



Planes Overhead: How Airplane Noise Impacts Home Values

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The rapid acceleration of urban connectivity through air transportation is a cornerstone of modern economic expansion, yet it creates an inherent friction between macro-level growth and localized quality of life. While the systemic benefits of aviation—increased trade, tourism, and capacity—are distributed regionally, the negative externalities, specifically noise pollution, are intensely concentrated. This research brief quantifies the degree to which noise externalities are "capitalized" into housing markets, examining the tension between operational efficiency and residential asset values.

Utilizing a robust quasi-experimental design, this study analyzes property value fluctuations across three major U.S. transportation hubs: Boston Logan International (BOS), Chicago O'Hare International (ORD), and Seattle-Tacoma International (SEA). By exploiting exogenous shifts in flight path architecture, the research provides a precise econometric foundation for understanding key components of the social costs of aviation noise. A rigorous examination of these impacts requires an analytical framework capable of isolating noise from other market variables through high-resolution data.

Methodology: Exploiting Changes in Flight Path Architecture

Determining the causal impact of noise on property values often suffers from "self-selection bias," where noise-tolerant residents move into affected areas. To overcome this, the study utilizes the implementation of Performance-Based Navigation (PBN) and major runway reconfigurations as

quasi-random events. These shifts altered noise exposure in ways that residents could not have anticipated, providing an ideal environment for a hedonic price model to measure market reactions.

The research achieves a technical superiority over traditional studies by utilizing a spatial resolution of 0.25 nautical miles. This high-resolution approach, powered by the Aviation Environmental Design Tool (AEDT) and ASDE-X radar-based flight trajectory data, ensures that noise is measured as it is actually "flown," rather than relying on generalized contours. The study identifies two primary sources of noise variation:

- **Performance-Based Navigation (PBN):** Satellite-based GNSS technology transitioned flight paths from broad, dispersed corridors into highly concentrated, precise tracks. This effectively "funneled" noise over narrow, high-intensity corridors.

- **Runway Reconfigurations:** Infrastructure projects, most notably the O'Hare Modernization Program (OMP), reconfigured intersecting runways into parallel alignments, fundamentally shifting traffic flows over neighborhoods that previously experienced minimal exposure.

These precise methodological controls allow for a definitive evaluation of how specific decibel increases translate into financial losses for homeowners.

Quantitative Results: The Cost of a Decibel

To bridge the gap between acoustics and economics, the study employs the **Day-Night Average Sound Level (DNL)**. As the primary regulatory metric, DNL calculates 24-hour average exposure but applies a 10-decibel penalty to nighttime flights (10:00 p.m. to 7:00 a.m.) to reflect the heightened social and biological costs of sleep disruption. The central finding across all three markets is a significant and consistent depreciation in housing prices relative to noise intensity. This is expressed through the **Noise Depreciation Index (NDI)**, which measures the percentage reduction in a home's value for every one-decibel (dBA) increase in noise.

The data indicates that a 1-decibel increase in noise exposure is associated with a reduction in housing prices between 0.6% and 1.0%. This capitalization effect suggests that airplane noise is a stable economic deterrent across diverse urban geographies. However, while the market response is consistent, the underlying "willingness to pay" for quiet reveals significant human and demographic heterogeneity.

Heterogeneity and Resident Preferences for Quietness

Economic "Revealed Preferences" suggest that the amount a resident is willing to sacrifice for a quieter environment is the

truest measure of that amenity's value. To derive annualized costs from property transactions, the researchers applied a 5% User Cost of Housing metric. This provides a clear view of the Marginal Willingness to Pay (MWTP)—the annual price a typical household would pay for a 1 dBA decrease in noise:

1. **Seattle (SEA):** \$221.36 (Highest average MWTP, reflecting high regional property values and a strong preference for quiet).
2. **Boston (BOS):** \$152.15.
3. **Chicago (ORD):** \$104.45.

Critically, the research reveals that this "taste for quietness" is deeply linked to sociodemographic profiles. Analysis of census block groups shows that the preference parameter for quietness is **positively correlated with higher household income but negatively correlated with the percentage of the non-white population**. These findings indicate that noise exposure is not only an economic issue but one of environmental justice, as more affluent and predominantly white communities demonstrate a higher financial threshold for avoiding aviation noise. While these results are descriptive rather than causal, they highlight disparities that may be relevant for federal and local policy design.

Policy Implications and Conclusion

The implementation of PBN procedures highlights a stark policy conflict. For the FAA, PBN offers systemic efficiencies: reduced fuel burn, lower carbon emissions, and increased airspace capacity. However, these regional benefits come at the expense of localized social costs. For example, the study shows that people in Boston and Seattle would be willing to pay to go back to the 2011 noise levels, while in Chicago, the average household would actually need about \$122 in compensation to return to 2011, because the changes there made things better for many residents.

Table 1. Regional Noise Depreciation Impacts

Region	Noise Depreciation Index (NDI)
Boston (BOS)	0.61%
Chicago (ORD)	0.60%
Seattle (SEA)	0.97%

These findings necessitate a shift in how aviation infrastructure is planned and mitigated. Policymakers must move beyond "generalized noise contours" and adopt as-flown trajectory data at high spatial resolutions to accurately assess the impact of flight path concentration. Furthermore, because the "taste for quietness" correlates with income and race, future mitigation strategies must account for these demographic disparities to ensure equitable outcomes.

Integrating housing market data into aviation planning is no longer a secondary consideration; it is a fundamental requirement for sustainable urban infrastructure. Future FAA environmental impact assessments must prioritize the quantification of localized capitalization effects to develop targeted, data-driven mitigation measures that reconcile the demand for global connectivity with the right to local quiet.

References

Link to the full working paper discussed in this brief:

Allroggen, F., Hansman, R. J., Knittel, C. R., Li, J., Wan, X., and Wang, J. (2026), "Planes Overhead: How Airplane Noise Impacts Home Values," [MIT CEEPR Working Paper 2026-06](#), March 2026.

About the Authors



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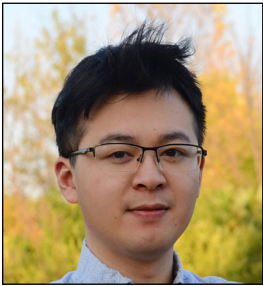
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