# Microeconomics: Business Cycle, Growth, Inequality Assignment

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1. What are the complete names of the four countries that are represented by the three-letter codes? In the following questions, refer to the countries by their full names, not by their codes.

   - Country 1: NZL is New Zealand

   - Country 2: CMR is Cameroon

   - Country 3: POL is Poland

   - Country 4: SDN is Sudan

2. Plot the evolution of the real per capita GDP of the four countries on the same chart using the log-scale. Describe the differences and similarities that you observe.

### Evolution of Real Per Capita GDP From 1970-2017 in log scale
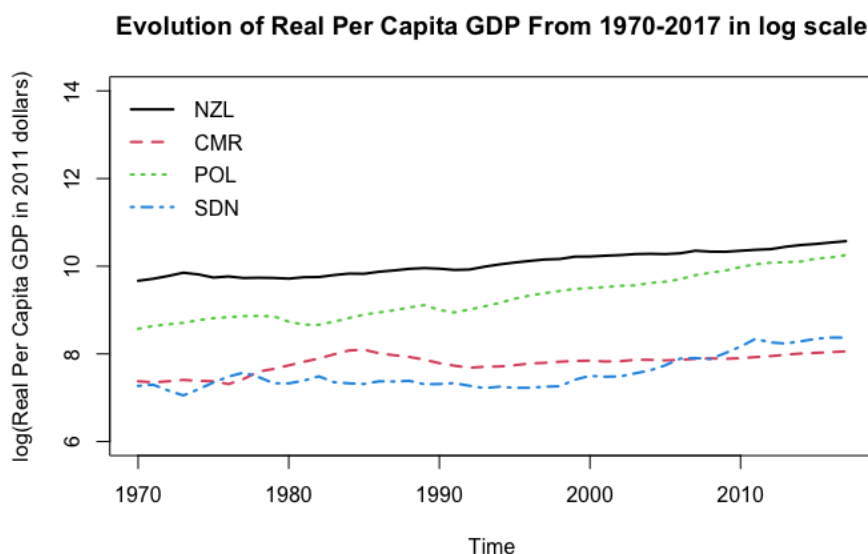
In general, there seems to be an increase in the real per capita GDP for each country in the long run. There seems to be a strong comovement between Poland and New Zealand and Sudan. Poland and New Zealand seem to be consistently increasing in GDP over the years, whereas Sudan begins to increase as well around 1999. Cameroon began to increase rapidly from approx. 1976 to 1985, but then that rate of change stagnates. This could be due to reduced trade relations or other factors. Poland and Sudan also share similar fluctuations around 1978 and 2010when there's a peak as opposed to the other countries.

3. Compute the cyclical component of each series expressed in logs using a quadratic trend and plot them on either 4 different line charts or on the same one. The choice is yours and it depends on which option provides a clearer approach to compare the cycles. Discuss what you see by answering the following questions:

- Do you observe a positive, negative or no comovement between the different business cycles?
- If you observe no comovement between two business cycles, can it be explained by the two countries being poor trading partners? You may have to search the internet to answer that question.
- If you observe a strong positive comovement between two business cycles, can it be explained by the two countries being strong trading partners? You may also have to search the internet to answer that question.
- Do you observe common periods of recession? Are they world-wide recessions? You may also have to search the internet to answer that question.

Cyclical Component Real Per Capita GDP From 1970-2017 in log scale
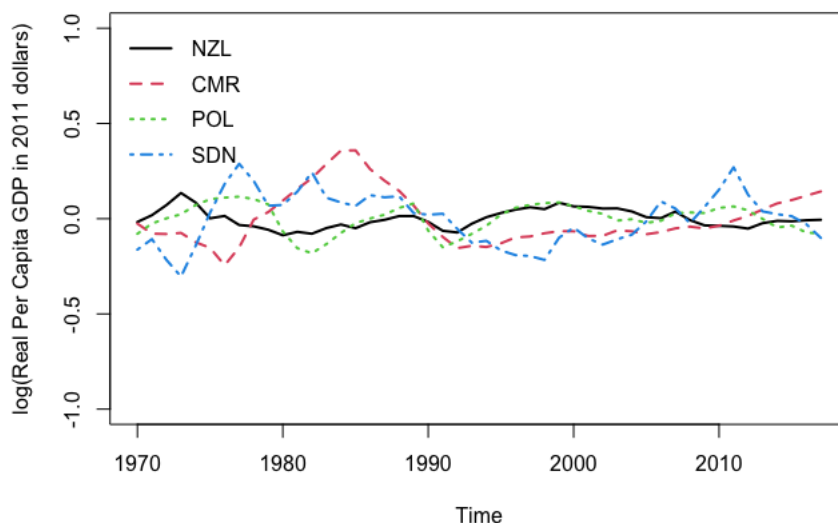
The strongest positive comovement seems to be between New Zealand and Poland. They peak at similar years and trough at similar years as well. There also seems to be a strong positive comovement between Sudan and Cameroon up until around 2010, when Sudan seems to follow the general decline along with New Zealand and Poland. Poland and New Zealand have strong trade relationships according to The Government of New Zealand website. This relationship dates to the late 1800s, including shared war experiences in World War 2, and much more. Their trading relationship has been increasing strongly throughout the past century. It is also true that Sudan and Cameroon are part of Africa and are very close geographically.

It is also noticeable that there was a worldwide dip around 1990. This could be attributed to the early 1990s recession which was due to several factors including Canadian and American politics (Canadian PM resigned, Bill Clinton became president of USA), the end of the Cold War, and the 1990 oil price shock as mentioned by Wikipedia.

4. Compute the average annual growth rate between 1970 and 2017 for all four countries. Then, produce a scatter plot with the 1970 real per capita GDP's expressed in logs on the x-axis and the average growth rates on the y-axis (you should have four points). Discuss the results by answering the following questions:

**Average Annual Growth Rate vs. 1970 Real Per capita GDP in logs**
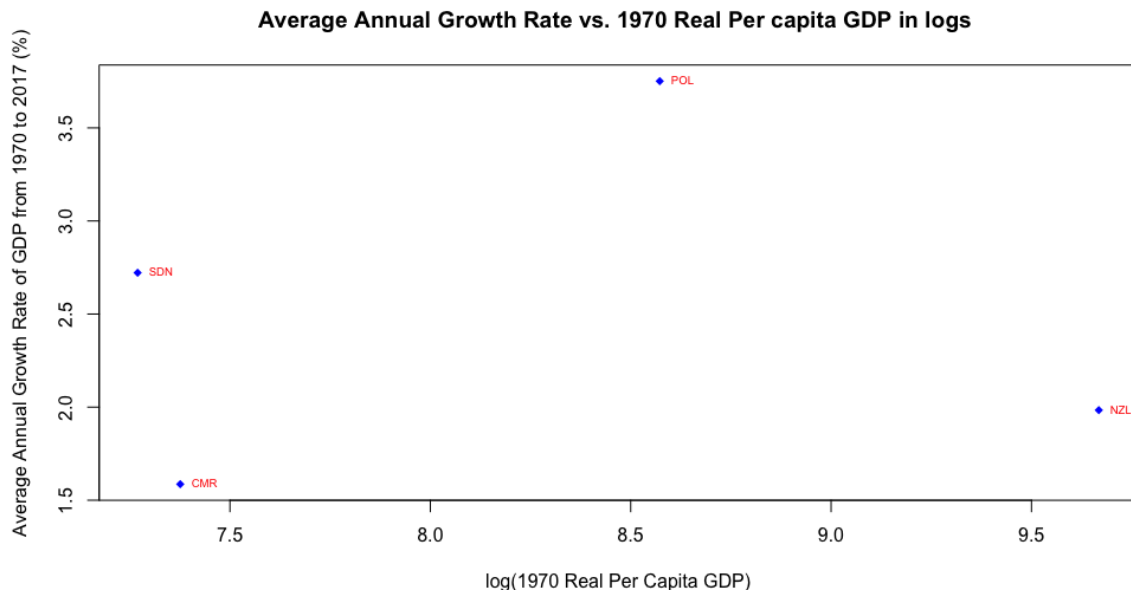
- Are the four countries converging to each other?

  Not all the countries are converging to each other. It seems as if Sudan, New Zealand, and Poland are somewhat converging. New Zealand starts off with the highest GDP and one of the slowest annual growth rates. Both Sudan and Poland have lower initial GDP in 1970, but higher growth rates. This indicates that these two countries likely converge with New Zealand; however, Cameroon has the lowest growth rate and lowest initial GDP. This indicates that this fourth country; Cameroon, does not necessarily converge with the other 3.

- Using countries' characteristics such as the level of education, life expectancy, economic freedom, etc., try to justify why some are converging and why some are not. You can use that data files from the module on Growth and Development or get the information from a reliable internet source (like the World Bank).

  According to the data from the World Bank, it seems that on average life expectancy has risen consistently in each country, education rates (literacy rate in adults) has remained consistently high in all 4 countries, and more. So, it seems that in general, the standard of living should be increasing, and all the countries should be converging. However, some reasons why Cameroon GDP is not increasing as fast is due to business freedom and investment freedom according to Heritage.org. These two factors were consistently decreasing or lower than world average from approximately 2005 to 2020. Such factors as well as political factors including terrorist attacks can account for this slow growth rate compared to the relatively peaceful and strong economies of the other 3 countries.

5. For this question, you must compare the distribution of real per capita GDP across all 152 countries in the two assigned years expressed in **thousands of international dollars of 2011** (the choice of units is to make the x-axis labels more readable). Create two histograms (with the option breaks=25), one for each year and interpret what you see. Do you see a difference in terms of inequality? Do you see a change in the proportion of poor countries?

Distribution of real per capita GDP across countries in 1973
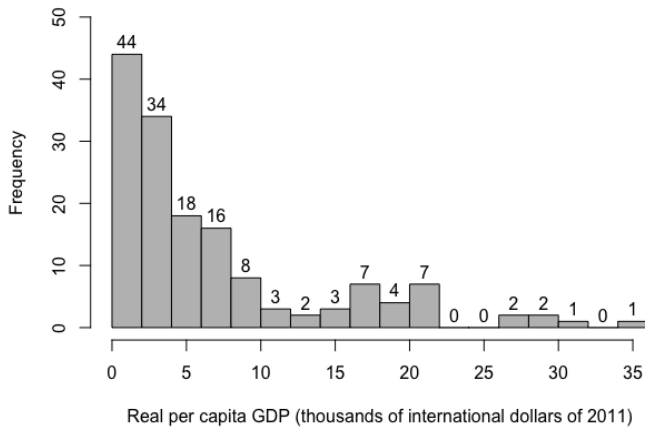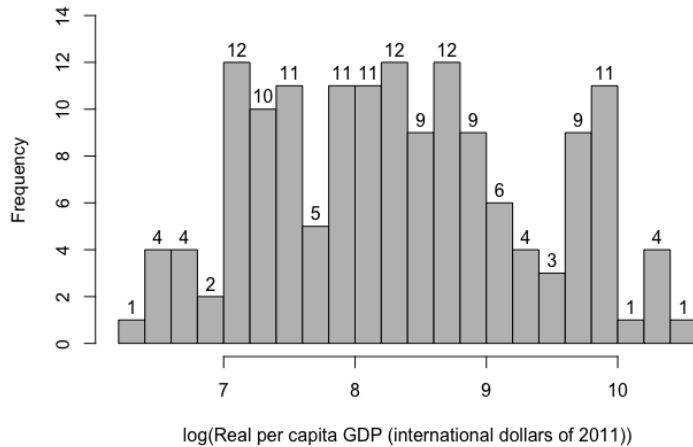

Distribution of real per capita GDP across countries in 2007
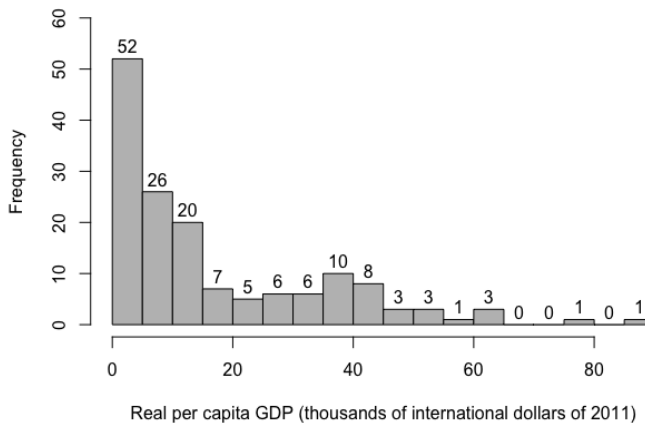

The real per capita GDP has increased quite a bit from 1973 to 2007 on average across all countries. This is visible from the x-axis. There are many more countries with more than 20 thousand dollars of 2011 in 2007 compared to 1973. Overall, the world may have improved in terms of GDP, however, the distribution still looks very similar. The relative proportion of poor countries remains the same and the graph is slightly skewed to the right where there are much fewer countries with a high real per capita GDP. This can be attributed to the global economy improving over time; however, the distribution remains relatively unequal.

6. For this question, you have to compare the distribution of real per capita GDP across all 152 countries in the two assigned years expressed logs. Create two histograms (with the option breaks=25), one for each year and interpret what you see. Do you see a difference in terms of inequality? Do you see a change in the proportion of poor countries? Also, explain why the histograms are different when the real per capita GDPs are expressed in logs.

Distribution of real per capita GDP across countries in 1973 in log

Distribution of real per capita GDP across countries in 2007 in log
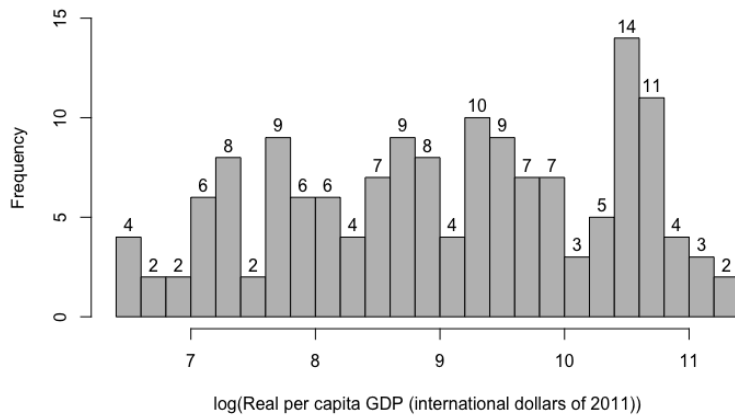
When expressed in log scale, there seems to be improvement in inequality in real per capita GDP across all the countries. As seen in the first graph, there are many countries around the centre of the x-axis (the mean real per capita GDP), however, in the second graph for 2007, the proportion of poor countries has decreased. On average, there is a greater number of countries on the right half of the graph compared to the left, showing that the proportion of poor countries has decreased from 1973 to 2007. Inequality seems to have decreased slightly. The histograms are much different when expressed in logs due to the smaller values but the same number of breaks. This allows for us to see the average and differences from the average much clearer compared to the original graphs. It shows a more "normal" distribution.

Works Cited

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