

TRANSPORT FINDINGS

Short-Run Price Elasticity of Demand for Public Transit in Belo Horizonte, Brazil: Evidence from a 2023 Fare Cut

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Findings

I estimate the short-run price elasticity of demand for public transit in Belo Horizonte, Brazil using monthly system reports between January 2022 and March 2026, exploiting a 25 percent fare cut on Trunk lines in July 2023 with Circular and Feeder lines as control. The line-level panel with clustered inference and a three-month event study (parallel pre-trends validated, $p=0.87$) yield a robust estimate near -0.20 across specifications. Heterogeneity across service types is substantial: bus rapid transit responds at -0.42 , while diametrical lines carrying over a third of ridership are essentially inelastic at -0.03 .

1. Questions

How responsive is bus ridership to fare changes in a large Brazilian city after the pandemic? Short-run urban transit price elasticities cluster between -0.2 and -0.6 , with central values around -0.3 to -0.4 (Goodwin 1992; Balcombe et al. 2004; Paulley et al. 2006; McCollom and Pratt 2004). I test the hypothesis that bus demand in Belo Horizonte sits at the lower, most inelastic end of this range, conditional on two system features: heavy reliance on captive users with limited modal alternatives, and electronic payment in over 80 percent of transactions.

Between January 2022 and March 2026 the city's two tariff groups, Trunk and Circular/Feeder, followed distinct fare paths. In July 2023 the Trunk fare was cut 25 percent (R\$ 6.00 to R\$ 4.50) by litigation and a subsidy decision rather than by demand, while the Circular fare held, leaving the Circular group as a contemporaneous within-system control.

2. Methods

Data are the monthly operational reports of the Belo Horizonte bus regulator (SUMOB): 51 consecutive months from January 2022 to March 2026, with line-month ridership for all regular and bus rapid transit lines (16,783 observations across 355 lines) and system aggregates such as fleet, trips operated, and revenue. Fares are observed by tariff group and deflated to constant prices by the Brazilian national consumer price index (IPCA), with January 2022 as the base. The system charges a single per-boarding fare with no daily, weekly, or monthly pass; over 80 percent is paid by smart card.

Table 1. Fare chronology by tariff group, with contemporaneous fleet and trips. Nominal fares (R\$). Both groups rose a third in April 2023; only the Trunk fare was cut in July 2023, with fleet and trips essentially unchanged.

Effective	Trunk (R\$)	Circular/Feeder (R\$)	Fleet	Trips/month
Jan 2022	4.50	3.15	2,410	462,000
23 Apr 2023	6.00	4.20	2,490	599,000
8 Jul 2023	4.50	4.20	2,484	601,000
Jan 2024	5.25	5.00	2,640	587,000
Jan 2025	5.75	5.50	2,724	600,000
Jan 2026	6.25	6.00	2,727	590,000

[Table 1](#) lists the six fare adjustments with contemporaneous fleet and trips. Fleet and trips operated were essentially unchanged around the July 2023 cut, so the estimate does not capture a service expansion; the cut came within a broader contract reform (per-kilometer remuneration, fleet renewal, expanded gratuities) applied across the network and absorbed by the within-system control.

The Trunk group aggregates diametrical (DI), semi-express (SE), perimetral (PE), radial (RA), bus rapid transit (MOVE), trunk-express (TO), station-gate (BLQ), and direct-radial (RD) lines; the Circular/Feeder group aggregates feeder (AL), downtown-circular (CI), and metro-feeder (AM) lines. VF (Vilas e Favelas, a low-income periphery service) and EC (executiva, a premium service suspended in the period) lines are excluded: the 14 VF lines, about 4 percent of lines and 1 percent of boardings, have carried no fare since April 2023 and so offer no price variation to identify a response; the post-April 2023 indicator R_t absorbs that regime and their small share makes any spillover onto the estimated lines negligible.

The preferred specification is a line-level panel with line fixed effects:

$$\log(P_{lt}) = \alpha_l + \beta \log(\tau_{g(l)t}) + \gamma R_t + \delta t + \sum_{m=2}^{12} \theta_m D_{mt} + \varepsilon_{lt},$$

where P_{lt} is monthly passengers on line l in month t , $\tau_{g(l)t}$ the real fare of its tariff group, R_t the post-April 2023 zero-fare regime indicator, t a linear trend, and D_{mt} month-of-year dummies; standard errors are clustered by line (355 clusters) and β is the elasticity. A three-month event study centered on the cut is the causal benchmark: the narrow window isolates July 2023 from the April 2023 adjustment that raised both groups, and a placebo centered on July 2024 (stable fares) tests for spurious effects. Six aggregate specifications serve as cross-checks.

The two groups share the same regulator, operators, and integrated network, so the within-system comparison differences out the macroeconomic, seasonal, and post-pandemic shocks common to both. They differ in network function, route length, and frequency, but these fixed differences load on

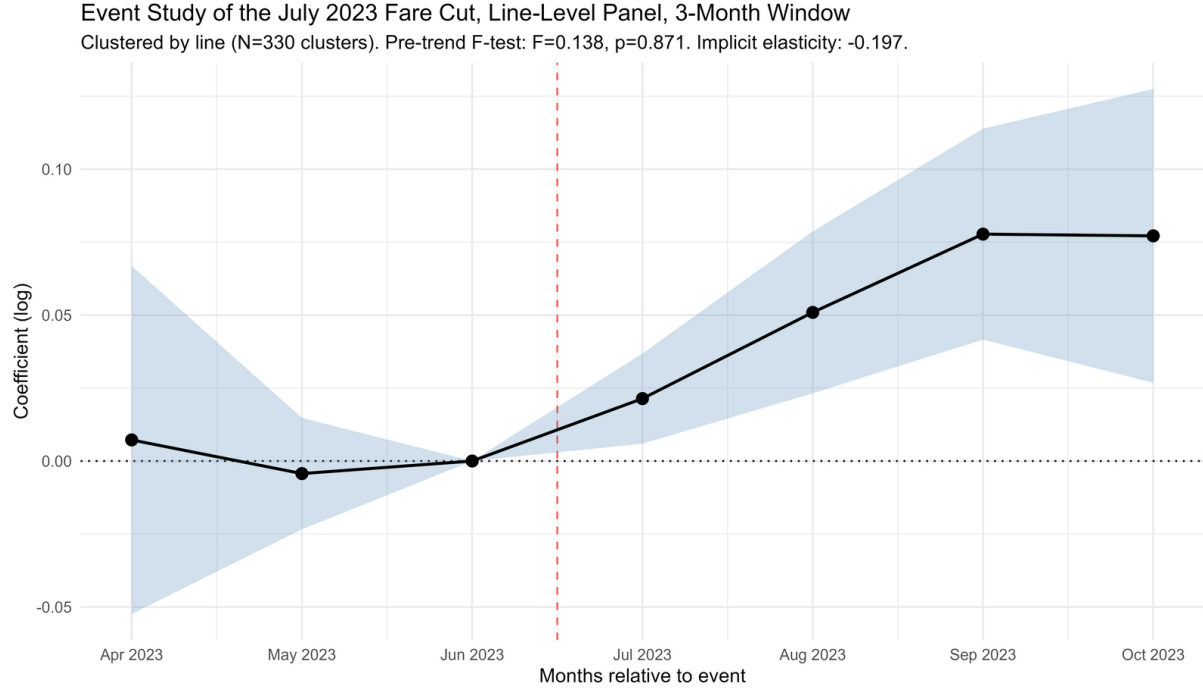


Figure 1. Event study of the July 2023 Trunk fare cut (line-level panel, three-month window): differential change in log ridership between Trunk and Circular lines, relative to June 2023. The dashed line marks the cut; shading is the 95 percent confidence interval (line-clustered). Parallel pre-trends: $F = 0.14$, $p = 0.87$.

the line fixed effects, not on β , which is identified from the differential fare change. Identification rests on common trends, which the event study supports (parallel pre-trends $F = 0.14$, $p = 0.87$).

3. Findings

The line-level panel gives a short-run own-price elasticity of -0.213 (clustered SE 0.066, $p = 0.001$; $N = 16,783$ line-months, 355 clusters), and the event study gives -0.197 (parallel pre-trends $F = 0.14$, $p = 0.87$). Six aggregate specifications span -0.12 to -0.19 , so the central estimate is about -0.20 . It is robust: adding trips-operated and fleet controls leaves the aggregate at -0.125 (SE 0.057), and dropping the month dummies from the line panel gives -0.263 (SE 0.058), both inelastic and significant. A placebo event study on July 2024 returns noise around zero, unlike the monotonic post-treatment rise in the real window.

Pre-event coefficients are statistically indistinguishable from zero; post-event coefficients rise monotonically to about +6 percent in log ridership three months after the cut ([Figure 1](#)). Dividing the average post-treatment effect by the log change in nominal fare ($\log(4.50/6.00) = -0.288$) yields -0.197 .

By service type ([Table 2](#)), the bus rapid transit corridor (MOVE) responds at -0.42 , more than double the system average, while the diametrical lines (DI), over a third of ridership, are essentially inelastic (-0.03); feeder, semi-express, and radial lines sit near the average. These estimates are exploratory:

Table 2. Service-type-specific short-run price elasticities, line-level panel with line fixed effects. Standard errors clustered by line.

Service type	Elasticity	SE	Pax share (%)
MOVE (BRT)	−0.42	0.07	7.2
Downtown Circulars (CI)	−0.21	0.14	2.0
Trunk-Express (TO)	−0.21	0.15	9.8
Feeder (AL)	−0.16	0.05	17.8
Semi-express (SE)	−0.14	0.06	6.1
Radial (RA)	−0.13	0.06	4.0
Station gate lines (BLQ)	−0.09	0.11	12.9
Diametrical (DI)	−0.03	0.05	36.5
Perimetral (PE)	+0.55	0.23	2.9
Direct Radial (RD)	+0.36	0.04	0.4
Metro feeder (AM)	−1.77	1.40	0.6

those on small shares (Perimetral and Direct Radial, together under 4 percent of ridership, and the imprecise Metro Feeder) likely reflect within-system reclassification or noise rather than genuine responses, and are not interpreted further. The robust pattern is the contrast between the elastic rapid-transit corridor and the near-inelastic high-volume diametrical lines.

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