Chapter 3 – Supply and Demand ~

1a –

(compare page 65) Number of customers 200 Number of firms 150

Price	0	2	4	4.909091	8	14
Market Demand	1800	1600	1400	1309	1000	400
Market Supply	0	0	900	1309	2700	5400
Excess Demand	1800	1600	500	0	-1700	-5000

1b - With 150 firms: s(p) = 150×max(0,3p-6) = max(0,450p – 900).
Demand equation: q(p) = max(0,1800 – 100p)
Quantity supplied equals quantity purchased:
450p – 900 = 1800 – 100p or , 550p = 2700
Hence p = 2700/550 = $4.91; q = 450*4.91 – 900 = 1309.5; Revenue = $4.91× 1309.5=6,429
Alternatively, substituting into the supply equation, s(p) = 150(3P-6) = 1,309.5

1c Existing producers

1d The rightward shift of the supply curve for petroleum raises the price of gasoline. This will cause an increase in the demand for ethanol, a *substitute* for oil made from corn, thus driving up the price of corn; and it will curtail the demand for SUV's, which have petroleum as a *complement*.

2a = p 118#8 –
price controls (also OK to do with 150 firms)
S(4) = 100(12-6) = 600 supplied; q^e = 1800 – 4*100 = 1400 demanded
Excess demand (*Shortage*) = q(4) – s(4) = 1400 – 600 = 800.

2=8b. Case #1: The person valuing the commodity the most is willing to pay $18, the next person just slightly less, so we slide down the demand curve from the left when those valuing the commodity the most get it, but must truncate the process at the point where quantity supplied under price controls is used up -- this generates a consumer surplus trapezoid with vertices at point 0,$18; 600,$12; 600, $4;and 0,$4 and area [(18+12)/2 – 4]× 600 = $6,600.

Case #2: I f those valuing the commodity the least get to buy it, the customer willing to pay only $4.00 at point e gets a shot at it; we slide up the demand curve from e until the quantity supplied is exhausted by the guy just willing to pay $10. Consumer surplus will be a triangle with vertices at 800,$10; 1400,$4, and 800, $4 with area (1400-800)× (10-4)]/2 = 600×11= $3,600.

Embellishment: If those who are allocated the commodity are allowed to resell it, the goods will end up with those who value it the most, but those who initially got the allocation will get the dollars. Thus allowing reselling makes both groups better off.

The producers are hurt – they are selling less at a lower price. So also are those customers who were willing to pay more than $6 but did not get the commodity after the price cap was imposed. Those who get to buy the commodity gain.

2=8c. A less elastic demand curve going through point e would be steeper, which means that all the consumer surpluses would be larger and the differences between them would be greater. Hence the losing consumers would suffer a greater loss of consumer surplus.

3. Questions 2 and 3 involve the Arc Elasticity formula 22, page 78. For 2 we have η = 0.07/0.1 = 0.7 or η =0.8/0.1 = 0.8. For 3 we have η = 4%/10% = 0.4. This suggests that cigarette consumption is more price sensitive than beer consumption.

For 5, $\frac{\partial q}{\partial p} = (1/2)\times -500000 p^{-1.5} M^{2/3}; \eta_p = -\frac{\partial q}{\partial p}\frac{p}{q} = (1/2)500000 p^{-1.5} M^{2/3}\left(p/q\right) = 1/2 \cdot$

For 9, $\frac{\partial q}{\partial M} = (2/3)500000 p^{-1/2} M^{-1/3}; \eta_M = (2/3)500000 p^{-1/2} M^{-1/3} \times (p/q) = 2/3$

See equations (30) and (31) page 82.

4. a. Government offers to buy corn at $8.00. Production will be 1,800, demand by the public, 1,000, so the government has to buy 800 bushels.

b. With a tax of $8.00, we must have $p_c - p_s$ = $8 and $q(p_c) = s(p_s) = s(p_c - 8)$.
The solution is p_s = $4.00, p_c = $12.00 and q =600. Tax revenue = 600 × $8 = $4800. It turns out that $8.00 is the revenue maximizing tax: ($18 – $2)/2 = $8.00 (see Figure 3.18, p 104) – the increase in the number of firms does not change the revenue maximizing tax, but it does affect the amount of revenue that is collected.

c. q(4) = 1400, s(4) = 600, and imports are 800.

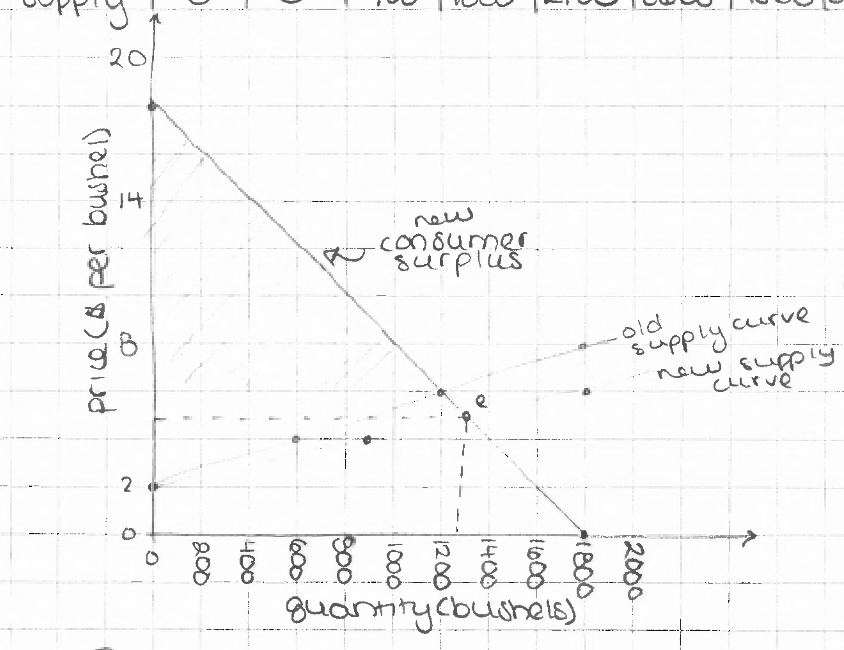
Chapter 8 Problem Set

Conner Brannen

1 a. 150 sellers

$s_j(p) = 3p - 6 \ (p \geq 2)$

price	0	\$2	\$4	\$6	\$8	\$10	\$12	\$14	\$16	\$18
demand	1800	1600	1400	1200	1000	800	600	400	200	0
supply	0	0	900	1800	2700	3600	4500	5400	6300	7200



From the graph we can see that the increase in the number of corn farmers caused the price to fall but the quantity sold and consumer surplus increases

b. $q_i(p) = 9 - p/2$

$q(p) = 200 q_i(p) = 1800 - 100p$

$S_i(p) = 3p - 6$

$S(p) = 150 S_i(p) = 450p - 900$

$S(p) = q(p)$

$1800 - 100p = 450p - 900$

$1800 + 900 = 450p + 100p$

$2700 = 550p$

$p = \$4.91$

$q(\$4.91) = S(\$4.91) = 1309$ bushels

$q(p) = 1800 - 100p$

$q^{-1}(p) = p(q) = 18 - q/100$

$S_c(p) = \int_0^{q(p)} [p(q) - p]\, dq$

$S_c(\$4.91) = \int_0^{1309} (18 - q/100 - 4.91)\, dq$

$= 13.09q - \frac{q^2}{200} \Big|_0^{1309}$

$= \$8567.41$

c. The producers lose $108 - ((8.73)(4.91)) = $108 - $42.86 = $65.14. They lose because they have to sell their products for less because of the increase in competition.

d. Because corn oil is a substitute for gas, an increase in the price of fuel will cause the demand for corn to increase. On the other hand, the increase in the price of fuel will discourage the use of SUVs, and therefore there will be a decline in the price of SUVs.

2. Price cap = $4.00

a. demand = 1400

supply = 600

excess demand = 1400 - 600

= 800

b $SC(\$4.00) = \int_0^{600} (18 - \frac{q}{100} - 4)\,dq$

$= \int_0^{600} (14 - q/100)\,dq$

$= 14q - q^2/200 \Big|_0^{600}$

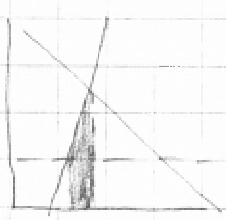
$= \$6600$

consumers lose $7200 - $6600 = $600

The consumers who would buy the product at a higher price lose. Those who would only buy the product at $4.00 gain. Producers also lose because they have to sell at a lower price even though there are people who are willing to pay a higher price.

c. If the price ceiling had been less elastic, consumers would gain because there would be less of a difference between before and after the price cap.

more elastic



less elastic

shaded area = supply decrease

3. Question 2: 7/10 = .7   8/10 = .8 = 4/5

The elasticity of smokers demand for cigarettes is 4/5. This means that the demand is somewhat responsive to change in price.

Question 3: 4/10 = 2/5

The elasticity of campus violence with respect to beer is 2/5, meaning that violence is less sensitive to a change in the price of beer, than cigarette demand is to a change in price per pack.

Question 6:

$q = 500{,}000p^{-1/2}m^{2/3}$ p = price of oil
M = income

a. price elasticity of demand $= \eta_p = -\frac{\partial q}{\partial p}\cdot\frac{p}{q}$

$\partial q/\partial p = 1/2(-500{,}000p^{-3/2}m^{2/3})$

$\partial q/\partial m = 2/3(500{,}000p^{-1/2}m^{-1/3})$

$\eta_p = -(1/2)(-500{,}000p^{-3/2}m^{-1/3}) \cdot p/500{,}000p^{-1/2}m^{2/3}$

$= \frac{(1/2)(500{,}000p^{-1/2}m^{2/3})}{500{,}000p^{-1/2}m^{2/3}}$

$= 1/2$

b. income elasticity of demand $= \eta_y = \frac{\partial q}{\partial y}\cdot y/q$

$\eta_y = 2/3(500{,}000p^{-1/2}m^{-1/3}) \cdot m/500{,}000p^{-1/2}m^{2/3}$

$= \frac{2/3(500{,}000p^{-1/2}m^{2/3})}{500{,}000p^{-1/2}m^{2/3}}$

$= 2/3$

Question 9

a. $q = 1000/p = 1000 \cdot 1/p = 1000p^{-1}$

$\eta = 1$

$dq/dp = -1000/p^2$

$\eta = -(-1000/p^2)\cdot p/q$

$= \frac{1000/p}{1000/p}$

$= 1$

b. $q = 100 - 10p + 20y$

p = price
y = income

$\partial q/\partial p = -10$

$\partial q/\partial y = 20$

$\eta_p = -(-10)\frac{p}{100-10p+20y}$

$= \frac{10p}{100-10p+20y}$

$= \frac{10p}{10(10-p+2y)}$

$= \frac{p}{10-p+2y}$

$\eta_y = 20 \cdot y/100-10p+20y$

$= 20y/20(5-p/2+y)$

$= y/5-p/2+y$

c. $q = 100y^{1/2}p^{-2}$

$\frac{\partial q}{\partial y} = 50y^{-.5}p^{-2} = 1/2\, q/y \cdot y/q = \eta_y = 1/2$

$\partial q/\partial p = -200y^{.5}p^{-3} = -2\, q/p \cdot p/q = \eta_p = -2$

4a. The government offers to purchase the corn at $8 per bushel, which is above the equilibrium price P^e. The government than buys however much is required to support the price. The government purchases the surplus of $S(P^s) - S(P^s)$ and can then stockpile the corn or can be used in such programs as free school lunches & the food stamp program

@$6.00...

quantity produced: 1200
quantity purchased: 1200

@$10.00...

quantity produced: 2400
quantity purchased: 800
(by consumers)

government must buy... 2400 - 800 = 1600 bushels

Question 9d, page 119.

Figure 3.24 is easier:
Since both demand curves generate the same B and A, they yield the same demand elasticity by the $\eta = B/A$ by the quick trick, or about $\eta = (1500-500)/500 = 2$.

For Figure 3.23
From geometry, the ratio B'A' = B/A. Therefore, B'A' = η from the quick trick. Sincee both demand curves have the same B'A', they must have the same elasticity at \$500, roughly $\eta = 500/(900-599) = 5/4 = 1.25$
Alternatively, you can derive B'/A' = η in almost the same way the B/A = η was derived for Figure 3.8

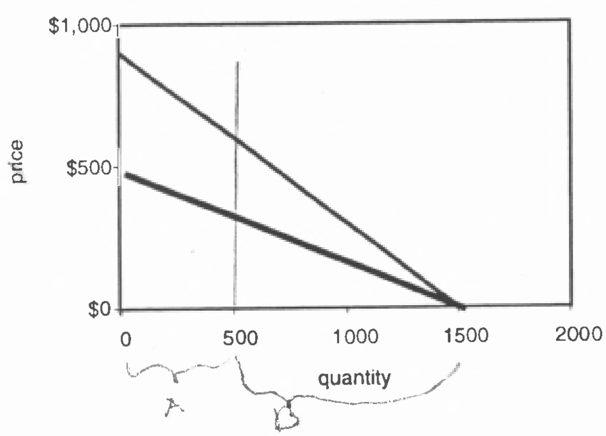


Fig. 3.24. Elasticity exercise (Continued)

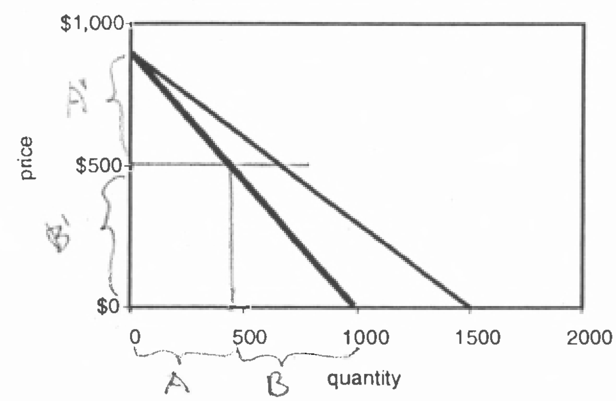


Fig. 3.23. Elasticity exercise