**Visualization of Complex Data**
**Final Project**
**Skill Migration**
**Fall 2021**

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# Introduction and background

In migration studies scholarship, highly skilled migration refers generally to the stream of migrants, i.e. foreign workers sharing specific characteristics and who therefore qualify for a particular visa category. (Weinar, et al.) Policymakers in both sending and receiving countries must respond to - and take advantage of - the movement of talented workers from developing countries. Skilled migration is frequently assumed to have a disproportionately negative impact on the countries of origin.(Weinar and Klekowski von Koppenfels, 2020)  Recent research and policy experience, however, call this premise into question and paint a more nuanced picture. When skilled migration is properly structured, both the source and destination countries can profit. (Clemens, 2013)

Destination countries can benefit from migrants' social, tax, and skill contributions to name the few. Even though brain drain is the first thing that comes to mind when thinking about the emigration of skilled individuals, research has shown that emigration brings a number of benefits that are often overlooked. Even if migrants do not return to their home countries, they transmit money, skills, technology, and even democratic ideas; their experiences can stimulate investments in education in sending nations; and they enhance their own life prospects in ways that would not be conceivable if they did not move. Furthermore, many skilled professionals are underemployed or unemployed in their home countries, therefore emigration might help developing countries reduce labor market constraints. (Clemens, 2013)

To study the trend of skilled migration, the World Bank Group and LinkedIn partnered to use corporate data to generate insights into development trends. The WBG and LinkedIn have partnered for three years to study the extent to which LinkedIn's data can inform policy. The partnership's initial phase assesses LinkedIn data from more than 100 countries with at least 100,000 LinkedIn members, spread over 148 sectors and 50,000 skill categories. The second and third phases concentrate on automating and scaling insights as well as expanding collaborative research. (Juni Zhu, Fritzler and Orlowski, n.d.)

For policymakers, making LinkedIn real-time data available for development use, particularly in developing nations, can be beneficial. For instance, LinkedIn data can assist answer urgent questions like "What skills are acquired or lost in my country as a result of talent migration?" "What are the most recent sectoral employment trends, and which skills are most relevant to them?" (Juni Zhu, Fritzler and Orlowski, n.d.)

## Objectives and goals

In this project, we want to understand how different skill groups are progressing based on skill, industry type, occupation, and migration (from a skill group and/or to a country). Our main targets of audiences are policymakers since they map the plans to retain and encourage talent in a specific country. It provides policymakers and researchers with extensive and dynamic insights into quickly changing labor markets. Leaders can use it to benchmark and compare labor markets worldwide, study skills, occupations, migration, and sectors, and make policy adjustments based on real-time data. In addition, it will also help a country's government and researchers to understand how the labor market is changing according to different socio-economic factors. Furthermore, this project can provide some references for anyone currently looking for a job and people who would like to travel to a different country for a better opportunity.

## Dataset and Questions

This [dataset](#) is from the World Bank and a part of Linkedin. It shows the skill migration between 2015-2019. It has 88,035 rows and 9 columns. Since the dataset has some null values and repeats values, we decided to use Tableau Prep to clean the dataset. After deleting null values, we have 140 data. Therefore, we decided to use this cleaned dataset for this project.

### Features

- **Country code / Country Name**
- **WorldBank Income Classification -** country's income category (low income, upper middle income, high income)
- **WorldBank Region Classification -** south asia, middle east, sub-sahara etc
- **Skill Group Id -** unique number for each skill group
- **Skill Group Category -** category based on field of study (eg: tech skills, business, soft, disruptive tech skills)
- **Skill Group Name -** specific name of skill (eg: software testing, airforce, data science)
- **Net per 10k -** net number migration per 10,000 people of the population

## Questions

1. What is the net value of skill migration from 2015 -2019?

2. How many positions are needed for the Tech skill set and Disruptive skill set?

3. How are the migration numbers for the "Data Science" field globally?

4. Is the migration pattern (inwards or outwards) largely dependent on the income class of the people migrating?

## Visualization and Discussion

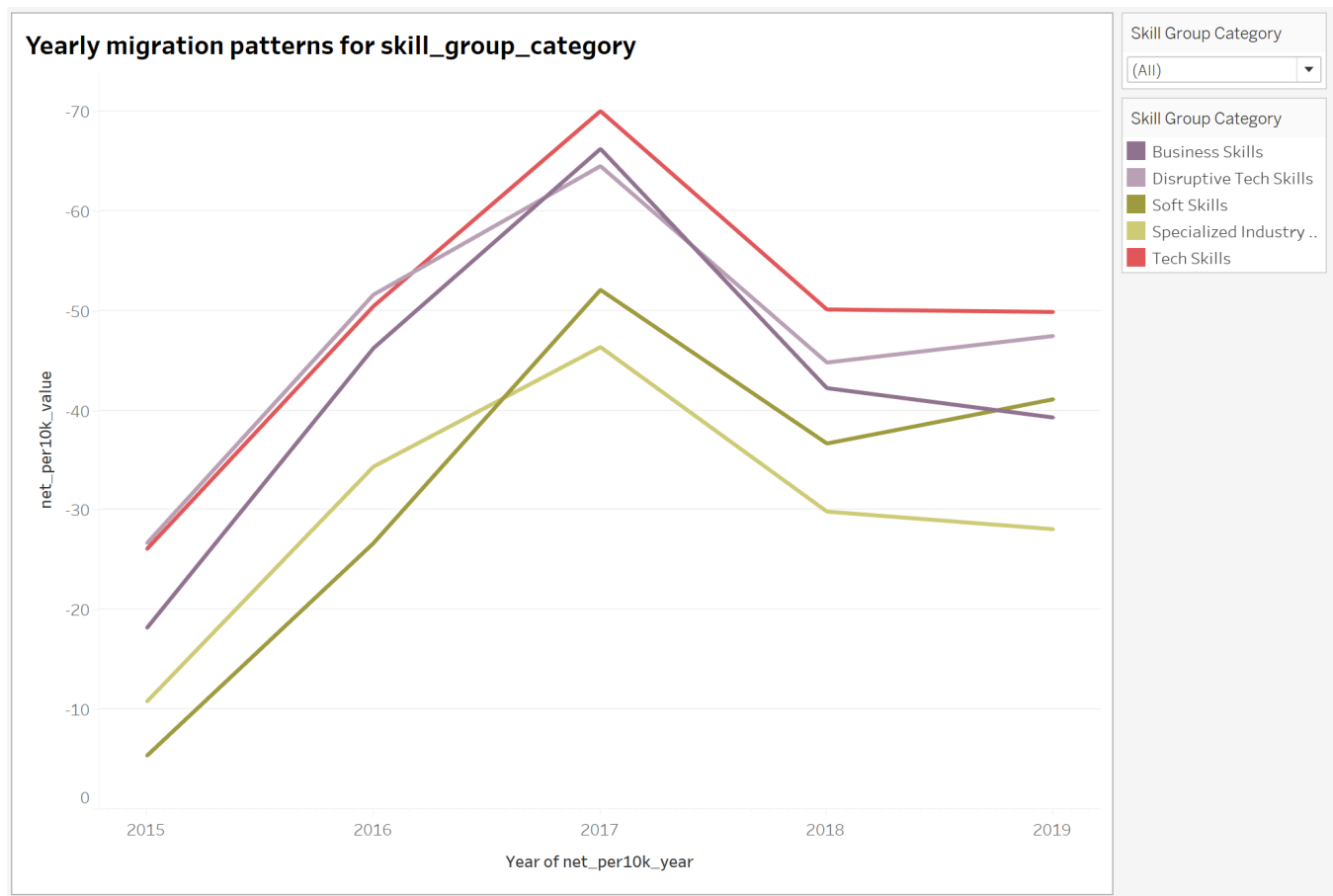**1. What is the distribution of the net value of skill migration from 2015 -2019?**



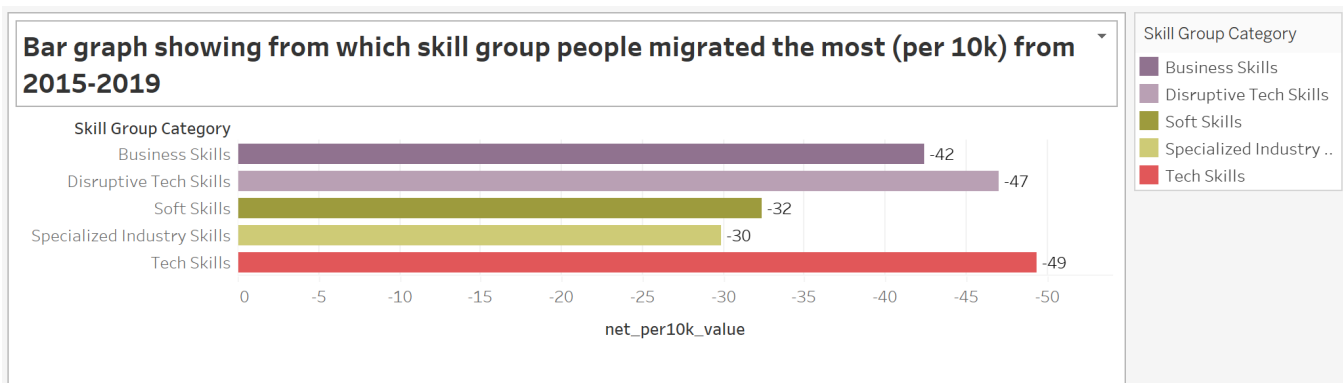**Fig 1:** Net skill migration value from 2015 -2019

**Fig 2:** Total net skill migration per 10k population based on the different skill groups

Figure 1 shows a yearly trend of migration for all the skill group categories. All skill categories follow similar yearly trends -increasing over the years. Figure 2, shows the values averaged out for all the years -2015-2019.
Tech skills and Disruptive Tech skills categories have the highest number for migrations which is expected due to the expanding and emerging tech firms that demand a large number of highly skilled individuals. In search of higher wages and higher living standards, a great portion of  people have emigrated from developing countries to developed countries for high-skilled technical job opportunities.

From figure 1, we see a spike in the year 2017 for migration of highly skilled individuals. According to an IMF report for the year 2017, they described that the GDP for that year accelerated over various regions of the world. Some countries that had high unemployment rates in the previous years had a strong employment growth in the year of 2017. In addition, many South American countries and Russia also exited recession in that same year. Furthermore, global trade for the year of 2017 was at its highest.(Celasun, Milesi-Ferretti and Obstfeld, 2017) The increasing world economy due to the reasons discussed, in addition to the expanding tech advancements lead to an increased demand for job opportunities, hence leading to the migration of skilled individuals.

## 2. How many positions are needed for the Tech skill set and Disruptive skill set?
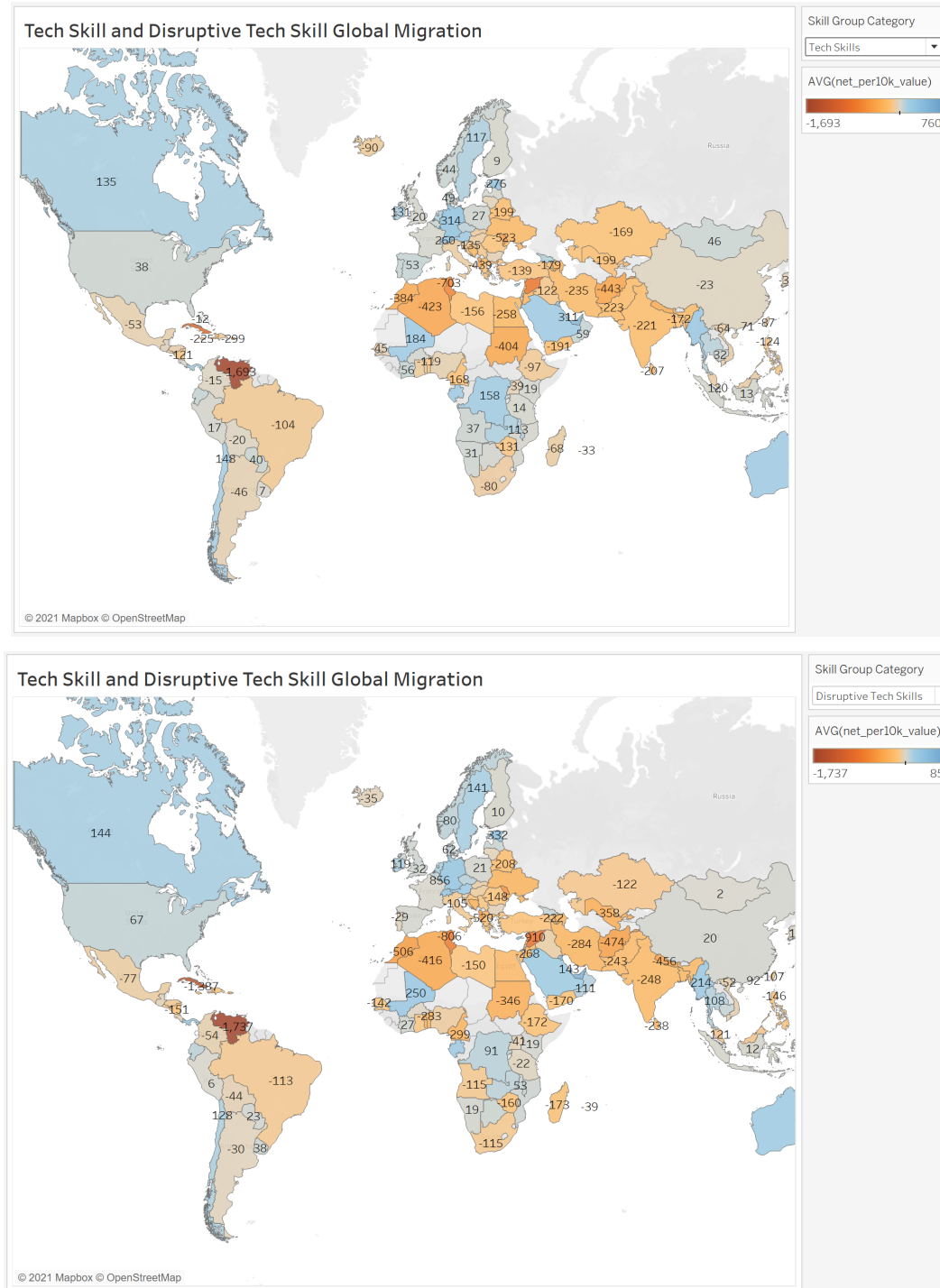


**Fig 3:** Tech and Disruptive tech skill positions needed to be filled for each country total from 2015-2019

In figures 2 & 3, blue shades represent the people who immigrated into that country. Orange shades show outward migration(emigration) from a country. Countries represented by shades of blue are the ones that are categorized as developed countries, whereas orange shades represent developing countries. This can also be explained using the net per 10k numbers for the countries. Countries in the blue shades have a positive net per 10k value, meaning that people are immigrating to these countries. On the other hand, for the orange-red shade

countries, we see negative net per 10k values, which show that these countries are losing their highly skilled individuals to the developed countries in blue.

For example, 221 people for every 10,000 people in India migrated out for opportunities in the Tech Skills category. This is intuitive because India has a lesser number of high-tech jobs per 10,000 of India's population. This phenomenon is coined as "Brain Drain." The governments of developing countries make regular policy changes to minimize and avoid "brain drain" from their country by creating more jobs in those specific skill categories. And such visualizations greatly help them in doing so.

Some of the solution implemented by the Indian government to minimize the brain drain include (Stanford University, n.d.):
1. Education: increase enrollment, encourage industry-academia collaboration, increase research funds for the premier technology institutes
2. Taxes: reduce taxes on import goods, encouraging technical graduates to begin start-ups
3. Foreign investment: subsidies for foreign companies (lower land prices, discounts in energy, etc.) to enter the country's borders, encouraging graduates to stay

Furthermore, looking at inward migration for developed countries like Canada, we can see 135 people entering the country per 10,000 of its population for opportunities in the Tech skills category. Similar trend can be observed from the second graph of figure 3 for  disruptive tech skills.

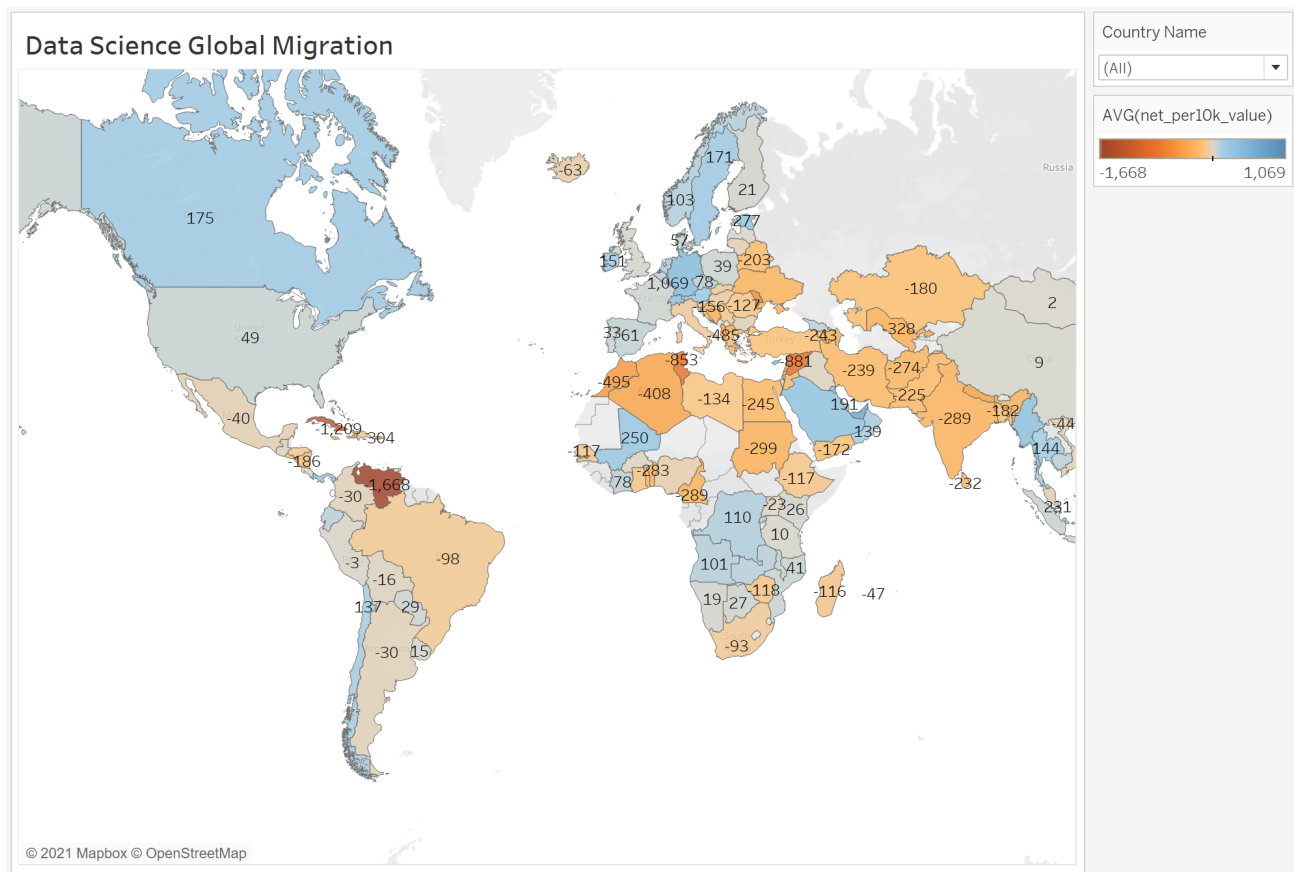# 3. How are the migration numbers for the "Data Science" field globally?



**Fig 4: Skilled migration outlook for the field of data science total from 2015-2019**

From figure 4, the shades of color represent the inflow and outflow of talent. Blue represents the inflow of talent, and orange represents the outflow of talent. So the chart above shows that the United States, Canada, and other regions have a large number of talents with DS skills moving to other regions. In contrast, other areas in orange color show a large number of talents with DS skills moving to other regions, that is, a large loss of talents. For example, the US needs 49 positions per 10k migrations, and Canada needs 175. Although we can see that some developed countries such as the U.S and Canada have many positions that attract more talents, several developing countries have more positions but are severely losing such skills.

For example, India is one of the main countries that has brain drain, and many Indian-Americans are born in India, have completed college and have at least a bachelor's degree. When looking at India, it has a large population , three million college graduates per year, but capital income is ranked globally 163rd. One cause of brain drain in India is that highly skilled individuals are either underemployed or unemployed due to lack of enough positions and the lower wages as compared to the developed countries.

Another reason for the brain drain from India is of people migrating to pursue higher education in research fields. The premier science and technology institutes in India are not well funded to carry out significant research. They don't have active collaborations with industry experts. Hence as any highly skilled individuals in a developing country, educated Indians migrate to developed countries like the US and Canada in pursuit of better opportunities and lifestyle.(Srivastava, 2018)

**4. Is the migration pattern (inwards or outwards) largely dependent on the income class of the people migrating**
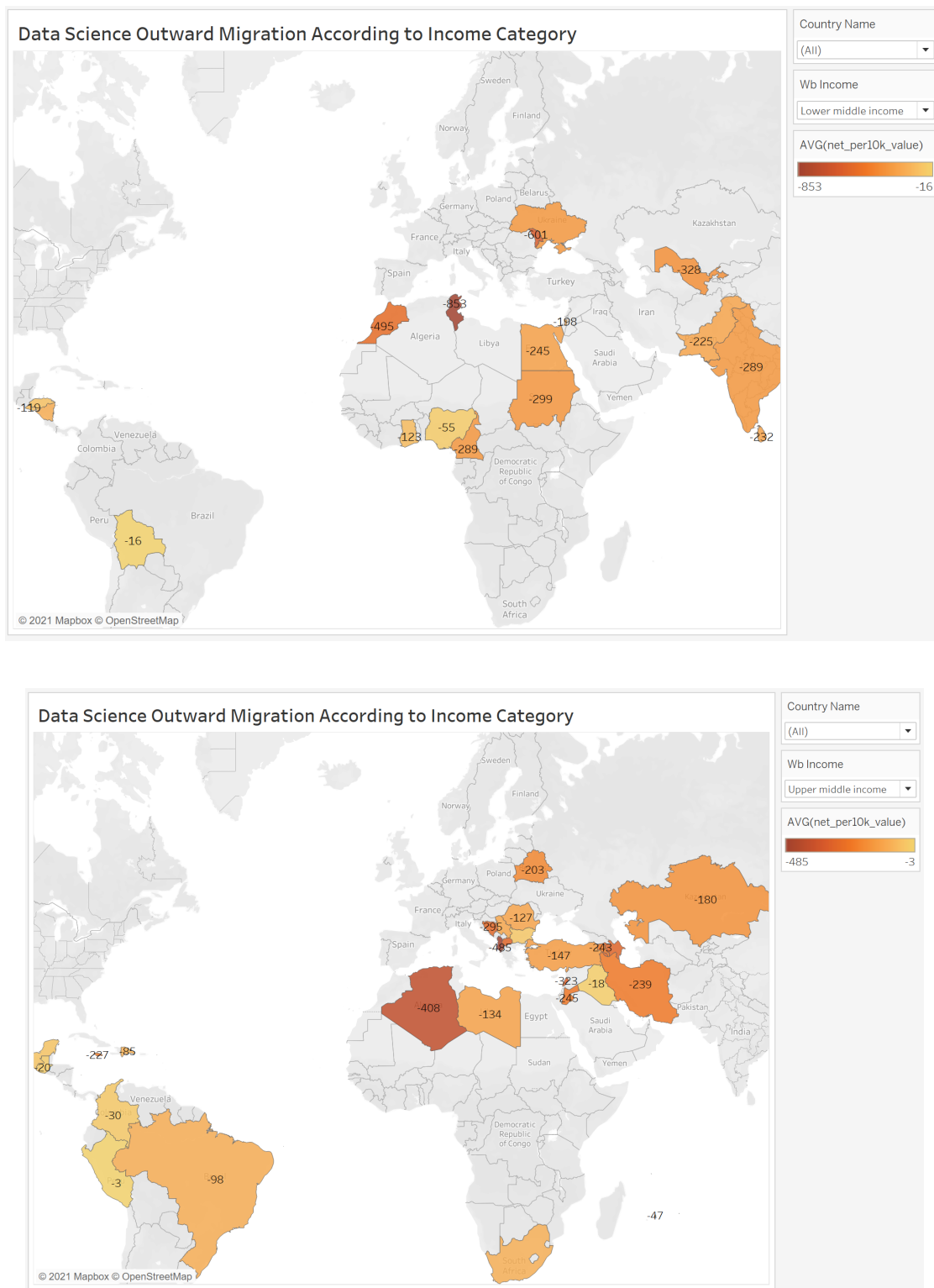




**Fig 5:** Outward skill migration rate for the field of data science for low and upper middle income countries, total for the year 2015-2019

As shown in figure 5, the migration numbers for a country are dependent upon the income class. If we consider lower-middle-income category migrations, higher numbers are seen in countries like India, Sudan, Morocco, etc. But we don't see any migration in the upper-middle-income category from these countries. Migrations in this income class are from countries like Iran, Algeria, Turkey, Brazil, etc. However, it is also important to consider that this data was collected from LinkedIn; hence it might not be conclusive of all the people that migrated from a specific country for a skill group.

The income-based analysis is extremely helpful for both the source and destination country in aiding policymakers and the government to get an insight into the labor market trends. As such, they can create opportunities and educational systems that can keep highly skilled individuals from emigrating.

A great example of a prosperous region in reversing brain drain is Taiwan. Starting from the late 1980s, Taiwan forged business-friendly policies that encouraged entrepreneurs to stay and the educated diaspora to return to their home country. They founded a science-based industrial park named, Hinschu that can produce talent that is competent to that of silicon valley. Another great example is the UAE, which is now the world leader in many new advancements and tourist attractions. The UAE was able to do so by attracting many skilled individuals to immigrate to their country. (Celasun, Milesi-Ferretti and Obstfeld, 2017)

## Conclusion

From this project, it is observed that migration has been increasing from 2015-2019. We saw a peak in migration for 2017, which was discussed because it was due to an increase in the global economy and increase in the global trade. There has been a decline in migration rate form the end of 2018 to year 2019, this was due to the covid pandemic which has disrupted international travel of any sort.

We also saw that tech and disruptive tech migrants took the lumpshare for all regions and years, where Canada and the US have the highest opportunities. In the same token, we saw that the US and Canada have the highest number of open positions for the field of data science. Furthermore, it was observed that global migration is dependent upon a country's income classification. The developed countries have since been in the receiving end of the skilled workers while the developing countries have been in the source end. Source countries, in the lower to upper middle income classification, would need to increase opportunities and advance the education sector to decrease the number of skilled workers that emigrate from their countries.

# References

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