Project 72
Aircraft Noise Exposure and Market Outcomes in the U.S.

Massachusetts Institute of Technology

Motivation

- Aircraft overflight noise has been shown to have economic effects, for example, on housing prices.
- The goal of this research is to assess and understand patterns in the distribution of aircraft noise and how they impact communities below.
- We assess the spatial distribution of impacts, including an analysis of whether specific groups are exposed to noise or the distribution is the result of self-selection.

Analyses presented:

1. Exposure patterns around U.S. airports
2. Mechanisms leading to exposed populations

Data and Method

Data Sources
- Flight track data: Threaded Track data for the year 2019.
- Demographic data: American Community Survey 5-year data for 2019.
- Demography & location data at household level: DataAxle (2011 to 2019)

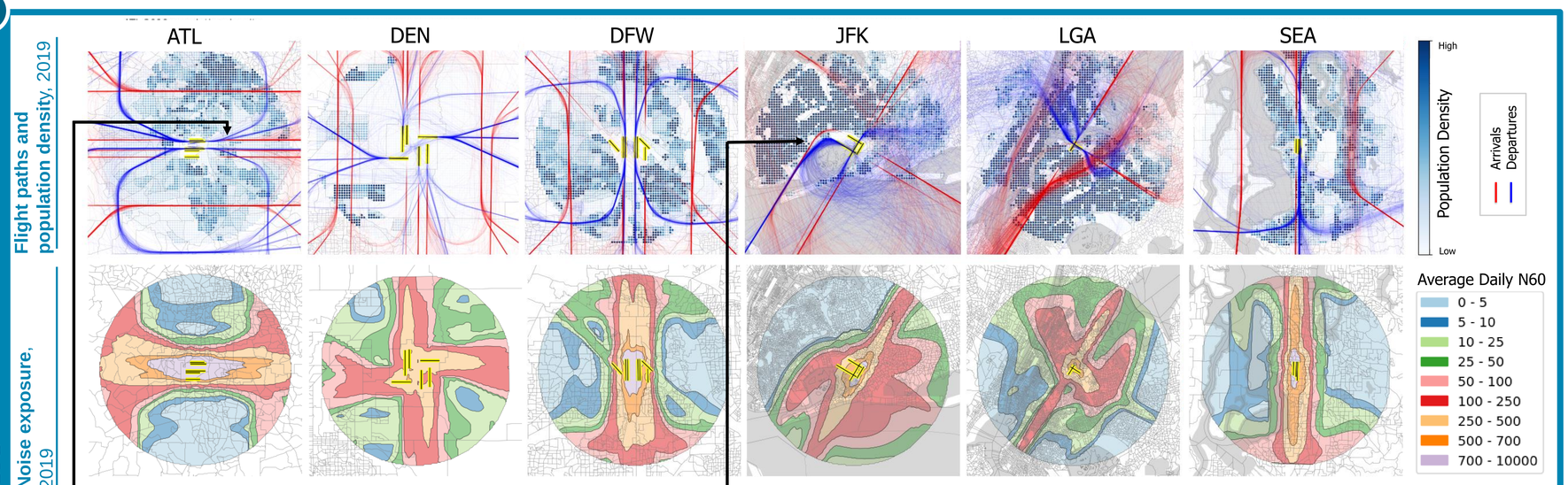
Noise metrics
- Average Daily N60: The number of overflights above a 60dBA noise threshold heard over 24 hours, averaged over a year.
- Day-night noise level (DNL), annual average

For 1 : Analysis of Exposure Patterns
1. Model noise data from 22 airports in the US using flight track data using a fast halfwidth approach*
2. Geospatially correlate population data to noise data to determine aircraft noise exposure*
3. Discover patterns and trends seen throughout multiple airports

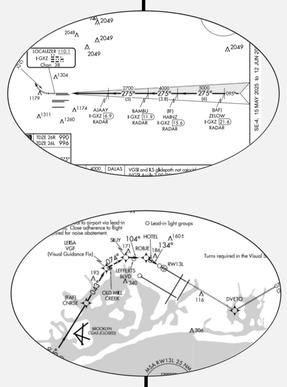
*For a study area with a 10nmi radius from the airport

For 2 : Analysis of Mechanisms
- Analysis of household flows in and out of census tracts and its empirical relationship with noise exposure and other drivers of neighborhood attractiveness
- Econometric techniques for causal analysis.

1 Analysis of exposure patterns



Approach Patterns



Approaches into the airport typically follow the **straight-in ILS approach** (shown above). Aircraft align with the runway before the final approach fix (typically 5 nmi from the runway threshold, as required by ICAO regulations).

In a few cases, such as the approach to JFK runway 13L, also known as the Canarsie approach, the final approach fix is within 5nmi of the runway threshold. This is considered an **RNAV approach**. The Performance Based Navigation (PBN) technology has enabled the greater use of arrival paths involving turns, which were previously limited to visual conditions.

Factors Which Impact Noise Exposure

Airport location

Factors such as distance from the city center and size of the metro area heavily influence the population size around an airport.

Runway Orientation

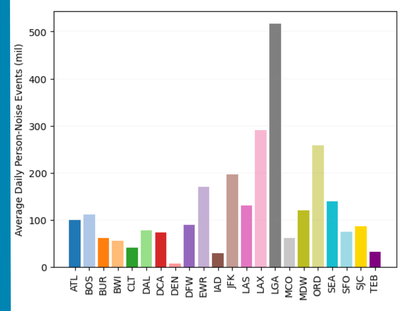
Typically, noise extends along the runway. Runways oriented in the direction of high populations result in greater levels of noise exposure.

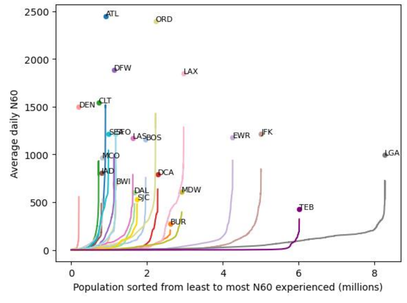
Arrival and Departure Procedures

Flight procedures can dictate noise patterns. Newer PBN-enabled procedures allow aircraft to avoid higher population areas, therefore lowering overall noise exposure.

Difficult to Modify → Easier to Modify

Multi-Airport Comparison

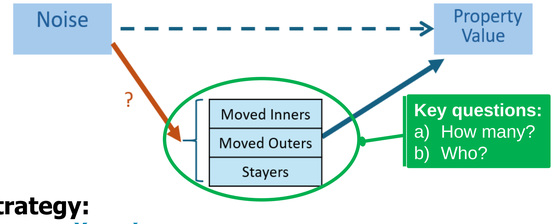




The plots illustrate how different airports in this study compare in noise exposure.

2 Analysis of Mechanisms

Does noise exposure have an impact on population composition by altering patterns of moving in and out of neighborhoods?



Empirical Strategy:

$$\text{flowrate}_{jt}^{Move-In} = \beta_0 + \beta_N Noise_{j\tau} + \beta_X X_{jt} + \delta_j + \delta_t + \varepsilon_{jt}$$

- Flow rate is calculated by aggregating at the census tract and year level.
- Estimated using census-tract level data.

Preliminary findings for Boston Logan Airport:
Preliminary findings suggest that noise may have an impact on the flow rates.

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