

Measuring Progress towards the UN Sustainable Development Goal 8

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C10

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1. Introduction

This report explores different continents' progress towards the UN Sustainable Development Goal 8, Decent work and economic growth, through exploratory data analysis on data from the World Inequality Database. This assessment is crucial as sustainable economic growth creates work opportunities and resources such as healthcare, education, and infrastructure, which are all fundamental to achieving other SDGs.

2. Methodology

2.1 Cleaning and Merging the Datasets:

Before starting our analysis, all datasets were standardised and cleaned to ensure consistency and comparability. We changed variable names across all data sets so that column names matched, which later allowed us to join the data sets. We checked the data types to ensure that all numerical variables were stored in numeric format. We converted country identifiers using ISO-3 code convention to enable geographic visualisation later on. Duplicate observations were identified and removed, and rows containing clearly invalid or non-numeric values for key variables such as GDP per capita or NIEET rates were excluded. Finally, the continent classification dataset, GDP per capita data, NIEET data, and the additional youth unemployment dataset were merged using country and year identifiers into our 'full_data' dataset.

We also created a variable to measure GDP per capita growth rate year-on-year (2017 PPP-adjusted), to allow assessment of sustained economic growth over time.

2.2 Selecting a 4th data set to work with:

To enhance our assessment of SDG 8, we chose to additionally use the youth unemployment rate data, from Our World in Data. We chose the data as it directly relates to the goal of achieving "full and productive employment and decent work for all," particularly for young people. While the NIEET rate captures a broad definition of youth disengagement (including those not seeking work), unemployment targets specifically the young people who are willing and able to work but cannot find employment. This distinction allows for a more nuanced interpretation of labour market conditions. The dataset also had a similar structure to the given data sets, because the measure was reported annually at the country level, making joining the data sets a straightforward process.

The Youth Unemployment data set comes from Our World in Data (OWID), a research organisation that compiles and publishes global development indicators from official international agencies such as the ILO and the World Bank. These primary institutions obtain unemployment statistics from labour force surveys conducted by national statistical offices. Because the source is transparent and widely used in academic and policy research, the dataset can be considered credible and suitable for evaluating SDG 8 outcomes.

2.3 Methodology for Question 1

For target 1, achieving sustainable economic growth, we will analyse GDP growth volatility in a few methods.

First, the average growth rate for all countries, Least Developed Countries (LDCs), and non-LDCs is calculated and plotted using the line graphs. These graphs will be used to analyse the trend in the average growth rate. We also included a 7% "benchmark" as an approximator for the 7% GDP growth rate goal (SDG 8.1). As GDP > GDP per Capita for developing nations, in general, any LDCs reaching 7% or more GDP per Capita growth rate is indicative of exceptional performance.

Then, we will employ standard deviations (SD) for 5-year rolling years, meaning datapoints on the current year and the previous 4 years, to see the volatility trends. In addition, the SD of pre-2015 and post-2015 periods are calculated to assess the SDGs' impact on volatility, while outliers are removed using the $1.5 \times \text{IQR}$ method. Box plots are also used to analyse this and to detect and assess the outliers.

2.4 Methodology for Question 2

To assess progress toward SDG Target 8.6, we analysed the youth_NIEET variable across continents from 1990–2020 using three perspectives: all countries, non-LDCs, and LDCs. First, we calculated and graphed average NIEET rates for each continent using the full dataset to capture global trends. We then excluded LDCs to examine how NIEET patterns differ in more developed regions, producing continent-specific graphs for non-LDCs. Next, we repeated the analysis using only LDCs to focus on the populations most relevant to the SDG target, generating separate NIEET trend lines for each continent. Finally, for every continent, we compared the trajectories of all countries, non-LDCs, and LDCs to evaluate differences in levels and trends, identify changes following the introduction of the SDGs in 2015, and determine whether NIEET reduction varied according to development status.

2.5 Assumptions and Limitations

The assumptions and limitations underlying our analysis of progress toward the SDGs are discussed in the Discussion section. One glaring limitation is the fact that the original CSVs have some countries omitted. Crucially, LDCs such as Yemen or Eritrea are not included in the original WorldBank data, which will impact our analysis of LDC nations in particular.

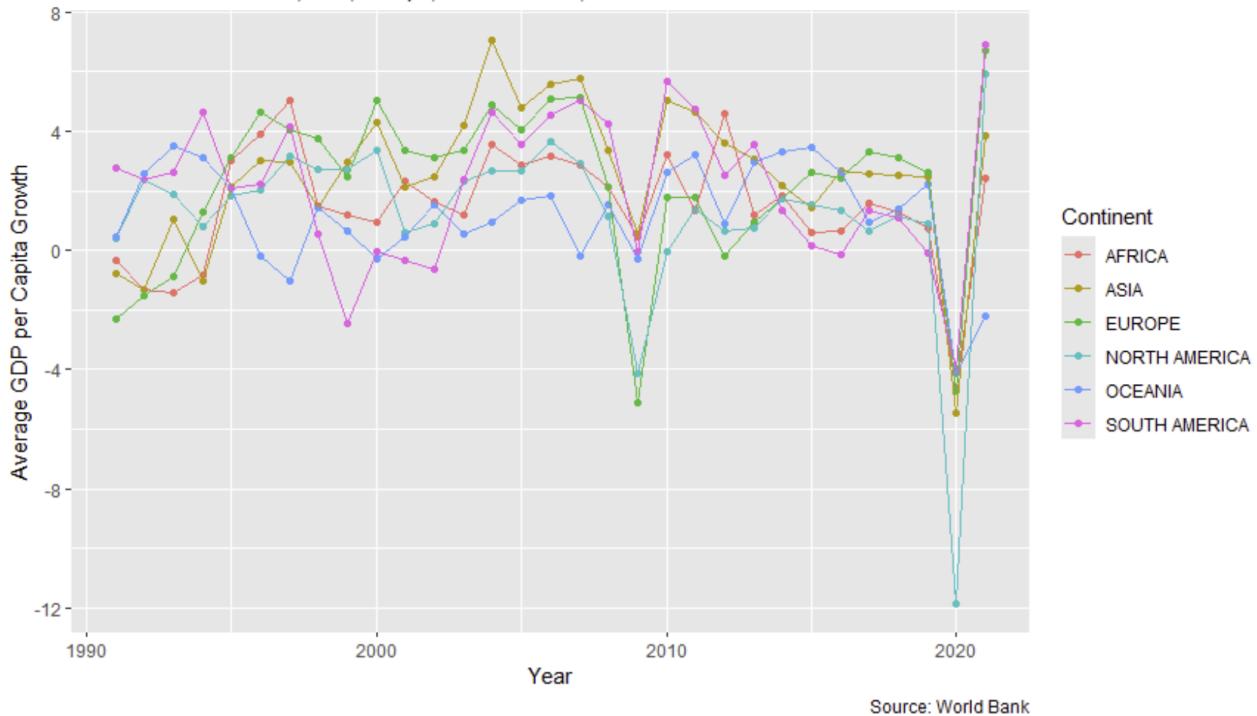
3. Result

3.1 Question 1

3.1.1 All Countries

First, we will explore the performance of different continents in terms of achieving sustainable economic growth.

Average GDP per Capita Growth Rate (World)
For Continents of Africa, Asia, Europe, North America, South America and Oceania



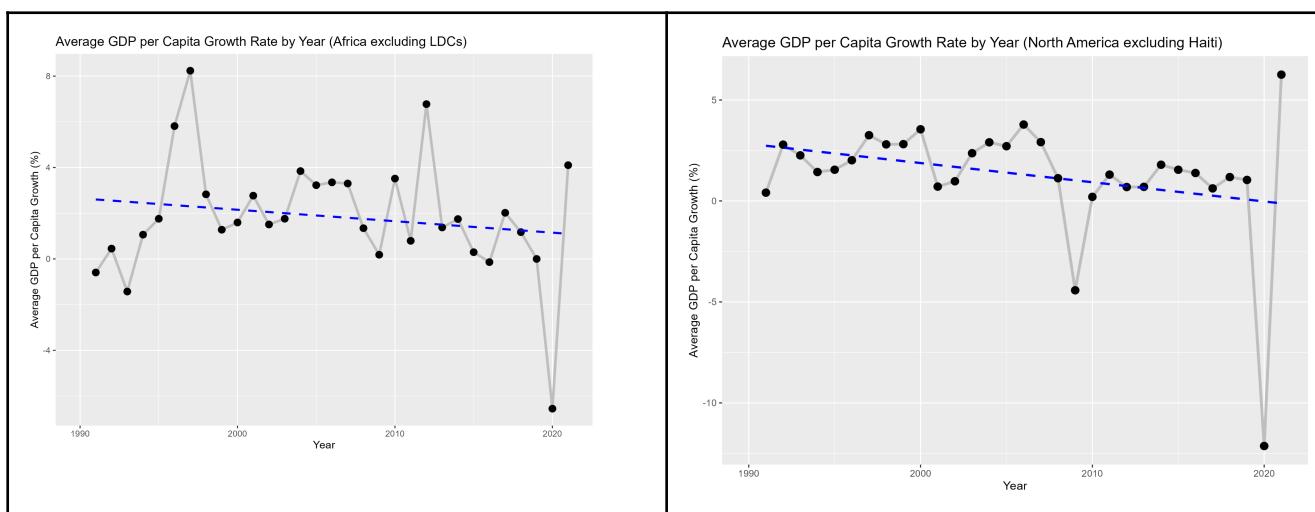
Source: World Bank

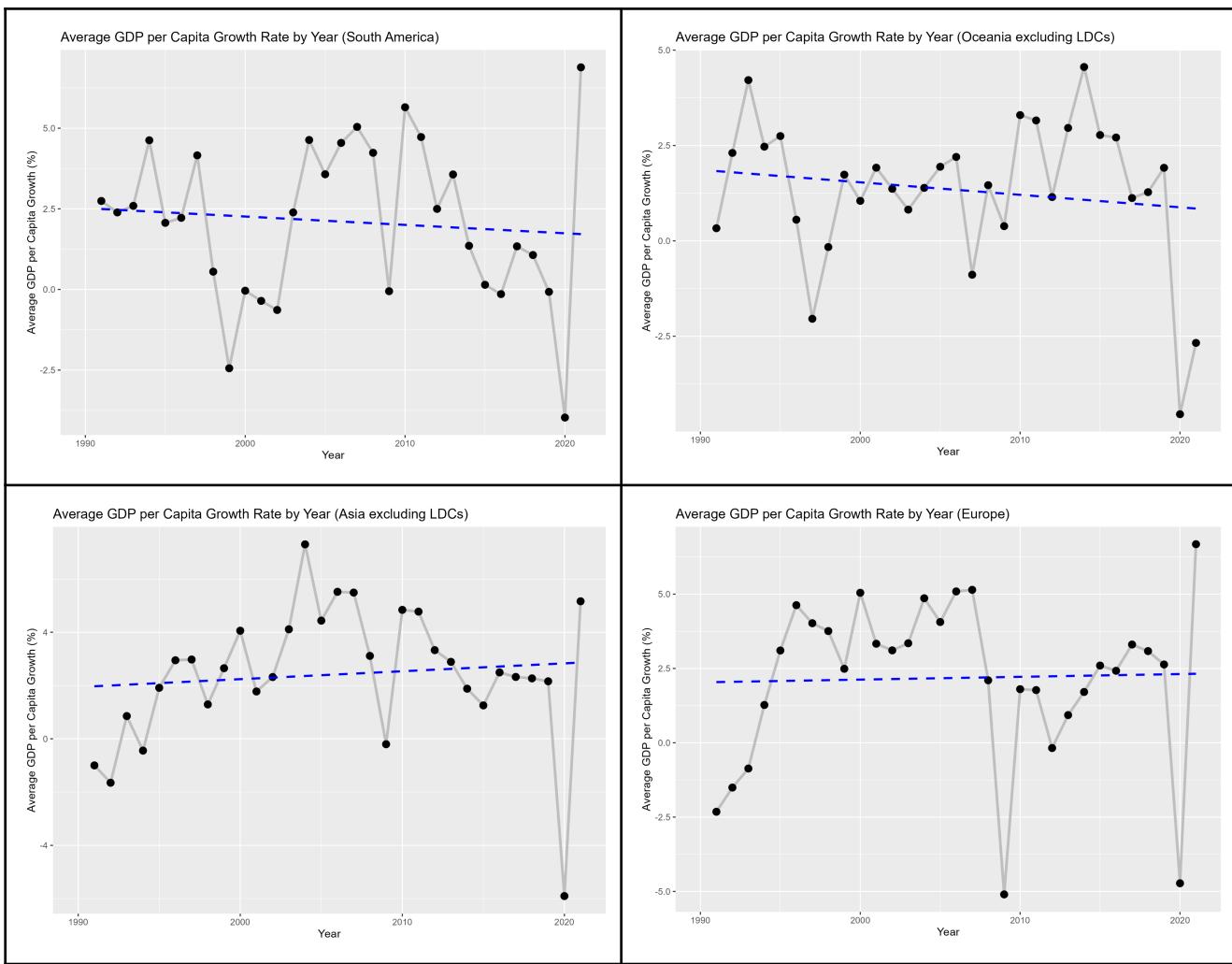
This graph plots the trend of GDP growth rate for each continent (y-axis) over the years (x-axis). Each coloured line represents a continent to be analysed.

Here, the trend line seems very volatile before 2015— with a huge dip in 2008— which could be due to the financial crisis. However, the growth rate seems to get more stable after 2015, although there is another significant dip in 2020 when the COVID-19 pandemic occurred.

3.1.2 Non-LDCs

Second, we will analyse the 6 continents with LDCs removed. This will keep cross-continental comparisons fair.





Africa

Whilst growth does remain positive overall, meaning African economies are still expanding, the pace of this expansion is slowing. This is indicated by the weak negative correlation ($r = -0.174$). These 22 countries are better off and have sustained per capita economic growth in accordance with the goal.

Asia

We can see a positive correlation ($r = 0.107$), indicating that there is gradual improvement in GDP per capita growth over time. Growth remains positive, and resilience can be seen in these non-LDC economies as they strongly rebound after 2009 and 2020, and continue to sustain GDP per capita growth.

Europe

Modest and stable growth can be observed from Europe's data, as the correlation is almost flat ($r=0.03$). This is expected with mature economies and developed nations, with stability prioritised over higher growth rates.

North America

Strongest negative correlation so far ($r=-0.286$), which reflects a slowing growth over time. However, this isn't a cause for concern as a slowing growth rate is expected from structured and mature economies, of which there are in North America (not including LDCs).

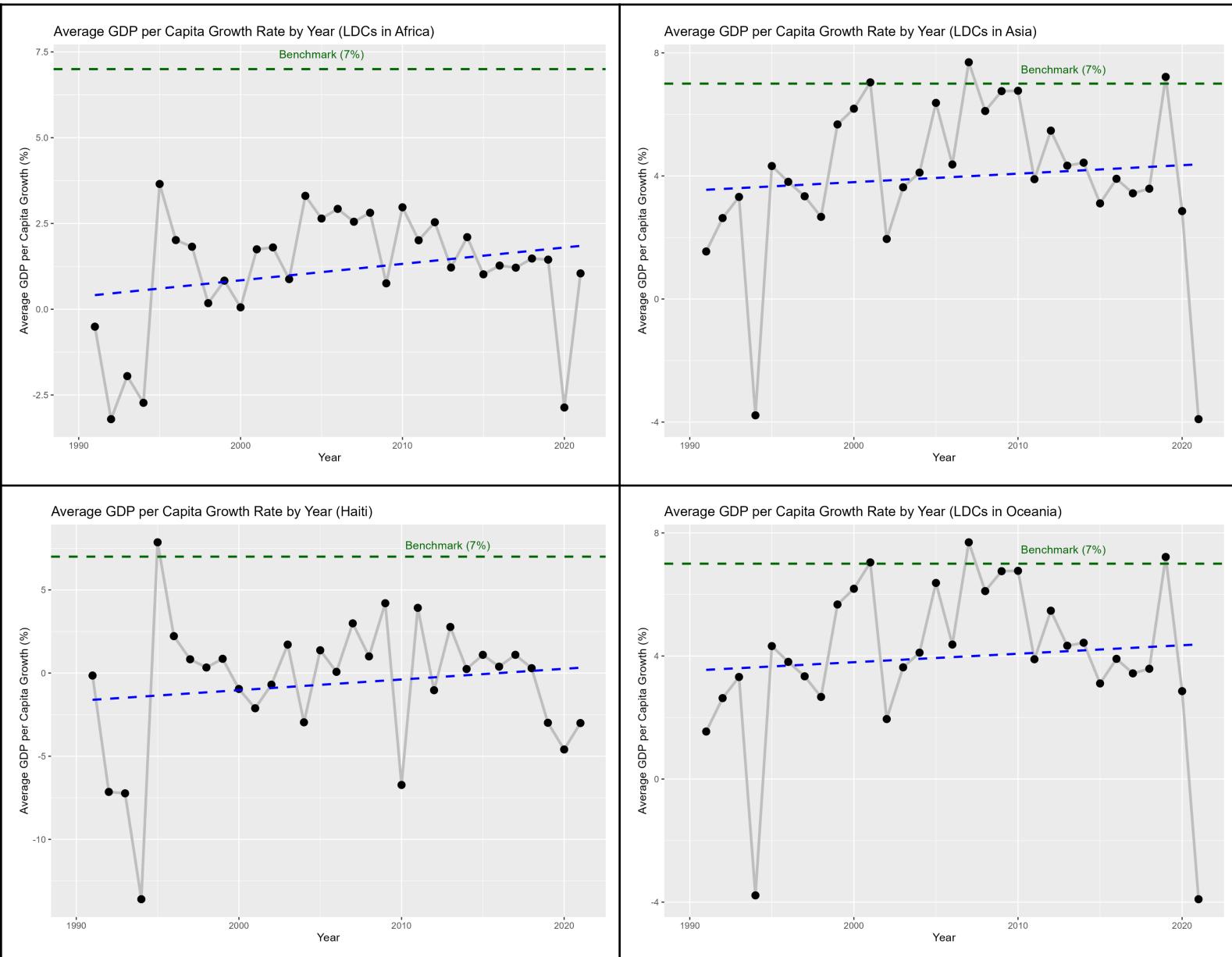
South America

A slight negative correlation ($r=-0.096$) indicated a mild slowing down in growth rate. Growth sustainability is dependent on South American economies diversifying.

Oceania

Weak negative correlation ($r=-0.155$) suggests a gradual slowdown. We also observe that non-LDC Oceanic economies are very vulnerable to externalities, as their post-crisis rebounds remain weaker than Africa or Asia.

3.1.3 LDCs



These graphs show the average GDP per capita growth for all LDCs in each continent (y-axis) over the years (x-axis). The green dashed line shows the benchmark of 7% GDP per capita growth rate, whereas the blue line is the best-fit line for all the data points. Although the GDP per capita growth rate is different from the GDP growth rate, it is used as a reference to measure its progress.

The bottom left graph does show the average growth rate in North America, but is labelled as “Haiti”, because Haiti was the only country classified as an LDC there.

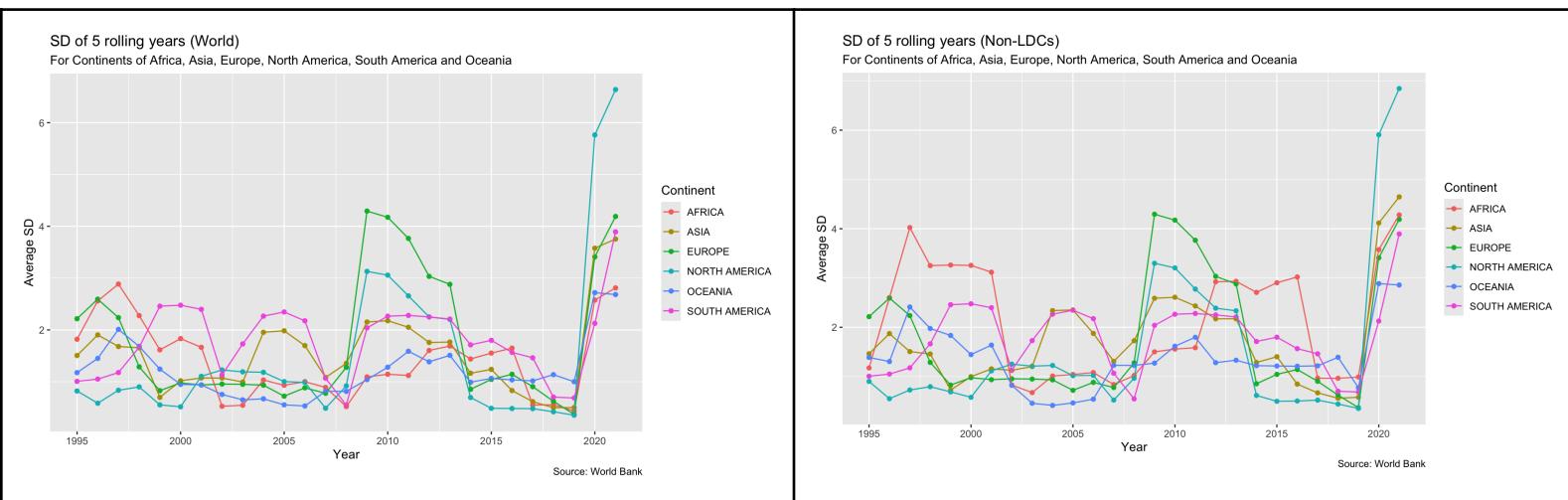
Although the line of best fit shows a general upward trend, the data points are farther away from the benchmark after 2015. For Africa and Haiti, the growth rate is never above 7% after 2015, and for Asia and Oceania, they only hit the benchmark in 2019 after 2015.

However, the volatility seemed to improve compared to pre-2015 and post-2015, similar to what we have seen above for all countries and non-LDCs. Yet, there is again a peak and a huge drop in 2020 and 2021.

3.1.4 Statistical Analysis

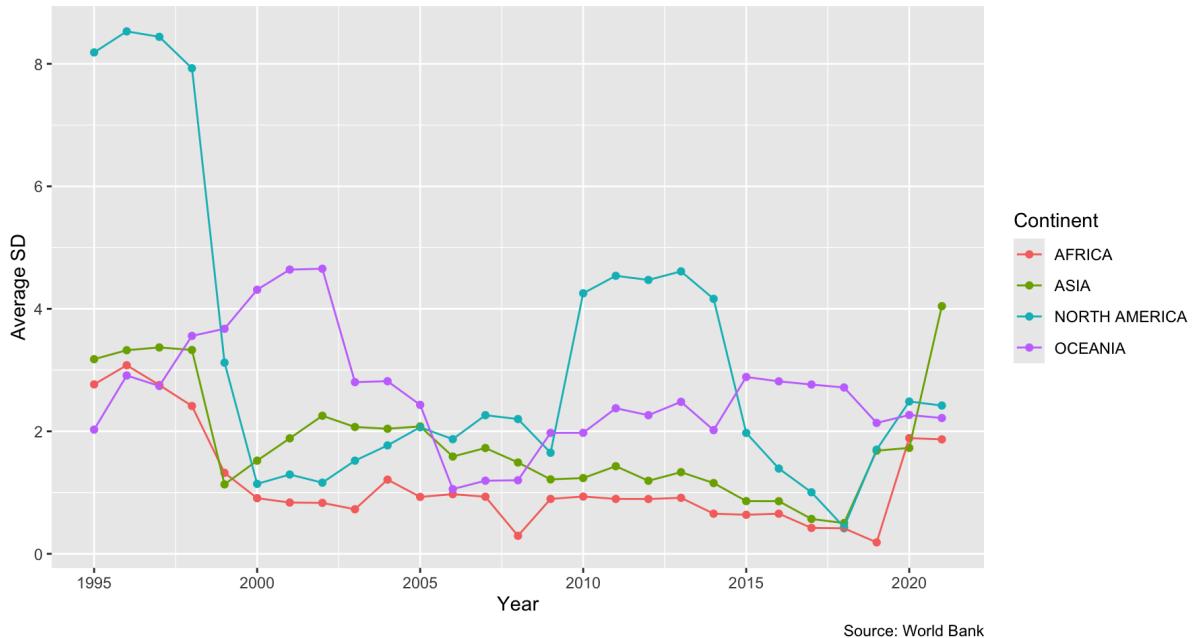
To give an evidence-based analysis, we will analyse the data through a statistical view of sustainability.

First, we will calculate the standard deviation (SD) for a 5-year rolling, i.e. for the current and 4 previous years, of the average growth rate for each continent. Below, the first graph takes the data of all countries the second one focuses on non-LDCs



For both graphs, there is a clear decline in the SD after 2015, indicating an increase in the stability overall for all countries and among non-LDCs.

SD of 5 rolling years (LDCs)
For Continents of Africa, Asia, North America, and Oceania



This graph for LDCs shows a similar trend, with a decline after 2015, although it is not as significant as the two graphs above. However, Oceania seems to have higher SDs compared to the years right before 2015.

Now, we'll investigate the SD for all years before and after 2015 to assess the impact of SGDs

For All Countries

continent (character)	pre_sd (double)	pre_sd_no_out (double)	post_sd (double)	post_sd_no_out (double)
Africa	1.726821	1.726821	2.301007	0.7069601
Asia	2.165921	2.165921	3.114043	0.5012834
Europe	2.613759	2.156180	3.424531	0.3699910
North America	1.593724	1.053531	5.516270	0.3545718
Oceania	1.326066	1.326066	2.755878	2.7558775
South America	2.121178	2.121178	3.220821	0.6867096
NA	1.448003	1.448003	2.746620	0.3312119

For non-LDCs

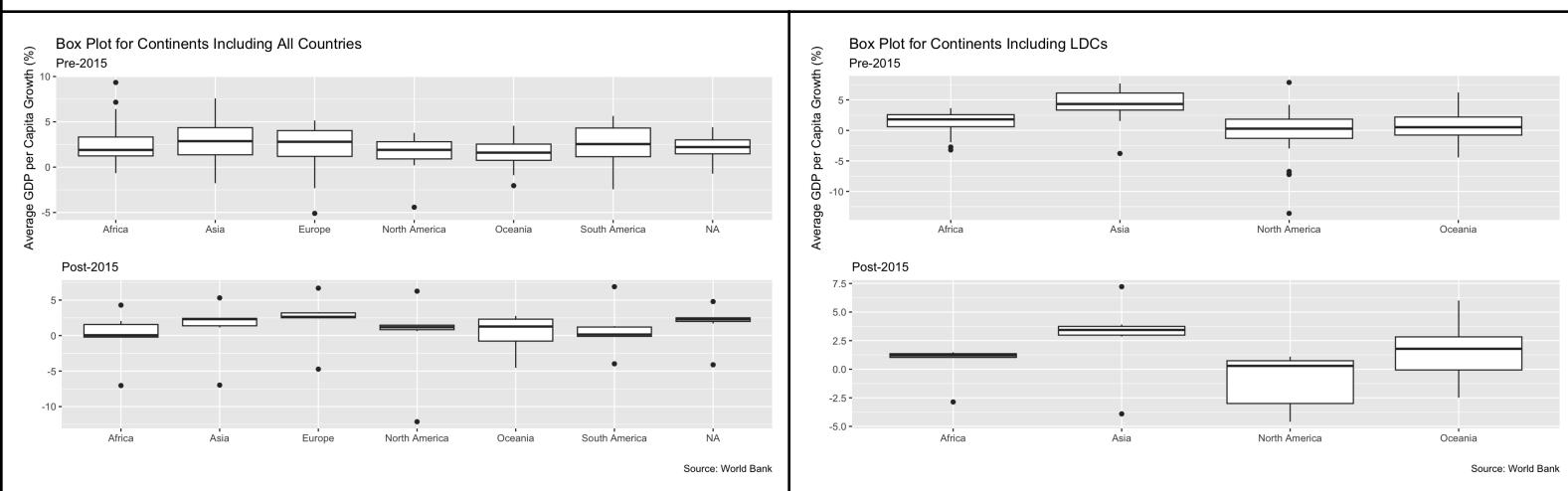
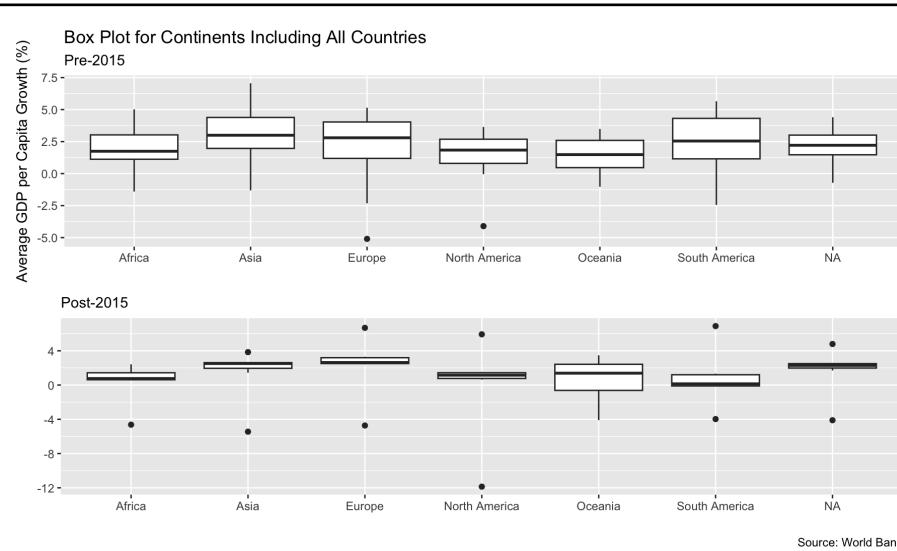
continent (character)	pre_sd (double)	pre_sd_no_out (double)	post_sd (double)	post_sd_no_out (double)
Africa	2.333860	1.586555	3.496325	0.9903507
Asia	2.306053	2.306053	3.833995	0.5805620
Europe	2.613759	2.156180	3.424531	0.3699910
North America	1.670052	1.068266	5.679743	0.3543382
Oceania	1.530462	1.346159	2.841682	2.8416821
South America	2.121178	2.121178	3.220821	0.6867096
NA	1.448003	1.448003	2.746620	0.3312119

For LDCs

continent (character)	pre_sd (double)	pre_sd_no_out (double)	post_sd (double)	post_sd_no_out (double)
Africa	1.846074	1.365683	1.563392	0.1939794
Asia	2.397746	1.711876	3.336455	0.4093403
North America	4.505304	1.921601	2.352816	2.3528156
Oceania	2.710580	2.710580	2.754181	2.7541812

These tables show the SD of Pre-2015 and Post-2015 (1sd and 3rd columns) and those after removing the outliers (2nd and 4th columns)

Standard deviations decline across most continents, for both LDCs and non-LDCs. For Oceania and North America, this does not seem to be the case, where Oceania's SD has increased for all tables, and North America's SD has increased for non-LDCs. However, comparing the SD values before and after outliers are removed, there is no difference between the data. This means the data points in 2020 and 2021, which must increase SD significantly, were not removed as outliers, and thus, we can't conclude that Oceania and North America are not progressing compared to other continents.



These box plots show the distribution of the average GDP growth rate, and we can see a similar pattern here as well. The interquartile range, which shows the distribution of the growth rate, which can be an indicator of volatility, is decreasing for most of the continents. In addition, we can observe how the number of outliers has increased for the plots after 2015. This indicates that the stability might only seem to be improved by excluding outliers.

3.2 Question 2

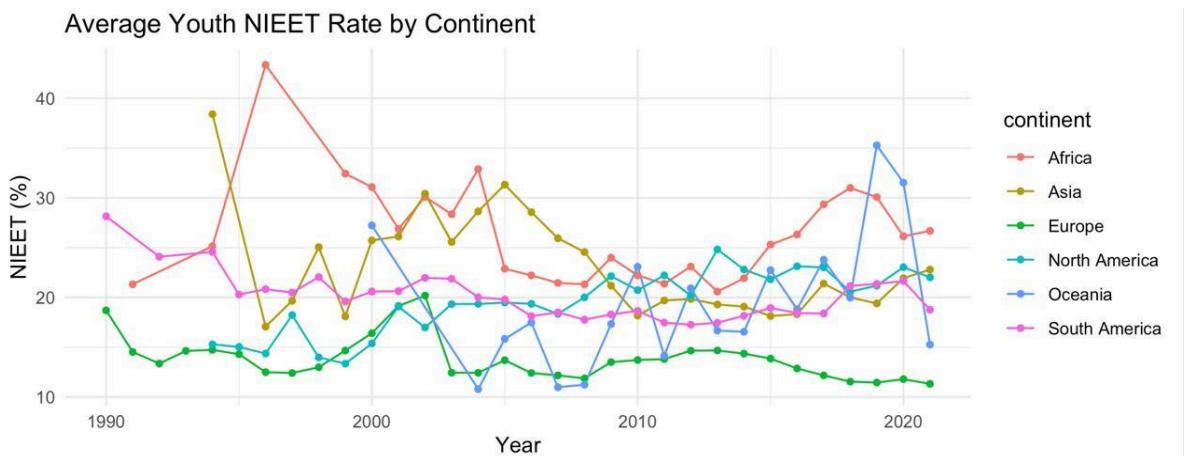
3.2.1 Progress Toward SDG Target 8.6

SDG Target 8.6 aims to substantially reduce the proportion of young people who are not in employment, education, or training (NIEET) by 2020. To evaluate progress, we analysed youth NIEET trends from 1990 to 2020 across all continents and further compared LDCs with non-LDCs. The NIEET indicator reflects young people who are disconnected from both learning and the labour market, which makes it a useful measure of youth exclusion.

3.2.2 NIEET Rate Across the Globe

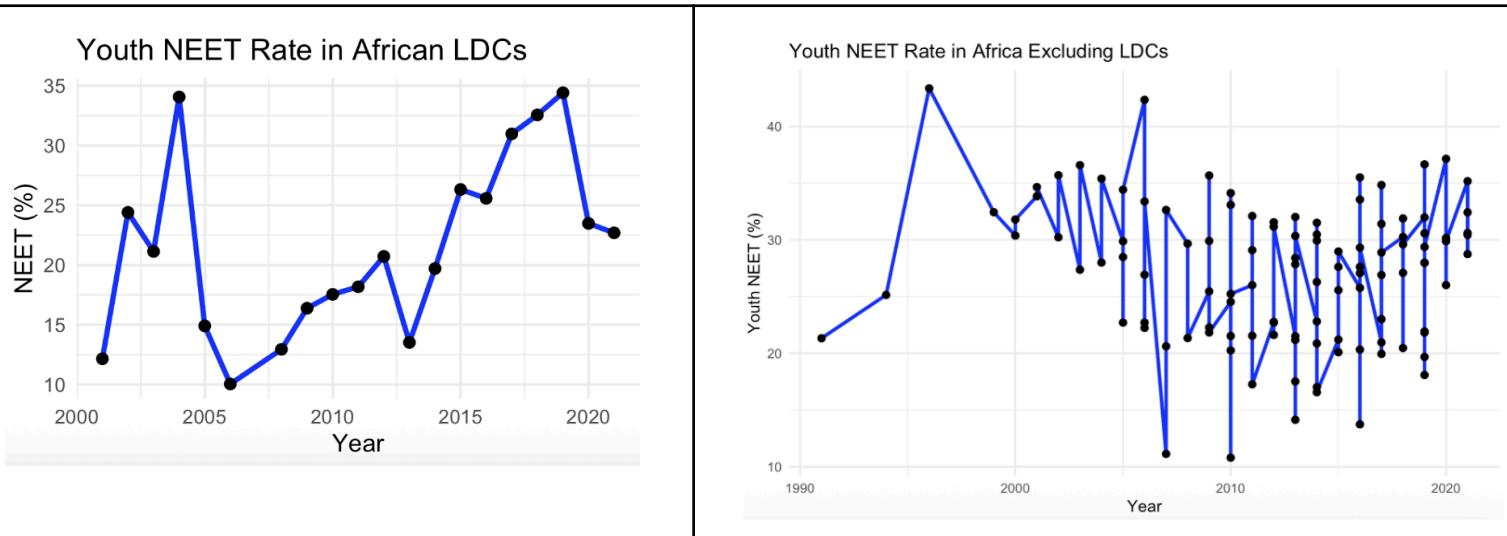
Looking at all continents together, there is a general movement downward over time, but progress is uneven. Europe clearly improves year after year, while Asia and Oceania show some gradual decline with a few setbacks. Meanwhile, Africa, South America, and North America struggle to show any long term reduction. Even after the introduction of the SDGs in 2015, when governments were encouraged to strengthen support for youth, most regions do not show a sudden shift in direction.

Average Youth NIEET Rate by Continent



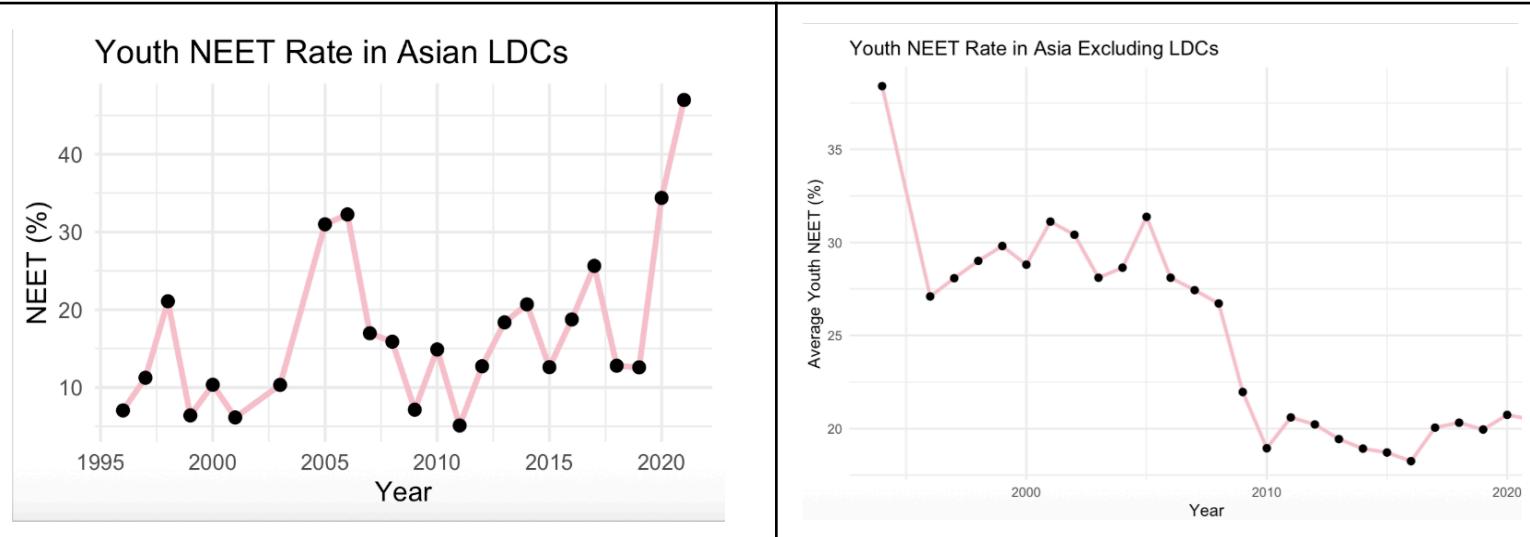
This suggests that while there have been efforts to address youth disengagement, it has been difficult for many parts of the world to make strong progress by the target year.

Africa



African LDCs consistently have the highest NIEET rates in the world. There are short periods of improvement, but the trend rises again as 2020 approaches. Non-LDC Africa performs slightly better but still shows only small changes over time. Neither group shows noticeable progress after 2015, which reflects the challenges of expanding education access and securing stable employment for a rapidly growing youth population.

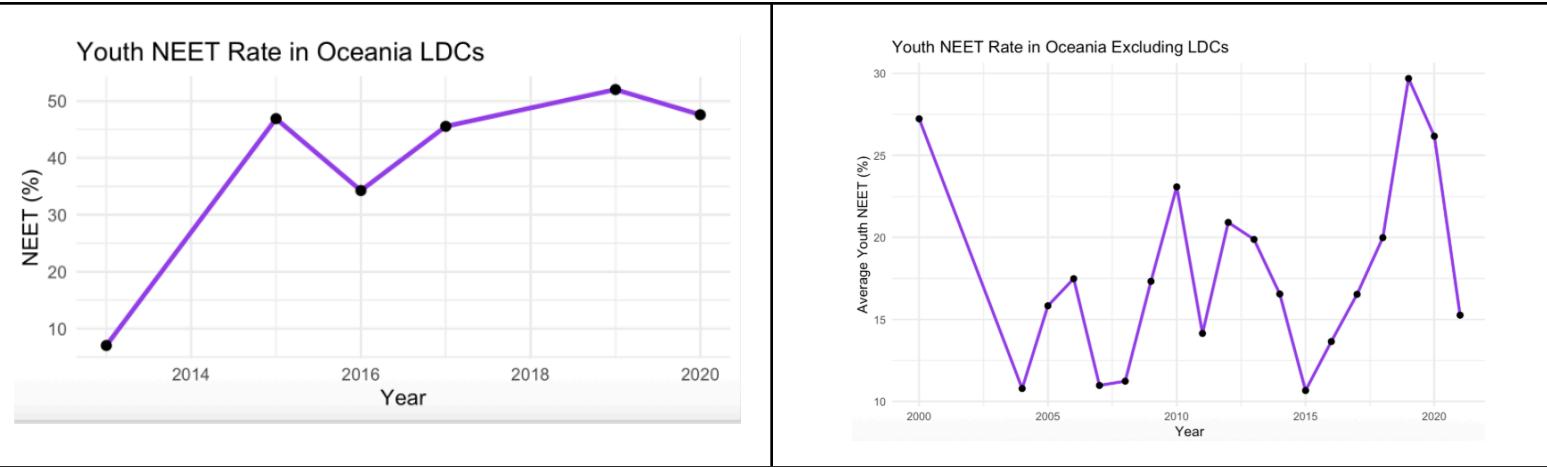
Asia



Asian LDCs display very unstable NEET rates. The graph shows sharp rises and falls, including a steep increase close to 2020. This suggests that young people in these countries are highly vulnerable to economic disruptions.

Non-LDC Asian countries show more promising change, especially after 2010, when NEET rates fall more steadily. This indicates progress but also highlights a growing gap between stronger and weaker economies within the region.

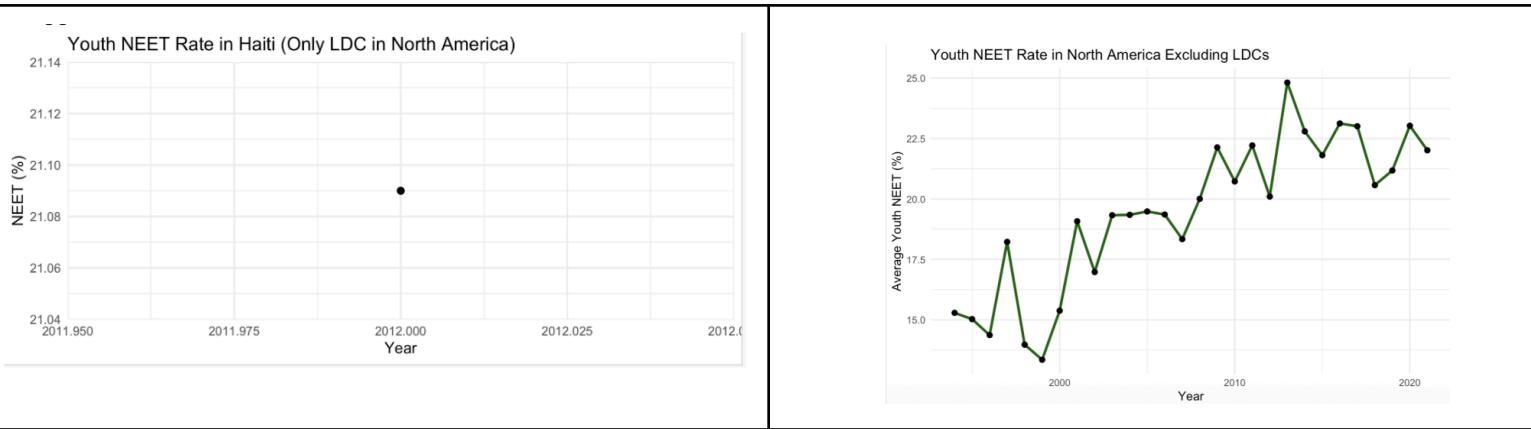
Oceania



Only a few countries in Oceania are LDCs, and the data shows their NEET rates rising toward 2020 rather than falling. This suggests that access to stable jobs and continued education is becoming harder for young people.

Non-LDC Oceania countries show lower and more stable NEET levels, although they do not show a strong long-term decline. Improvements in the region remain slow and uneven.

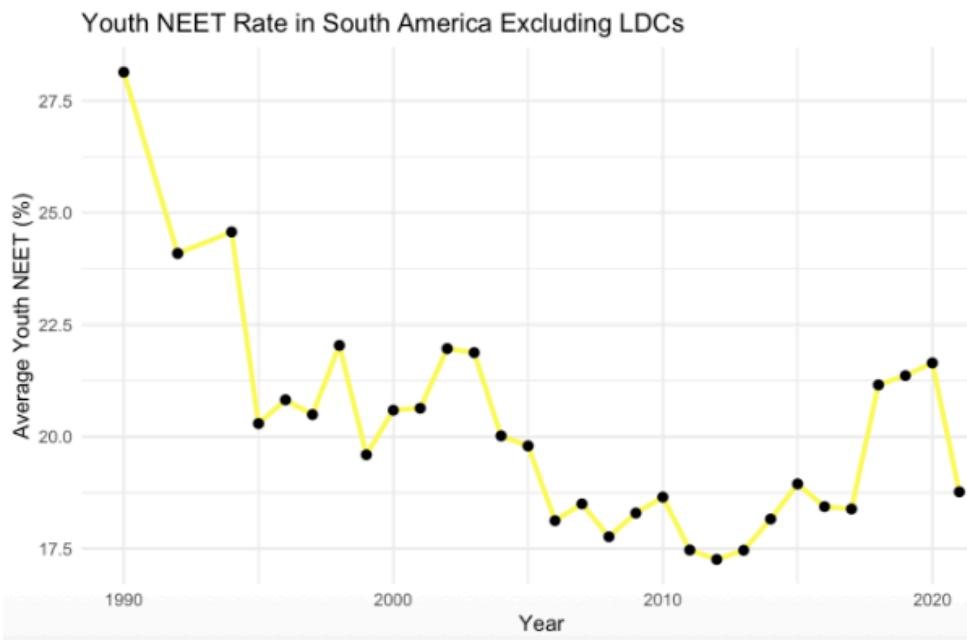
North America



Haiti is the only LDC in North America. Due to limited data, we cannot fully track progress over time, but the NIEET level available in the dataset is relatively high.

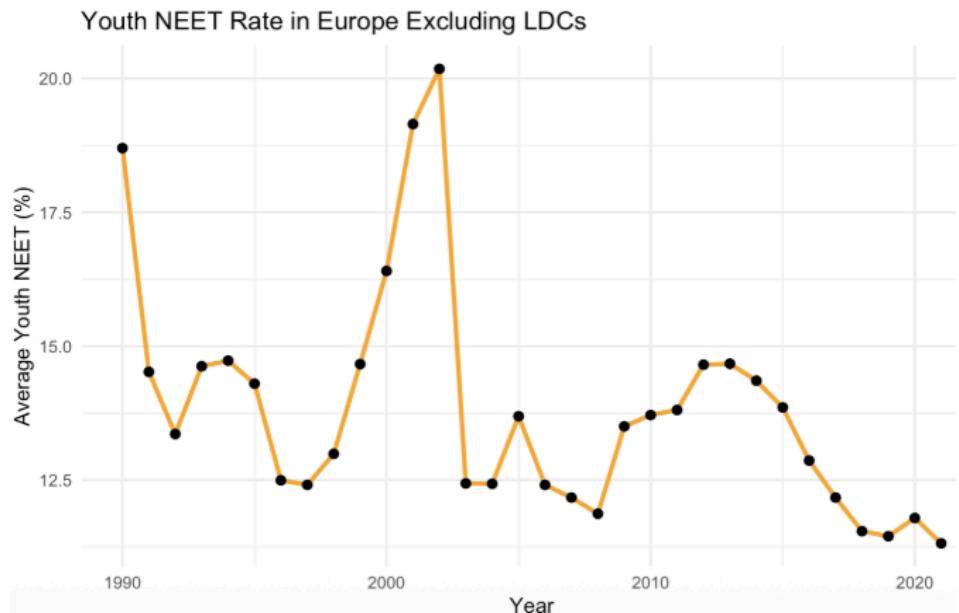
In the United States and Canada, NIEET rates slightly rose after 2015, rather than fall. This means that even high-income countries face challenges in supporting young people who struggle to enter the workforce or continue their studies.

South America



South America has no LDCs, yet the region still shows little progress. NIEET levels remain fairly constant throughout the period, with a slight rise as 2020 approaches. This may reflect economic hardships and limited access to training programs. Overall, the region does not move closer to meeting the SDG target.

Europe



Europe is the clearest example of sustained improvement. NIEET levels gradually fall from the early 2000s to around 10 to 12 percent by 2020. Progress continues after the SDGs begin, which suggests that youth support programs and labour market reforms have been effective in helping young people stay engaged.

4. Discussion

Q1

Our finding that the volatility declined across most continents post-2015, despite increases in Oceania (for the average of all countries) and North America (for non-LDCs), suggests progress towards sustainable growth in general. On the other hand, LDCs consistently missing the target of 7% growth rate indicates insufficient progress in those regions.

The first limitation of this analysis is that since the outliers have been removed, we could not see if the countries are performing sustainable growth, even when including those years where those events hugely impacted the growth rate. Therefore, our conclusion of progress toward sustainable growth might not hold if sustainability requires resilience to exceptional events such as the COVID-19 pandemic.

The second limitation lies in the process of averaging the growth rate in a continent. For diverse continents like Asia and Africa, this process can hide the disparities within the continent, and thus, the averaged data might not reflect the overall situation properly.

The last limitation is the limited time series after 2015. Since we have only 7 data points available, where 1 or 2 are affected by COVID-19 pandemic, the reliability of the trend and its SD might not be very high, which weakens our analysis.

Q2

Some regions, especially LDCs, have many missing NIEET data points, which makes trends less reliable. Regional averages can also hide big differences between individual countries. NIEET figures may not fully capture informal or irregular employment, so youth disengagement could be overstated in some regions.

Finally, changes after 2015 are difficult to interpret because policy impacts take time and events like COVID-19 may have influenced recent spikes.

5. Conclusion

Overall, we can see that progress towards Sustainable Development Goal 8 is uneven. Whilst economic growth stability has improved in many regions, most LDCs fail to meet the 7% benchmark and Youth NIEET rates only show moderate decline, highlighting the need for stronger action on inclusive education and employment policies.

6. References

- Engel, Claudia A. "Using Spatial Data with R." *Using Spatial Data with R*, 17 November 2025, <https://cengel.github.io/R-spatial/>. Accessed 5 December 2025.
- "R for Data Science (2e)." *R for Data Science (2e)*, <https://r4ds.hadley.nz/>. Accessed 5 December 2025.
- "UN list of least developed countries | UN Trade and Development." *UNCTAD*, <https://unctad.org/topic/least-developed-countries/list>. Accessed 8 December 2025.
- "Youth unemployment rate ILO." *Our World in Data*, 2024, <https://ourworldindata.org/grapher/unemployment-rate-for-young-people?tab=table&time=latest#reuse-this-work>. Accessed 01 12 2025.

7. Appendices

Github link <https://github.com/maelalou/C10>

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