

# San Francisco International Airport Passenger Traffic

Jacques Sham & Charles Siu

# Background and Motivation

- SFO is a transpacific gateway -> passenger traffic is heavy
- We want to understand passenger traffic pattern to
  - 1) Monitor if tax revenue is used reasonably on SFO
  - 2) To explore the need for airport expansion

San Francisco International Airport Passenger Traffic  
*Jacques Sham & Charles Siu*  
May 02, 2018

**Part 1: Executive Summary**

San Francisco is the Pacific gateway to the United States. Commuters travel in and out of the city, and a great percentage of those is by air, through the San Francisco International Airport (SFO). Maintenance for SFO accounts for a considerable amount in tax expenditure. We would like to investigate whether tax revenue is spent wisely by examining the passenger traffic of SFO. DataSF, San Francisco's official open data portal, maintains a dataset on the passenger count for every airline that operates at SFO. The dataset contains more than 17,000 entries between 2005 and 2017. Each entry is a flight activity that contains the name of the airline, the destination or origin region of the flight, as well as the passenger count. We analyzed the dataset and discovered that, the passenger traffic at SFO was growing at a steady rate, demand for international travel was increasing among low cost carriers, and United Airlines is the largest operator at SFO. We believe passenger traffic determines the effective use of tax revenue in SFO. Meanwhile, understanding passenger traffic pattern helps decision-making on investment. This analysis allows San Francisco taxpayers to understand how tax is spent on air travel infrastructure, and for airport authorities to propose investments for airport expansion.

**Part 2: Introduction to the Data**

**I. Overview**

San Francisco is the 13th largest city in the United States and is the Pacific Gateway to the nation. The city's airport SFO, accounts for the majority of air traffic in and out of the SF Bay Area. SFO has been in operation since 1927, with its first international service started in 1946. The airport is the 2nd busiest airport in California, the 7th busiest airport in the United States, and the 23rd busiest airport in the world. SFO has received numerous awards from various air travel rating agencies, such as the 3rd Best Airport in North America in 2012 and 3rd Best Airport Worldwide in 2014 from SkyTrax. There are 3 domestic terminals and 1 international terminal to accommodate the massive flow of passengers travelling to different parts of the United States and the world.

# Dataset

- Dataset from OpenSF
- Contains destination, origin, airlines, terminals, passenger count
- Between 2005-2017
- 17000+ rows, 12 columns

```
> glimpse(data)
Observations: 17,264
Variables: 12
$ airline    <chr> "Ameriflight", "ATA Airlines", "ATA Airlines", "ATA Airlines", "Air Canada", "Air ...
$ code       <chr> "A8", "TZ", "TZ", "AC", "AC", "AC", "CA", "CA", "AF", "AF", "NZ", "NZ", "FL", "FL", ...
$ isDomestic <lgl> TRUE, TRUE, TRUE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, T ...
$ region     <chr> "US", "US", "US", "US", "Canada", "Canada", "Canada", "Canada", "Asia", "Asia", "Europe", "Euro...
$ type       <chr> "Enplaned", "Deplaned", "Enplaned", "Thru / Transit", "Deplaned", "Enplaned", "Deplaned", "Enpl...
$ category   <fct> Full Service, Low Fare, Low Fare, Low Fare, Full Service, Full Service, Full Service, Full Serv...
$ terminal   <fct> Other, Terminal 1, Inte...
$ area        <chr> "Other", "B", "B", "B", "B", "B", "G", "G", "A", "A", "G", "G", "A", "A", "A", "A", ...
$ pax         <int> 7, 13010, 12226, 3316, 18986, 18360, 282, 337, 3470, 3078, 7565, 7175, 6688, 7450, 4096, 4057, ...
$ month      <fct> August, January, January, January, January, January, January, January, January, Januar...
$ year        <dbl> 2006, 2006, 2006, 2006, 2006, 2006, 2006, 2006, 2006, 2006, 2006, 2006, 2006, 2006, ...
$ cat_temp   <chr> "Full Service", "Low Fare", "Low Fare", "Low Fare", "Full Service", "Full Service", "Full Service", ...
```

# Cleaning data

- Standardize airlines names  
eg. “United Airlines - Pre 07/01/2013” and “United Airlines” both means “United Airlines”
- Re-identify the category  
eg. Air China, Air New Zealand recorded as Low cost carrier, but they are full service carrier
- Rename columns for coding convenience later
- Convert date into month and year

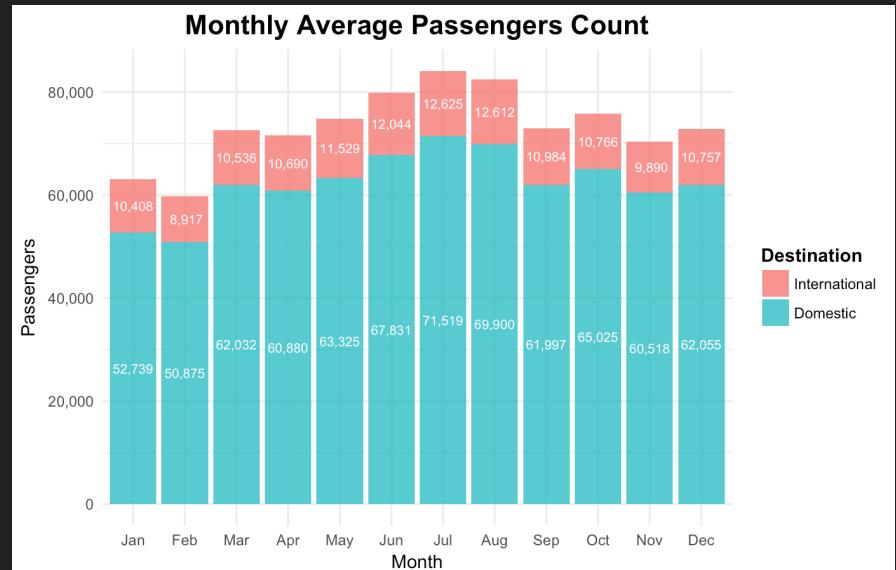
# San Francisco International Airport (SFO)

- Operation since 1927
  - 2nd busiest airport in CA
  - 7th busiest airport in US
  - 23rd busiest airport in the world
- 
- 3 domestic terminals
  - 1 international terminal
  - 55,823,712 passenger count in 2017
  - Average annual passenger growth:  
4.82%



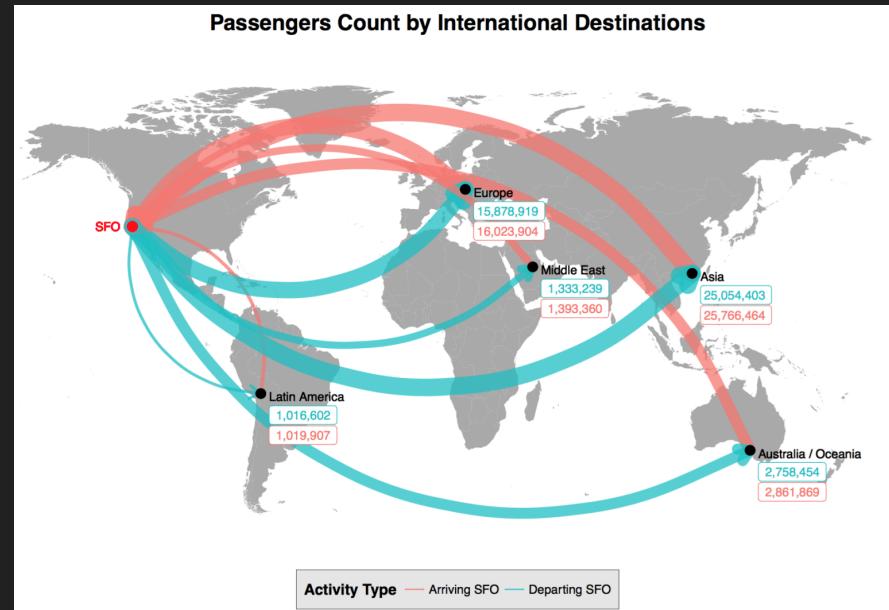
# Monthly Average Passengers Count

- 77% are domestic travelers
- Summer - June, July, August: Peak Season
- Christmas - December: Peak Season
- Summer period is the busiest period for international travel



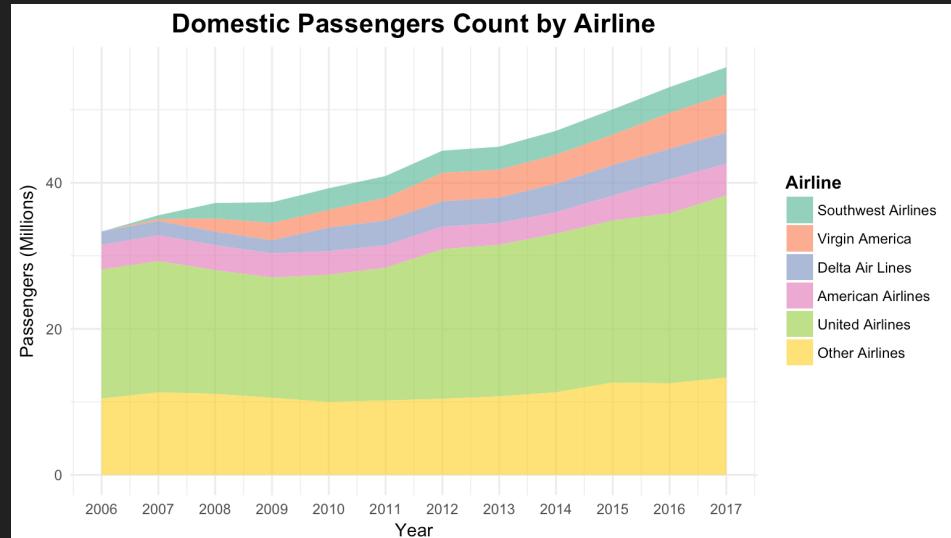
# Destination

- Between 2006 and 2017, 51M passengers coming from/flying to other US cities
- 2nd is Asia, 16M; follow by Europe, 10M
- Latin America very little: about 2M



# Domestic Airlines

- Top 5 airlines in SFO:  
Southwest Airlines,  
Virgin America, Delta Airlines,  
American Airlines, United Airlines
- Account for 85% of domestic  
travelers



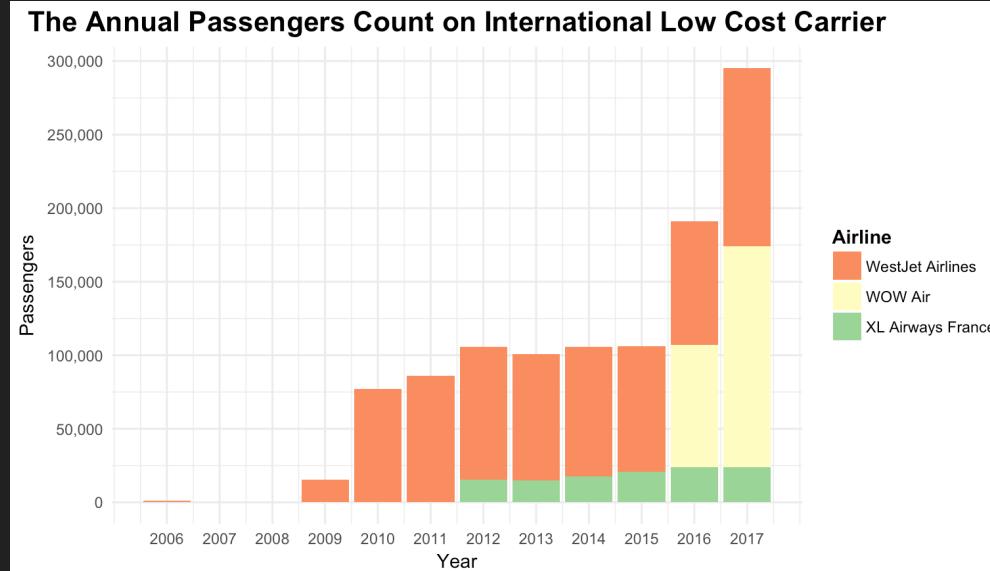
# Low Cost Carrier

- Low Cost Carrier (LCC) means airlines offer cheap air ticket by cutting cost
- Such as Southwest Airlines
- About 6M LCC travelers in SFO in 2017, account for 11%
- Other major domestic LCC are Frontier Airlines, Jetblue



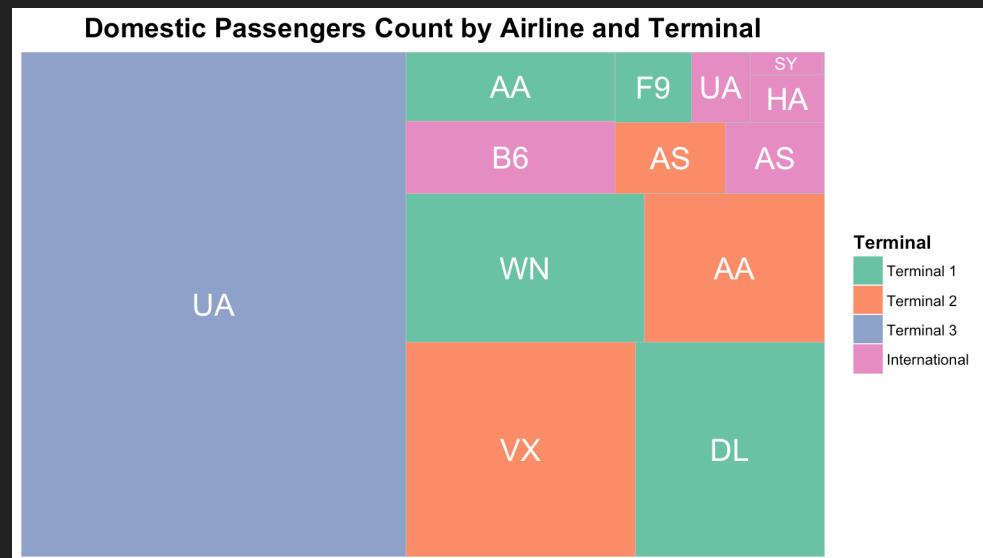
# Low Cost Carrier

- Wow Air is the first international LCC operates in SFO since 2016
- First year passenger growth increase 81.2%
- Expect to have more international LCC passengers



# Terminals

- Terminal 1: Delta Airlines, Southwest Airlines, Frontier Airlines, American Airlines  
24% domestic passengers
- Terminal 2:  
Alaska Airlines, Virgin America,  
American Airline  
21% domestic passengers
- Terminal 3: United Airlines  
48% domestic passengers
- International Terminal: Hawaiian Airlines,  
Jetblue Airways, Sun Country Airlines,  
Alaska Airlines  
7%



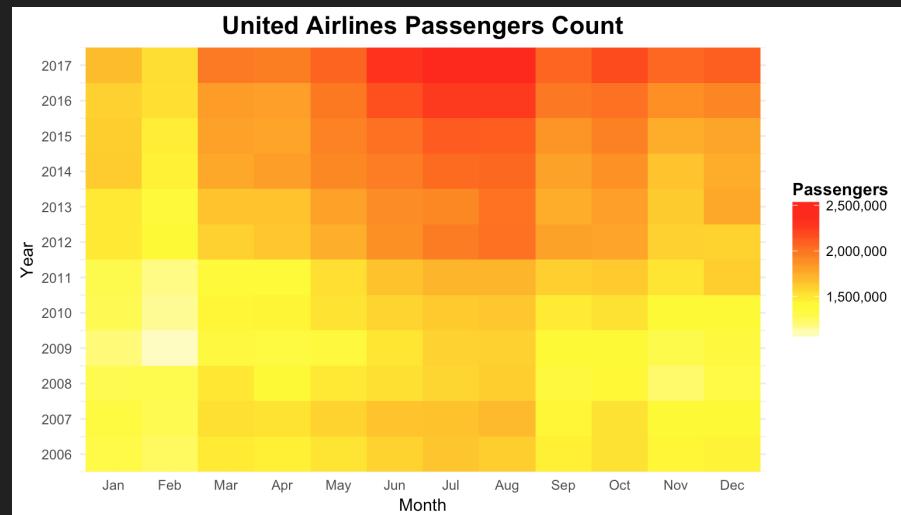
# United Airlines

- United Airlines is the largest carrier in SFO
- SFO is the West Coast primary hub of United Airlines
- United Airlines' footprint in SFO can be traced back to 1937



# United Airlines

- Passenger traffic was low until 2012
  - Jumped after 2012
  - Passenger traffic is heavier in Summer period
  - Very sensitive to seasonal effect



# Conclusion

- About 77% travelers in SFO are domestic travelers
- Annual passenger growth: 4.82%
- Most of the travelers took United Airlines
- United Airlines is very sensitive to seasonal effect
- Tax spent on SFO is reasonable
- Expansion is possible due to the passenger growth



# Future Analysis

- We only focus on passenger traffic in terms of airline, destination/origin region
- We want to trace the destination/origin cities and country
- Also aircraft model
- Keep track on United Airlines passenger traffic after its incidents

