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HW#5 Due February 25, 2021

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3. Suppose the price elasticity of demand for heating oil is 0.2 in the short run and 0.7 in the long run.

   a. If the price of heating oil rises from \$1.80 to \$2.20 per gallon, what happens to the quantity of heating oil demanded in the short run? In the long run? (Use the midpoint method in your calculations.)

   b. Why might this elasticity depend on the time horizon?

7. Suppose that your demand schedule for pizza is as follows:

Price	Quantity Demanded (income = \$20,000)	Quantity Demanded (income = \$24,000)
\$8	40 pizzas	50 pizzas
10	32	45
12	24	30
14	16	20
16	8	12

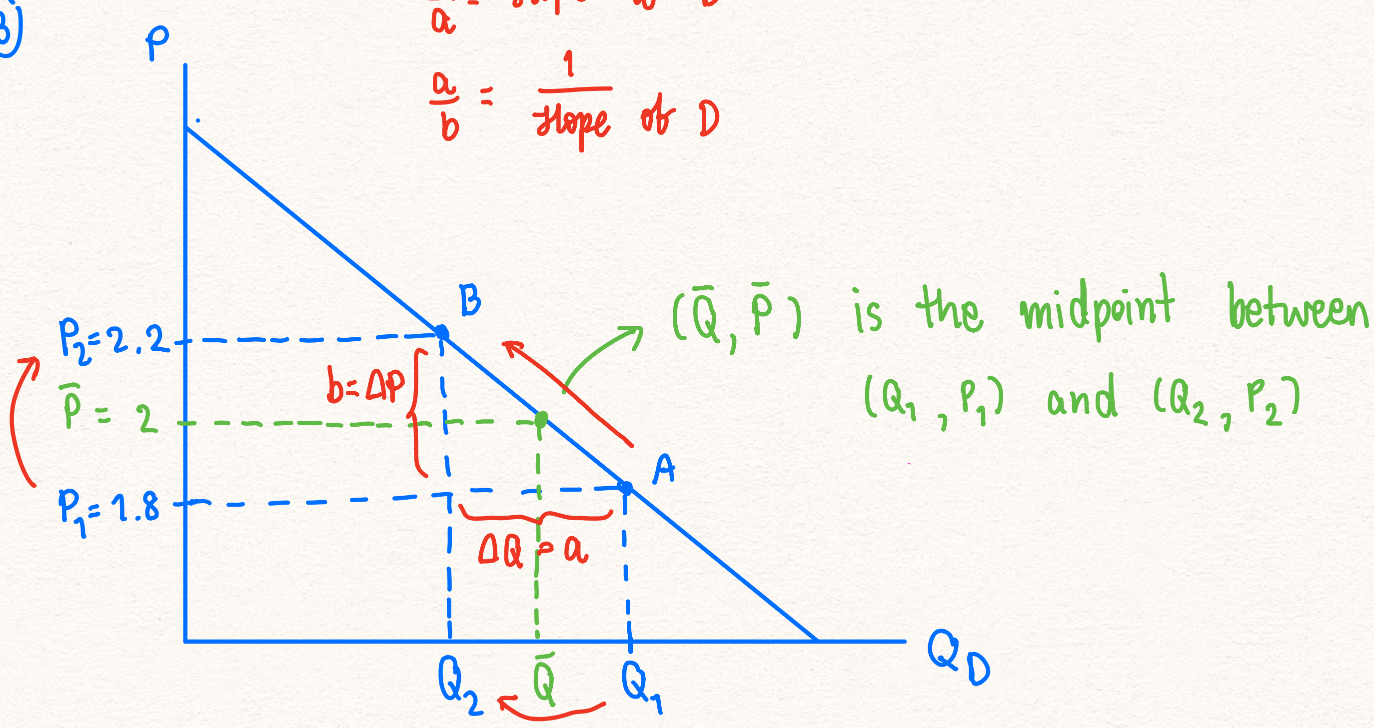
   a. Use the midpoint method to calculate your price elasticity of demand as the price of pizza increases from \$8 to \$10 if (i) your income is \$20,000 and (ii) your income is \$24,000.

   b. Calculate your income elasticity of demand as your income increases from \$20,000 to \$24,000 if (i) the price is \$12 and (ii) the price is \$16.

3

$\frac{b}{a}$ = slope of D

$\frac{a}{b} = \frac{1}{\text{slope of D}}$



Average price $= \bar{P} = \frac{P_1 + P_2}{2} = \frac{1.8 + 2.2}{2} = \boxed{2}$

a) Short run Using midpoint method

$$\eta_D = \frac{\%\Delta Q}{\%\Delta P}$$

$$\eta_D = \frac{Q_1 - Q_2}{\underbrace{Q_1 + Q_2/2}_{\bar{Q}}} \cdot \frac{\overbrace{(P_1 + P_2)/2}^{\bar{P}}}{|P_1 - P_2|}$$

$$0.2 = \%\Delta Q \cdot \frac{(1.8 + 2.2)/2}{|1.8 - 2.2|}$$

$$0.2 = \%\Delta Q \cdot 5$$

$$\%\Delta Q = 0.04$$

Q_D decreases 4%

Long run Using midpoint method

$$\eta_D = \frac{\%\Delta Q}{\%\Delta P}$$

$$\eta_D = \frac{Q_1 - Q_2}{\underbrace{Q_1 + Q_2/2}_{\bar{Q}}} \cdot \frac{\overbrace{(P_1 + P_2)/2}^{\bar{P}}}{|P_1 - P_2|}$$

$$0.7 = \%\Delta Q \cdot \frac{(1.8 + 2.2)/2}{|1.8 - 2.2|}$$

$$0.7 = \%\Delta Q \cdot 5$$

$$\%\Delta Q = 0.14$$

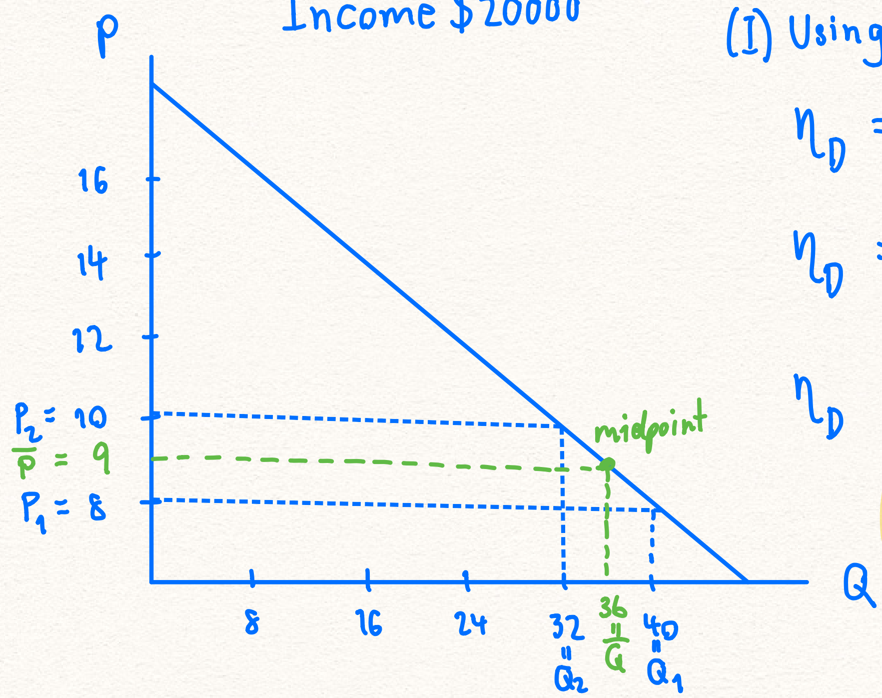
Q_D decreases 14%

∴ If the price of heating oil rises from 1.8 \$ to 2.2 \$ per gallon, the quantity of heating oil demanded in short run is less than that in long run.

b) This elastic depends on the time horizon because in short run we have less time to find substitutes.

⑦ a)

Income \$20000



(I) Using midpoint method

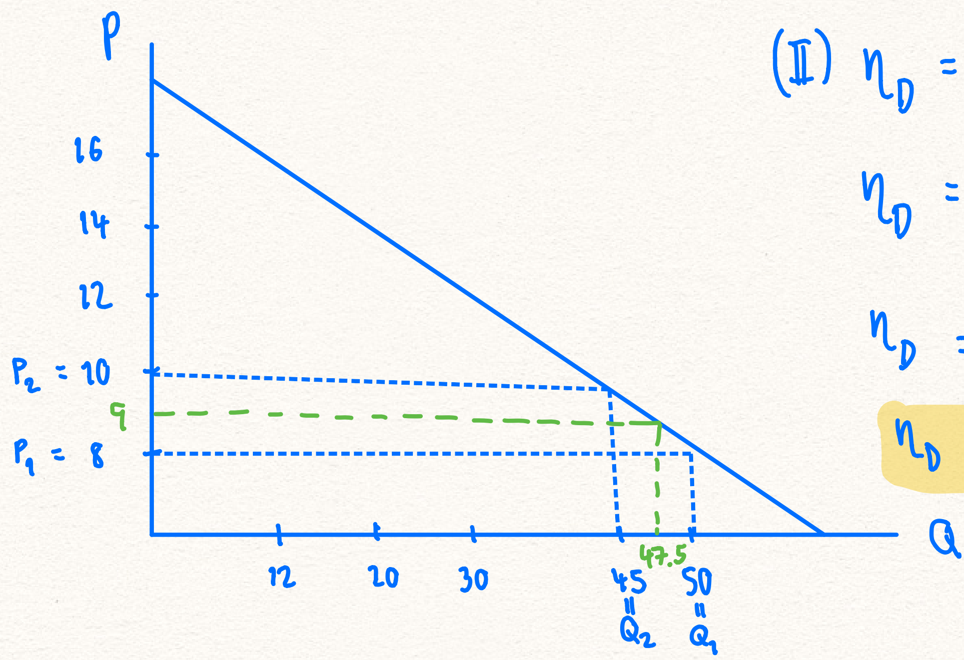
$$\eta_D = \frac{\%\Delta Q}{\%\Delta P}$$

$$\eta_D = \frac{Q_1 - Q_2}{\underbrace{Q_1 + Q_2/2}_{\bar{Q}}} \cdot \frac{\overbrace{(P_1+P_2)/2}^{\bar{P}}}{P_1 - P_2}$$

$$\eta_D = \frac{40-32}{36} \cdot \frac{9}{-2} = \frac{\cancel{8}\,4}{\cancel{36}\,4} \cdot \frac{\cancel{9}}{\cancel{2}}$$

$$\boxed{\eta_D = -1} \ \#$$

Income \$ 24000



(II) $$\eta_D = \frac{\%\Delta Q}{\%\Delta P}$$

$$\eta_D = \frac{Q_1 - Q_2}{\underbrace{Q_1 + Q_2/2}_{\bar{Q}}} \cdot \frac{\overbrace{(P_1+P_2)/2}^{\bar{P}}}{P_1 - P_2}$$

$$\eta_D = \frac{5}{47.5} \cdot \frac{9}{-2}$$

$$\boxed{\eta_D = -0.474} \ \#$$

b) (I) The price is \$12.

At Income \$20,000 → $Q_D = 24$

\$24,000 → $Q_D = 30$

$$\eta_D = \frac{\%\Delta Q}{\%\Delta P}$$

$$\eta_D = \frac{(Q_2 - Q_1)/Q_1}{(P_2 - P_1)/P_1}$$

$$\eta_D = \frac{\Delta Q_D}{\Delta P} \cdot \frac{P_1}{Q_1}$$

$$\eta_D = \frac{\cancel{6}}{4000} \cdot \frac{\cancel{20000}\ 5000}{\cancel{24}\ 4}$$

$$\eta_D = 1.25 \ \#$$

(II) The price is \$16.

At Income \$20,000 → $Q_D = 8$

\$24,000 → $Q_D = 12$

$$\eta_D = \frac{\%\Delta Q}{\%\Delta P}$$

$$\eta_D = \frac{(Q_2 - Q_1)/Q_1}{(P_2 - P_1)/P_1}$$

$$\eta_D = \frac{\Delta Q_D}{\Delta P} \cdot \frac{P_1}{Q_1}$$

$$\eta_D = \frac{\cancel{4}}{\cancel{4000}} \cdot \frac{\cancel{20000}\ 5}{\cancel{8}\ 2}$$

$$\eta_D = 2.5 \ \#$$