Measuring Progress Towards the UN Sustainable Development Goal 8: Decent Work and Economic Growth

1. Introduction

The United Nations Sustainable Development Goal 8 (UN SDG8) aims to promote sustained and inclusive economic growth, productive employment, and decent work for all by 2030. Within this goal, Target 1 focuses on sustaining per-capita economic growth at a level of at least 7% annual GDP growth in Least Developed Countries (LDCs), while Target 2 calls for a "substantial reduction in the proportion of youth not in employment, education, or training (NEET) by 2020" (*Goal 8 | Department of Economic and Social Affairs*). Together, these targets reflect the need for expanding economic output as well as ensuring that young people are meaningfully integrated into education and the labour market.

To evaluate global progress toward SDG 8, this report analyses both long-term GDP per capita patterns and NEET rates across six continents, drawing on the datasets provided alongside additional population, youth unemployment, and development data. GDP per capita is widely used as an indicator for economic development, reflecting changes in economic output relative to population size over time. This allows us to assess whether regions such as LDCs, identified by the UN M49 classification, are approaching the 7% growth benchmark. In parallel, NEET indicators offer insight into youth participation and opportunity, which we supplemented with youth unemployment data to capture broader labor-market conditions.

By comparing trends across regions and various development groupings, we assess whether sustained growth has actually been achieved and whether it has translated into improved youth outcomes. This combined approach allows us to not only measure progress toward each target individually but also to examine the relationship between economic expansion and youth workforce inclusion globally.

2. Methodology

2.1 Analytical Approach for Targets 1 and 2
We utilised the given datasets "continents-according-to-our-world-in-data.csv" and "gdp-per-capita-worldbank.csv" to obtain basic data on GDP levels across countries and time, from which we calculated the annual growth rate as our main indicator of economic performance. We also incorporated the World Bank's open population data to calculate population-weighted continental averages, providing a more accurate representation of a typical person within the continent. This aligns with UN SDG 8, which aims to be achieved 'for all' (*Goal 8 | Department of Economic and Social Affairs*), as well as preventing regional distortion as small countries no longer hold a greater influence over the average than they truly do. This approach does hold its own limitations, which shall be included in the discussion section of the report.

To assess progress towards Target 1, after initially plotting the evolution of GDP growth for both unweighted and weighted data and carrying out a comparison, all further analysis was carried out using weighted data.

We first compared long-term GDP growth across continents, and then decided to examine within-continent variations using two development classifications: tertiles and the UN LDC classification. Tertiles were calculated by dividing the GDP per capita data for each year into three, and corresponding countries are then classified as low, medium, and high. This creates an equal sample size for each group, allowing us to draw more concrete conclusions in our analysis as we can more easily compare various groups. However, using GDP per capita alone to classify countries may not be entirely accurate. There are other factors and measures that determine a country's development level; therefore, we have chosen to also utilize the M49 additional dataset containing LDCs. This directly relates to the target, utilizing three measures to determine if a country meets the criteria: Income (GNI), Human Assets (HAI), and Economic and Environmental Vulnerability (EVI) (*Least Developed Countries Category*). Combining these measures gives a more comprehensive view of a country's development level, so we have incorporated this into our analysis where we compare LDCs and non-LDCs across continents.

To summarize growth dynamics, we calculated statistical tests such as mean, median, and standard deviation of annual growth rates over time, aiding in our assessment of whether economic growth has been sustained in a continent, as specified in the target.

Switching over to Target 2, we adopted the same development-level tertile classifications to maintain methodological consistency, producing trend comparisons of NEET rates across the low, medium, and high development groups within each continent.

A challenge in the NEET data was inconsistent time coverage across continents, which would cause discontinuities in the charts and thus affect comparability. To address this, we restricted analysis to a common year range (2000-2020) where data existed globally. Then, using this standardized dataset, we assessed each continent's progress by calculating both the net change in NEET levels and the estimated slope over time for each continent.

To broaden our perspective on the labour market, we integrated youth unemployment data, which we cleaned and merged with the NEET dataset. Then, we conducted correlation analyses at both global and continental scales, with the relationship supported by scatter-plot visualisations. We also calculated net changes and trend slopes for unemployment rates, allowing us to compare whether movements in NEET aligned with labour-market outcomes. These combined measures enabled a multi-dimensional evaluation toward Target 2.

2.2 Visualization Approach
Across both targets, we adhered to the principles of graphical excellence, which aim to 'give the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space' (Tufte, *Graphical Excellence*). Figures were designed to avoid distortions and encourage comparisons within and across continents, ensuring that graphs highlight the underlying economic and youth-engagement patterns effectively.

3. Results

3.1 Target 1

To begin our analysis of progress towards Target 1, we visualised annual growth of GDP per capita using an animated choropleth to reveal any patterns regarding the countries within continents *(See Appendix 1)*. Immediately, this graph revealed that annual change tends to be similar amongst countries in the same continent, as evidenced, for example, in 2005, where most Asian countries tended to have an increase in GDP for that year. Despite this, we can see that variation within continents can differ, as seen in Africa, which could lead to a greater standard deviation in the data.

Furthering this pattern, we then investigated the per capita growth across continents using statistical measures, utilising both unweighted and population-weighted conditions. In doing so, we can see that across all continents, the mean growth rate was positive, with Asia having the largest growth rate across the time period for both conditions *(See Appendix 2)*. Although the trend seems to be upward, we cannot ignore fluctuations in average growth rates. This is particularly true in South America, where the highest standard deviation is recorded, which may denote inconsistent performance from some countries on the continent. Following this, we plotted line graphs showing the growth rates by year, where we see the rate is generally fluctuating in the range of -2% and 7%, with some extreme cases of decline in 2008 and 2020. This corresponds to the Financial Crisis and the COVID-19 Pandemic, which are potential contributing factors to the high standard deviations calculated *(Figure 1)*. These events show that North America was greatly impacted; however, when factoring in the weighted growth rate, we can see its rate isn't an outlier in comparison to other continents *(Figure 2)*.

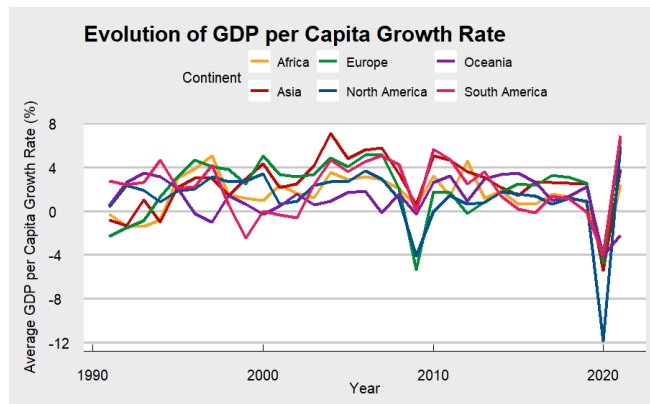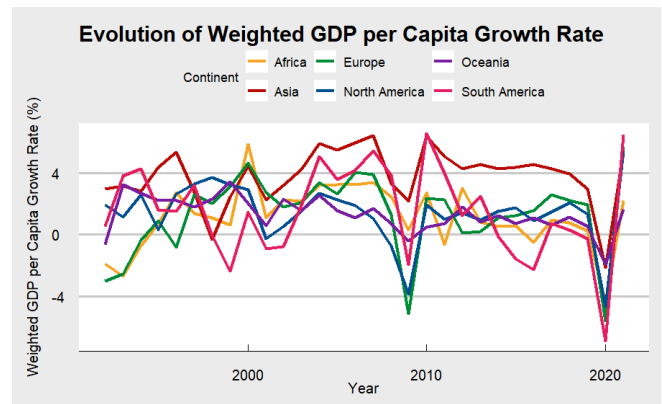*Figure 1*   *Figure 2*

To deepen our understanding of each continent's progress, we classified each country based on its development, firstly by dividing them into tertiles. When doing so, we realised that Europe consists of no low-development countries beyond 1997, thus forcing us to ignore them in our analysis to prevent inaccuracy. When looking into the other five continents, we see that there is still great variation between growth rates among low-development countries, as Asia still exhibits an average 4.37% growth, while in other continents it is below 1%, so we cannot conclude there is a correlation between the tertile groups and their growth rate *(See Appendix 3)*. This variation is furthered by the

standard deviations being vastly different between tertiles of different continents, since Africa's 11.9 in high-development countries is much greater than that of any other continent. Furthermore, this is seen within continental disparities, such as in Africa, where some years consist of a much larger proportion of low-development countries, possibly affecting the significantly lower standard deviation of 2.8 in this tertile.

When the graphs are plotted for each continent, we can see some cases of sharp spikes in the growth rate, especially amongst the medium-development countries. This suggests that they may be more volatile and greatly affected by external shocks *(Figure 4)*. Above all, we see that the low-development countries are generally situated below the 7% benchmark, suggesting that the target has not been met, even with certain continents demonstrating relatively steady growth, such as South America, with their rate consistently sitting between -5% and 5%. Despite this, some continents have exceeded this benchmark on numerous occasions, but as this isn't sustained, we cannot conclude that the target has been achieved *(Figure 3)*.
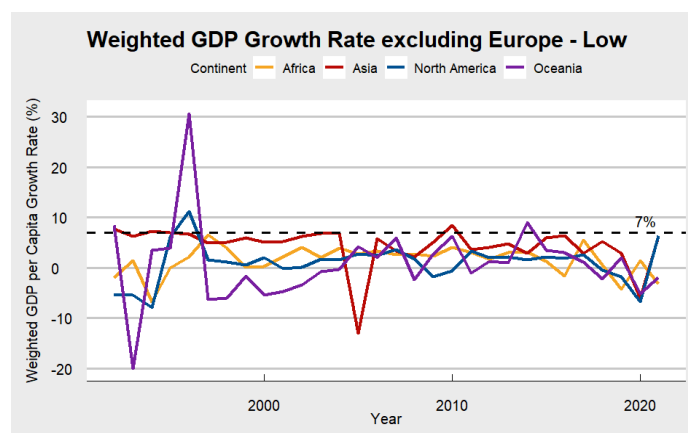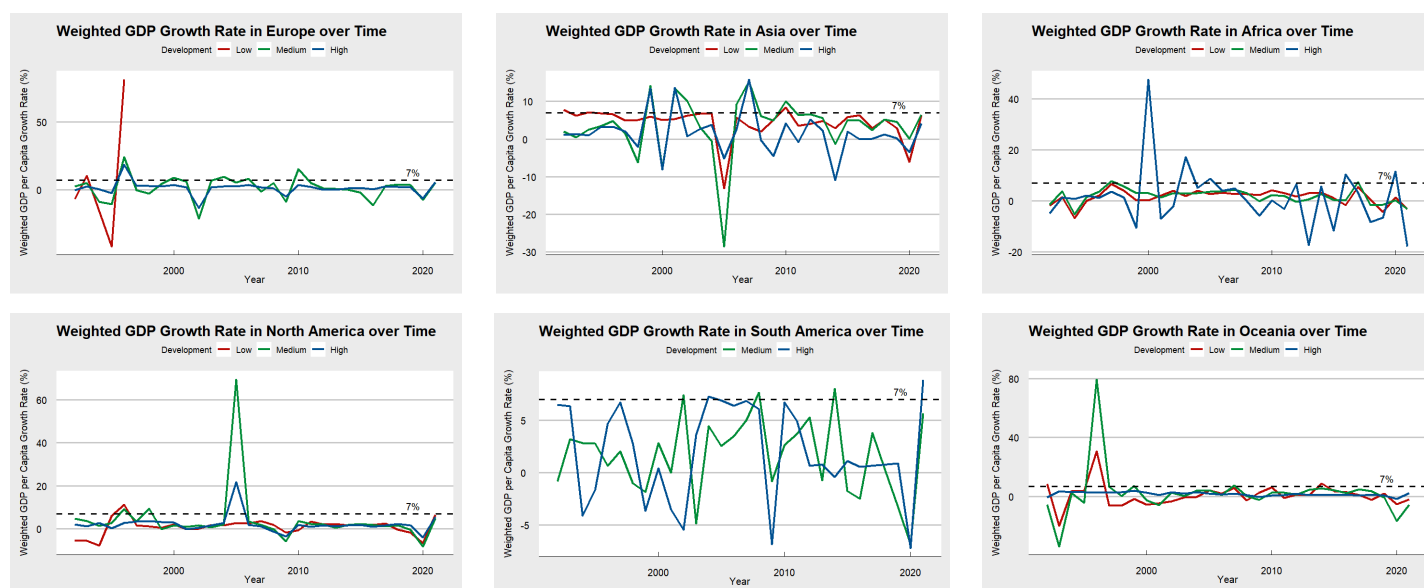

Figure 3

Figure 4

Following this, we divided the continents into LDC and non-LDC countries based on the UN classification and identified a similar set of results. Both North America and Oceania remain those with the lowest growth rates; however, these rates were lower than those for the tertiles, with North

America exhibiting a negative mean growth rate for its LDCs. Asia possesses the highest growth rate among both LDCs and non-LDCs, whilst also having a low standard deviation, thus suggesting they are sustaining growth at a higher and more consistent rate in comparison to other continents, regardless of development. On the other hand, Oceania's LDCs show a large standard deviation of 4.3, a stark contrast to its non-LDCs with a low standard deviation of 1.1, demonstrating large differences in their growth stability *(See Appendix 4)*. This disparity helps highlight that continents can have both similar and very distinct growth rates between their LDC and non-LDC countries. When we average this across continents, we can deduce that LDCs struggle to meet the target due to reduced growth and stability, as seen through their lower mean and higher standard deviation. This struggle is seen throughout all continents, despite Oceania and North America reaching the 7% target once prior to 2000 and Asia coming very close in 2007; thus, we are generally unable to definitively conclude that continents are meeting this target *(Figure 5)*.

Figure 5

3.2 Target 2

Immediately, we see that when using the common years, the global NEET rate shows an overall decline; however, the rates for individual continents show great variety, with some increasing and others decreasing *(Figure 6)*. Africa and Asia both show a decrease, but with fluctuation throughout the time period, whereas Europe demonstrates a more steady reduction. The other three continents all display an increase in their NEET rate over this period. The average slopes follow the same pattern, with Africa, Asia, and Europe displaying a downward trend and therefore meeting the second target at a surface level, whereas North America, Oceania, and South America have moved further away from the goal. These measurements highlight how global progress towards reducing the NEET rate is very uneven, with Africa, Asia, and Europe all improving in line with the UN's target, whilst the remaining continents have worsened, denoted by their increasing rates of varying magnitude.
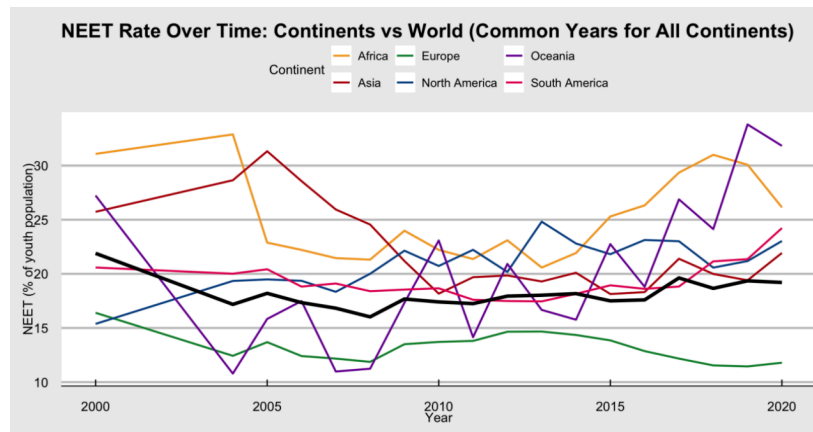
Figure 6

To present a more thorough analysis, we again divided the countries into tertiles based on their development levels. Yet, we see that no continent shows a stable hierarchy, as volatility is common. Only Europe and North America show a clear arrangement, whilst other continents, such as Oceania and Asia, shift very frequently. As a result, these inconsistent patterns indicate that the development level on its own bears little explanation for the intracontinental NEET rate disparities.
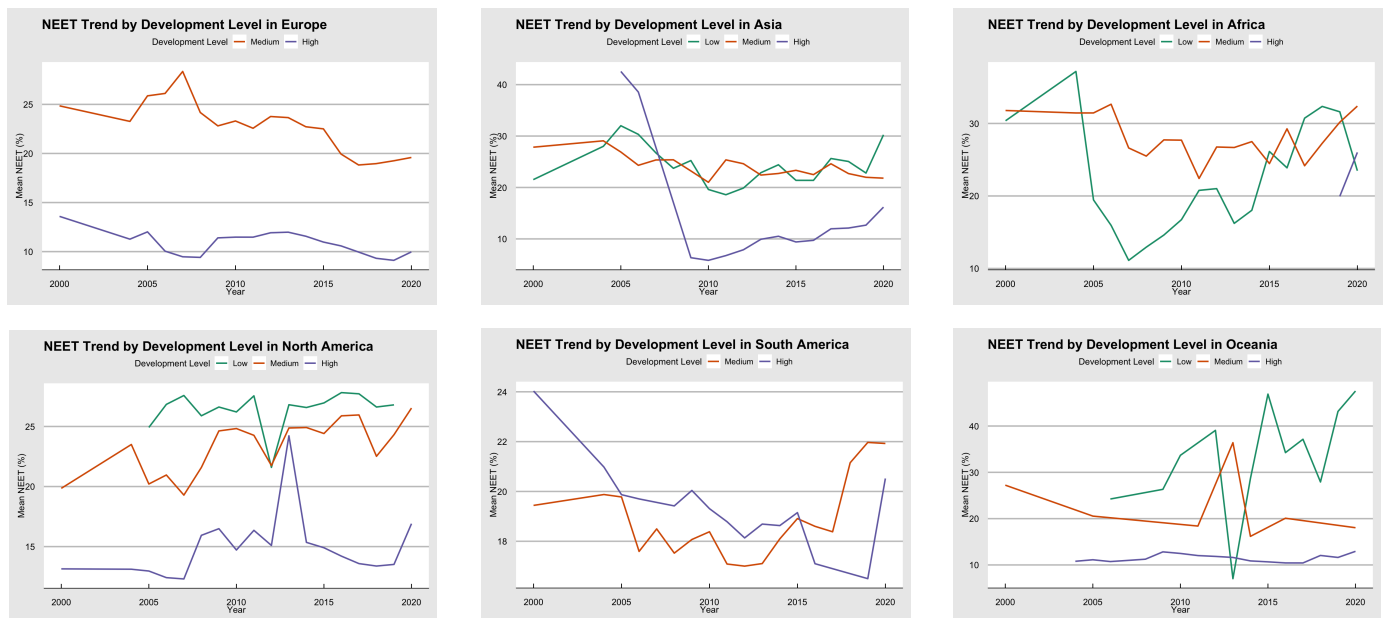

Figure 7

Our additional file containing data on youth unemployment helps provide a broader understanding of the labour markets of each continent. Excluding Asia, all continents show an increase in youth unemployment over these periods, with Europe and North America seeing earlier spikes followed by

6

periods of stability in their trends *(Figure 8)*. These generally increasing trends establish our basis for analysing how youth unemployment may affect the NEET rate of continents *(See Appendix 5)*. To achieve this, we computed the correlation between youth unemployment rates and NEET rates at a global and continental level *(Figure 9)*. Globally, the 0.371 correlation indicates a weak positive correlation between these two variables, whilst the coefficients for each individual continent are of varying strength. North America is the only continent to show nearly no linear correlation, whilst Europe and Asia both show stronger correlations above 0.65 *(See Appendix 6)*. These values suggest that there is a positive relationship between these variables; however, we are unable to fully explain the changes in NEET rate with just youth unemployment given the presence of underlying third variables. Additionally, when comparing the changes in both indicators annually across continents, we see that they are not always moving in the same direction. As for Africa and Europe, there is an increase in youth unemployment, yet a decrease in the NEET rate *(See Appendix 7)*. This suggests that their NEET rate improvements (in line with the UN target) are not driven by stronger labour market conditions. For Asia, both indicators show a small reduction, denoting progress towards the target, whereas they increase simultaneously in Oceania and North and South America, thus depicting a clear deterioration in youth outcomes. Overall, we can conclude that both indicators must be observed when assessing progress towards target 2 rather than relying solely on labour market measures due to the additional variables influencing their outcomes. Despite continents such as Africa and Europe reducing their NEET rate, it may only be a result of shifting effects, since youth unemployment still rises significantly.
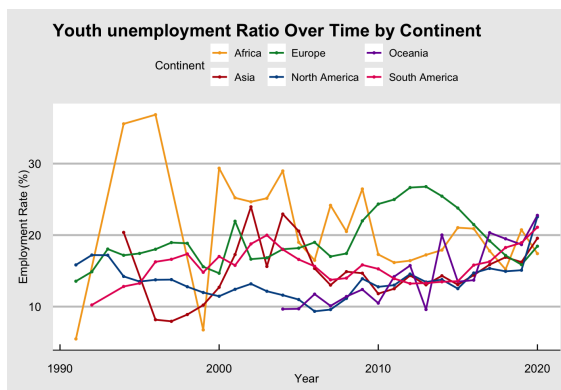

Figure 8

Figure 9

4. Discussion and Limitations

Firstly, while population-weighted GDP reflects the experience of the average individual, it introduces several limitations. Large economies have a disproportionately strong influence on the continental average, meaning that fluctuations in highly populated countries can overshadow smaller nations entirely. As a result, weighted data may smooth out variations that are necessary for the analysis. Similarly, continents dominated by one or two populous countries may appear more stable than they actually are. While weighting aligns with the SDG focus on inclusive development, it reduces our ability to evaluate progress at a country-level scale.

Additionally, tertile classification ensures equal group sizes, but relies solely on GDP per capita, which does not account for institutional or social development factors. Countries may therefore move between tertiles without genuine structural change. Similarly, the UN M49 classification supports direct evaluation against the 7% benchmark; however, uneven LDC distribution across continents limits comparability evaluations. In regions with one or fewer LDCs, such as Europe, North America, and Oceania, "average LDC" results simply reflect the trajectory of a singular country, whereas the non-LDC category aggregates many nations. Thus, fluctuations in one LDC would impact the data disproportionally compared to the continent-wide average. As a result, our LDC v. non-LDC findings should be seen as a broad indication of patterns, rather than a definitive comparison of the two groups.

Finally, NEET data varied by continents, requiring analysis to be restricted to the common 2000–2020 period and limiting our ability to observe longer-term trends. The development-level data contain substantial missing values, and our simple classification (low, medium, high) cannot fully capture within-continent differences. Correlation analysis between NEET and youth unemployment cannot establish causality, and external factors such as policy interventions or macroeconomic shocks were not incorporated, all of which may influence youth labour outcomes beyond what our data captures.

5. Conclusion

Ultimately, our analysis provides a comparative measurement of individual continents' progress towards these two UN targets despite lingering limitations, namely inconsistencies in data availability among others. Our findings indicate that Asia performs best in relation to both targets simultaneously, yet there is widespread unevenness between the other continents due to fluctuations in their data within the time period. In particular, most continents appear to fall consistently short of the 7% growth rate amongst lesser developed countries in target 1, potentially implying that this target may require reassessment. As a whole, this depicts both the successes and adverse challenges faced in an attempt to align with the UN's goal of sustainable development. Moving forward, future progress will likely rely not only on economic growth but also on improved labour market access, strengthened education systems, and targeted policies that support youth participation.

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Github Repository:

https://github.com/kssanft/C12-Data-Science

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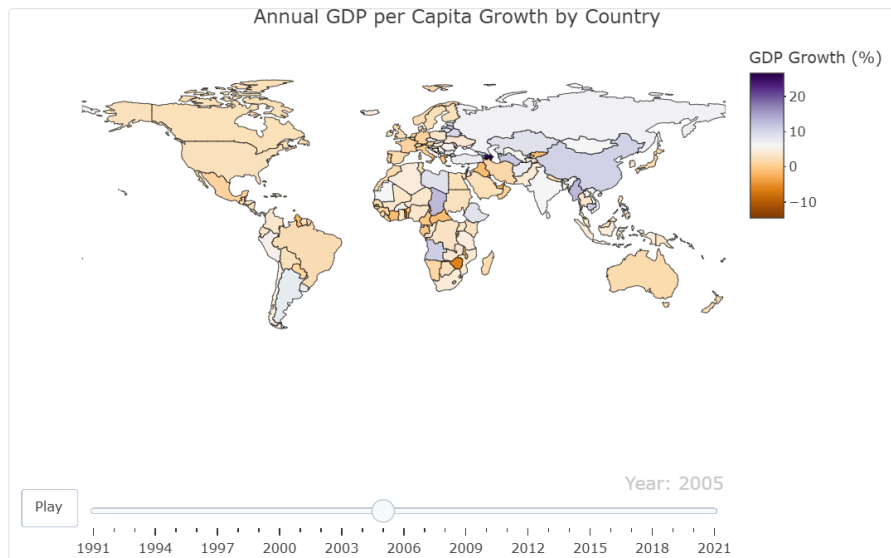
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Appendix

Appendix 1:

Appendix 2:
Unweighted:

Continent <chr>	mean_GDP_growth <dbl>	SD_GDP_growth <dbl>	median_GDP_growth <dbl>
Africa	1.504187	1.930350	1.485996
Asia	2.556074	2.431821	2.658273
Europe	2.151833	2.769122	2.570441
North America	1.229565	2.920457	1.529751
Oceania	1.215930	1.724394	1.436290
South America	2.105798	2.465457	2.388781

6 rows

Weighted:

Continent <chr>	mean_GDP_growth <dbl>	SD_GDP_growth <dbl>	median_GDP_growth <dbl>
Africa	1.148686	2.043387	1.003203
Asia	3.824893	1.843229	4.256523
Europe	1.289275	2.602871	1.968131
North America	1.391694	1.966841	1.488533
Oceania	1.322735	1.146529	1.386605
South America	1.493169	3.009449	1.506641

6 rows

Appendix 3:

Development <fctr>	Continent <chr>	mean_GDP_growth <dbl>	SD_GDP_growth <dbl>	median_GDP_growth <dbl>
Low	Africa	1.5161064	2.846638	2.111456
Low	Asia	4.3673303	4.182765	5.219085
Low	Europe	10.8036856	51.778951	1.803698
Low	North America	0.9219845	3.850564	1.634441
Low	Oceania	0.8896284	7.918142	1.008367
Medium	Africa	1.8154490	2.869012	2.442882
Medium	Asia	3.4748082	7.973320	4.882796
Medium	Europe	1.6608669	8.644125	3.353060
Medium	North America	4.0878841	12.785008	1.771010
Medium	Oceania	2.3165735	16.657765	2.322304

1-10 of 17 rows   Previous 1 2 Next

Development <fctr>	Continent <chr>	mean_GDP_growth <dbl>	SD_GDP_growth <dbl>	median_GDP_growth <dbl>
Medium	South America	1.6395535	3.667458	2.587667
High	Africa	1.3042218	11.905630	1.206919
High	Asia	1.6283622	5.630162	1.351049
High	Europe	1.4005872	4.814593	1.888783
High	North America	2.1037489	4.160304	1.644149
High	Oceania	1.6526538	1.253373	1.675170
High	South America	1.9896685	4.750677	1.938133

11-17 of 17 rows   Previous 1 2 Next

Appendix 4:

LDC <chr>	Continent <chr>	mean_GDP_growth <dbl>	SD_GDP_growth <dbl>	median_GDP_growth <dbl>
LDC	Africa	1.2861462	2.440047	1.649320
LDC	Asia	4.0191508	1.809120	4.453435
LDC	North America	-0.6597217	4.159387	0.313984
LDC	Oceania	0.3060241	4.308116	0.612143
Non-LDC	Africa	1.3925571	2.151573	1.318932
Non-LDC	Asia	3.8513990	1.869221	4.253413
Non-LDC	Europe	1.2892754	2.602871	1.968131
Non-LDC	North America	1.4004734	1.966162	1.499658
Non-LDC	Oceania	1.3392197	1.149424	1.401573
Non-LDC	South America	1.4931690	3.009449	1.506641

Appendix 5:

	Continent <chr>	first_year <dbl>	last_year <dbl>	unemp_first <dbl>	unemp_last <dbl>	change <dbl>	slope <dbl>
1	Africa	1991	2020	5.48	17.4	11.9	0.411
2	Asia	1994	2020	20.4	19.6	-0.821	-0.0316
3	Europe	1991	2020	13.6	18.4	4.89	0.169
4	North America	1991	2020	15.8	22.6	6.73	0.232
5	Oceania	2004	2020	9.66	22.8	13.1	0.819
6	South America	1992	2020	10.2	21.1	10.9	0.388

Appendix 6:

	correlation <dbl>
1	0.371

```
  Continent    correlation
  <chr>            <dbl>
1 Africa           0.344
2 Asia             0.655
3 Europe           0.699
4 North America    0.142
5 Oceania          0.319
6 South America    0.509
```
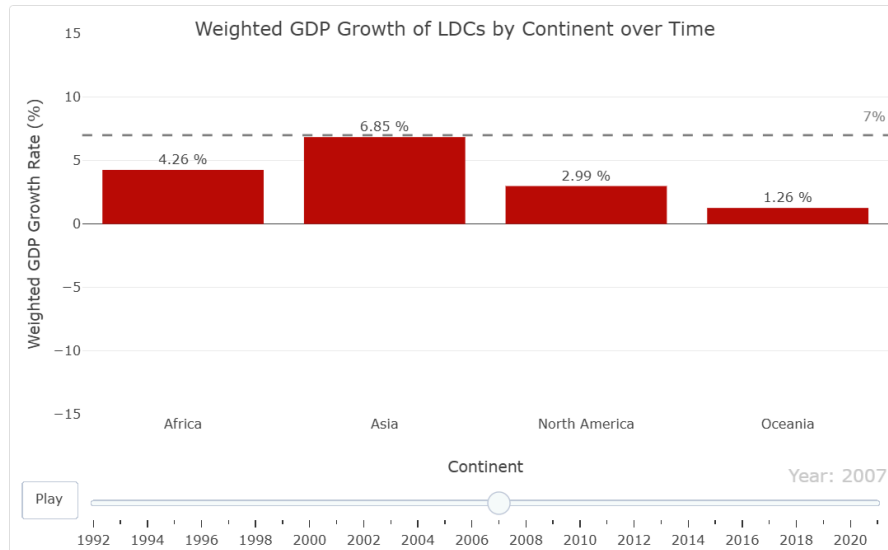
Appendix 7:

```
  Continent      neet_change neet_slope unemp_change unemp_slope
  <chr>              <dbl>       <dbl>        <dbl>        <dbl>
1 Africa             -4.94      -0.247        11.9         0.411
2 Asia               -3.80      -0.190       -0.821       -0.0316
3 Europe             -4.61      -0.231         4.89        0.169
4 North America       7.65       0.383         6.73        0.232
5 Oceania             4.59       0.230        13.1         0.819
6 South America       3.64       0.182        10.9         0.388
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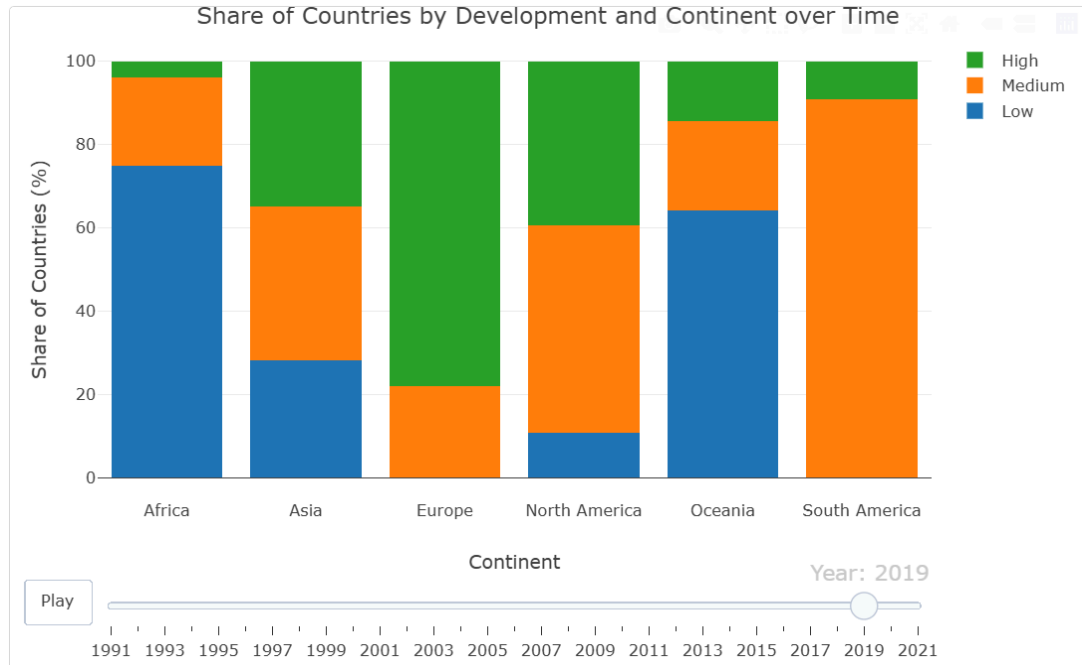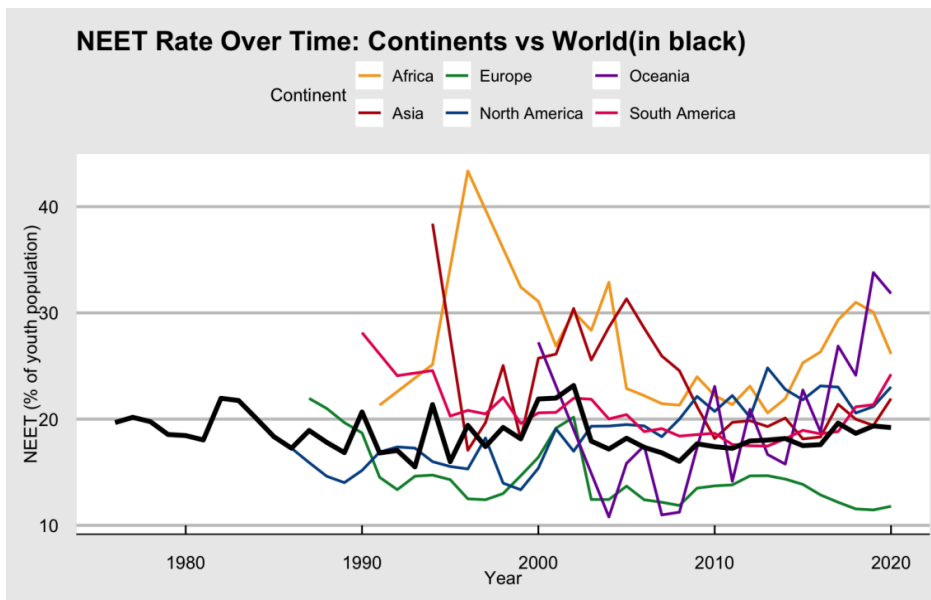
Appendix 8:

Appendix 9:

Share of Countries by Development and Continent over Time

Appendix 10:

NEET Rate Over Time: Continents vs World(in black)

Continent	first_year	last_year	neet_first	neet_last	change	slope
<chr>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
Africa	2000	2020	31.1	26.1	-4.94	-0.247
Asia	2000	2020	25.7	21.9	-3.80	-0.190
Europe	2000	2020	16.4	11.8	-4.61	-0.231
North America	2000	2020	15.4	23.0	7.65	0.383
Oceania	2000	2020	27.2	31.8	4.59	0.230
South America	2000	2020	20.6	24.2	3.64	0.182

14