Impact of the Washington Bridge Closure on Bus Ridership

Analysis of RIPTA Ridership Data

Project Background

The Washington Bridge in Providence, RI consists of three independent bridge structures - a westbound bridge, an eastbound bridge, and a pedestrian bridge. In December 2023, the westbound Washington Bridge was shut down after a routine inspection found critical failures with the bridge's anchor rods. This resulted in profound effects on the Providence community; significant delays en-route to work and school, affected businesses, and widespread uncertainty. Within a week, the eastbound bridge had been reconfigured into two lanes eastbound and two lanes westbound. By April 22, 2024, the eastbound bridge had been reconfigured to allow three lanes of traffic in both directions. Figure 1 shows the full timeline of these events.
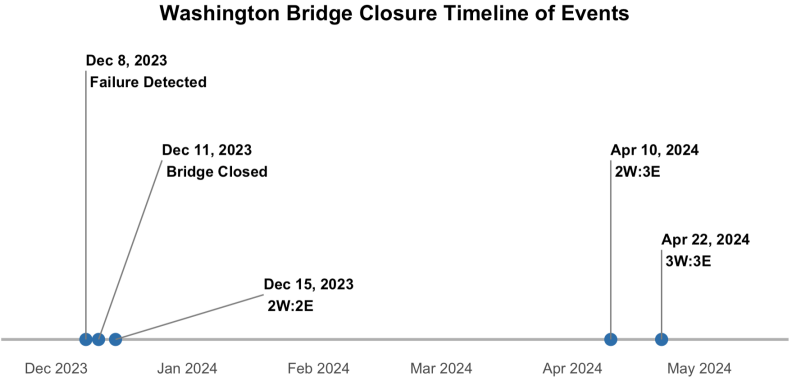

Figure 1.

This analysis focuses on the impact of the bridge closure on bus ridership using data from the Rhode Island Public Transit Authority (RIPTA). The routes affected by the bridge closure can be seen in Figure 2. This includes the routes that directly used the westbound bridge as well those using the Henderson Bridge, which has seen a significant increase in traffic as traffic patterns have shifted. We define the affected routes as Routes 32, 33, 34, 35, 24L, 60, 61X, and 78.
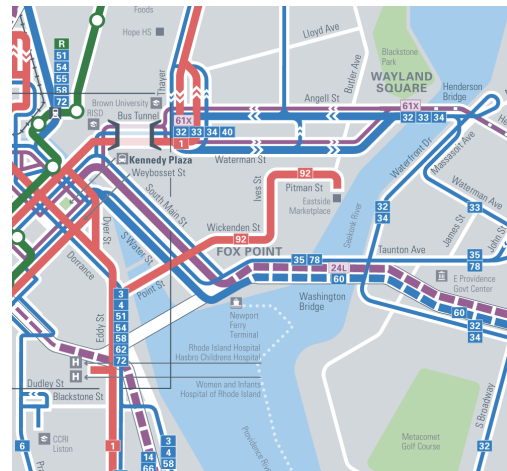

Figure 2.

Analysis

In order to analyze the impact of the bridge closure on ridership, we use all other routes as our control or comparison group. Figure 3 shows that ridership fluctuated over time for both groups, including a noticeable drop after the bridge closure. This can be partially explained by changes in the bus schedules, which are updated three times a year to reflect seasonal changes.
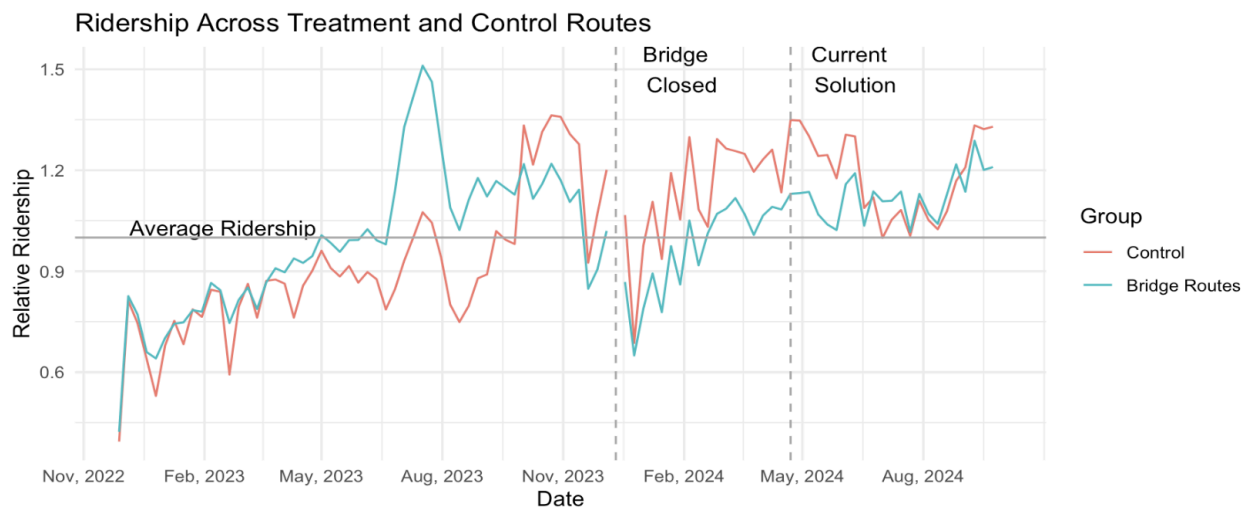

Figure 3. Relative ridership is calculated as the weekly ridership divided by the average weekly ridership..

The data used for this analysis consists of daily ridership by route from December 1, 2022 to August 31, 2024. We break the time period into three time intervals:

- Pre-Bridge Closure: December 1, 2022 through December 10, 2023
- Temporary Solution: December 11, 2023 through April 21, 2024, the initial configuration with two lanes open westbound.
- Current Solution: April 22, 2024 through August, 2024, the current configuration with three lanes in both directions.

To estimate the impact of the bridge closure on ridership, we employ a negative binomial difference-in-differences model for daily ridership by route with fixed effects for day of the week, route, and schedule as well as an interaction between route and schedule. Figure 4 shows the predicted and observed ridership. The model estimated that the impacted routes saw a 5.6% decrease [95% CI: -0.6% increase to 11.0% decrease] in ridership due to the bridge closure during the initial period of December, 2023 to April, 2024 and continue to see a 6.4% decrease [95% CI: -0.8% increase to 12.9% decrease] in ridership due to the closure. Note that the confidence intervals indicate that neither of these results are statistically significant at the 0.05 level.
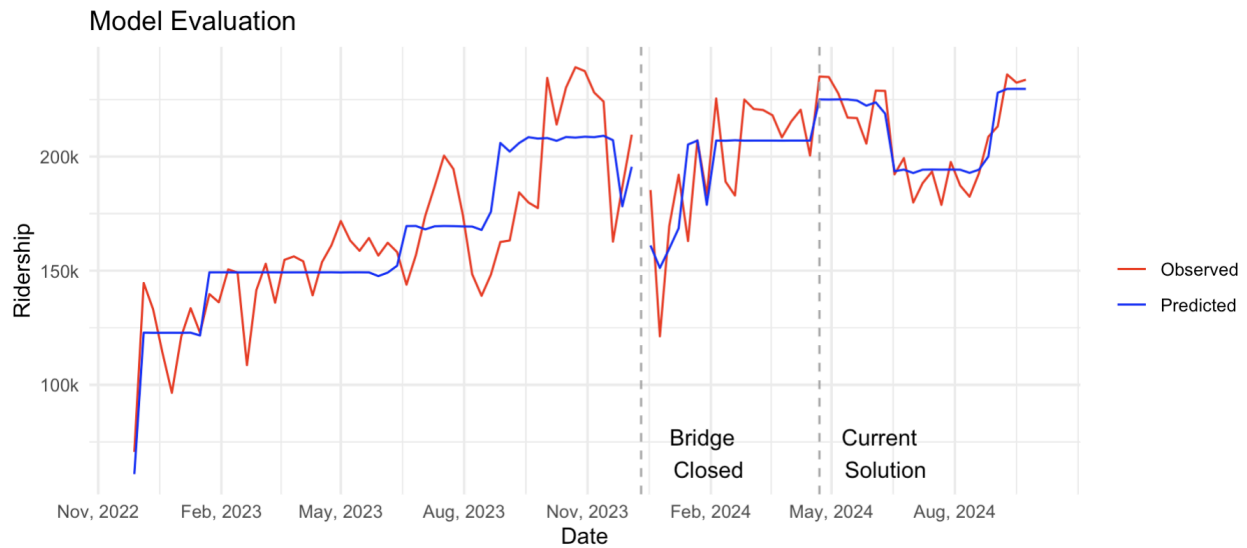

Figure 4.

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