

Japan Tourism Data Analysis Project

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Introduction

On January 17, 2025, the Straits Times published an article named, [“Record-breaking 691,100 Singaporeans visited Japan in 2024”](#). This news was not surprising to me, as I had heard of many friends and family travelling to the land of the rising sun in recent years. However, I was curious to learn more about the travel profile of visitors to Japan, and had questions such as:

- Do tourists to Japan, such as Singapore visitors, visit the big cities of Tokyo, Kyoto and Osaka only?
- Which months of the year are the most popular and least popular for foreign visitors to visit Japan?
- Are Singaporean tourists one of the biggest groups of foreigners to visit Japan?

Coincidentally, I had just completed the Google Advanced Data Analytics Project on Coursera and was looking for some datasets that I could get working on, particularly on a topic that I was interested in. I noticed that the Japan National Tourism Organization (JNTO) had published many datasets related to foreign visitors to Japan, and had an entire website dedicated to Japan Tourism Statistics. hence I decided to delve deeper into these datasets and create charts that are not available on the JNTO website.

Executive Summary

Singapore Visitor Arrivals to Japan have definitely rebounded after the Covid-19 pandemic, in 2023 and 2024 visitor numbers consistently surpassed Covid-19 levels for every month. The year end months of December and November consistently emerge as the peak travel months , while August and July are always the least popular months to visit. This trend is exemplified by the stark contrast between December 2024, which saw an estimated 136,200 Singaporean visitors, and August 2024, with only 24,781. Singapore's neighbour, Malaysia also sees quite similar trends in Visitor arrivals to Japan, with lower peak arrivals in November and December. The proportion of Singapore visitors - out of all foreign visitors - is the highest in December, with 3.90% of all visitors to Japan in that month being Singapore visitors. This is followed by November, October and May. The higher proportion of Singapore visitor arrivals in these months may be attributed to the mid-year and year-end school holidays.

Analysis of Prefecture Visit Data from 2023 showed that Tokyo, Osaka, Chiba, Kyoto and Yamanashi prefectures are the five most popular prefectures for Singapore leisure travellers to Japan. The five least popular prefectures are Shimane, Fukui, Kochi, Okinawa and Kagawa prefectures. The difference in the prefecture visit rate between the most visited prefectures and least visited prefectures is huge - Tokyo was 66.19% while Shimane was reported to be 0%. This trend might be attributed to most travellers only visiting destinations along [Japan's Golden Route](#) - for example Mount Fuji in Yamanashi Prefecture, and the shrines and temples in Kyoto. This trend also draws parallels with all other leisure travellers to Japan. On average, Singapore leisure travellers tend to visit the prefectures of Tokyo, Chiba and Yamanashi more as compared to overall leisure visitors, and do not really visit Fukuoka, Okinawa and Oita. Compared to five years ago, Singapore leisure travellers in 2023 choose to visit Osaka, Kyoto, Yamanashi prefectures more, while less inclined to visit Okinawa and Hokkaido.

Analysis A1: Singapore Visitor Arrivals to Japan by Month

Datasets used: *Inbound_Singapore*

I obtained the dataset from [Japan's Tourism Statistics website](#) and named it *Inbound_Singapore*. The dataset had five columns: Country, Month, Year, Growth Rate, and Visitor Arrivals. Subsequently the Country and Growth Rate columns were removed as they were irrelevant to the analysis. There was also missing data for Visitor Arrivals to Singapore for the months of November and December 2024. I added November 2024's numbers from this [JNTO's press release](#) and December numbers from the [Straits Times article](#).

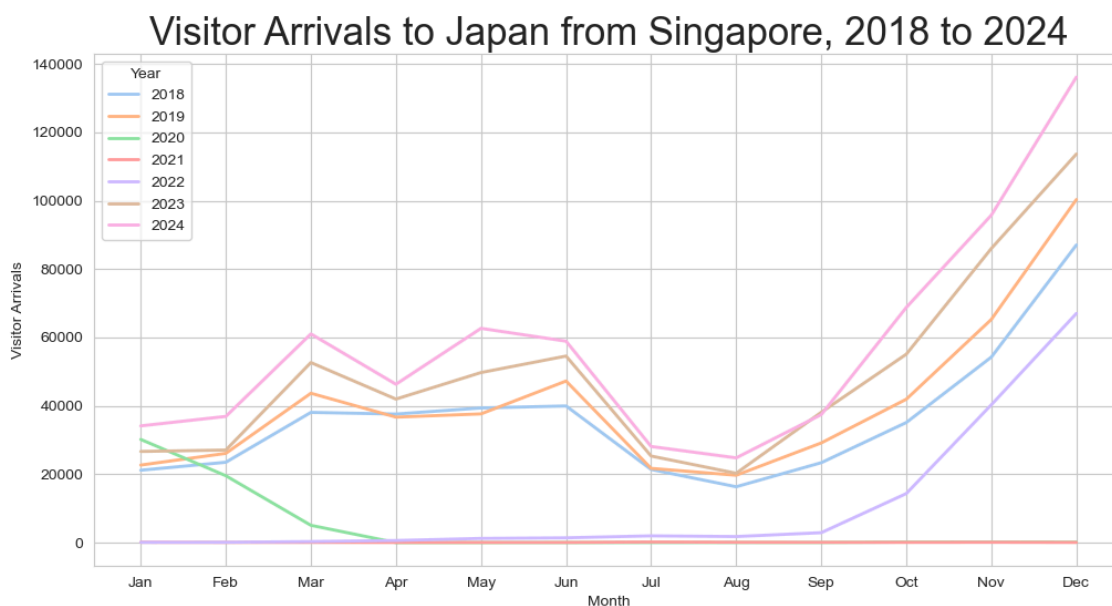


Fig 1.1.1 - Singapore Visitor Arrivals to Japan by Month

Overall, Singaporean visitors to Japan have been increasing year by year. One prominent trend is that Singaporean visitor arrivals peak every December. There is a huge outlier in the data, which could be attributed to the Covid-19 pandemic, with visitor numbers from April 2020 to September 2022 being near zero. December, November, October are the most popular months to Japan for Singapore visitors, while August, July, September, January, February are the popular months. November and December also marks the year-end School Holidays, which could explain the higher visitor numbers. For every single month, 2023 and 2024 visitor numbers also surpassed pre-covid visitor arrivals.

	Month	Year	Month_of_Year	Visitor_Arrivals
0	Jan	2018	0118	21169.0
1	Feb	2018	0218	23496.0
2	Mar	2018	0318	38089.0
3	Apr	2018	0418	37605.0
4	May	2018	0518	39385.0
...
79	Aug	2024	0824	24781.0
80	Sep	2024	0924	37433.0
81	Oct	2024	1024	68790.0
82	Nov	2024	1124	95800.0
83	Dec	2024	1224	136200.0

Fig 1.1.2 - Table showing Singapore Visitor Arrivals to Japan in 2024

Statistical Results:

The most popular month for Singaporean visitors to Japan is in Dec, with 136200 visitors.

The least popular month for Singaporean visitors to Japan is in Aug, with 24781 visitors.

The average number of Singaporean visitors to Japan per month is 57595.5

The standard deviation of Singaporean visitors to Japan per month is 31994.84

The range of Singaporean visitors to Japan in 2024 is 111419.0

2024 December as compared to 2018 December statistics

The difference between Singapore visitors to Japan in December 2024 and December 2018 is 49117.0.

This means that the amount of Singapore visitors during the month of December increased by 56.4% in 6 years.

2024 December as compared to 2024 August Statistics

August is the least popular month for Singapore visitors to visit Japan, in contrast to December which is the most popular month.

The amount of Singapore visitors to Japan in December 2024 is 5.5 times the amount of visitors in August 2024.

Analysis A2: Visitor Arrivals to Japan - Singapore and Malaysia Comparison

Datasets used: *Inbound_Singapore*, *Inbound_Malaysia*

In this analysis, I used a new dataset, *Inbound_Malaysia*. This dataset contains the monthly visitor numbers for Malaysian visitors to Japan, from 2018 to 2024. As this dataset contained the same characteristics as the *Inbound_Singapore* dataset, I performed the same data cleaning techniques and also added in the missing data for November and December 2024 numbers. December 2024 visitors numbers were obtained from a [Business Today article](#) that quoted numbers from JNTO KL, while November 2024 statistics were obtained from this [JNTO's press release](#), same as the source for Analysis A1.

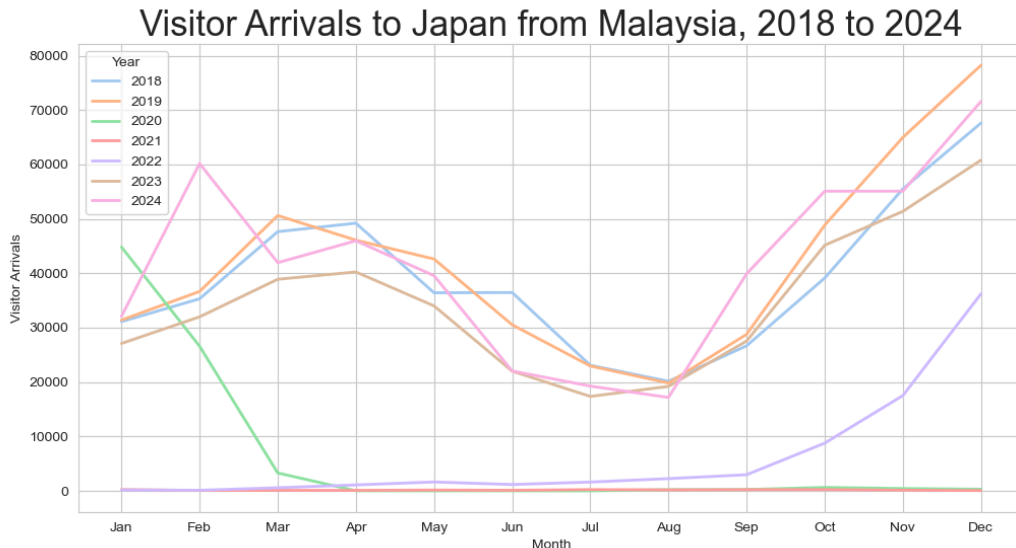


Fig 1.2.1 - Malaysia Visitor Arrivals to Japan by Month

According to preliminary data for 2024, Malaysia visitors to Japan have surpassed pre-Covid 19 levels for certain months. The first time that Malaysia visitors managed to surpass pre-Covid levels was in September 2023. The peak of Malaysia visitors is in **December 2019**. An outlier is the spike in visitor numbers in February 2024, high in contrast to February numbers in other years. The least popular month for Malaysia Visitors in 2023 is in July, while for 2024 it is in August. A small observation is that there is a small number of visitors to Japan in October 2020, during the Covid-19 Pandemic.

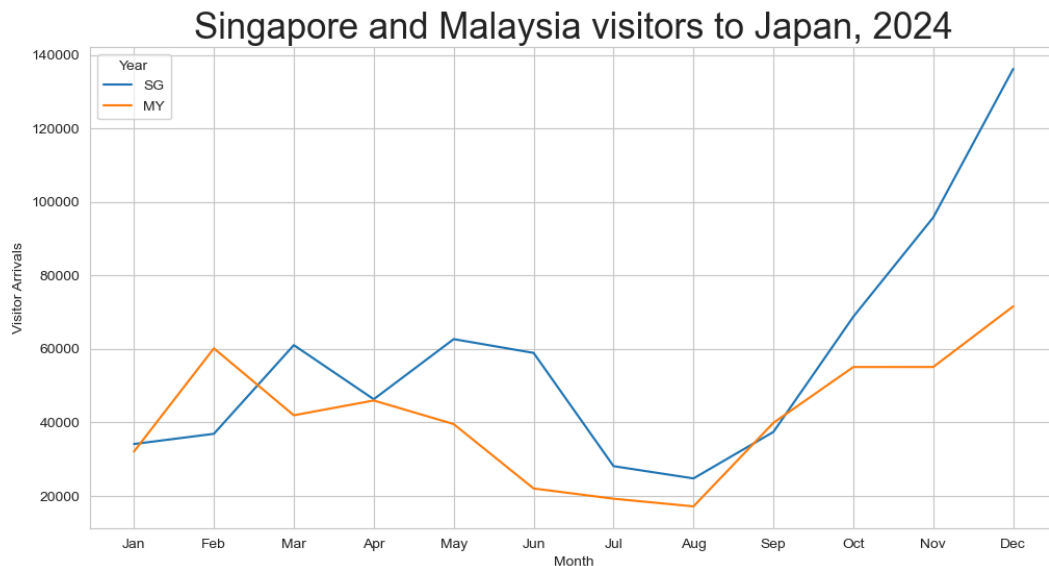


Fig 1.2.2 - Malaysia Visitor Arrivals to Japan by Month

The purpose of this graph is to compare and contrast Singapore and Malaysia visitor numbers to Japan. Both countries see a similar trend where visitor numbers increase from August to December, with August being the trough while December being the peak. The difference is that Singapore visitor numbers to Japan increase at a faster rate. In 2024, Malaysia visitor numbers to Japan exceeded Singapore numbers only in the months of February and September. June is not a popular month for Malaysians to visit Japan, while for Singapore, there is still a decent number of visitor arrivals to Japan for that month.

Analysis A3: Singapore Visitor Numbers as a proportion of overall visitor numbers

Datasets used: *Inbound_Singapore*, *Inbound_Overall*

Inbound_Overall.csv contains data that shows the data of visitors to Japan from every single country. Data aggregation had to be performed to view the sum of visitors overall to Japan by month. Data was then merged with Singapore visitors data, and then a new field was created to calculate the proportion of Singapore visitors for a certain month out of all visitors to Japan.

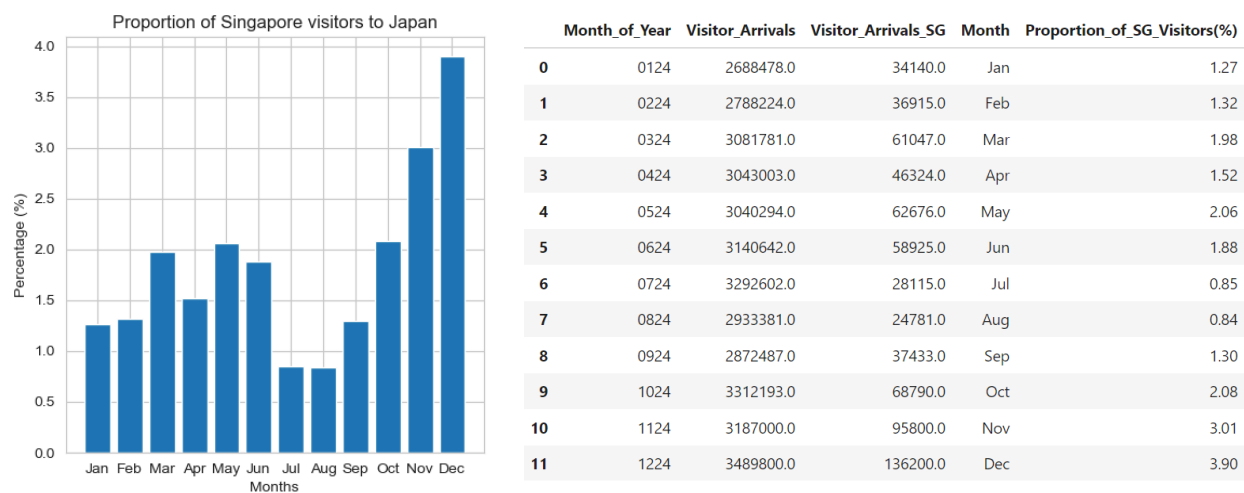


Fig 1.3.1 and 1.3.2 - Proportion of Singapore Visitors to Japan

In 2024, December has the highest proportion of Singapore visitors to Japan as compared to all foreign visitors to Japan. This is followed by the months of November, October, May, and March. July and August sees the least proportion of Singapore visitors to Japan.

Analysis A4: One-way ANOVA

Datasets used: *Inbound_Singapore_ANOVA*.

Inbound_Singapore_ANOVA contains Singapore visitor numbers to Japan every month from 1990 to October 2024. It contains the same five columns as the *Inbound_Singapore* dataset used in [Analysis A1](#): Country, Month, Year, Growth Rate, and Visitor Arrivals.

This box plot below shows the distribution of data for each month.

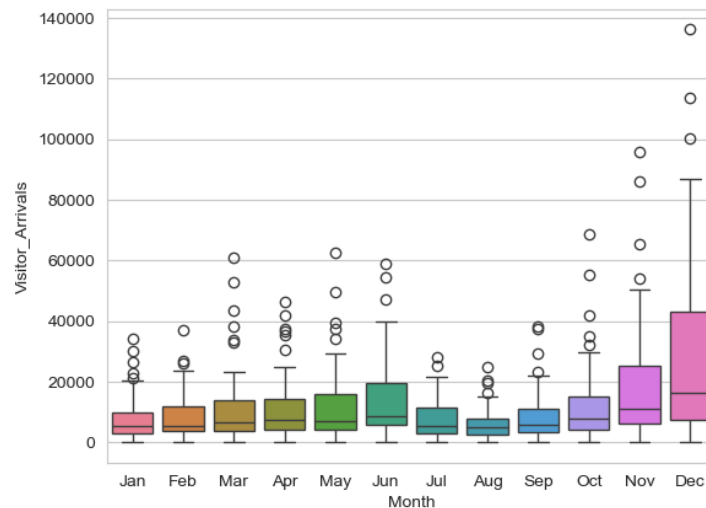


Fig 1.4.1 - Singapore Visitor Arrivals to Japan by Month, 1990 to 2023

December has the largest range and largest mean as well. In contrast, August had the smallest range. In addition, the range starts from zero for all months, as visitor arrival data is still being recorded during the Covid-19 pandemic.

A one-way ANOVA was conducted to compare the effect of months of the year on visitor arrivals to Japan from Singapore. The null hypothesis is that there is no difference in visitor arrivals based on month, while the alternative Hypothesis is that there is a difference in visitor arrivals based on month.

Results of ANOVA Test:

	sum_sq	df	F	PR(>F)
C(Month)	1.991782e+10	11.0	6.524752	4.867323e-10
Residual	1.132258e+11	408.0	NaN	NaN

Fig 1.4.2 - ANOVA

Multiple Comparison of Means - Tukey HSD, FWER=0.05						
group1	group2	meandiff	p-adj	lower	upper	reject
Apr	Aug	-6031.8857	0.936	-19122.1649	7058.3934	False
Apr	Dec	20254.8	0.0	7164.5209	33345.0791	True
Apr	Feb	-3410.4571	0.9994	-16500.7363	9679.822	False
Apr	Jan	-4097.3429	0.997	-17187.622	8992.9363	False
Apr	Jul	-4293.4571	0.9954	-17383.7363	8796.822	False
Apr	Jun	2638.1143	1.0	-10452.1649	15728.3934	False
Apr	Mar	532.2857	1.0	-12557.9934	13622.5649	False
Apr	May	700.2286	1.0	-12390.0506	13790.5077	False
Apr	Nov	8517.6286	0.595	-4572.6506	21607.9077	False
Apr	Oct	1541.2571	1.0	-11549.022	14631.5363	False
Apr	Sep	-2849.4571	0.9999	-15939.7363	10240.822	False
Aug	Dec	26286.6857	0.0	13196.4066	39376.9649	True
Aug	Feb	2621.4286	1.0	-10468.8506	15711.7077	False
Aug	Jan	1934.5429	1.0	-11155.7363	15024.822	False
Aug	Jul	1738.4286	1.0	-11351.8506	14828.7077	False
Aug	Jun	8670.0	0.5672	-4420.2791	21760.2791	False
Aug	Mar	6564.1714	0.8898	-6526.1077	19654.4506	False
Aug	May	6732.1143	0.8718	-6358.1649	19822.3934	False
Aug	Nov	14549.5143	0.0152	1459.2351	27639.7934	True
Aug	Oct	7573.1429	0.7577	-5517.1363	20663.422	False
Aug	Sep	3182.4286	0.9997	-9907.8506	16272.7077	False
Dec	Feb	-23665.2571	0.0	-36755.5363	-10574.978	True
Dec	Jan	-24352.1429	0.0	-37442.422	-11261.8637	True
Dec	Jul	-24548.2571	0.0	-37638.5363	-11457.978	True
Dec	Jun	-17616.6857	0.0008	-30706.9649	-4526.4066	True
Dec	Mar	-19722.5143	0.0001	-32812.7934	-6632.2351	True
Dec	May	-19554.5714	0.0001	-32644.8506	-6464.2923	True
Dec	Nov	-11737.1714	0.1286	-24827.4506	1353.1077	False
Dec	Oct	-18713.5429	0.0002	-31803.822	-5623.2637	True
Dec	Sep	-23104.2571	0.0	-36194.5363	-10013.978	True
Feb	Jan	-686.8857	1.0	-13777.1649	12403.3934	False
Feb	Jul	-883.0	1.0	-13973.2791	12207.2791	False
Feb	Jun	6048.5714	0.9348	-7041.7077	19138.8506	False
Feb	Mar	3942.7429	0.9979	-9147.5363	17033.022	False
Feb	May	4110.6857	0.9969	-8979.5934	17200.9649	False
Feb	Nov	11928.0857	0.1137	-1162.1934	25018.3649	False
Feb	Oct	4951.7143	0.9851	-8138.5649	18041.9934	False
Feb	Sep	561.0	1.0	-12529.2791	13651.2791	False
Jan	Jul	-196.1143	1.0	-13286.3934	12894.1649	False
Jan	Jun	6735.4571	0.8714	-6354.822	19825.7363	False
Jan	Mar	4629.6286	0.9914	-8460.6506	17719.9077	False
Jan	May	4797.5714	0.9884	-8292.7077	17887.8506	False
Jan	Nov	12614.9714	0.071	-475.3077	25705.2506	False
Jan	Oct	5638.6	0.96	-7451.6791	18728.8791	False
Jan	Sep	1247.8857	1.0	-11842.3934	14338.1649	False
Jul	Jun	6931.5714	0.8482	-6158.7077	20021.8506	False
Jul	Mar	4825.7429	0.9879	-8264.5363	17916.022	False
Jul	May	4993.6857	0.984	-8096.5934	18083.9649	False
Jul	Nov	12811.0857	0.0616	-279.1934	25901.3649	False
Jul	Oct	5834.7143	0.949	-7255.5649	18924.9934	False
Jul	Sep	1444.0	1.0	-11646.2791	14534.2791	False
Jun	Mar	-2105.8286	1.0	-15196.1077	10984.4506	False
Jun	May	-1937.8857	1.0	-15028.1649	11152.3934	False
Jun	Nov	5879.5143	0.9462	-7210.7649	18969.7934	False
Jun	Oct	-1096.8571	1.0	-14187.1363	11993.422	False
Jun	Sep	-5487.5714	0.9672	-18577.8506	7602.7077	False
Mar	May	167.9429	1.0	-12922.3363	13258.222	False
Mar	Nov	7985.3429	0.6897	-5104.9363	21075.622	False
Mar	Oct	1008.9714	1.0	-12081.3077	14099.2506	False
Mar	Sep	-3381.7429	0.9995	-16472.022	9708.5363	False
May	Nov	7817.4	0.7181	-5272.8791	20907.6791	False
May	Oct	841.0286	1.0	-12249.2506	13931.3077	False
May	Sep	-3549.6857	0.9992	-16639.9649	9540.5934	False
Nov	Oct	-6976.3714	0.8426	-20066.6506	6113.9077	False
Nov	Sep	-11367.0857	0.1617	-24457.3649	1723.1934	False
Oct	Sep	-4390.7143	0.9945	-17480.9934	8699.5649	False

Fig 1.4.3 - Tukey's Multiple Comparisons

Results

A one-way ANOVA revealed that there was a statistically significant difference in mean visitor numbers from Singapore between at least eleven groups. $F(11,408) = 6.524752$, $p = <0.05$. We can reject the null hypothesis that there is no difference in visitor arrivals based on Month.

Tukey's HSD Test for multiple comparisons found that the mean value of visitor numbers from Singapore was significantly different between August and December. Adjusted p-value was 0.

List of Groups that were significantly different:

- April - December (p:0.0)
- August - December (p: 0.0)
- August - November (p:0.0152)
- December - February (p: 0.0)
- December - January (p:0.0)
- December - July (p:0.0)
- December - June (p: 0.0008)
- December - March (p: 0.0001)
- December - May (p: 0.0001)
- December - October (p: 0.0002)
- December - September (p:0.0)

There was no statistically significant difference in many other groups, for example March - September. The adjusted p-value between the two groups was 0.9995 with a confidence interval of -16472.022 to 9708.5363.

Analysis B1: Prefecture Visit Rate - Singapore (2013)

Datasets used: *Singapore.csv*, *jpn_admbnda_adm1_2019.shp* (under 'maps' folder)

Japan Tourism Statistics's website contains a section 'Visits to Regions of Japan', that provides a list of data of the prefectures visited by foreign visitors to Japan. The data is the summary of questionnaire surveys that are targeted towards foreign travellers departing Japan. *Singapore.csv* was downloaded off the site that contains Prefecture Visit Rate data for Singapore visitors, whose purpose of visit is Sightseeing and Leisure (tourists). Do note that the Prefecture Rate Ranking data is collected only from April 2023 to December 2023, which is a current limitation of this dataset. *Singapore.csv* contains two columns, *Prefecture* e.g. Tokyo and *Visit Rate (%)*, up to four decimal places.

Japan Tourism Statistics's website already displays this data in a graph and table form, but I felt it would have been more interesting for the data to be displayed in the form of a map. Two requirements are required for this to work in Python: a *Shapefile* and a Python library that works with geographic data e.g. *Geopandas*. *Jpn_admbnda_adm1_2019.shp* was obtained from [The Humanitarian Data Exchange](#) site, and it contains shapes of the 47 different prefectures of Japan.

Data cleaning was conducted before merging these two dataframes together. The discrepancies between the two datasets were under the "Prefecture" column. There were a lot of minor differences that had to be resolved before merging these two datasets. For example, "Oita" in the *Singapore.csv* had to be changed to "Ōita Prefecture" in order to match the Prefecture name in the other dataset. This ensured that no issues would arise when performing an inner join on these two datasets.

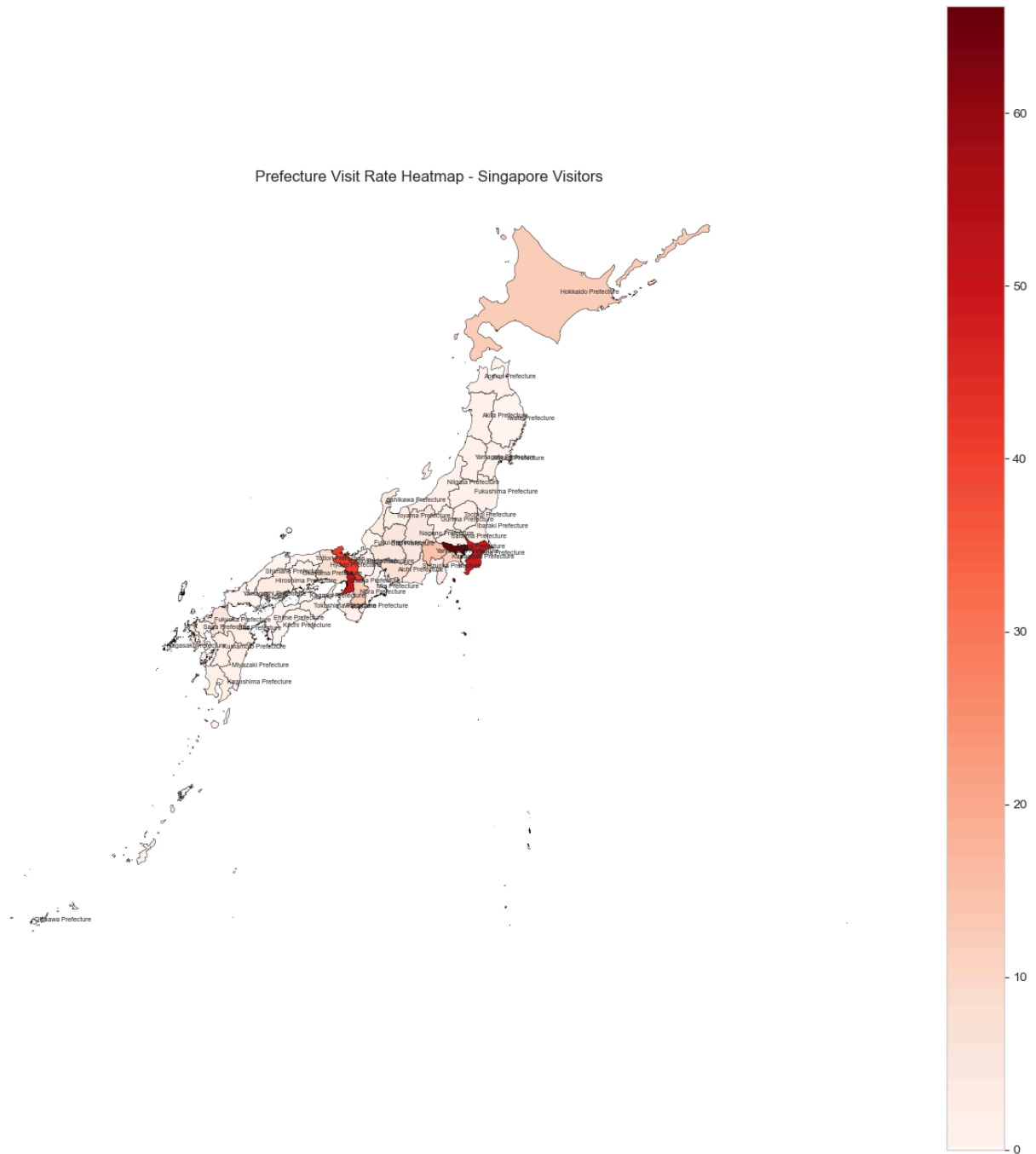


Fig 2.1.1 - Prefecture Visit Rate Heatmap - Singapore Visitors (Sightseeing and Leisure)

Most Singapore tourists (for sightseeing and leisure) to Japan are only concentrated on a few prefectures. The most visited prefecture is Tokyo, followed by Chiba, Osaka and Kyoto prefectures. Other than these prefectures, Nara, Hokkaido, Yamanashi, Kanagawa, Hyogo, Aichi prefectures see a sizable proportion of Singapore tourists.

Analysis B2: Prefecture Visit Rate (Singapore vs Overall)

Datasets used: Singapore.csv, Overall.csv, jpn_admbnda_adm1_2019.shp

The purpose of this analysis is to compare the Prefecture Visit Rate between Singapore and all tourists, to identify which regions of Japan are visited more by Singapore tourists as compared to foreign tourists as a whole. *Overall.csv* was obtained from the same section of the Japan Tourism Statistics's website as *Singapore.csv*.

Data cleaning and transformation was performed to join all three datasets together, and a new field was created to calculate the difference of the Prefecture Visit Rates between Singapore tourists and all tourists.

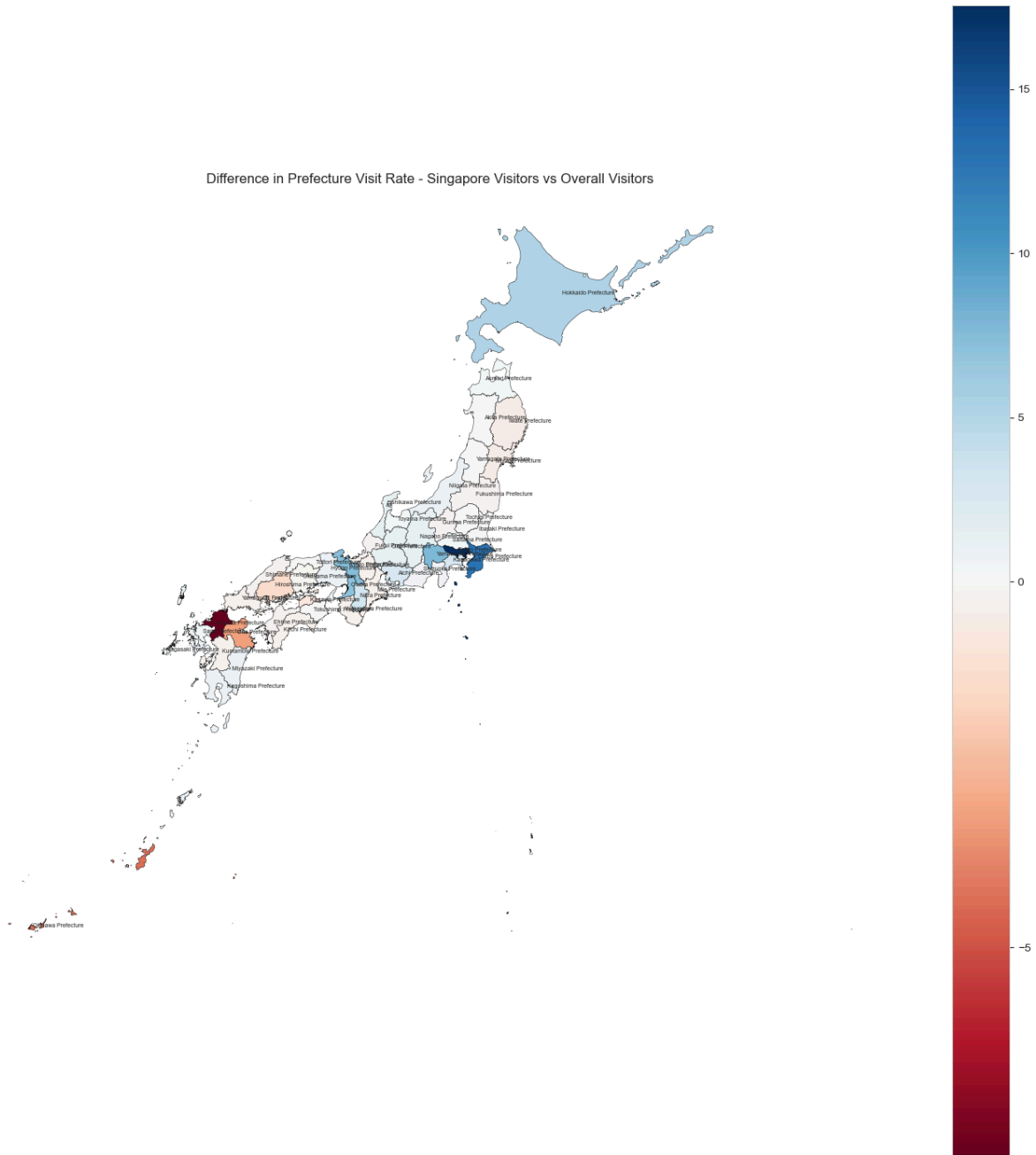


Fig 2.2.1 - Prefecture Visit Rate Heatmap - Singapore vs All Visitors (Sightseeing and Leisure)

As compared to other foreign visitors, there is a greater proportion of Singapore tourists that choose to visit Tokyo, Chiba, Yamanashi, Kyoto, Osaka and Hokkaido. For prefectures that are not as much visited by Singapore visitors, they are those that are located in Western Japan, namely Fukuoka, Okinawa, Oita and Hiroshima prefectures.

Analysis B3: Singapore Tourists Prefecture Visit Rate (2018 vs 2023)

Datasets used: Singapore.csv, Singapore_2018.csv, jpn_admbnda_adm1_2019.shp

This analysis was conducted to ascertain there is a difference in Prefecture Visit Rate between the years 2018 and 2023 by Singapore tourists. An increase in Prefecture Visit Rate over these six years does not mean that there are more tourists visiting a certain prefecture, this is dependent on the number of Singapore tourists visiting the country. Instead, it means that out of all the Singapore tourists in 2018 and 2023, the proportion of these tourists choosing to visit a certain prefecture is greater. A limitation of this data is also that 2023 data did not survey tourists from January to March.

Singapore_2018.csv was obtained from the same section of the Japan Tourism Statistics's website as Singapore.csv. Data cleaning and transformation was performed to join all three datasets together, and a new field was created to calculate the difference of the Prefecture Visit Rates between Singapore tourists in 2023 and 2018.

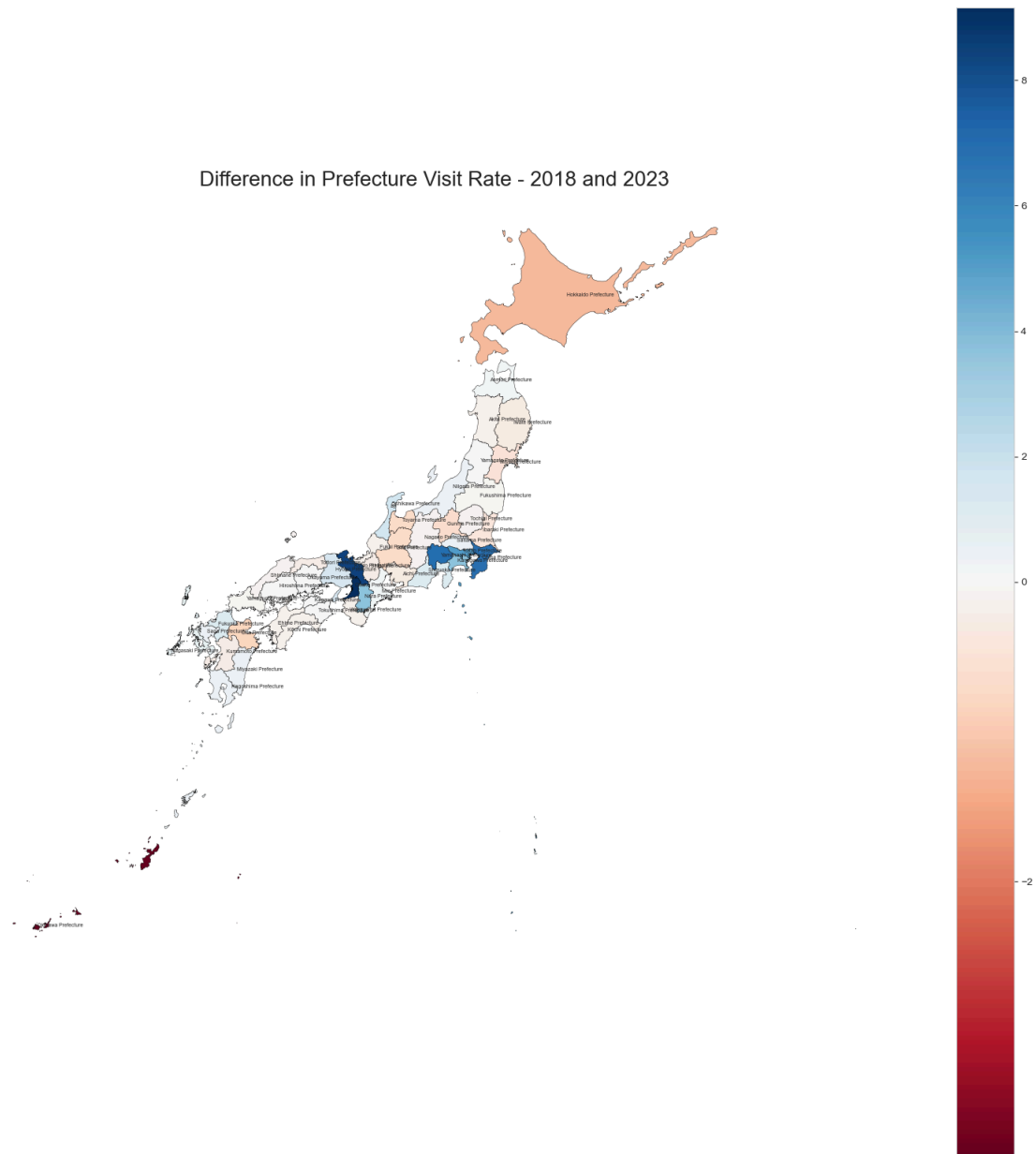


Fig 2.3.1 - Prefecture Visit Rate - Singapore tourists 2023 vs 2018

From 2018 to 2023, Okinawa, Hokkaido, Oita saw the biggest drops in Prefecture Visit Rates, which means that a lesser proportion of Singapore tourists are choosing to visit these prefectures. The prefectures that saw the largest increase in Prefecture Visit Rates are Osaka, Kyoto, Yamanashi, Chiba, which mostly happens to be along Japan's Golden Route.

Due to the limitation of the data, it may be unfair to use 2023's data to compare against 2018's data due to the lack of data in 2023 January to March. Many tourists visit Hokkaido in the winter months, such as the yearly Sapporo Snow Festival in February, and having the lack of data could have resulted 2023's Hokkaido Prefecture Visit Rate to be lower than 2018's one. A solution to resolve this issue is to wait for the release of 2024's Prefecture Visit Rate data, and then compare it to 2019's Prefecture Visit Rate data.

Analysis B4: Prefecture Visit Rate presented in Tableau

A drawback of plotting this data in Geopandas is that it is difficult for readers to identify the different prefectures of Japan, especially if they are unfamiliar with the Geography of Japan. Tableau is more useful than Python to display maps as it is interactive and you can see the prefecture name when a user's cursor hovers over it. In addition, Tableau has built in geo-data so there is no need to add any shapefile, and it gets the job done with no coding needed.

Link to [Tableau](#):

Prefecture Visit Rate Heatmap

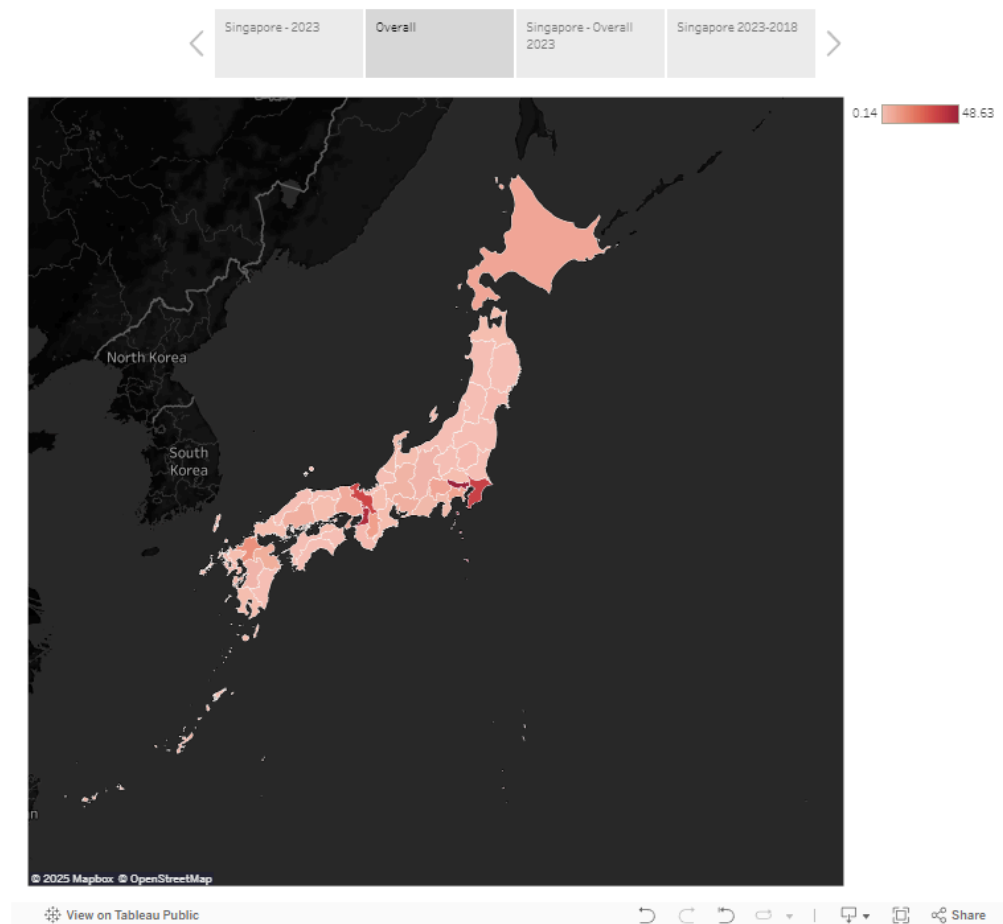


Fig 2.4.1 - Preview of Prefecture Visit Rate Heatmap in Tableau

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