25402226_DemographicIndicatorTrends

1 Assignment 1:

2 1: Introduction: Demographic Indicators (Project 4)

This project seeks to analyze and discern the key factors and trends in the dataset provided. Specifically, this study will look at the changes in Infant mortality rate (IMR), population density and population change and seeks to find meaningful representations and insights on what these figures describe faceted on income-group/development group, region, and the nature of a countries access to the sea (landlocked vs having accessing to the sea).

The research question in particular is as follows: What relationship, if any, exists between net migration rate (as a metric of population change) have on Infant Mortality Rate (IMR) as a metric of quality of life. Furthermore, this project seeks to contextualize this question broadly in the context of region and income-group/development group, to see if net migration and associated changes in population metrics are influenced by variables such as region, and the nature of a countries access to the sea (landlocked vs having accessing to the sea.

2.1 2) Data Wrangling and Preparation:

An initial data-frame was created with all the relevant columns present that I have deemed as relevant for the project. The original database was filtered by Location and Location Type name, in order to only extract the data types to be examined project. The location values filtered for were all mentions of "development/developed/developing, while also filtering for all mentions of income level. This was done explicitly so as to to be as selective as possible.

he relevancy of these variables were found after an inital preview of the data where the unedited dataset was read in and manually inspected after removing non-values and NA values. A new column named decades was created in order to easier visualize data in graphs, and improve readability of any visualisations made. This initial data-frame "demo_indic_initial" was then formed by way of a select statement selecting 8 of the initially filtered columns, namely: Location, Time, NetMigrations, LocTypeName, Decade, PopChange, PopDensity, IMR. Further data frames will use this initial cleaned data-frame as a starting point and then further filter depending on the question being answered.

In graph 1, a further filtered dataframe (df) was created to just demonstrate a basic plot of net migration by region so as to see general migration trends, selecting exclusive those variables which had the value of "Georgraphic region" in the LocTypeName column. This df was further processed by generating an average value of migration by region by decade, so trends on these 2 variables could be plotted.

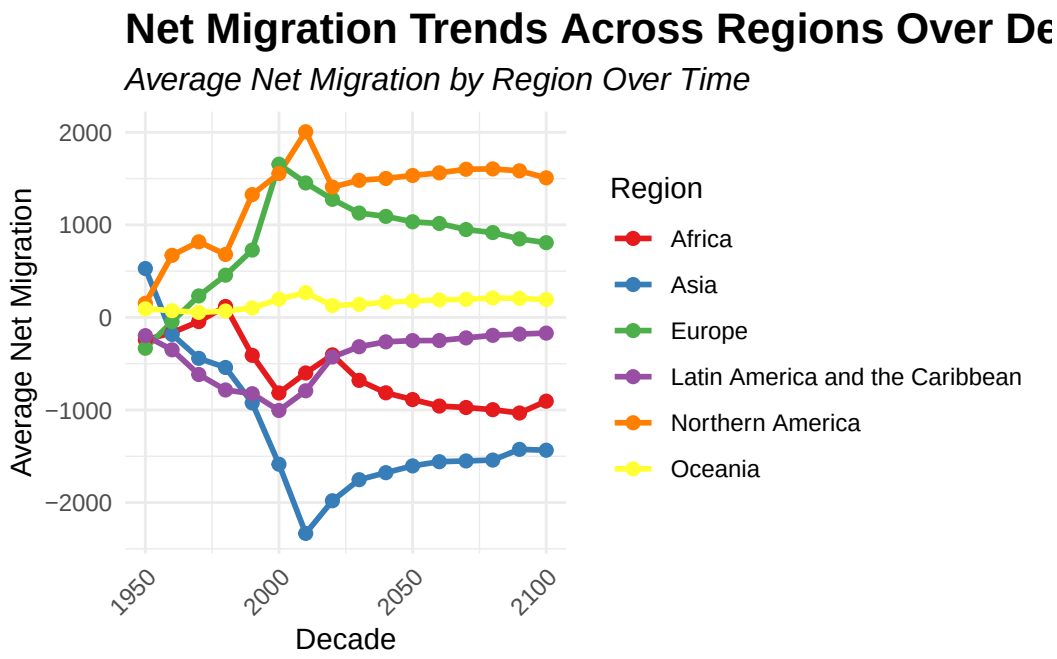
From here , the data was filtered even further, income_groups and regions have selective vectors being chosen to plot the 2 graphs, both showing population growth over time, but faceted by income group for 1 graph and by region for the other. This was done similarly for population change and IMR to see the relationship between these 2 variables contextualized and faceted buy income group and region. In all of these new data-frame creations, duplicate stipulations for removing NA's and the creation of the decade column are added to ensure that NA's and empty cells are not included where at all possible without violating the general integrity of the data.

Population density and IMR columns are then filtered for by doing a 2D visualization to more simply see the trends without clear decade progression, rather just as a general trend over time from 1950 - 2100 (with no clear indication of each specific decade a point occurs in). This is further investigated by the creation of a boxplot showing the relationship between net migration and income group, specifically filtering for low to lower-middle income groups, as this was identified as least developed group, or group with the worst standard of living and how that has affected net migrations. Lastly, landlocked countries vs countries with sea access are filtered for and plotted to see if landlocked countries have ahigher or lower relative migration rate as opposed to countries with sea access. This is done by producing and displaying summary statistics for the filtered rows and columns, looking at landlocked developing countries and countries with sea access .

2.2 3 & 4: Exploratory Data Analysis (EDA) and Reporting:

2.2.0.1 Graph 1: Net Migration Trends

Research Question 1: What trends exist in net migration data when grouped by region, and is significant difference between regions ?

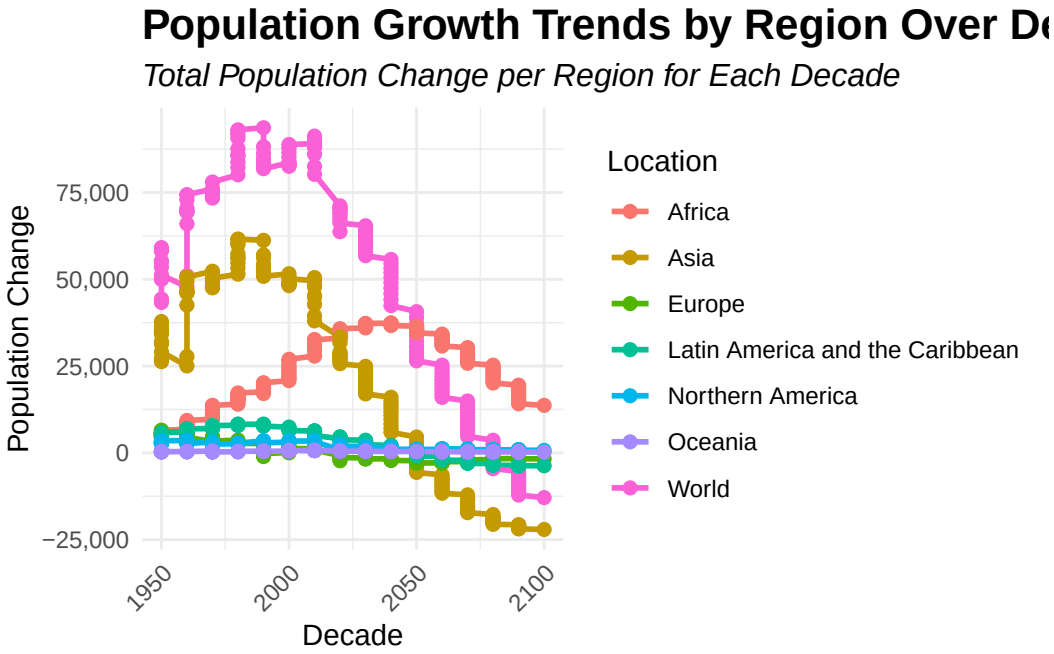


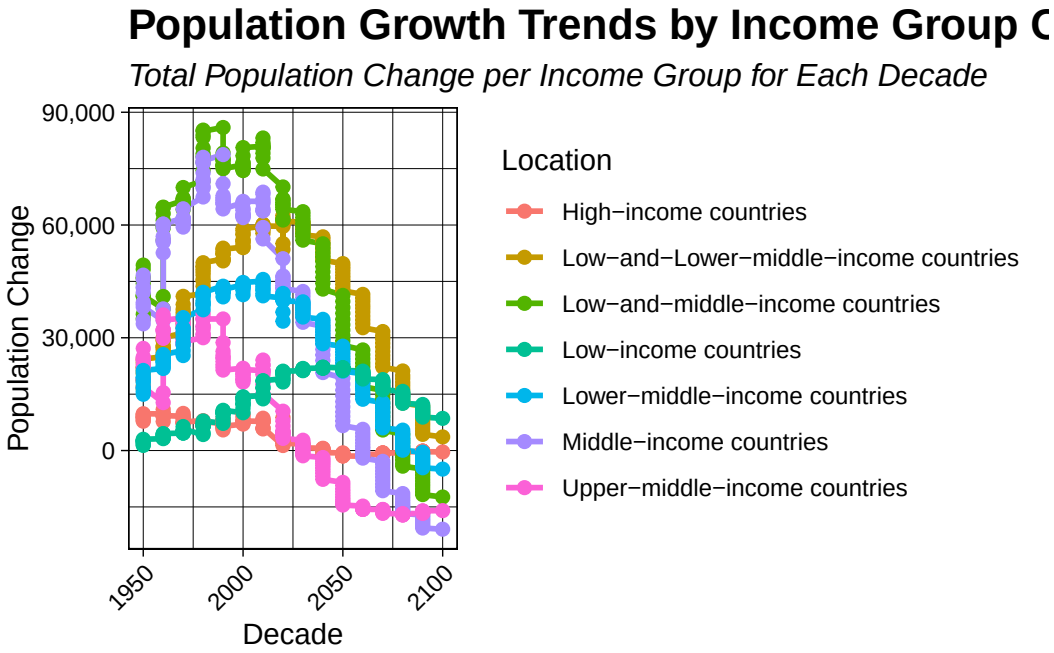
As can be seen in the plot above, regions containing the largest component of lower income/less developed countries have a negative migration rate, meaning the flow of people is coming from these countries and into more developed regions. Asia, Latin American & the Caribbean, as well as Africa, demonstrate continually negative average net migration rates over the decades when compared to

Oceania, North America and Europe. As such, it is immediately obvious that indeed a trend does exist, and that the general direction of migration is from larger, less developed regions to regions which are traditionally considered more developed and have a greater general level of income.

2.2.0.2 Graph 2 & 3: Population growth trends by region and by income level

Research Question 1.1: Having established a general migration pattern between regions over the decades, how does population growth vary based on income and region ?



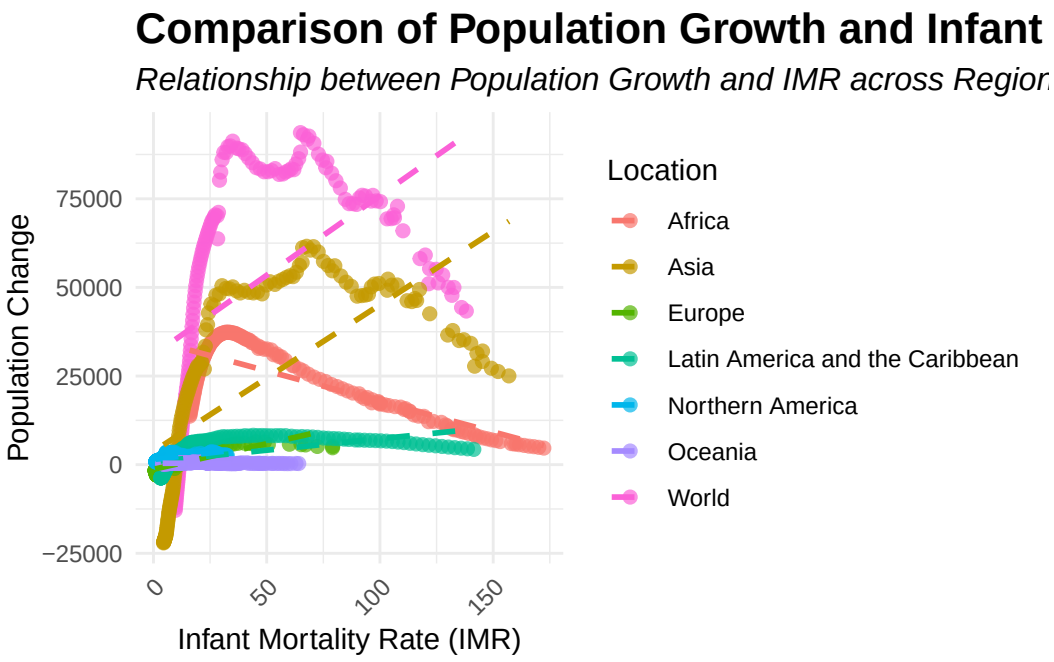


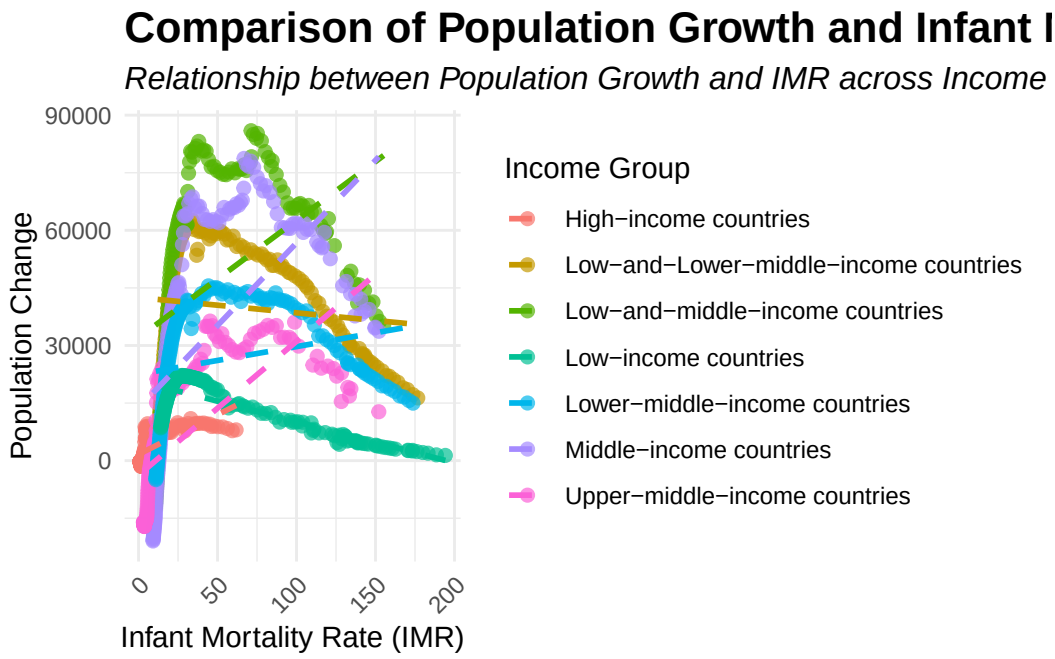
As is evident in the population growth trends by region graph, African and Asian population between (approximately) 1965 to 2015 experienced a boom, with the other resepictive regions poplation change

staying relatively constant, if not declining from when data collection began. Interestingly, the population change by region graph is remarkably similar to the population change by income group. This suggests that countries experiencing greater and/or moire consistent population change (ie growth) are correlated to lower income groups, with a massive leap in popluation change in lower-middle and miss class income groups in around the same period as the Asian and African boom when looked at population chnage by region. The similarities of this strongly suggest that lower income countries are responsible for greater levels of migration out of them and into higher income group countries, while also contributing to a significant growth in the lower-middle and low income groups worldwide. Interpreting this, it appears that population change in Asia and Africa, couple with high levels of exiting migration from these nations leads to the formation of a larger low and lower-middle income class, highlighting the global issues of urbanisation as those who are migrating to more developed countries cause a larger proportion of the population (via growth) to be considered in the low/ lower-middle income group.

2.2.0.3 Graphs 4 & 5: Population Growth by and Infant Mortality Rate across Regions and Income Groups

Research Question 2: Does population change (growth or shrinking) have a meaningful effect on infant mortality rate when measure acorss income groups and regions?

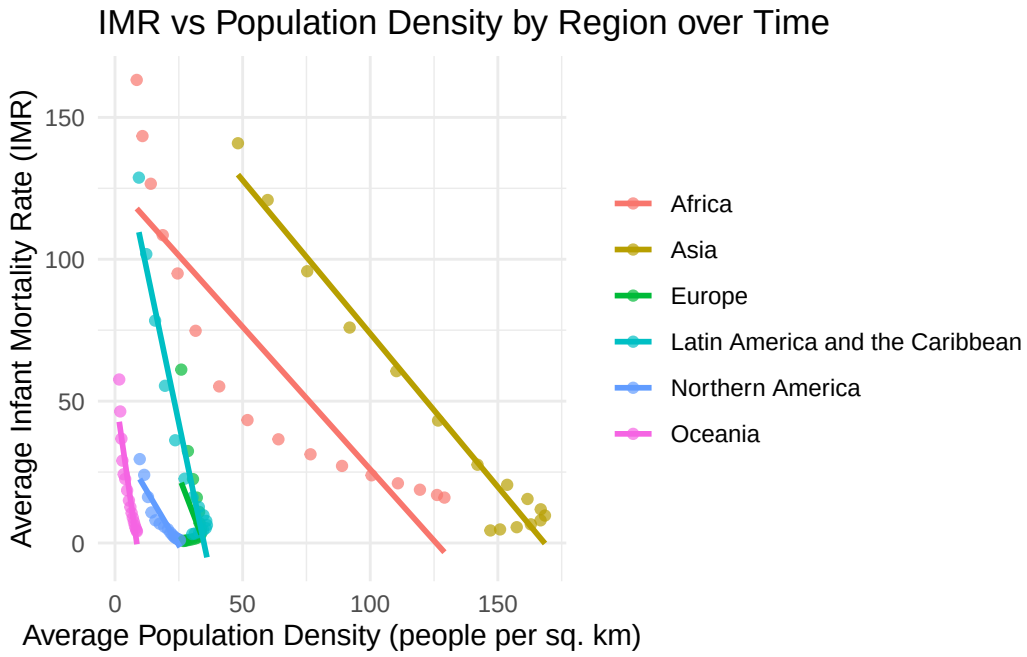




Both Asia and Africa have shown an increasing IMR consummate with population growth. Contextualizing this by looking at the previous graphs, it become clear that migration from these countries may be an attempt to escape from the worsening living conditions and general quality of life metrics (such as IMR). Despite the migration, the population of these regions continues to grow, albeit at a decreasing rate, with both relative population change and overall infant mortality rate projected to continue decreasing from the current day into the future. Again, when comparing the regional IMR graph to the income group IMR graph, there are undeniable similarities between them. Low income and low-middle income countries which have the greatest population change also appear to have increasing rate of IMR int he period discussing in reserach question 1 and 1.1. This points to the infrastructure strain of the population boom in these countries both locally and globally (as the world IMR went up in this period too), suggesting that despite migrating AWAY from these regions, the IMR of these countries still has been seen to increase in these countries. However, these regions have also seen the greatest relative decline in IMR over the decades after that peroid, suggesting the quality of life metrics in these regions are improving as migrations and relative population change decrease.

2.2.0.4 Graph 6: IMR vs Population Density

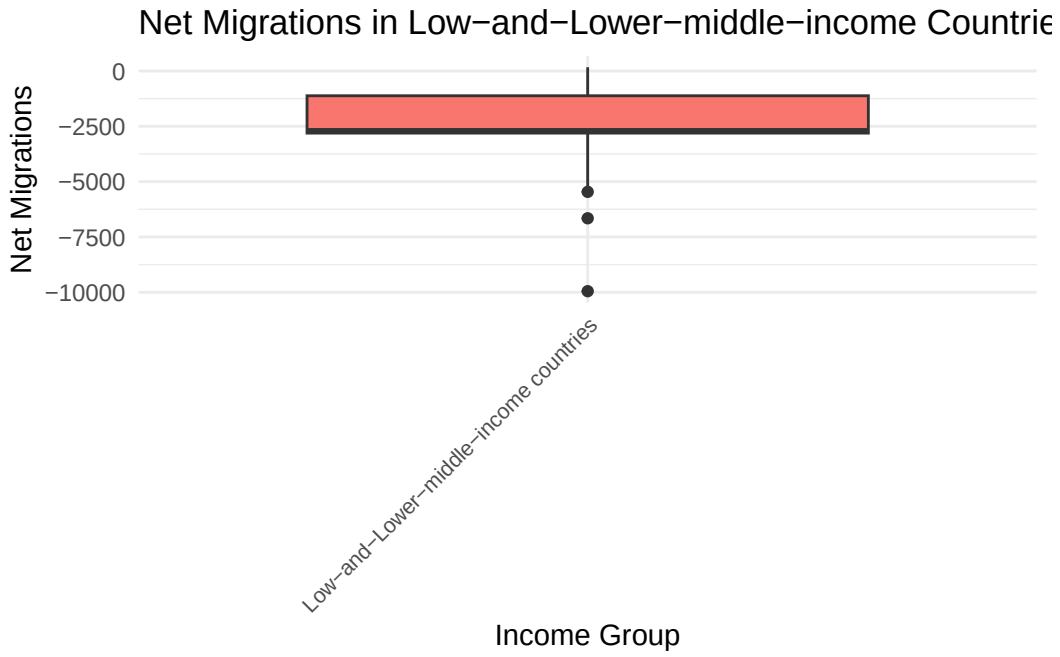
Research Question 3: Does a relation exist between population density and IMR exist? If so, what kind of relationship?



Rather surprisingly, and counter to what has been suggested prior, where urbanisation has shown to increase the growth or occurance of negative quality of life metrics, the above graph seems to show an inversely proportional relationship between IMR and population density. The greater the density of people (ie in cities through urbanisation), the lower the average IMR. This suggests that urbanisation and migration from rural areas to cities actually decreases average Infant Mortality Rate.This proves to be an interesting contrast to analysis conducted thus far which has suggested otherwise. This analysis is further contextualized by displaying a boxplot of the net migration rates in low and lower-middle income countries shown below in Graph 7.

2.2.0.5

Graph 7: Net Migrations in Low-and-Lower-middle-income Countries

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# A tibble: 16 x 2
   Decade GlobalAvgNetMigration
    <dbl>                 <dbl>
 1   1950                 -5.02
 2   1960                -70.4
 3   1970                -90.7
 4   1980               -112.
 5   1990               -175.
 6   2000               -395.
 7   2010               -403.
 8   2020               -354.
 9   2030               -258.
10   2040               -254.
11   2050               -252.
12   2060               -251.
13   2070               -249.
14   2080               -247.
15   2090               -239.
16   2100               -228.
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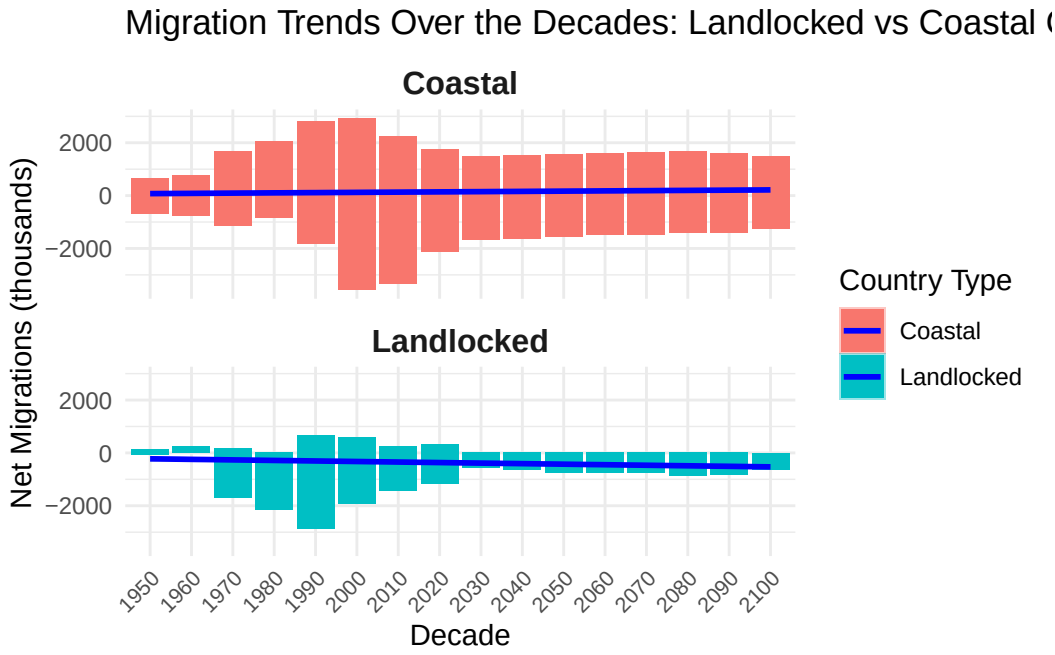
2.2.0.6 Graph 8 and 9: Migration Trends Over the Decades: Landlocked vs Coastal Countries

Research Question 4: Does a countries geographical access to the sea affect its migration trends ?



Graph 8 and 9 demonstrate the relationship between net migration rates in landlocked developing countries and compares it to these same trends in countries with sea access. Despite developing countries/low/lower-middle countries demonstrating higher exit migration rates in previous analyses, the above visualisations seem to point to geographical positioning relative to sea access being an even more significant impact on net migrations, with much greater variability in the top graph as opposed to the bottom graph, with higher average exit and entry migration levels across the board for countries with access to the sea. The visualisations when looking into the future also indicate much steadier levels of both types of migration (positive and negative) projected into the future for countries with sea access as opposed to those who are landlocked and developing. This indicates that globalisation and ease of access to sea-borne transport routes are key factors in urbanization levels.

2.3 5) Conclusion of Reporting:

Tying this into previous analyses of income groups, the underlying trend across all analyses (bar the exception in the analyses shown in graphs 6 and 7) seem to hold true and answer the overarching research question definitively, suggesting that all factors mentioned in the introduction do play significant (albeit varying) roles in the formation of greater proportions of lower income groups while demonstrating a negative impact on quality of life metrics such as IMR. The correlation of a majoity of analyses in suggesting the negative impact of migration of individuals from lower income countries suggests the potential for future research into more variables which may provide clarity and further insight into the factors most significant to quality of life metrics such as IMR and the creation/growth of low/lower-middle income groups.