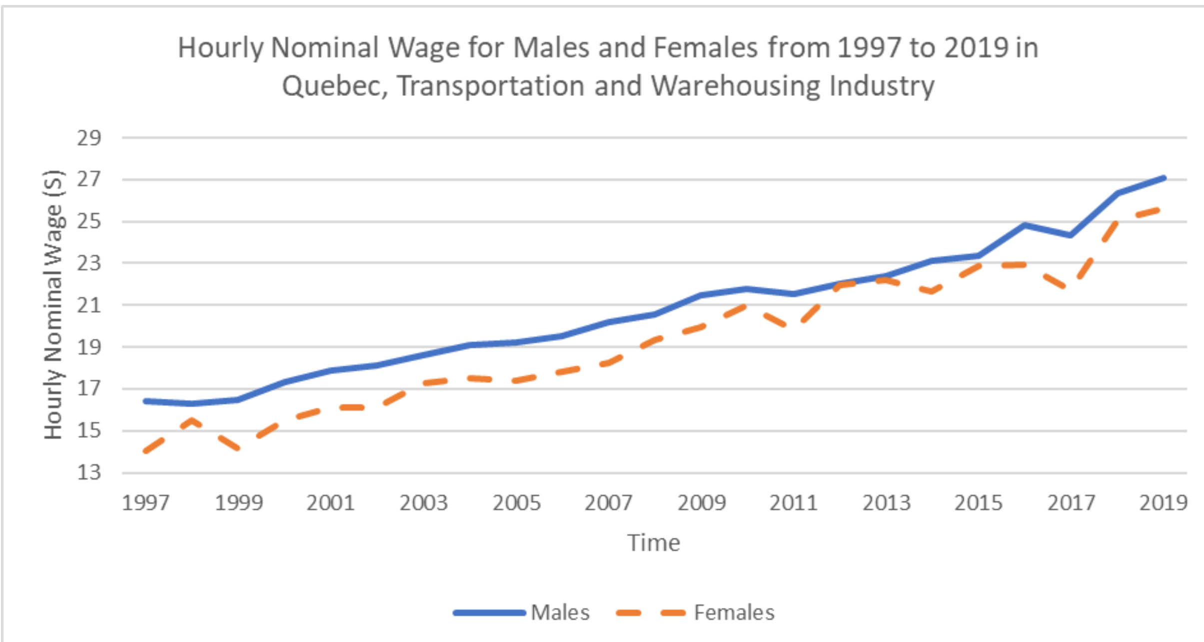
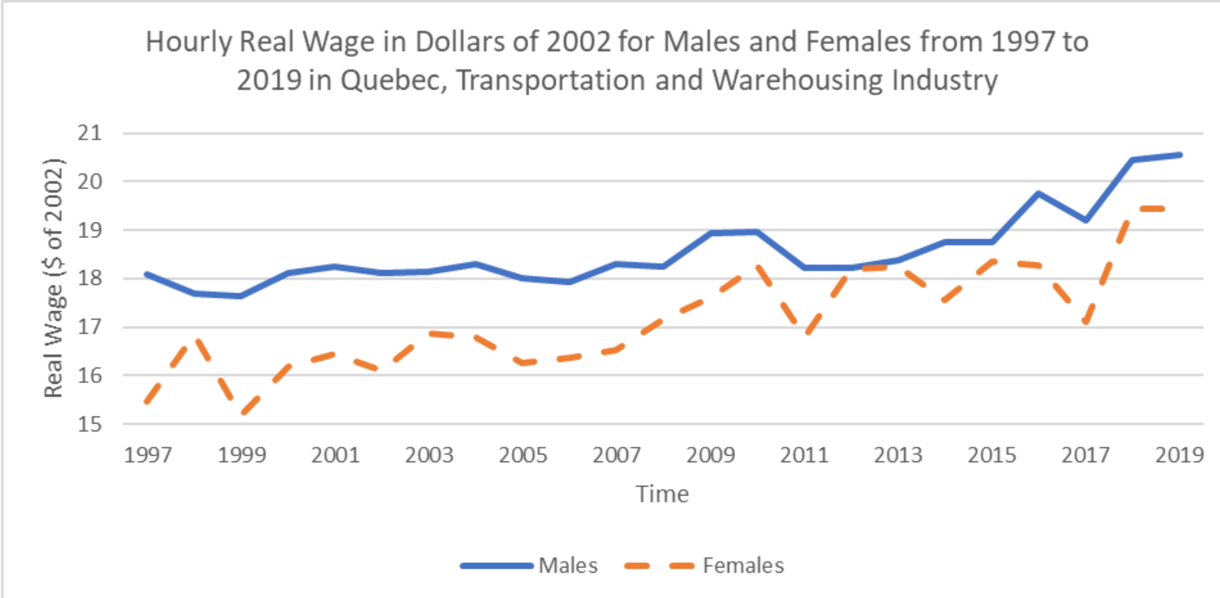
Part A: The Cost of Living

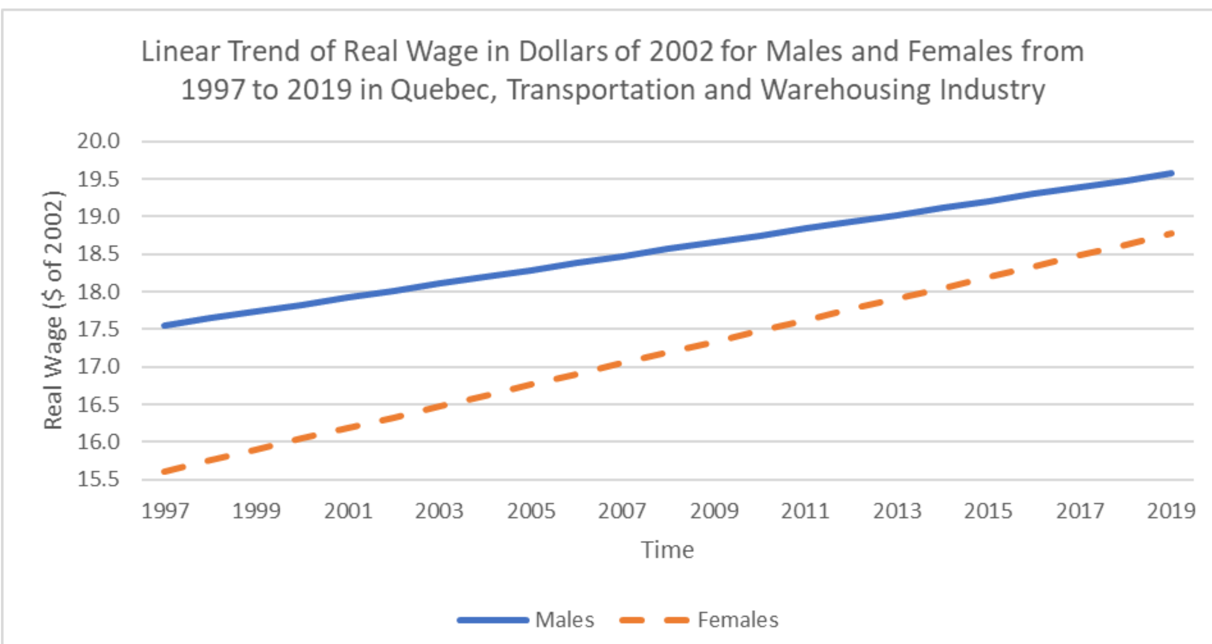
1. The hourly nominal wage series shows an overall positive trend and has increased between 1997 to 2019 for both males and females in Quebec, Transportation and Warehousing Industry, which is evident as hourly nominal wage increased from $16.43 to $27.06 and $14.04 to $25.61, respectively. Thus, there is minimal difference between male and female trends. However, females appear to fluctuate more than males with short period increases followed by decreases between 1997-1999 and after 2009. Additionally, males had a higher hourly nominal wage throughout the entire period, except for around 2012 where males and females had similar wages ($22.00 vs. $21.97).



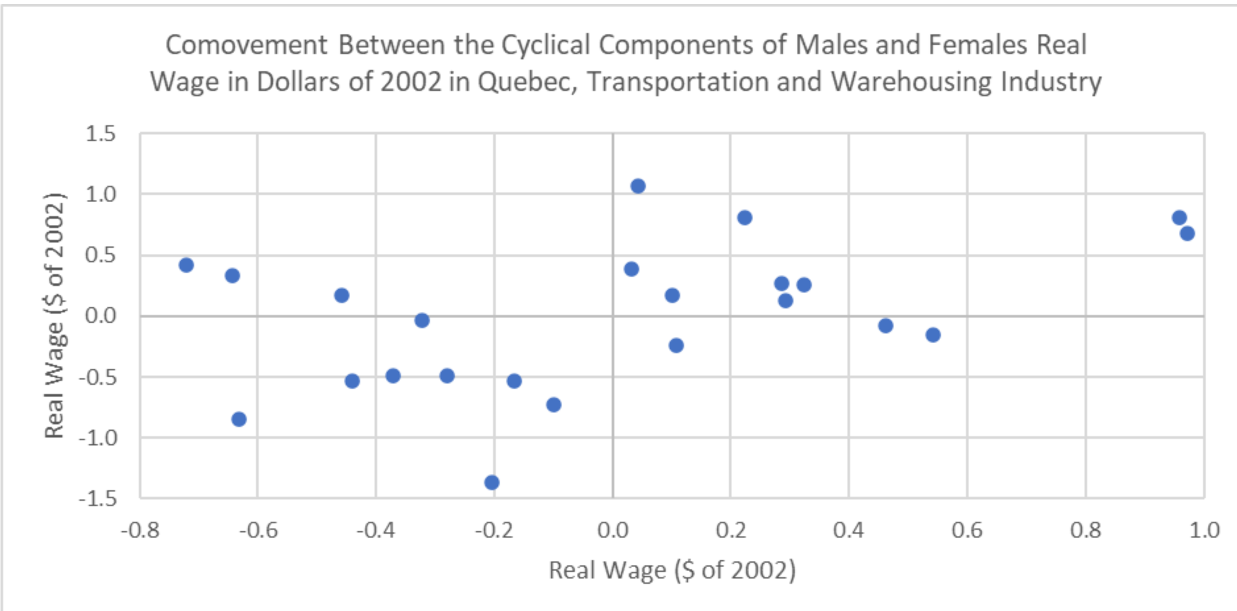
2. Similarly, the following hourly real wage series shows an overall positive trend and has increased, to a lesser extent, between 1997 to 2019 for both males and females in Quebec, Transportation and Warehousing industry from $18.09 to $20.55 and $15.46 to $19.45, respectively. In comparison to the previous graph, the overall wage increase is smaller ($10.63 vs. $2.46 males, $11.57 vs. $3.99 females) and fluctuations are more pronounced. Between the two charts, the hourly real wage series provides a better picture of the evolution of the standard of living of individuals working in the Transportation and Warehousing industry, such that it is misleading to conclude that males and females have increased their purchasing power based on the hourly nominal wage increase as the cost of the 2002 basket of goods has increased by 31.7% over the same period, so the nominal wage has simply followed inflation, whereas the real wage series accounts for inflation.



3. It is evident that the wage gap is changing on average, such that the wage gap between males and females is decreasing. At the beginning of the period in 1997, the wage gap was $1.94 and has decreased to $0.81 by 2019. This is reasonable as the annual change on average for females is $0.14/year, which is greater than the annual change on average of males, $0.09/year, enabling female real wage to grow at a faster rate than males and ultimately narrow the wage gap over the 1997-2019 period.



4. The cyclical components of male and female real wage shows a weak positive comovement as points are moving in relatively the same direction, such that high male real wage is generally associated with high female real wage. This result is plausible as inflation affects males and females equally, thus not significantly influencing one gender's real wage over the other. As seen in the previous question, males and females have relatively similar positive/increasing annual changes on average, indicating that as males' real wage increases, females' also increases, resulting in a positive comovement.

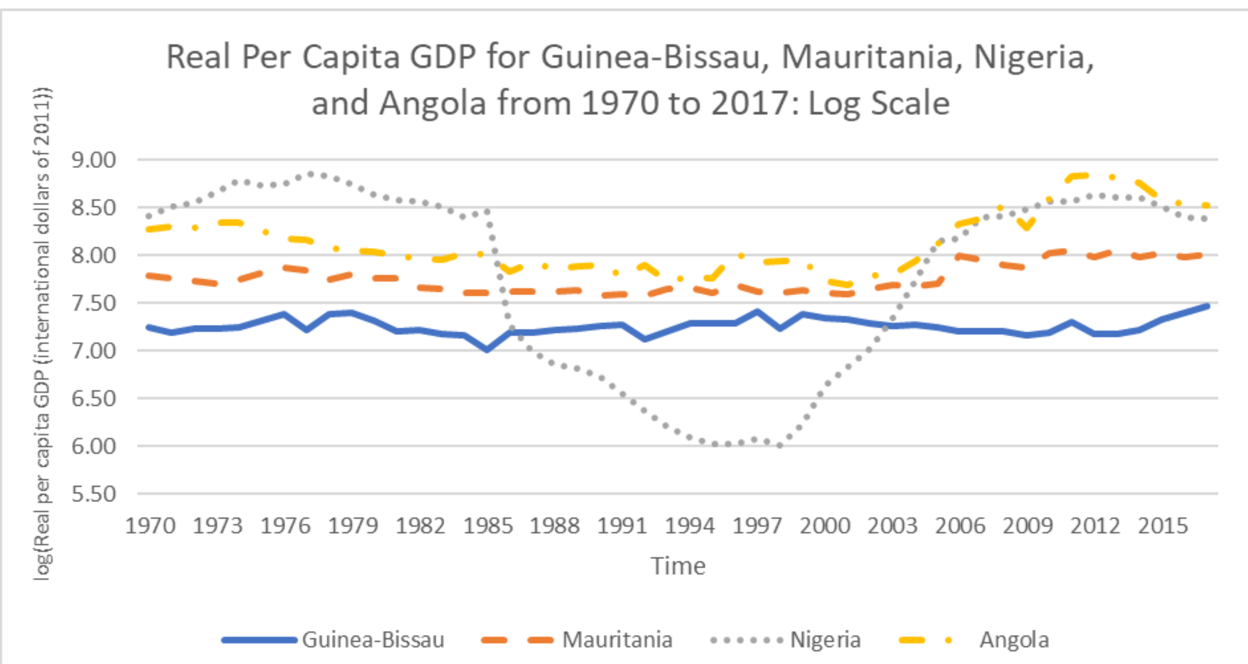


Part B: Business Cycle, Growth and Inequality

1. **GNB** – Guinea-Bissau **MRT** – Mauritania **NGA** – Nigeria **AGO** – Angola

2. It is evident that amongst the four countries, Angola, Mauritania, and Guinea-Bissau had less drastic changes in their real per capita GDP during the 1970 to 2017 period as fluctuations are significantly less volatile as opposed to Nigeria. The three former countries had shorter, less volatile fluctuations on average, whereas Nigeria had longer, more volatile fluctuations on average with a sharp decline between 1985 to 1997 followed by an increase. Although less prominent, Angola also follows a similar evolution to Nigeria, such that there is a gradual decrease from 1973 to 1994 followed by an increase, forming a "U" shape. On the other hand, Mauritania and Guinea-Bissau do not show the same evolution as their real per capita GDP appears to remain relatively constant throughout the period, excluding minor short-term fluctuations.

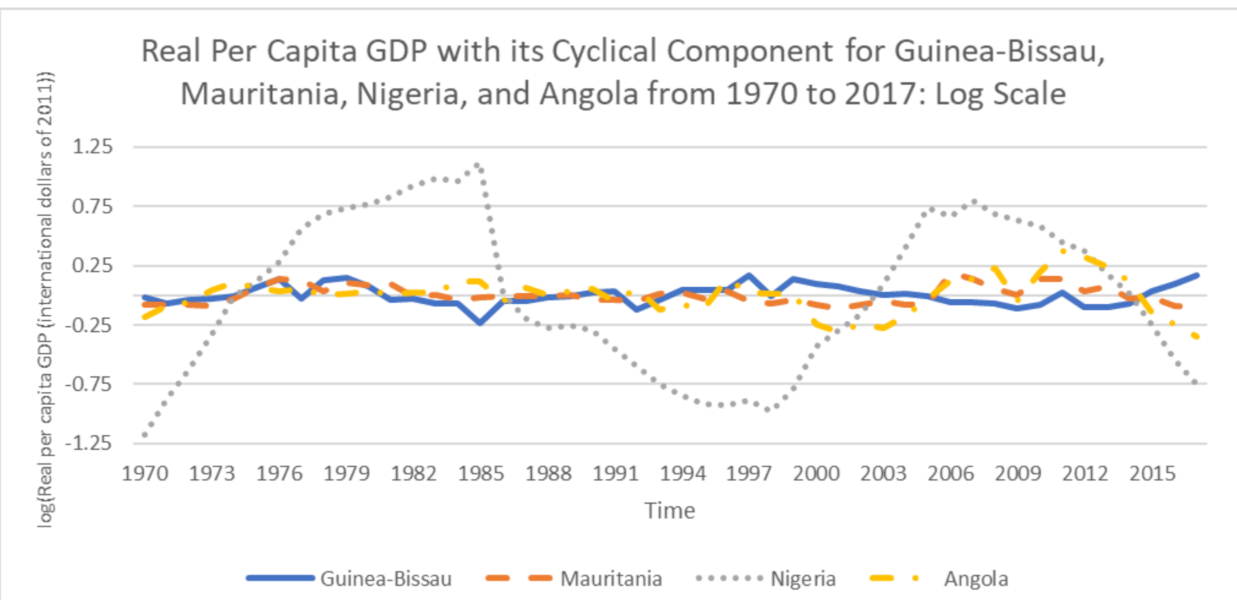
   At a broad overview, Nigeria had the highest real per capita GDP from 1970 to 1985 followed by Angola, Mauritania, and Guinea-Bissau with the lowest. Throughout 1985 to 2000, Nigeria had the lowest real per capita GDP with a wide gap between the other three countries while Angola had the highest followed by Mauritania and Guinea-Bissau. Lastly, from 2000 to 2017, Nigeria rose to one of the highest real per capita GDPs along with Angola followed by Mauritania and Guinea-Bissau.



3. There appears to be a positive comovement between Mauritania and Angola's business cycles as they tend to increase and decrease in real per capita GDP similarly. The two countries have had decades of history trading raw iron bars, utility meters, batteries, barium sulphate, electric motors, etc., ranging from $1M to $5M in exports. As presented in the previous question, Guinea-Bissau is more like Mauritania and Angola than Nigeria, but it appears to have a weaker and possibly negative comovement with the two. This aligns with the fact that Guinea-Bissau is a poor trading partner with Angola (< $100k cumulative exports) and Mauritania (< $10k cumulative exports).

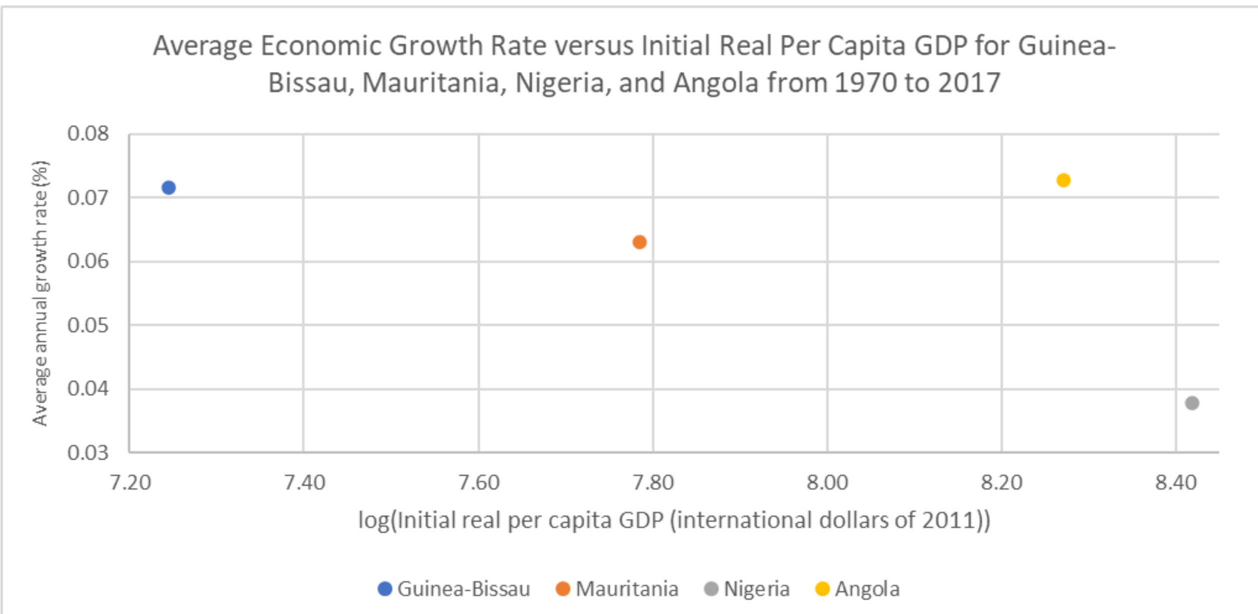
As for Nigeria, despite the wide real per capita GDP gaps and fluctuations, it shows a positive comovement with Mauritania and Angola, which is supported by the countries' trade history of around $4M+ exports with Angola and nearly $60M exports with Mauritania. However, with Guinea-Bissau, the two are poor trade partners as although Nigeria exports a fair amount to Guinea-Bissau, the latter does not.

Within the period, there are seldom common periods of recession between the four countries. It is evident that Guinea-Bissau, Mauritania, and Angola remain relatively stable as their cyclical components do not indicate any significant movements around the trend. One exception with a global recession includes the drop in crude oil prices in 2016, which had negatively impacted the economies in Nigeria and Angola as seen by the negative value of the cycle, indicating it has moved below the trend and undergone recession. Otherwise, Nigeria experienced a period of recession in 1967 due to the decision for rapid, large-scale industrialization and between the '80s and '90s due to unsustainable rural consumption and crude oil prices. Lastly, Angola in 2000 following a civil war.

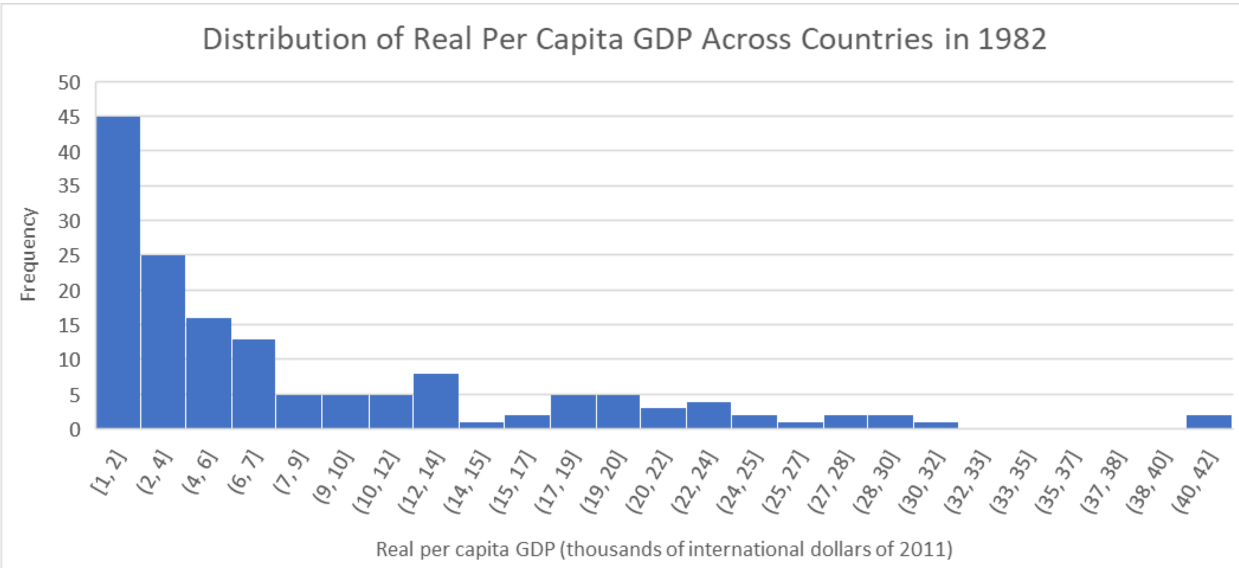


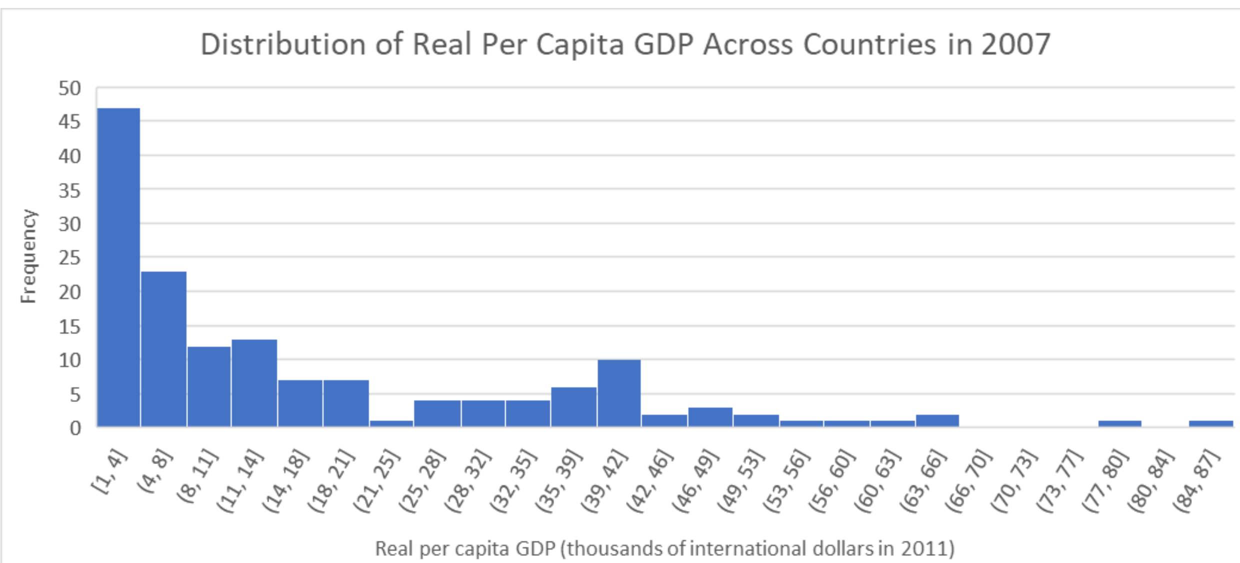
4. No, not all four countries are converging to each other. Convergence through a scatterplot is observed by a negative comovement such that initially poor countries (low real per capita GDP) grow faster (higher average annual growth rate) than countries that were initially rich. Based on these observations, Angola diverges as it has the highest average annual growth rate despite being the second richest country, whereas Guinea-Bissau, Mauritania, and Nigeria converge.

Based on country characteristics, the four countries have relatively similar standards of living such that children have 8+ years of schooling, individuals ages 25 and over have 3+ years of education, life expectancies of 55+ years, etc., which provides a solid foundation to indicate countries with similar characteristics eventually converge. However, it is possible that although Angola shares characteristics, it is diverging with its high growth rate due to post-war growth between 2002-2008 when there was high inflation, rising unemployment, rising oil production, etc. During this period, Angola's standard of living was lower than the other countries and thus, resulted in its faster growth.



5. Visually, it appears that there is no difference in terms of inequality between 1982 and 2007 as the distribution of real per capita GDP remains similar with a large proportion of poor countries, smaller proportion of countries in the middle, and very few rich countries. However, the x-axis scale range has doubled, an increase of around $40k, which indicates that there is more inequality in 2007 than in 1982. Although countries have higher real per capita GDP in 2007, the gap between poor and rich countries is even more prominent.





6. With the following graphs, inequality is less prominent as the gap between poor and rich countries is not as pronounced, suggesting there is minimal differences in terms of inequality between 1982 and 2007. However, inequality still exists and has increased by 2007 as the gap between the poor and rich has increased. Proportion-wise, the two years are relatively similar, however, it appears the proportion of poor countries had decreased slightly in 2007 and shifted towards the middle of the distribution. The misleading conclusion of a more equal distribution is because large differences in dollars translate into small differences in logs, resulting in a more "equal" spread when expressed in logs.