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Problem Set #2 (Due 02/14/2024 by 10a; hand in on paper at beginning of class; if you cannot attend that day, leave in my mailbox, Urban 350)

For full credit, please show your work!

Costs and Revenue (per boarding ride, adapted from NTD reporting; go there for more actual detail: https://www.transit.dot.gov/ntd/transit-agency-profiles/tri-county-metropolitan-transportation-district-oregon)

	2019	2022
MAX Light Rail boardings	38.8 million	18.6 million
…AVC	$3.25	$6.85
…ATC	$4.30	$8.85
…MC	$1.00	$1.20
…MR=AR (farebox only)	$1.20	$1.05
Scheduled Bus Service boardings	56.5 million	30.8 million
…AVC	$4.10	$7.80
…ATC	$5.45	$10.20
…MC	$2.80	$3.35
…MR=AR (farebox only)	$1.05	$0.95

Based on the short-run cost figures provided above, and what you've learned from class and readings, answer the questions that follow on transit service provision.

1. Calculate the average fixed cost (AFC) per ride and total fixed cost (FC) for each transit mode before and after Covid. Did AFC rise or fall post-Covid? What about total FC? Did AFC and FC move as you expected or not? Briefly interpret the results.
2. Assume (perhaps a big assumption, but…) Trimet's short-run cost structure stayed the same from 2019-2022. Choose Bus **or** MAX, and sketch a graph with a simple set of plausible cost curves for Trimet. Be sure to include AFC, AVC, ATC, and MC. Don't worry about getting the numbers just right; focus on the shape and relationship of the cost curves.
3. Add (or draw a new sketch if needed) the following to your cost sketch:
    a. Add a 2019 demand curve and a fare (use the value of farebox revenue) to your plot. This doesn't need to be precise, but take some care in adding

these based on the numbers in the table for your chosen mode.

b. Label the resulting Q_{2019}, and draw a vertical line up that intersects the cost curves. Briefly explain what the following represent:
   i. Difference between the fare (MR) and MC?
   ii. Difference between the fare and AVC?
   iii. Difference between the fare and ATC?

4. Economic efficiency suggests we provide provide a service up to the point MB=MC. Ignoring potential externalities, for your chosen 2019 service (Bus or MAX), should the fare be higher, lower, or stay the same on efficiency grounds only? Briefly explain why.
5. Calculate percent change in ridership from 2019 to 2022 for bus and for MAX.
   a. Which declined at a higher rate? Why might that be?
   b. How do these compare with the ridership changes reported in the "Cities on three continents…" reading from Week 1?
6. Add to your sketch from 3 (or draw a new sketch), the demand and fare (assume fare=MR=AR) shifts due to Covid. Label the resulting Q_{2022}, and carry that vertical line up to intersect MC, AVC, and ATC.
   a. Explain what your graphical analysis suggest is happening to AVC and ATC due to the demand shift?
   b. Calculate the change in total variable costs for your chosen mode from the table.
   c. Your analysis in part (a) above provides part of the answer for the large increase in AVC, but (b) suggests another factor, especially since TriMet did cut service for both Bus and MAX around 15% in response to Qd declines. Total variable costs will always go down with quantity (since MC is always positive). The fact that they went up from 2019-2022 suggests there was also an upward shift in variable costs. Hypothesize what might have driven that shift in VC/Q, remembering some of the key items included in transit variable (operating) cost.
7. Given that there were no fare changes between 2019 and 2022, hypothesize one or more factors that could have led to a reduction in marginal fare revenue per ride. [HINT: think about why the marginal fare revenue is less than a single ride fare, then $2.50].