

Problem Set 7 – Supply and Demand

*Estimated time: about an hour. Type your responses and submit a single PDF *ON CANVAS*. Show your work on anything you compute. Label all axes and key points on graphs. A photo of a hand-drawn sketch is fine.*

Part 1: Building Demand and Supply

1. A small district needs school bus drivers. The district's marginal willingness to pay for each additional driver, and the lowest annual wage at which each of five local people would take the job, are:

Driver	District's MWTP	Person's minimum wage
1st	\$52,000	\$28,000
2nd	\$46,000	\$34,000
3rd	\$40,000	\$40,000
4th	\$34,000	\$46,000
5th	\$28,000	\$52,000

- (a) At a wage of \$40,000, how many drivers does the district want to hire? How many people are willing to drive? Explain each answer in one sentence.
 - (b) Build a demand and supply schedule for wages of \$28,000, \$34,000, \$40,000, \$46,000, and \$52,000. Report the gap at each wage.
 - (c) Graph demand and supply on one set of axes as step functions, with drivers on the horizontal axis. Mark the market-clearing wage and quantity.
 - (d) The district's classified-staff schedule pays \$34,000. Is there a shortage or a surplus? How big? Name two ways it would show up for families, rather than as a change in the wage.
 - (e) A board member proposes raising driver pay to \$46,000 so that every route is covered. Using your schedule, how many drivers would the district hire at \$46,000? Explain why paying above \$40,000 does not get more routes covered.
2. Five students are deciding whether to enroll for a year at a community college. Their marginal willingness to pay for the year is:

Student	MWTP
A	\$7,000
B	\$6,000
C	\$4,000
D	\$3,000
E	\$1,000

- Graph these as a bar chart ordered from highest to lowest MWTP. At tuition of \$4,000, how many students enroll?
- How many enroll at \$6,000? At \$1,000?
- The state introduces a \$1,000 grant for every enrolled student and tuition stays at \$4,000. How many enroll now? Is this a shift in demand or a movement along the demand curve? Explain.
- Which student is the marginal student under the grant? Of the total the state spends on grants, how much goes to students who would have enrolled without it?
- Why would a researcher estimating “the return to community college” care about which students are marginal?

Part 2: Equilibrium, Shortages, and Shifts

- A state’s market for special education teachers, with w in thousands of dollars and Q in teachers:

$$Q_D = 520 - 4w \quad Q_S = 8w - 140$$

- Find the market-clearing wage and number of teachers. Show your work and check your answer in both equations.
- The state’s schedule pays \$50,000. How many teachers do districts want? How many people are willing to teach? How big is the shortage?
- The state lowers the maximum caseload per special education teacher, so districts want 60 more teachers at every wage. Write the new demand equation and find the new equilibrium.
- Instead, start again from the original equations. A neighboring state raises its pay and 60 fewer people are willing to teach in this state at every wage. Write the new supply equation and find the new equilibrium.
- In (c) and (d) the wage rose to the same level. How could you tell the two apart using data on teachers employed?
- These equations assume 8 more people are willing to teach for each additional \$1,000. Give two reasons the true supply of special education

teachers is probably much less responsive than that.

4. A state pays every teacher on a single statewide salary schedule. In an urban district, many certified teachers live within commuting distance. In a rural district two hours away, very few do.
 - (a) Draw the two labor markets side by side, with the same posted wage in each. Show which district has a shortage and which has applicants to spare. Explain what makes the two supply curves different.
 - (b) The legislature raises the schedule by \$5,000 statewide. Show the effect in each market. In which district does the shortage shrink more, and why?
 - (c) Instead, the state offers a \$5,000 stipend only to teachers who work in rural districts. In which market does a curve shift, which curve, and in which direction? Compare the cost of this policy to the across-the-board raise in (b).
 - (d) Give one reason the rural stipend might work less well than the model predicts.

Part 3: Higher Education

5. A state flagship has seats for 30,000 students and cannot expand in the short run. Demand for seats is $Q_D = 60 - 2P$, with Q in thousands of students and P in thousands of dollars.
 - (a) Graph demand and supply. If tuition could adjust freely, what tuition would clear the market, and how many students would enroll?
 - (b) The legislature freezes tuition at \$10,000. How many students want a seat? How many get one? How big is the shortage?
 - (c) How is that shortage rationed, given that the price cannot rise? Which students are shut out?
 - (d) A recession raises demand by 10 at every price, so $Q'_D = 70 - 2P$. With tuition still frozen at \$10,000, how big is the shortage now? What happens to enrollment?
 - (e) The legislature funds 6,000 more seats, with tuition still frozen and recession-level demand. What happens to enrollment and to the shortage?
 - (f) Who gains and who loses from the tuition freeze? Name at least one group in each category.
6. True or False, and explain in one or two sentences.

Name: _____

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- (a) "Districts across the state report unfilled teaching positions, so there is a shortage of teachers."
- (b) "The district raised its salary schedule, so the supply of teachers increased."
- (c) "Teacher wages rose in this state last year, so demand for teachers must have gone up."
- (d) "Making the state flagship tuition-free would sharply raise the number of students it enrolls."
- (e) "A grant program raised enrollment, so the whole grant budget was money well spent on getting students into college."