

BUSINESS ANALYSIS PROJECT

Nova Scotia Emigration Deep Dive

Instructor: Dr. Kyung Lee

Institution: Dalhousie University

Course: BUSI/INFO 6513

Table of Contents of the Report

NO.	Section	Descriptions
1.	Introduction	<ul style="list-style-type: none">- Brief overview of the Nova Scotia Interprovincial migration.- Importance of analyzing economic and social indicators.
2.	Tool Selection Rationale	<ul style="list-style-type: none">- Reasons for choosing Power BI as the external tool and Tableau as the internal tool.
3.	The Datasets	<ul style="list-style-type: none">- The sources, the descriptions of variables and # of datapoints, explanations of how we found and merged the datasets.- Table summarizing each dataset, including the description and purpose.
4.	Data Collection and Cleaning	<ul style="list-style-type: none">- Steps for data preparation for analysis.- Data wrangling, cleansing, and merging (If have)
5.	Research Question (Data Analysis and Visualization)	<ul style="list-style-type: none">- Research questions → How they evolved during our analysis → Final research questions addressed.- Detailed analysis of metrics using Power BI and Tableau.
6.	Comparative Analysis of Tools	<ul style="list-style-type: none">- User interface, ease of use, visualization capabilities, and Functionalities.
7.	Results and Implications	<ul style="list-style-type: none">- Summary of key insights.- How can these insights inform economic and social policy planning in Nova Scotia?
8.	References	<ul style="list-style-type: none">- APA Style references.
9.	Appendix	<ul style="list-style-type: none">- Additional details not included in the main part.

1. Introduction

Interprovincial migration is not only a critical factor in demographic change but also holds important policy considerations for any Canadian province (Rashti *et al.*, 2015). These migratory flows can provide significant economic benefits by reallocating labor from regions with low productivity and high unemployment to regions with high productivity and low unemployment. Limited immigration in certain regions may raise concerns about their economic future and imply declining population growth and the inability to address regional skill shortages through immigration strategies (Serlenga and Shin, 2020). To respond to this challenge, the Canadian government introduced the Provincial Nominees Program, which aims to create a balanced regional distribution of immigrants (Baglay, 2012).

In Nova Scotia, the province has seen a net influx of interprovincial migrants exceeding the annual target of 1,000 people since mid-2014. From 2021 to 2022 alone, Nova Scotia surpassed its goal by more than 10,300 migrants settling in the province (OneNS, 2023). However, a recent report published by Statistics Canada on the net provincial migration figures shows a sharp contrast for Summer 2023. For the first time in eight years, the net migration figure for the province has plateaued, suggesting that an equal number of people moved away from Nova Scotia as those who arrived from other provinces. Economists caution that it is premature to determine if this signals a broader shift in population patterns unless future quarterly data confirms it (CBC, 2023). While it may be premature, it is important from a policy standpoint to acknowledge that a shrinking population poses significant challenges on a region's productivity that can hamper economic growth and straining social insurance systems (Kearney *et al.*, 2022).

2. Research Questions

With these socioeconomic implications, this project aims to understand people's motivations to emigrate from Nova Scotia and will seek to answer the following questions:

2.1. *What is the net migration population figure for Nova Scotia?*

Understanding the net migration population figure for the province provides crucial insights into the province's demographic trends. A positive net migration indicates that more people are moving into the province than leaving, which may indicate economic growth, job opportunities, or lifestyle appeal. Conversely, a negative net migration suggests important factors that may be driving residents away. Monitoring this figure helps policymakers and stakeholders gauge the province's attractiveness and identify areas for improvement or investment.

2.2. *How have the federal infrastructure investments in Nova Scotia impacted the province's emigration?*

Improved infrastructure, such as education, transportation, public facilities, and utilities can enhance the quality of life, create job opportunities, and stimulate economic growth. These improvements may reduce the incentives for residents to leave the province in search of better living conditions or opportunities elsewhere.

2.3. How have the health infrastructure investments in Nova Scotia impacted the province's emigration?

Enhanced healthcare infrastructure can lead to better health outcomes, increased life expectancy, and improved overall well-being for residents. This may contribute to a higher quality of life and reduce the likelihood of residents seeking healthcare services outside the province or moving to regions with perceived better healthcare facilities.

2.4. How do the retail prices of basic goods in Nova Scotia impact the province's emigration?

Higher prices can make living costs burdensome for residents, potentially leading to a desire to move out to more affordable provinces. Understanding the correlation between retail prices and migration patterns can provide insights into the economic factors driving population movements.

2.5. How does income level in Nova Scotia impact migration trends?

Higher income opportunities can attract individuals seeking better economic prospects, while stagnant or declining incomes may push residents to seek opportunities in other provinces.

2.6. How does unemployment in Nova Scotia impact migration trends?

High unemployment can lead to outmigration as individuals seek employment opportunities in provinces with better job prospects. Investigating the impact of unemployment on migration can offer valuable insights into the province's labor market dynamics and economic resilience.

2.7. Which three provinces have the biggest influx of migrants from Nova Scotia?

Identifying the provinces that receive the largest influx of migrants from Nova Scotia can highlight key destination regions for residents leaving the province. Understanding these migration patterns can help policymakers and stakeholders in both Nova Scotia and the recipient provinces anticipate demographic changes, plan for infrastructure needs, and address potential challenges related to migration.

2.8. How has infrastructure investment in these provinces impacted the Nova Scotia emigration?

Analyzing the relationship between infrastructure investment in recipient provinces and Nova Scotia's emigration can provide insights into the broader dynamics influencing population movements.

3. The Datasets

All the data sets shown in Section 3.1 were sourced from Statistics Canada:

3.1. Description of Datasets

The paper aims to see the impacts of several factors on Nova Scotia's emigration through the years; hence, Dataset 1 (See Table 1) was set as the primary dataset upon which all other data sets were merged because it had the longest continuous annual population records for each province.

Table 1. Original datasets used for the paper sourced from Statistics Canada.

Dataset	Title	Size (col by rows)
1 (Primary)	Interprovincial migrants by province of origin and destination (annual)	15 x 7633
2	Low income (after-tax) in Nova Scotia based on census family (annual)	24 x 56
3	Function of Government – University & Colleges in Nova Scotia (annual)	16 x 47
4	Function of Government – Health & Social Service Institutions in Nova Scotia (annual)	16 x 47
5	Federal Contribution to Infrastructure in each province (annual)	22 x 20415
6	Labor Force Characteristics – Unemployment in Nova Scotia (monthly)	8 x 119
7	Average retail price in Nova Scotia for the selected product (monthly)	85 x 121

3.2. Data Cleansing and Merging

The most crucial part of the data preprocessing was to ensure all datasets used covered the same period. While Dataset 1 included data from 1971 to 2023, only 2008 to 2022 contained consistent records, hence, all analyses for the paper were based on these years.

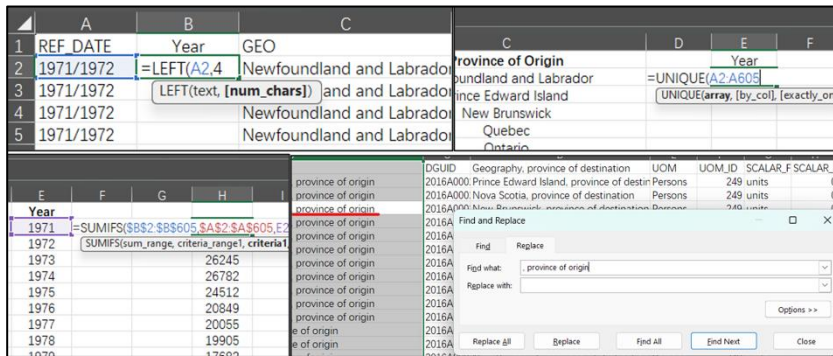


Figure 1. Excel functions used in data cleansing.

MS Excel was used for cleaning the datasets that were all downloaded as .csv files. 'Left', 'Find what', 'Replace with', 'Replace all', 'Unique', and 'SUMIFS' functions were used to prepare the data sets ready to be combined by 'merging'. Other methods used but not limited to

'Mixed References', 'Transpose', 'V-Lookup', and 'Paste Special' functions.

After cleaning, the next step was to upload the primary dataset into Power BI, then uploading the rest one at a time. To merge the datasets (Figure 2), 'Merge Queries'

Merge					
Select a table and matching columns to create a merged table.					
Cleaned-Overall 08-23					
Year	People Moved-in NS	People Moved-out NS	Migrants Mobility	Number of Persons in Low-Income	Per
2008	15467	16218	-751	172360	
2009	15172	14560	612	168110	
2010	14553	14594	-41	166990	
2011	14410	17276	-2866	165780	

Figure 2. Merge queries were used to combine all the datasets.

function was used, with the years used at the matching column because all the datasets had the same years. All records were then formatted consistently (changing ‘Unemployment Person’ from decimals to whole numbers) to ensure no analytical errors.

The combined master dataset was named ‘Overall-Final Dataset’ and contains 16 rows (showing 1 header and 15 years of data from 2008 to 2022) and 56 columns (containing records from the merged datasets).

4. Description of Analytical Tools – Microsoft Power BI and Tableau

Microsoft Power BI (external tool) and Tableau were both used to visualize the data to gain insights to answer the questions on how some of the factors impacted Nova Scotia emigration.

Both Power BI and Tableau are business intelligence tools developed and provided by Microsoft and Tableau Software (acquired by Salesforce in 2019), respectively. They are designed to help users extract, transform, and visualize data to gain important insights to better understand the stories concealed in these data.

Power BI allows users to pull the dataset or data source from almost all types, including SQL databases, Excel spreadsheets, JSON, Azure, and even the web. It supports real-time data streaming and automatic refreshing, enabling users to access the latest data at any time and perform real-time analysis and decision-making (Microsoft, 2023). Similarly, Tableau allows connectivity to a wide range of data sources, allowing users to import and analyze data from various databases, spreadsheets, cloud services, and even big data platforms. Both provide strong data visualization capabilities allowing users to quickly create graphs, charts, and collaborative dashboards.

From a user’s standpoint, both Power BI and Tableau offer comparable user interfaces and usability features. Both platforms feature a familiar start menu and provide tools for editing and transforming data. Power BI employs the Power Query Editor to refine data into the desired structure and format, while Tableau offers an additional interface for data conversion and shaping to facilitate analysis and visualization.

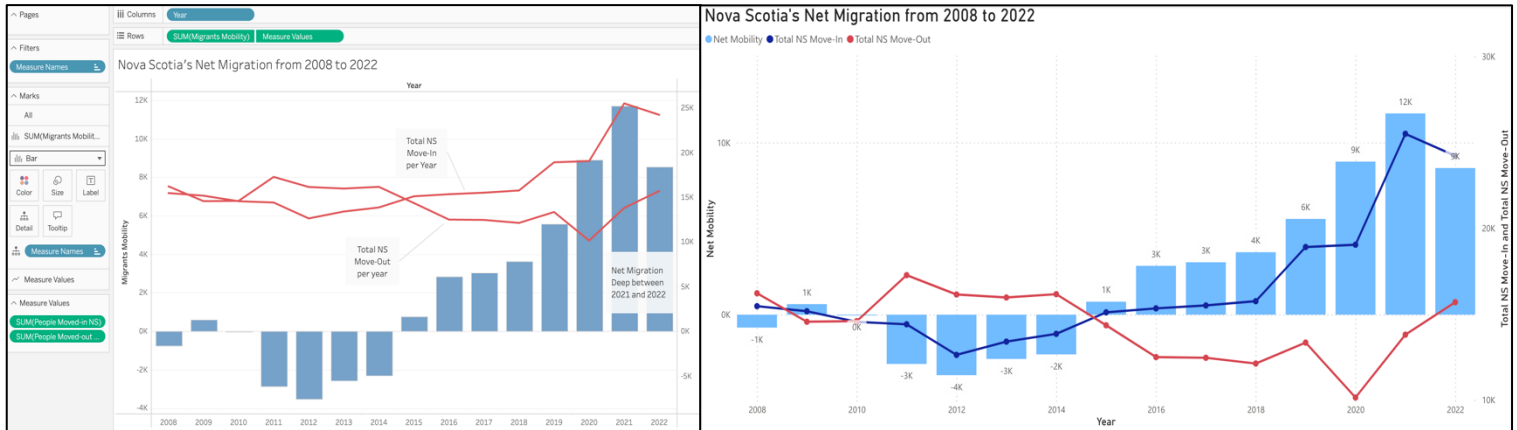
A standout feature of both platforms is their intuitive ‘drag-and-drop’ functionality, allowing users to effortlessly create visualizations by selecting and dragging data directly onto the workspace. However, Power BI’s workspace stands out for its streamlined and simplified design compared to Tableau’s interface.

5. The Findings

This section summarizes how the relevant data from the master dataset ‘Overall-Final Dataset’ were visualized in both Tableau and Power BI. Hence, the discussions begin on how the relevant data were added to the row and column bins for each tool and no longer outlines how the data were sourced to visualize each question. It includes the differences on how the visualizations were created for each tool. The derived insights are presented at the end of each question while an aggregate analysis of the implications of the findings are found in Section 6.

5.1. Nova Scotia Net Migration

Studying the net migration in Nova Scotia is important because it helps policymakers plan to address the challenges and opportunities associated with migration. Answering this question at the beginning set the stage for all the rest of the analyses to closely examine other factors that may impact population movements in the province. The importance of considering the net migration in the context of net outflow provides important insights on possible implications in certain sectors of the economy. For this analysis, three measures were observed, 'People Moved-in NS', 'People Moved-out NS', and 'Migrants Mobility'.



Tableau

Line graphs excel at visualizing trends and patterns over time. Because lines connect data points, it implies a continuous flow of people moving in and out. Bar charts are ideal for comparing discrete values and highlighting magnitudes, making it easier to see if there is a net gain or loss in population movements. Combining both line and bar charts allows easier analysis both in flow and the net change in population movements and avoid overwhelming viewers with too much detail at first glance.

Building on this premise, the 'Year' was dragged from the data pane to columns and 'Migrants Mobility' into the rows. The 'Measured Values' containing all records was then dragged from data pane and removed all irrelevant data leaving 'People Moved-in NS' and 'People Moved-out NS'. From the Marks Card, the line chart was selected from the drop-down list. Right clicking on the collective 'Measure Values' containing the both the move in and move out data and selecting the dual axis option created a secondary axis for the move in and move out data. From the Marks Card, the bar chart was selected for the measure values. The graphs were formatted in different colors for more visual impact and annotations were added for easier identification.

Power BI

The Line and Stacked Column Chart in the visualizations tab was selected to create two types of graphs in one chart. The 'Year' was dragged from the data field to the x-axis box while 'Migrants Mobility', 'People Moved-in NS', and 'People Moved-out NS' were dropped into the y-axis box. To visualize properly, the 'Migrants Mobility' was assigned as the bar chart, and the rest were assigned as line graphs. For more visual impact, the lines were set in different colors, and the bars appearing below the zero line were set to red indicating negative net. Finally, the 2022 net mobility was set to orange to indicate a significant finding in the province's population movement.

Differences

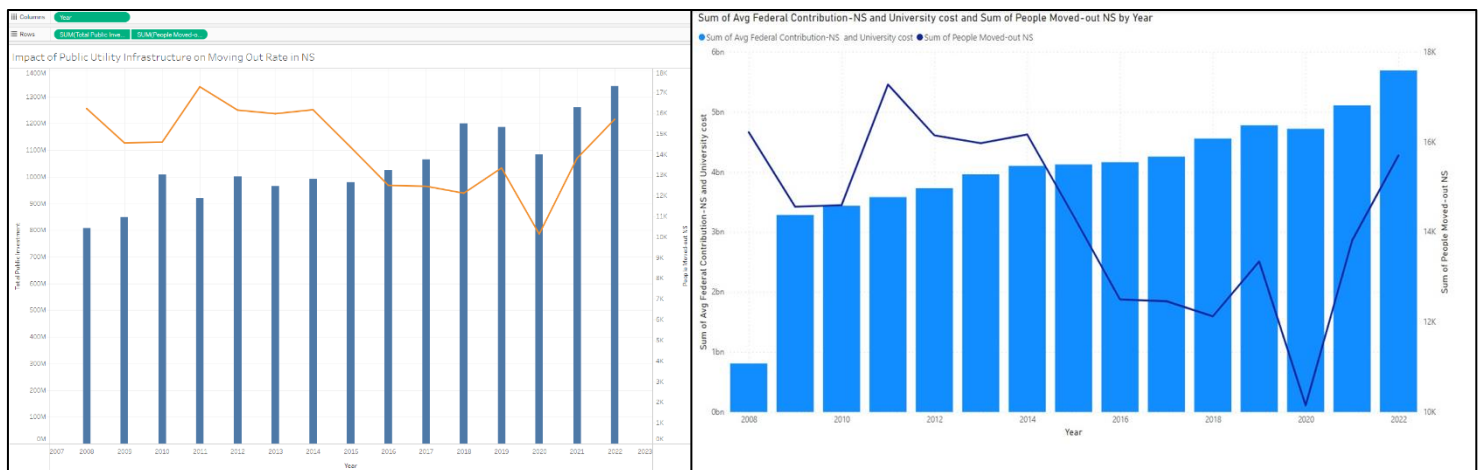
Creating similar visualizations in Tableau and Power BI come with different approaches. Tableau uses rows and column bins while Power BI uses x and y-axis boxes for user to drag and drop their measures. However, Power BI's familiar interface may be easier to navigate even for first time users especially because many of the functionalities present in Excel are also found in Power BI.

Insights

The visualization of the net migration in Nova Scotia reveals that from 2011 to 2014, the province experienced a net negative migration with the lowest point in 2012 of around 4000 outflows. Beginning 2015, the province experienced a steady increase in net migration peaking in 2021. Notably, 2020 had the lowest population outflow movement which may have largely been due to limited mobility during the COVID-19 pandemic. However, it is important to highlight that in 2022, the net migration significantly decreased from 2021 and was even lower than 2019. This discovery gives a better perspective to examine the factors that may have contributed to the steady increase between 2015 to 2021 and what possibly triggered the decrease in net movement in 2022.

5.2. Federal Infrastructure Investments vs. NS Emigration

To examine how federal infrastructure investments in Nova Scotia affect migration trends, the relationship between the federal infrastructure spending on Nova Scotia and the number of people moving out of the province was explored. In this case, the federal infrastructure all aggregate spending to maintain and develop public facilities such as higher education, public transport, roads and highways, utilities, and sanitation.



Tableau

To visualize this, a new measure was created and named 'Total Public Investment' and adding the values for 'Universities and Colleges' and 'Federal Contribution – NS'. The 'Year' was added to the column, the calculated measure 'Total Public Investment' and 'People Moved out NS' were added to the row. This resulted in two lines that were merged into a single graph by clicking the second graph, choosing the Dual Axis option, and setting it to bar chart.

Power BI

Like Tableau, a new measure 'Total Public Investment' was created by adding the values of the 'Universities and Colleges' column and 'Federal Contribution-NS'. This was done by creating a measure by right-clicking on the column header and selecting 'New Measure'. Using the SUM

function in the formula bar, sum the values in the selected column to get the ‘Total Public Investment’ measure values. The ‘Year’ was added to the X-axis and the measures ‘Total Public Investment’ and ‘People Moved out NS’ were added to the y-axis. The graph chosen to represent the output is a bar and line graph where the bars represent ‘Total Public Investment’, and the line graph represents the ‘People Moved-Out NS.’

Differences

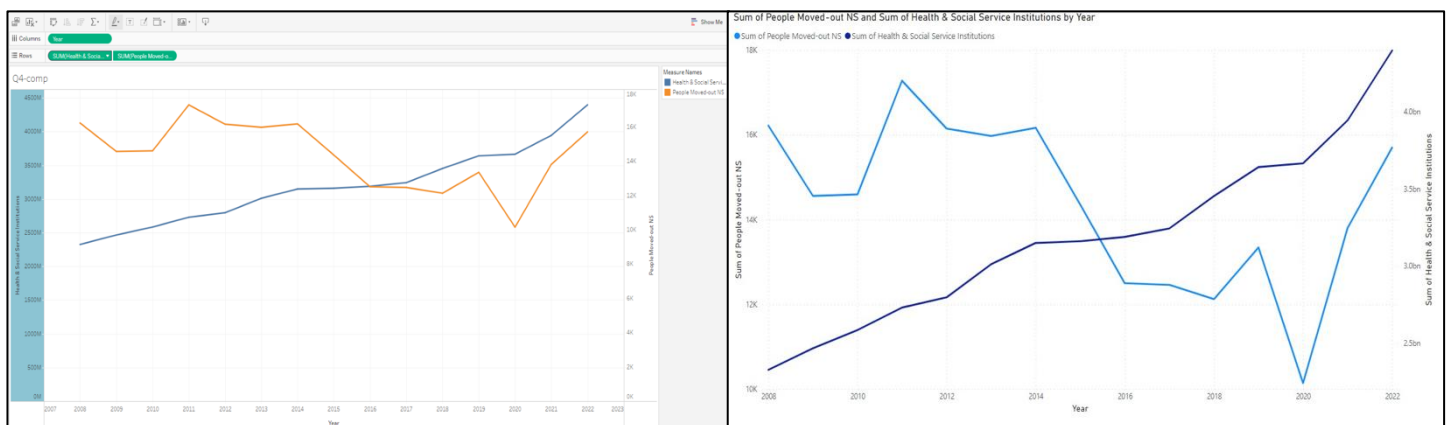
Both Tableau and Power BI use similar UI thereby making visualization a quick and easy task. However, the main difference was when creating the measure “Total Public Investment”. It was much easier in Power BI due to its drag and drop functionality as opposed to tableau which uses the create measure function that opens a dialog box where the user manually needs to type in the formula for the calculated field. This would open doors for errors especially when complicated formulas have to be used.

Insights

The graph depicts a 12-year trend in federal investments in Nova Scotia and their influence on migration out rates. It shows a steady increase in federal investments, which coincides with a notable decrease in migration out rates from 2014 to 2020. This suggests that the influx of federal funds may have contributed to making the province a more attractive location for residents, resulting in fewer people leaving the region with the trend indicating a positive impact of federal investments on migration patterns in the province for this period. However, despite sustained public infrastructure investments, the total outflow has increased from 2021 to 2022. While public spending on infrastructure development had a positive effect, a more important indicator may be affecting people’s decisions to leave the province post pandemic.

5.3. Health Infrastructure Investments vs. NS Emigration

To examine how health infrastructure investments in Nova Scotia affect migration trends, the relationship between the spending on developing and maintaining health infrastructures on Nova Scotia and the number of people moving out of the province was explored.



Tableau

The 'Year' was added to the column and the measure 'Health Institutions' and 'People Moved out NS' were added to the row. This generated a chart with two-line graphs. The second graph was assigned to the secondary axis by right-clicking on it and choosing the Dual Axis option.

Power BI

The line chart was chosen to represent the movement of NS emigrants and the trend on health infrastructure spending in Nova Scotia. The 'Year' was added to the x-axis box and the measures 'Health Institutions' and 'People Moved out NS' were added to the y-axis box. This resulted in two-line graphs as shown in **Figure**.

Differences

There was no major difference in creating the above graphs as the dataset already had the fields required to produce the visualizations. However, since Tableau is available for both Mac and Windows and it offers accessibility via online sign-in makes it better in terms of accessibility when compared to Power BI which is not available for Mac users.

Insights

The graph illustrates a 12-year trend in health infrastructure investments and its impact on migration out rates in Nova Scotia. Notably, there is a steady increase in health infrastructure investments over the period, indicating sustained government efforts to enhance healthcare services in the region, resulting in a correlation between the rise in health infrastructure investments and a reduction in migration out rates. Specifically, from 2014 to 2022, there is a marked decline in migration out rates, suggesting that improvements in healthcare infrastructure may have contributed to making Nova Scotia a more appealing destination for residents. However, an increasing trend in outflow over recent years may be indicative of a more powerful driving force to influence the people to leave the province.

5.4. Cost of Basic Goods vs. NS Emigration

To examine how retail prices in Nova Scotia affect migration trends, the relationship between food prices and the number of people moving out of the province was explored. For this case, however, only years 2017 to 2022 were considered because this was the only period that contained the most consistent data for all years.



Figure: The people moved-out of NS (Tableau) and The Average Retail Price in NS (Tableau).

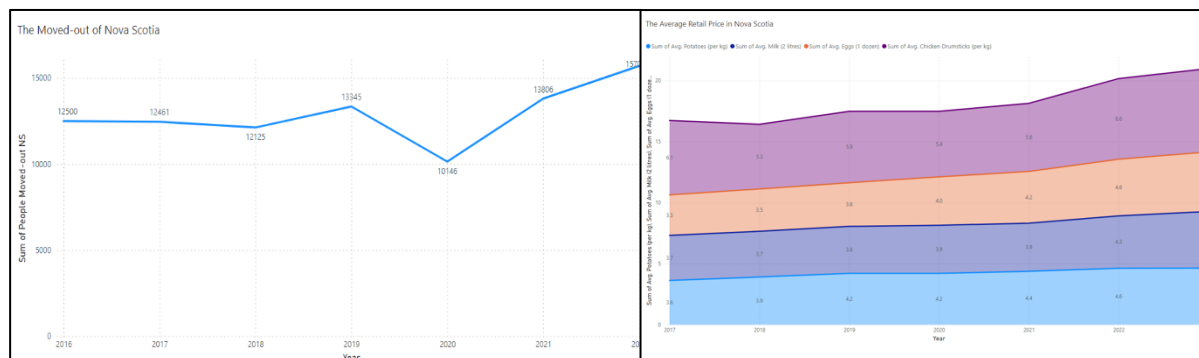


Figure: The people moved-out of NS (Tableau) and The Average Retail Price in NS (Tableau).

Tableau

First, drag the years to the columns, then drag the average price of each item to the rows. The area chart was selected to demonstrate the trend of the price of each commodity over time. Next, a line graph was created by dragging the year to the columns and the number of the population movements to the rows to show the trend in a line graph. Titles were added to each graph to clearly illustrate what the chart was showing.

Power BI

Similarly, the Line Chart was selected and dragging the 'year' from the list of fields to the axis box, and 'People moved-out NS' to the values box. The visualization was formatted by turning on display values for each point from the Data tab. Stacked Area chart was selected and the 'year' field was dragged from the list to the axis box. The 'Average Price' field for all the different items were dragged to the Values box and automatically creating a stacking effect. The colors were adjusted accordingly in the Format tab.

Differences

Tableau allows to creation of separate Y-axes for each metric. It is possible to have multiple measures each displayed on a different Y-axis, and each Y-axis can have a separate scale and range. Power BI's standard visualizations support at most one primary Y-axis, which limits the number of measures that can be displayed simultaneously.

In Power BI, setting a fixed scale interval is usually done by adjusting the Start and End values of the Y-axis, and setting the Maximum and Minimum values. The free web version of Power BI does not provide the same level of scale interval control as Power BI Desktop.

Insights

The area chart shows the prices of most commodities are trending upward. For example, from 2016 to 2023, the average price of chicken thighs increased from \$6.09 to \$6.83. This indicates a steady upward trend in the prices of these basic food items in Nova Scotia over the period analyzed, which may reflect inflationary pressure on food prices.

Going to the migration trend at the same time, the line graph shows some fluctuations, but overall, the number of people moving out of the country has been trending to increase in recent years. Combining the data from the two charts, although we cannot be certain that there is a direct relationship between these price increases and the number of people moving out, we can speculate that price increases may be one of many factors influencing residents' decisions to move.

5.5. Movement of Low-income Population vs. NS Emigration

To examine how income levels in Nova Scotia affect migration trends, the relationship between the population with low incomes and the number of people moving out of the province was explored.

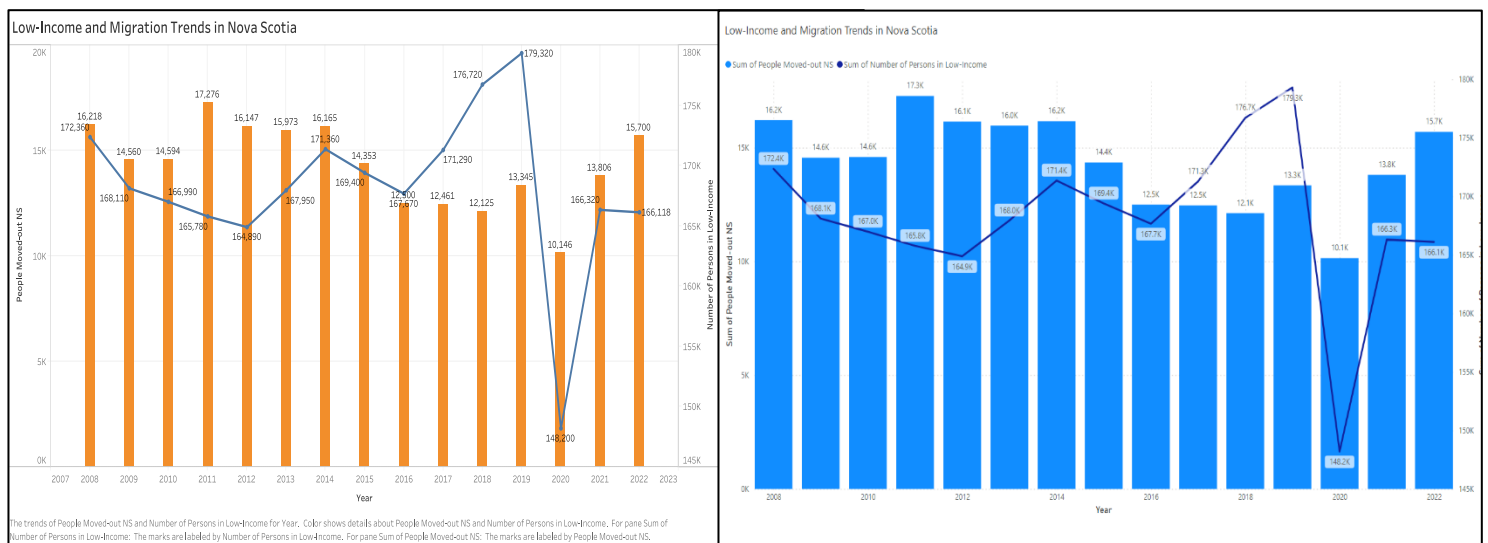


Figure: The Low-income and migration trends in NS (Tableau)

Tableau

The Combined Chart was selected to show the two quantitative variables over time. The 'Year' field was dragged to the column, while the measures for the 'Number of People Moving In' and the 'Number of Low-income People' were dragged to the row box. The bar chart for the 'Number of People Moving Out' and the line chart for the 'Number of Low-income People' were overlaid.

Power BI

The combination chart (bar and line) was selected, with the 'Year' field dragged to the x-axis area. The y-axis of the bar chart was set by dragging 'Moved-Out NS' to the bar chart values box. The 'Number of Low-income People' was dragged to the line chart value box. Data labels for both graphs were turned on in the format panel to display the values. The chart colors, labels, and legends were adjusted to improve readability.

Differences

The final visual output of the two tools is similar, but the experience and customization options available during the creation process are slightly different. For instance, manipulating the secondary y-axis in Power BI is easier than Tableau.

Insights

The visualizations suggest that while there may be a correlation, it is not directly causal. The sharp drop in emigration in 2020 may be due to the COVID-19 pandemic, which has limited population mobility and temporarily altered migration trends. Despite some fluctuations, the apparent increase in the number of low-income persons from 2017 to 2019 does not always imply an increase in the number of immigrants moving out of Nova Scotia. This demonstrates the complexity of migration decisions, which can be influenced by a combination of economic factors, social factors, and policy changes.

5.6. Movement of Unemployed Population vs. NS Emigration

To examine how the movement of the unemployed people in Nova Scotia affect migration trends, the relationship between the unemployed population and the number of people moving out of the province was explored.

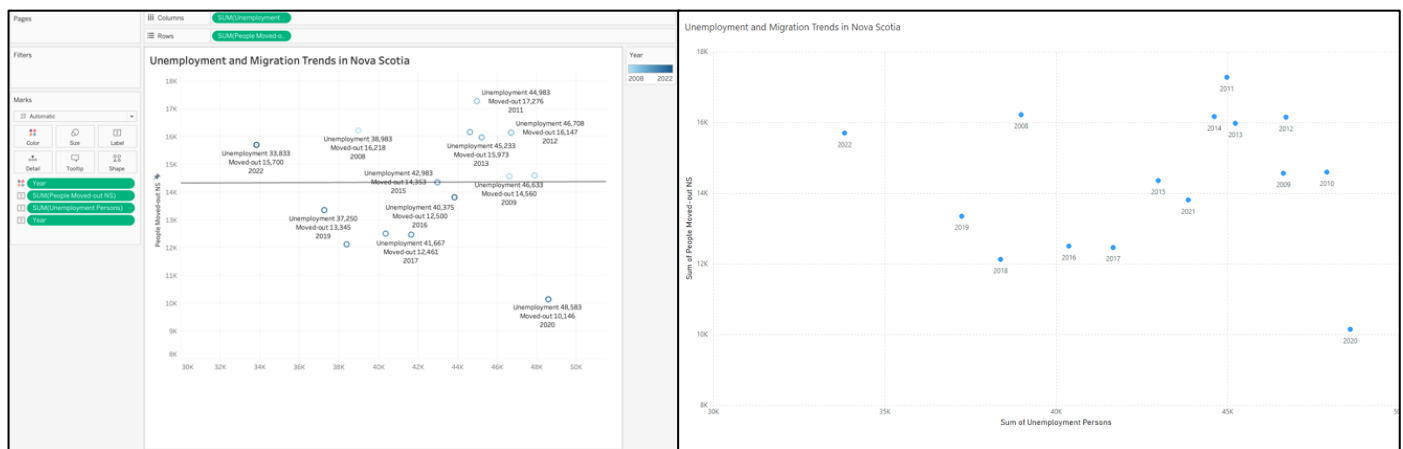


Figure: Unemployment and Migration Trends in NS (Tableau).

Tableau

A scatterplot was created showing the number of "moved-out migrants" and the number of "unemployed" in Nova Scotia for different years. Each point represents a year's worth of data, and the corresponding values are shown directly on the graph. The size and color of the markers were adjusted, the years were set to be color-coded so the points for different years are displayed in different colors. Data labels were added directly to the scatterplot for each point. The range of the axes were adjusted to make sure the data points are well distributed with less blank space. A trend line was added to the graph, and the regression equation, R-squared, and p-value were displayed.

Power BI

The scatter chart icon was selected from the visualizations pane. The 'Year' field was dragged into values, 'Sum of Unemployment Persons' dragged into the y-axis box, and the 'Sum of People Moved-out NS' was dropped into the y-axis box. The color and size of the data points were adjusted in the 'Format' pane to make them more readable.

Differences

Manipulating both tools to create scatterplots were done similarly by specifying one metric as the X-axis and another as the Y-axis.

Insights

The scatter plot illustrates that there is no clear straight-line relationship between the 'number of people moving out' and the 'number of unemployed' and the trend line is almost horizontal. The regression analysis shows that the R-squared value is very low, close to 0, indicating that the model cannot effectively explain the changes in the number of people moving out of the country; the P-value is very high, far exceeding the level of the commonly used test of significance (e.g., 0.05), which implies that the relationship between the number of unemployed and the number of people unemployed is very low. This means that there is no statistically significant linear relationship between the number of unemployed and the number of people moving out of the country.

5.7. Top 3 Provinces for NS Emigrants

To find the top 3 provinces of destinations for Nova Scotia emigrants, the distribution of annual interprovincial immigration per province were studied of which the population from Nova Scotia was observed.

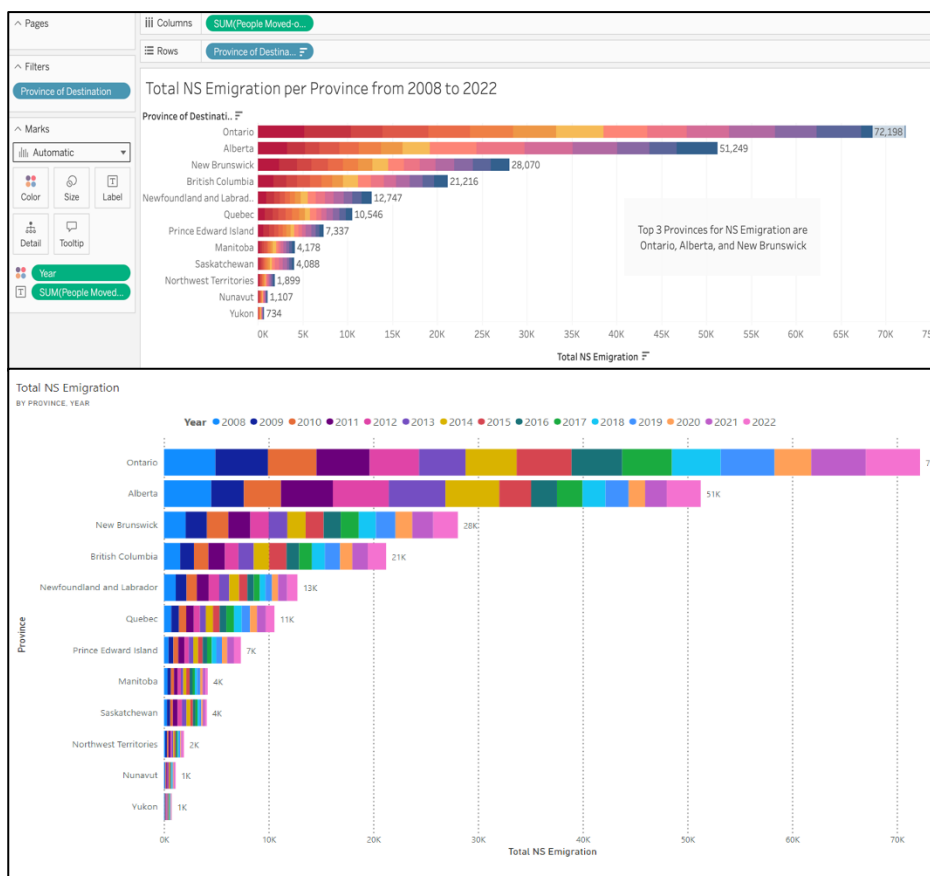


Figure 3. Change this later.

the distribution of NS emigration for each province from 2008 to 2022. For more visual impact, each year was set to a different color to highlight the magnitude of outflow for each year per province. Right clicking on the y-axis (provinces) and sorting them in descending order rearranged the bar charts with the province with the highest influx at the top. All other parts were formatted accordingly.

Differences

Tableau

From the data pane, the 'People Move-out NS' was dragged to the column and 'People Move-out NS per Province' to the rows. This automatically generated a monochromatic bar chart that sorted the provinces in descending order. The colors were adjusted to 'Sunrise-Sunset Diverging' to visualize the distribution of the annual outflow. All the other parts were added and formatted to create more visual impact.

Power BI

Using this tool, the stacked bar chart was selected from the Visualizations panel. The 'Year' was dragged to the x-axis, and the 'People Move-out NS per Province' was dragged to the y-axis. This created a horizontal bar chart showing

While a few subtle differences were observed in generating the bar charts, Tableau was able to generate the bar chart with far less steps needed to create a stunning visualization. Creating them in both tools were relatively easy with minimal needs to format and improve its parts like formatting data labels and adding annotations.

Insights

The chart reveals that the top three provinces of destination for Nova Scotia emigrants are Ontario, Alberta, and New Brunswick (a far third). From 2008 to 2022, these provinces received over 151,000 people have left the province and may have a negative impact on the province's economy and social fabric. Policymakers may need to consider ways to encourage people to stay in the province, or to attract new residents to permanently settle in Nova Scotia.

5.8. Federal Infrastructure Investments of Top 3 Destinations vs NS Emigration

To examine the relationship between the infrastructure investments of the Top 3 provinces of destinations and Nova Scotia emigration trends, a closer look on the data for the federal spending on infrastructure development in Ontario, Alberta, and New Brunswick from 2008 to 2022 and the province's move out population were done for this analysis.

Tableau

The 'Year' was dragged from the data pane to the columns bin, and 'Measure Values' to the rows. All irrelevant measures were removed leaving the data for federal infrastructure contribution for the top New Brunswick, Alberta, and Ontario. The 'People Move-out NS' was placed to the right of 'Measure Values' in the rows bin and right-clicking to choose dual axis to set the outflow data to secondary axis. In the marks card, the infrastructure chart was set to bar and the outflow data set as line chart. The colors for the stacked bar charts were assigned for each province to highlight the spending for each province. Annotations were fitted to the chart and all other parts were formatted accordingly.

Power BI

Using this tool, the 'Line and Clustered Column' chart was selected. The 'Year' was dragged to the x-axis box, while 'NB Federal Infrastructure Contribution', 'AB



Federal Infrastructure Contribution’, and ‘ON Federal Infrastructure Contribution’ were placed in the column y-axis box to visualize the investment spending as bar graphs. ‘People Move-out NS’ was placed in the Line y-axis box to visualize this measure as a line chart stacked over the investment bar graphs. The labels, colors, and font formatting were set accordingly.

Differences

Creating the clustered column with a line series overlay was relatively easy in Power BI. However, this was tricky in Tableau. In Tableau, side-by-side bar charts are typically created by placing ‘Measure Names’ on the columns itself. This results in a categorical axis being established, with each bar representing a specific measure. Line graphs, on the other hand, require a continuous axis (like dates) to connect data points. In dual axis chart, both graphs must share the same axis. Because the bar represents categories, the line is plotted against these categories as well, leading to disconnected dots instead of a smooth line. A stacked bar chart was created instead to demonstrate the major challenge for Tableau beginners who may require a good understanding on the continuous and discrete numerical properties.

Insights

The findings on Section 5.2 (public infrastructure investment) and 5.7 (top 3 provinces of destination) provide an important premise to the analysis of this question especially in relation to how the dynamics in other provinces impact the decisions of the people to leave Nova Scotia. Overlaying the outflow over the infrastructure investments in these provinces reveals a strong correlation between the magnitude of the investment and distribution of emigrants to each of this province in recent years. From 2014 to 2018, Nova Scotia has seen an increase in net migration (Figure 4?) when investments in Alberta and Ontario have declined over this period. Notably, in 2019 the outflow spiked right about the time when these provinces received a substantial increase in federal infrastructure funding. While the COVID-19 pandemic temporarily obstructed interprovincial mobility, a surge in outflow was observed in 2021 and has sustained ever since resulting in a drop in net mobility for the first time since 2015.

6. The Implications

Migration patterns are dynamic and can be influenced by various factors over time. Government spending on public infrastructures and social services can have a stabilizing effect on migration by improving the attractiveness of a region and implying a better quality of life. However, the increase in migration outflow post pandemic highlights the impact of external events on migration patterns. Increase in the prices of basic goods suggests inflationary pressure making the province a less affordable place to live and influence residents’ decisions to move elsewhere. The inverse relationship between Nova Scotia’s net migration and infrastructure investments in major provinces suggests that interprovincial migration flows from Nova Scotia may have been driven as much, or more, by strong labor demand pulls from provinces like Alberta and Ontario than it has been by local economic conditions.

Policymakers should adopt a multifaceted approach to address migration challenges. While infrastructure investments and healthcare improvements are essential, they must be complemented by strategies to enhance economic opportunities, control living costs, and improve overall quality of life. Understanding and addressing the labor market dynamics and economic opportunities in neighboring provinces can help Nova Scotia compete more effectively in retaining and attracting residents.

7. Reflection on the Tools Used (??)

<Insert here.>

References

- Baglay S. Provincial nominee programs: a note on policy implication and future research needs. *Int Migr Integr.* 2012;13:121–41.
- CBC Lite New N.S. population data shows end to years-long interprovincial migration trend.* Retrieved February 12, 2024 from <https://www.cbc.ca/lite/story/1.7067869>
- Government of Nova Scotia. (2023). *Nova Scotia Labour Force Survey : Annual Highlights.* Retrieved from Nova Scotia: [https://explorecareers.novascotia.ca/ns-labourmarket#:~:text=The%20youth%20\(aged%2015%2D24,6%2C000%20jobs%2C%20%2B2.5%25\).](https://explorecareers.novascotia.ca/ns-labourmarket#:~:text=The%20youth%20(aged%2015%2D24,6%2C000%20jobs%2C%20%2B2.5%25).)
- Government of Nova Scotia. (2024, February 12). *Academic Partnership Program.* Retrieved from Nova Scotia: <https://novascotia.ca/programs/academic-partnership/>
- Microsoft. (2023, November 11th). *Real-time streaming in Power BI.* Retrieved from Lern Microsoft: <https://learn.microsoft.com/en-us/power-bi/connect-data/service-real-time-streaming>
- Kearney, M. S., Levine, P. B., & Pardue, L. (2022). The puzzle of falling US birth rates since the great recession. *Journal of Economic Perspectives*, 36(1), 151-176.
- Halifax Regional Municipality. (2024, January 17). *Provincial Financial Indicators Report* . Retrieved from Halifax: <https://cdn.halifax.ca/sites/default/files/documents/city-hall/boards-committees-commissions/240117afsc121.pdf#:~:text=The%20overall%20Financial%20Conditions%20Index,moderate%20risk%20for%20fiscal%20instability.>
- Hayes, A. (2024, February 07). *Labor Force Participation Rate: Purpose, Formula, and Trends* . Retrieved from Investopedia: <https://www.investopedia.com/terms/p/participationrate.asp#:~:text=The%20labor%20force%20participation%20rate%20indicates%20the%20percentage%20of%20all,the%20state%20of%20the%20economy.&text=The%20rate%20varies%20over%20time,%2C%20demographic%2C%20and%20e>
- Inter-Provincial Migration | *OneNS*. (2023, June 1). Retrieved February 12, 2024 from <https://www.onens.ca/goals/goal-1-inter-provincial-migration>
- Invest Nova Scotia. (2024, February 12). *Invest Nova Scotia.* Retrieved from Invest Nova Scotia: <https://investnovascotia.ca/>
- Kenton, W. (2023, July 03). *Debt-to-GDP Ratio: Formula and What It Can Tell You* . Retrieved from Investopedia: <https://www.investopedia.com/terms/d/debtgdpratio.asp>
- Microsoft (2024, January 31). What is Power BI? Retrieved February 11, 2024, from <https://learn.microsoft.com/en-us/power-bi/fundamentals/power-bi-overview>

Nova Scotia Public Service Commission. (2023). *Moving Toward Equity Employment Equity and Diversity in the Nova Scotia Public Service 2022–2023*. Halifax: Province of Nova Scotia.

ONE Nova Scotia. (2024, January 02). *Municipal Stability* . Retrieved from One Nova Scotia: <https://www.onens.ca/goals/goal-18-municipal-stability>

Rashti, A. A., Koops, A., & Covey, S. (2015). The Effects of Capital on Interprovincial Migration: A Nova Scotia Focused Assessment. *Dalhousie Journal of Interdisciplinary Management*, 11.

Serlenga, L., & Shin, Y. (2021). Gravity models of interprovincial migration flows in Canada with hierarchical multifactor structure. *Empirical Economics*, 60, 365-390.

Scotia, G. o., & Devanney, M. (2007). *Business Research*. Truro: Nova Scotia Department of Agriculture.

Statistics Canada. (2024). *Education Training and Learning*. Retrieved from Statistics Canada: https://www.statcan.gc.ca/en/subjects-start/education_training_and_learning

Tourism Revenues. (2019, January 2024). Retrieved from Tourism Nova Scotia: <https://tourismns.ca/tourism-revenues>