declining over time, primarily due to the dynamism of Emerging Economies in Asia but they are still enormous. Within countries inequality has increased dramatically in the last four decades and represents now about 70% of global inequality. Given the tensions generated by global inequality (massive migration and political instability in the Global North, wars and extremism in the Global South) it is critical to better understand the relations at the different levels and types of inequality.

Extreme income inequality within countries measured by the Rich-to-Poor ratio (RTP) is significant at the global economy level, where the average person in the richest 1% of the population earns an income that is 55 times higher than the income of the average person in the poorer 50% of the population. The analysis has shown that high rates of growth tend to contribute to higher levels of income inequality in a consistent way. In this perspective, inequality is an endogenous and persistent characteristic of the markets economies and is unlikely to vanish with economic progress.

The theoretical model developed and the econometric analysis has established

that different types of inequality are related to each other. In the macro-regional scale, it seems that inequalities between countries may affect inequalities within countries in a positive way, while in the global scale a reduction in the gap between the Global North and the Global South is associated with a reduction of internal extreme income inequality for the less advanced countries. This co-movement is not monotonic, suggesting that countries with lower external gaps may converge further to the advanced top only at the expense of greater internal income inequalities. This trade-off may explain why the distance covered in both fronts during the last 33 years is not impressive, suggesting that inequality needs to be understood in a holistic approach, where internal and external gaps need to be confronted together.

This paper sets the ground for further analysis regarding the unexplored relationship of between and within geographical areas inequalities. One line of research is to examine this relation at the national and regional level, for groups of countries that provide regional statistics for a reasonable time period. A second line of research is to introduce in the models potential drivers of inequality, like globalization or technological change, or policy and institutional variables, like taxation and the regulatory framework. Finally, the relation of the different aspects of inequality to political processes, like discontent in the Global North and extremism in the Global South could also be considered to be promising topics of analysis for further research.

## Acknowledgements

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## Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. The data originate from open sources such as the World Bank and United Nations.

## Conflicts of Interest

There is no conflict of interest.

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## Appendix

**Table A1.** Income shares according to income category.

| | Top 1% | Top 10% | Bottom 50% |
|---|---|---|---|
| Upper middle income | 16.9 | 47.7 | 12.3 |
| Lower middle income | 16.7 | 48.8 | 12.6 |
| Low income | 16.9 | 50.2 | 12.5 |
| High income | 13.5 | 39.4 | 17.0 |

**Table A2.** Income shares according to the geographic category.

| | Top 1% | Top 10% | Bottom 50% |
|---|---|---|---|
| Europe & Central Asia | 12.1 | 36.1 | 18.7 |
| Middle East & North Africa | 17.5 | 49.6 | 12.5 |
| Sub-Saharan Africa | 16.7 | 50.9 | 11.9 |
| East Asia & Pacific | 15.3 | 42.3 | 15.2 |
| North America | 15.7 | 41.7 | 13.0 |
| Latin America & Caribbean | 18.7 | 52.3 | 9.2 |
| South Asia | 18.2 | 45.8 | 15.4 |

**Table A3.** Gini index for income inequalities globally, 1980-2022.

| | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|
| World | 55.90 | 56.07 | 56.57 | 57.48 | 57.60 | 57.91 | 57.28 | 56.70 | 56.77 | 56.8 |
| Income categories | | | | | | | | | | |
| Low-income | 61.99 | 62.19 | 62.56 | 62.57 | 61.09 | 60.79 | 60.55 | 60.02 | 60.04 | 59.7 |
| Lower middle income | 60.99 | 61.13 | 61.38 | 60.93 | 60.58 | 60.58 | 59.60 | 58.89 | 58.91 | 59.5 |
| Upper middle income | 58.16 | 58.31 | 58.59 | 60.45 | 60.74 | 60.54 | 59.86 | 58.72 | 59.42 | 59.1 |
| High income | 46.93 | 47.14 | 48.09 | 49.80 | 50.87 | 52.09 | 51.63 | 51.65 | 51.35 | 51.4 |
| Geographic area categories | | | | | | | | | | |
| East Asia and Pacific | 53.04 | 53.21 | 53.95 | 54.46 | 54.88 | 56.21 | 56.36 | 55.07 | 53.71 | 55.1 |
| Europe and Central Asia | 42.78 | 43.02 | 43.83 | 47.19 | 47.87 | 48.59 | 47.83 | 48.02 | 48.08 | 47.9 |
| Latin America & the Caribbean | 67.37 | 67.37 | 67.37 | 67.37 | 67.37 | 67.33 | 66.20 | 64.70 | 66.41 | 65.2 |
| Middle East and North Africa | 61.13 | 61.13 | 60.88 | 60.55 | 60.86 | 61.03 | 60.86 | 60.24 | 60.02 | 60.1 |
| North America | 43.72 | 45.40 | 48.12 | 50.37 | 52.59 | 53.60 | 53.48 | 53.83 | 55.81 | 56.2 |
| South Asia | 52.86 | 53.72 | 54.63 | 56.22 | 56.99 | 57.38 | 55.93 | 55.00 | 54.79 | 55.4 |
| Sub-Saharan Africa | 63.66 | 63.76 | 64.22 | 63.59 | 62.76 | 62.34 | 61.70 | 61.18 | 61.12 | 61.2 |

Source: Own estimates from World Inequality Database (WID).

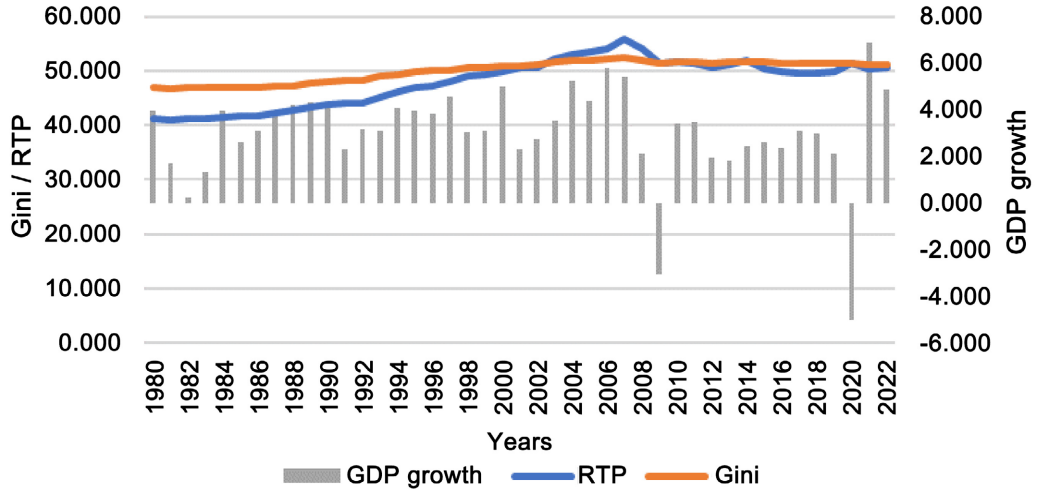


Figure A1. High income countries Gini, RTP and GDP growth.

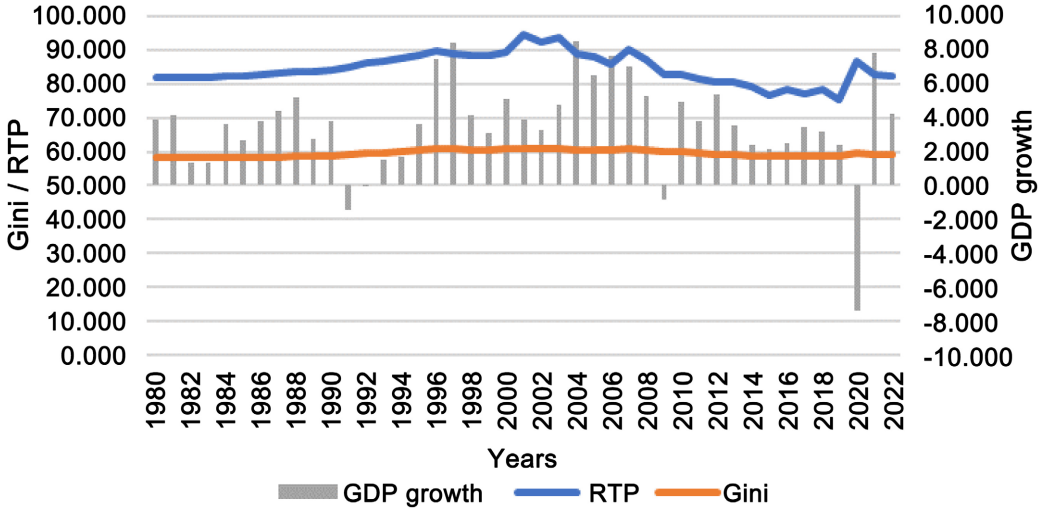


Figure A2. Upper middle income countries Gini, RTP and GDP growth.

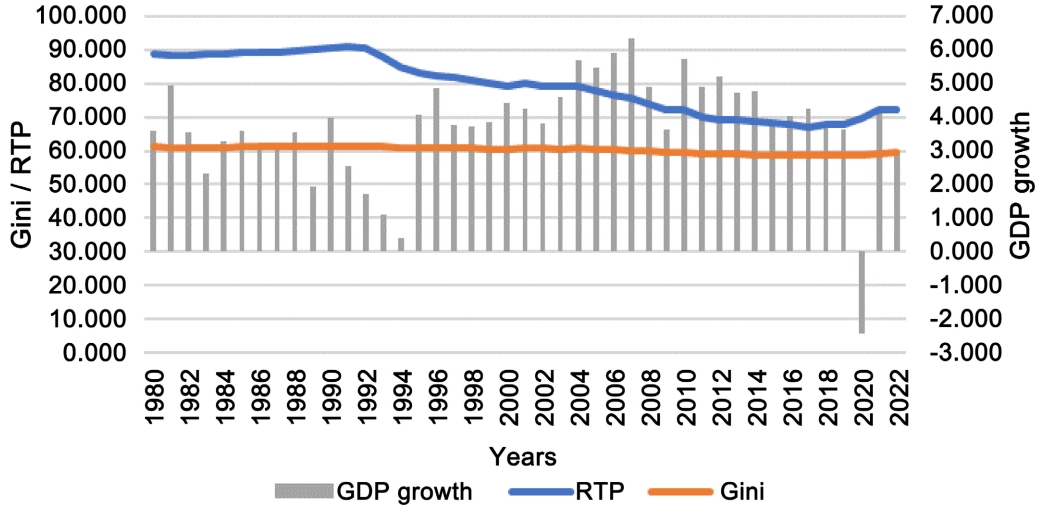


Figure A3. Lower middle income Gini, RTP and GDP growth.

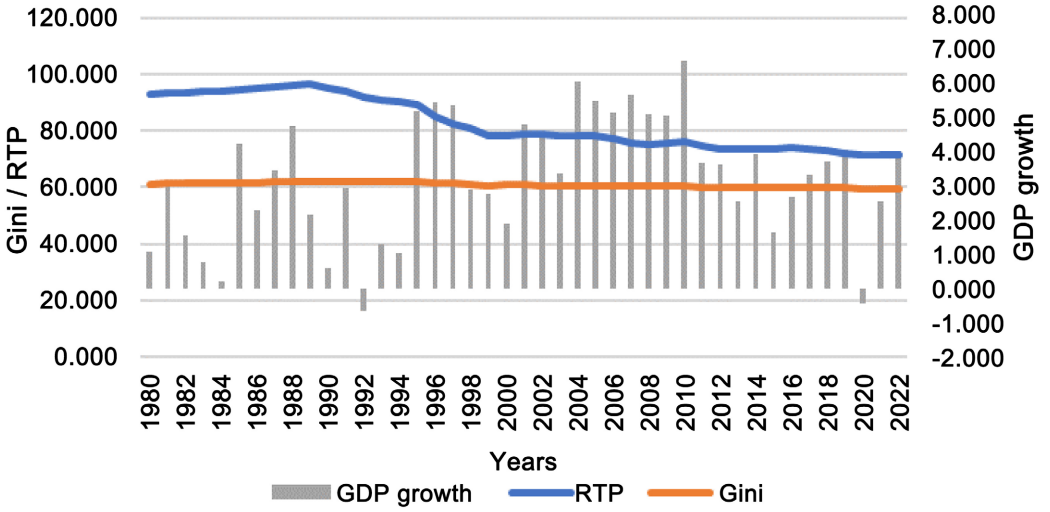


Figure A4. Low income countries Gini, RTP and GDP growth.

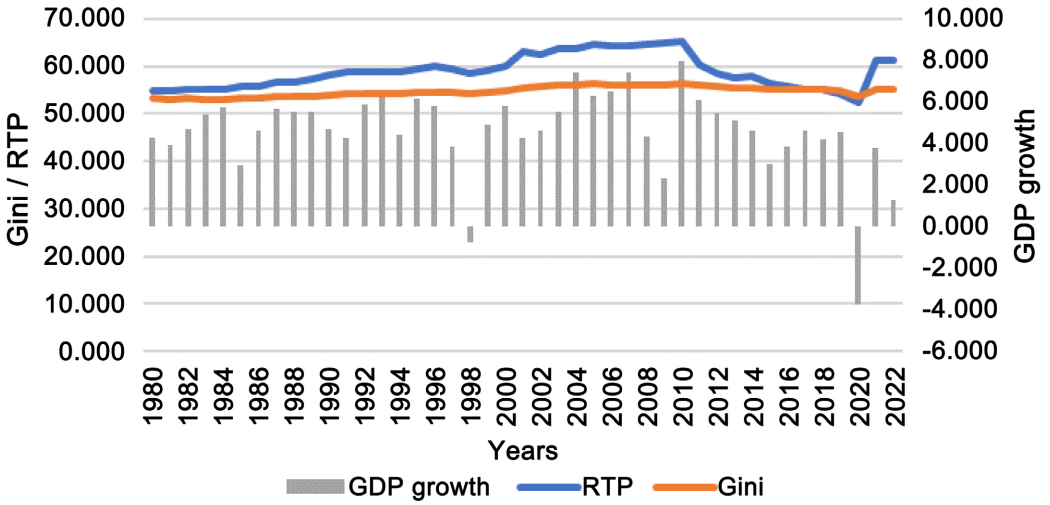


Figure A5. East Asia and Pacific countries Gini, RTP and GDP growth.

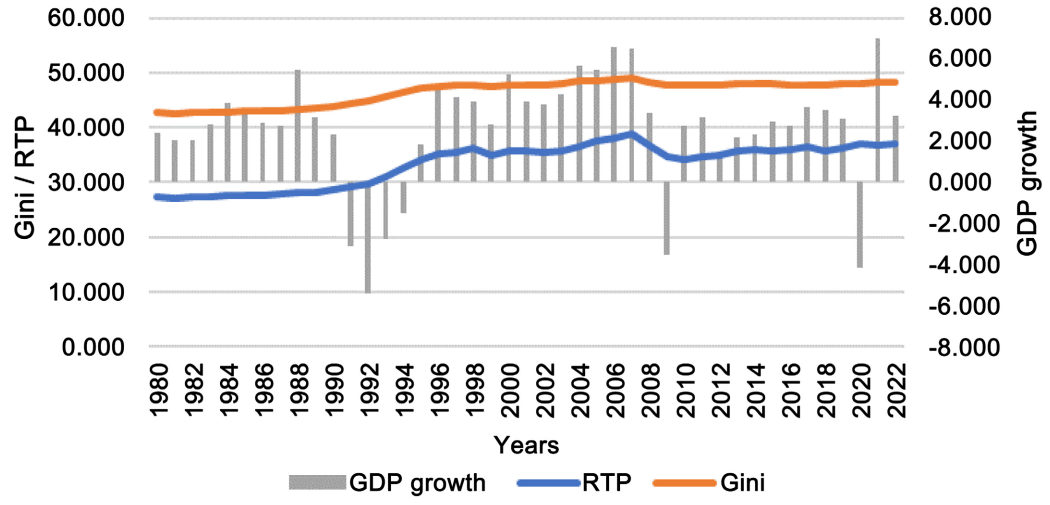


Figure A6. Europe and Central Asia Gini, RTP and GDP growth.

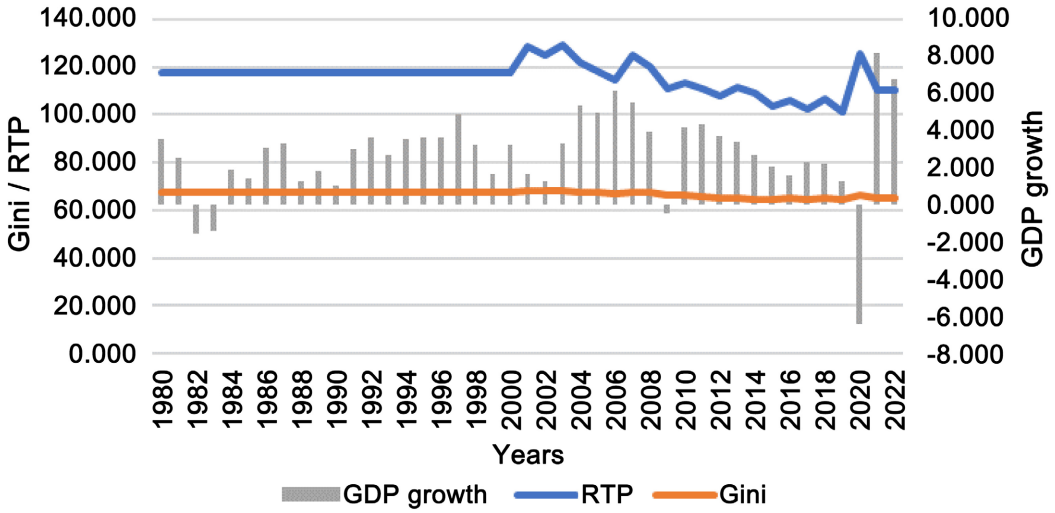


Figure A7. Latin America and Caribbean countries Gini, RTP and GDP growth.

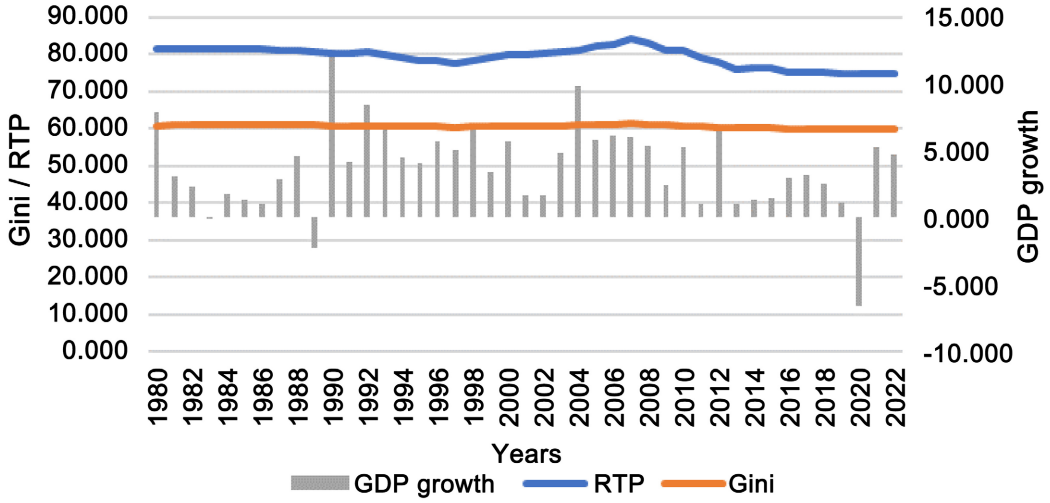


Figure A8. Middle East and North Africa countries Gini, RTP and GDP growth.

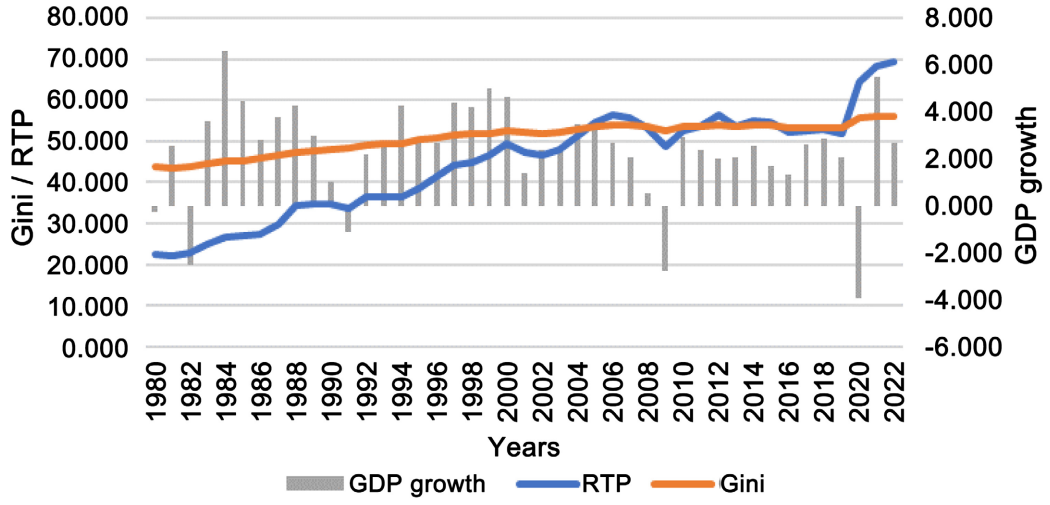


Figure A9. North America countries Gini, RTP and GDP growth.

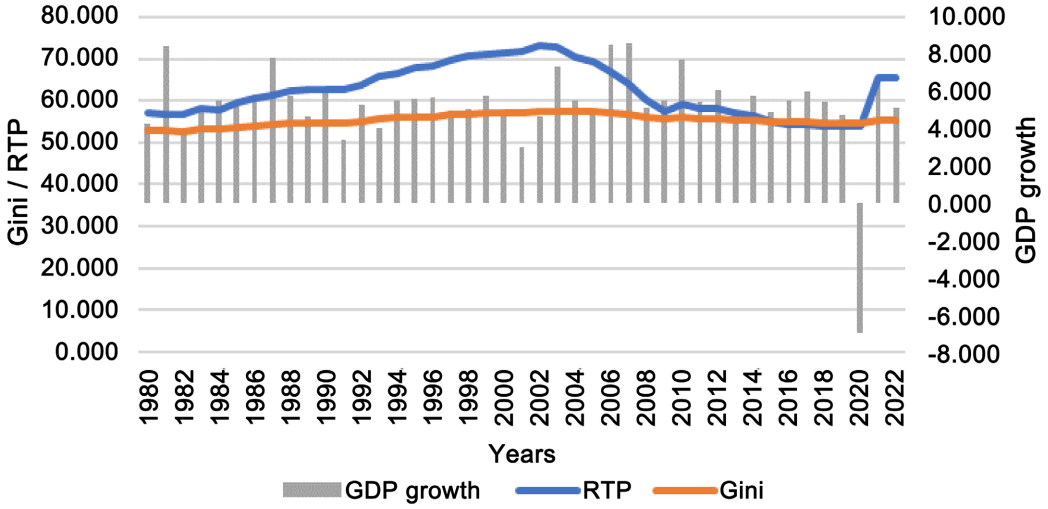


Figure A10. South Asia countries Gini, RTP and GDP growth.

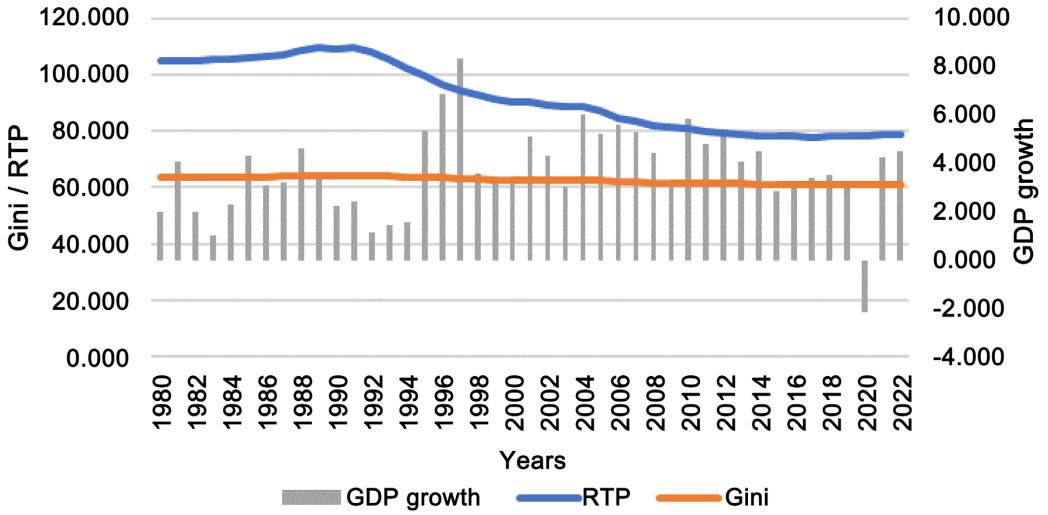


Figure A11. Sub-Saharan Africa countries Gini, RTP and GDP growth.