

**Name: Hui (Victoria) Li**

## **1. Introduction**

In this paper, we perform graphical analysis on the cleaned “UN\_MigrantStockTotal\_2015.xlsx” dataset. After cleaning, we are able to see there are 232 unique countries, 6 major areas, and 11 geographical regions in the dataset. In this paper, we present insights on:

- 1) What are 2015 international migrant stock patterns by gender in major areas?
- 2) What are trends of international migrant stock patterns in major areas from 1990 - 2015?
- 3) What are international migrant stock patterns by geographical regions in 2015?
- 4) What are the proportions of women in international migrant stocks in major areas?
- 5) What is the relationship between refugee stock and international migrant stock from 1990 - 2015?

## 2. Methods

❖ **Question 1:** What are 2015 international migrant stock patterns by gender in major areas?

**Method : Bar Chart**

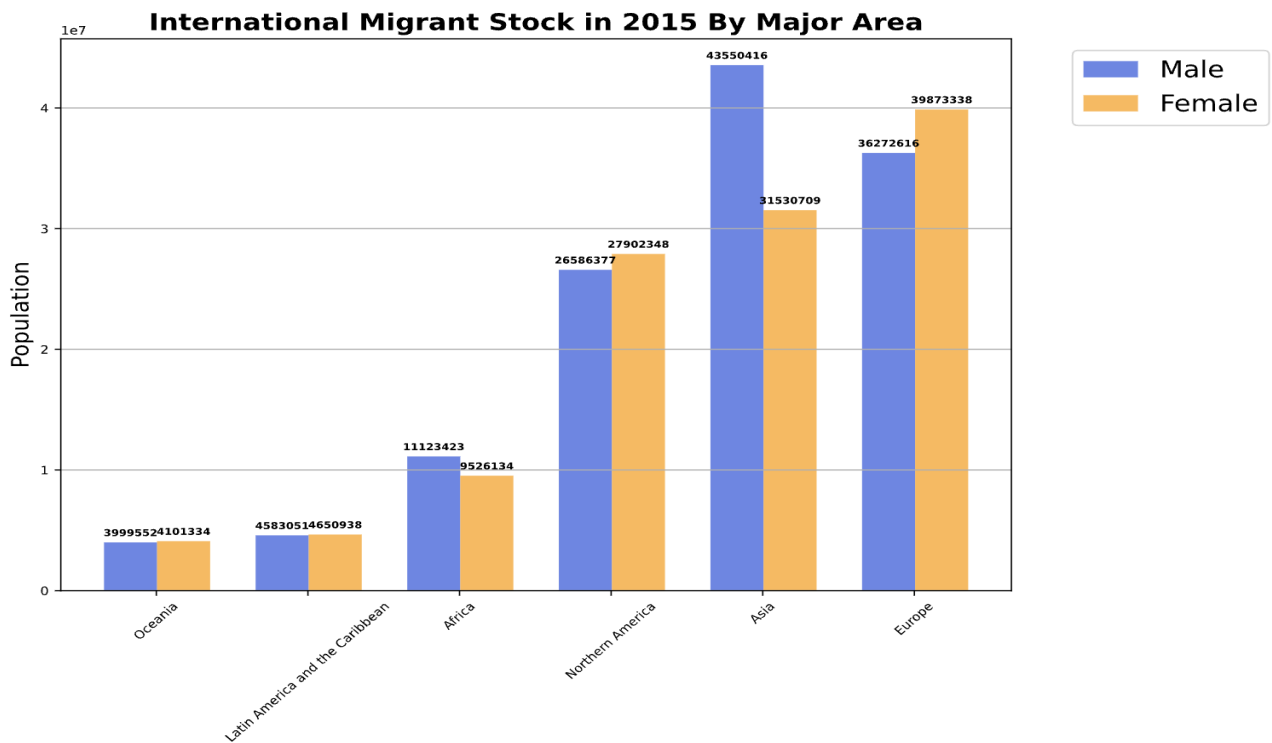


Figure 1: International Migrant Stock in 2015 By Major Area

From Figure 1, we observe that the orange bar represents 2015 international migrant stock by females, and blue bar represents 2015 international migrant stock by males. The graph indicates that there are more females migrating to Northern America and Europe. However, there are more males migrating to Asia and Africa than females. There are little differences in international migrant patterns for Oceania and Latin America and the Caribbean areas. The pattern implies that females tend to migrate to areas where most developed countries are, and

male migrants more frequently to areas where most developing countries are. Males favor areas that economies are not fully saturated and governmental regulations are loose. On the other hand, females prefer to migrate to countries that are more stabilized, prosperous, and safe. The graph satisfies principle 1 of Tufte's principle. For instance, the comparison between international migrant stock by males and females in Asia is clear and consistent. The bars are closely positioned. Readers can easily locate the comparisons. The horizontal gridlines also help readers to locate which range the value of bar is in. Secondly, the labeling is detailed and thorough. The y-axis label indicates that the y-axis corresponds to population (e.g. number of people). The x-axis label shows all five major areas, and the rotation makes labeling more visual. The title "International Migrant Stock in 2015 by Major Area" is meaningful because it directly tells readers what information the graph contains. The legend also specifies what blue and orange bars correspond to. The value labeling on the top of each bar shows data variation. Although I did not include units in the graph, the labeling on y-axis is sufficient enough to help readers understand the graph. Lastly, I used 2-dimensions to convey information that is 2-dimensional.

❖ **Question 2:** What are trends of international migrant stock patterns in major areas from 1990 - 2015?

**Method: Line Graph**

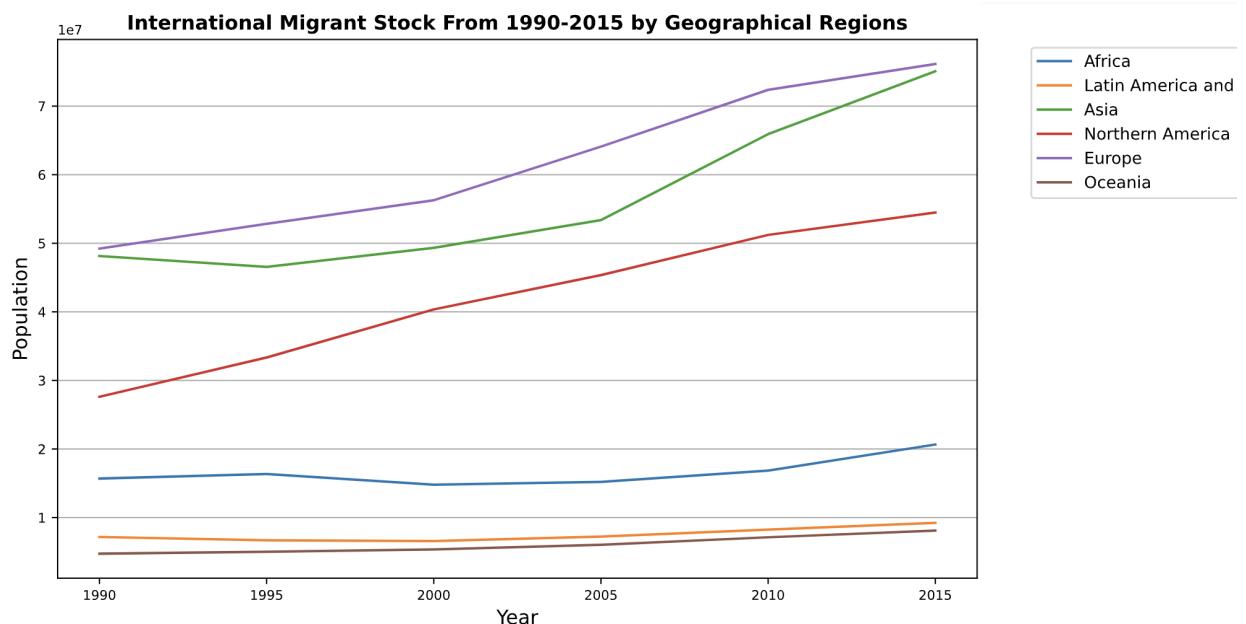


Figure 2: International Migrant Stock From 1990-2015 by Geographical Regions

From Figure 2, we see that the change in international migrant stock is significant in Europe, Asia, and Northern America from 1990 to 2015. However, there are little changes in international migrant stock in Oceania, Latin America and the Caribbean areas, and Africa from 1990 to 2015. Relating back to Figure 1, we observe that areas that experience significant differences of international migrant stocks by gender are likely to have significant changes in international migrant stocks. The slope indicates that Northern America had the largest rate of increase in international migrant stock from 1990 to 2015. From 2005 to 2015, Asia experienced the largest rate of increase in international migrant stock. The graph satisfies the principle 1 of Tufte's principle. The scaling is the same for all six major areas. Readers can easily see the comparison by colors and scaling. The labeling is detailed and thorough. The y-axis label indicates values in y-axis correspond to population. The x-axis label indicates that values are year (e.g. 1990, 1995). The legend specifies major areas by colors of line graphs. Each line graph shows data variation in each major area. The labeling on y-axis and x-axis specifies units in these two axes. Lastly, I used 2-dimensions to convey information that is 2-dimensional.

❖ **Question 3:** What are international migrant stocks by geographical regions in 2015?

**Method: Treemap**

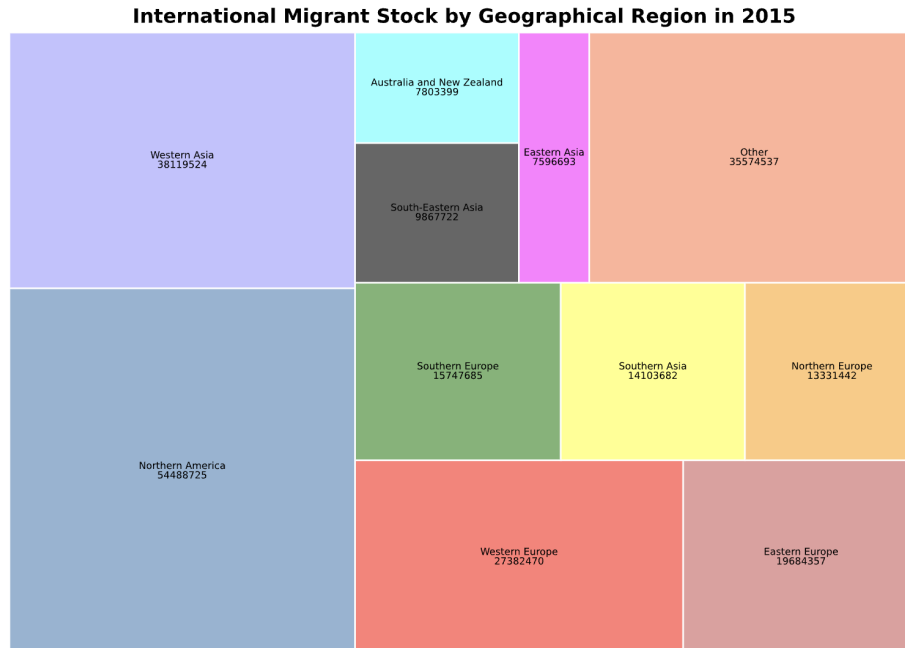


Figure 3: International Migrant Stock by Geographical Region in 2015

From Figure 3, we observe the 2015 international migrant stock pattern by geographical region. The method is treemap. The larger the rectangle, the more 2015 international migrant stock in this geographical region. We can see that Northern America has the largest international migrant stock. Western Asia has the second largest, and Western Europe has the third largest. The pattern indicates that there are large numbers of people who want to migrate to Northern America. The United States especially attracts thousands of people because it has the largest world economy, most advanced technologies, and best educational opportunities. For Western Asia, it has a lot of natural resources which attract countries and corporations to come. For Western Europe, it has the most complete infrastructure and industries (e.g. automobile, chemical engineering). As a result from the map, we can conclude that people tend to migrate to regions that have the best economy, resources, infrastructure, and industries. Applying differently from the last two graphs, I used numbers and sizes of rectangles for scaling. Visually, it is straightforward because readers can easily see the size of international migrant stock by the size of the rectangle in the treemap. The labeling is concise. For each rectangle, I included the geographical region that it corresponds to. Moreover, I bolded the title “International Migrant Stock by Geographical Region in 2015” for better visualization. Size of rectangles and numbers show data variation in geographical regions. Lastly, I used 2-dimensions to convey information that is 2-dimensional.

❖ **Question 4:** What are the proportions of women in international migrant stocks in major areas?

Method: Box Plot

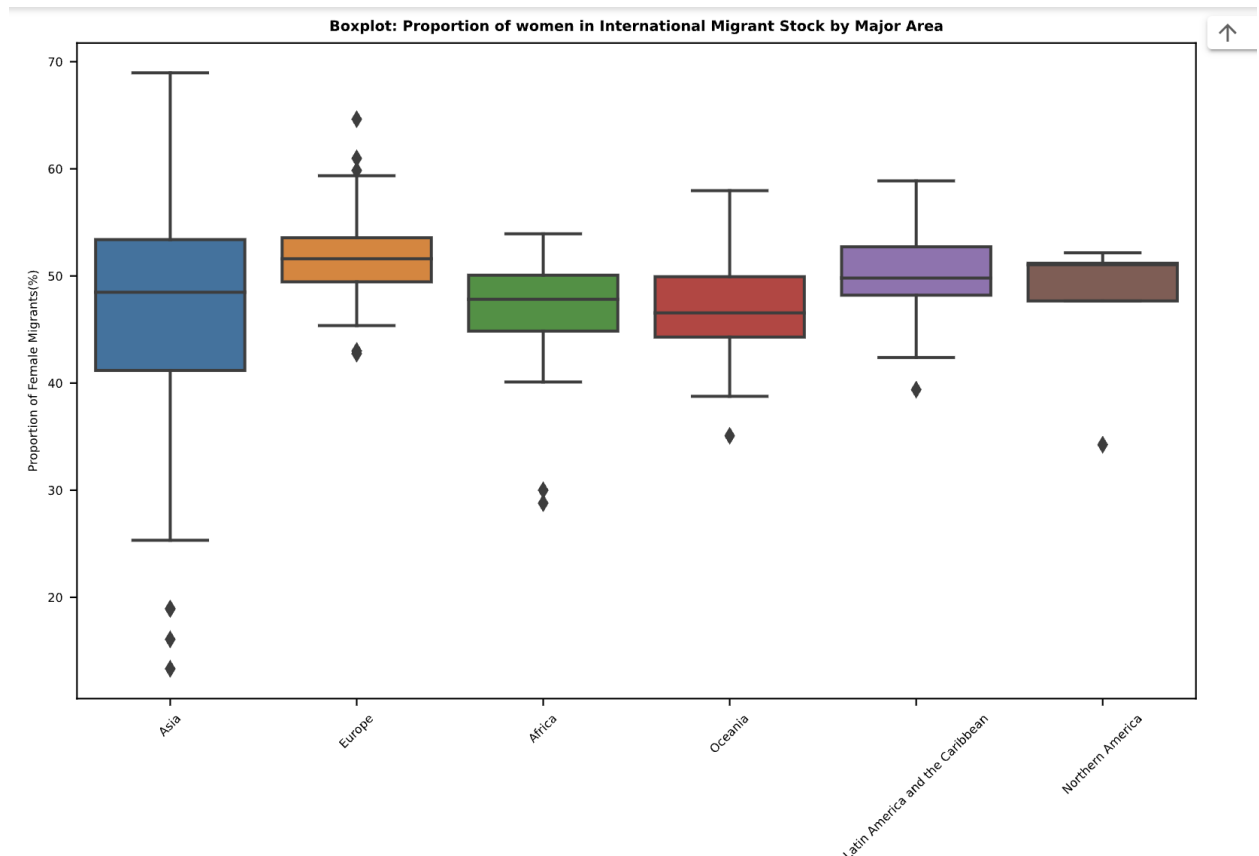


Figure 4: Boxplot of proportion of women in International Migrant Stock by Major Area

From Figure 4, we observe that the median of proportion of women in international migrant stock is below 50% for Asia, Africa, and Oceania. For Northern America and Europe, the median is above 50%. For Latin America and the Caribbean, the median is very close to 50%. Analyzing with Figure 1, we can see that there are fewer females migrating to Asia and Africa than males do, and there are more females migrating to Europe and Northern America. For this graph, I specify the unit on the y-axis to be percentages. The labeling is concise and consistent. The label on the y-axis is the proportion of female migrants. The label on the x-axis is each major area. I used different colors to differentiate between boxplots by different major areas.

Each box plot shows data variation in percentage of female migrants by major areas. The title is meaningful because it specifies the method used and what information the graph contains.

- ❖ **Question 5:** What is the relationship between refugee stock and international migrant stock from 1990 - 2015?

Method: Scatter Plot

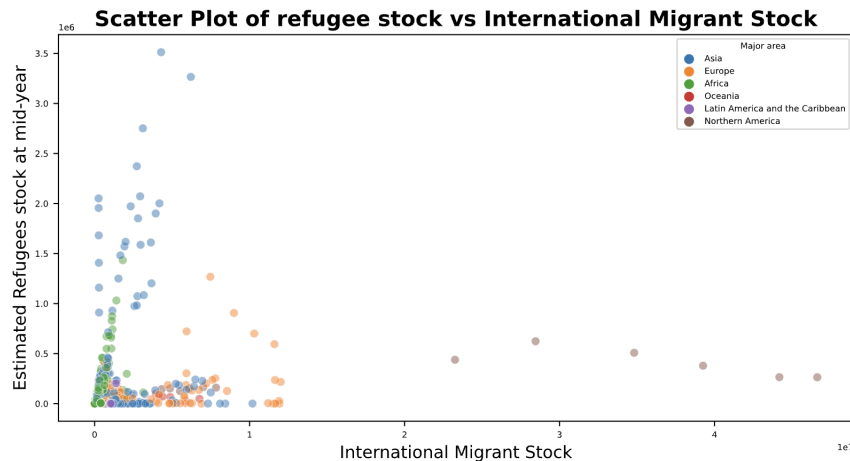


Figure 5: Scatter Plot of refugee stock vs International Migrant Stock

From Figure 5, we observe that there is no essentially clear relationship between refugee stock and international migrant stock from 1990 to 2015. However, if we consider different major areas, we can see that refugee stock tends to increase much faster than international migrant stock does in Asia. For Northern America, refugee stock tends to stay steady or changes very little when international migrant stock dramatically increases. For other major areas, refugee stock tends to increase when international migrant stock increases. However, in order to fully understand and analyze the relationship, we need to take potential confounding variables (e.g. economy, politics) into consideration. This labeling of this graph is consistent. The y-axis label is the estimated refugee stock. The x-axis label is the international migrant stock. The legend specifies which color each major area corresponds to. Moreover, I bolded the title for better visualization. Different colors and positions of dots show data variation. Lastly, I used 2-dimensions to convey information that is 2-dimensional.

### 3. Conclusion

From the above five graphs, we can conclude that there are more female migrants migrating to Europe and Northern America. There are more male migrants that come to Asia and Africa. The proportions of female and male migrants migrating to Oceania and Latin America and the Caribbean are approximately the same. Moreover, male migrants tend to migrate to countries that are developing, less regulated, and financially unsaturated. Female migrants come to countries that are developed, prosperous, and safe. Northern America is the region that has the highest international migrant stock because of its strong economy, advanced technology, and educational opportunities. Western Asia has huge deposits of natural resources which attract migrants to come. Western Europe has the most complete infrastructure, industries, and welfare system.

#### **4. Discussion**

In order to fully analyze international migrant stock patterns, we need to take more confounding variables (e.g. economy, political stability, natural disaster ) into account. Those variables can possibly affect patterns. Conclusion in this paper is only correlational instead of casual. For the future work, we still need more geographical, meteorological, financial, and political data for a thorough analysis.