

# Econ 101 Assignment 2 Solution Set

ASSIGNMENT 2 ECON 101 FALL 2017

Due: November 2 in class 10:30am SOLUTION SET

## QUESTION 1

A per-unit tax on the seller and a price support program have a similar effect on a market because

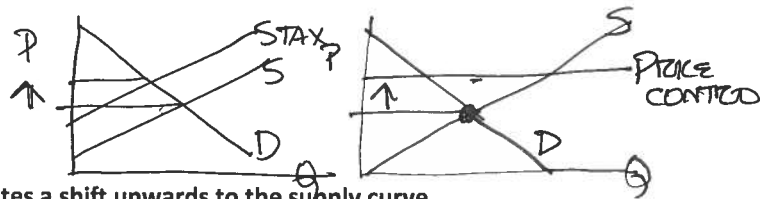
- both raise the amount of the good exchanged in the market
- both raise the price at which the good sells**
- both leave excess supply that needs to be purchased by the government
- both result in the cost of production exceeding the value the consumer gets from the good
- both increase consumer's surplus and decrease producer's surplus

Please select your answer. Explain your answer and use a well labelled graph as part of your answer.

- both raise the price at which the good sells**

In most cases,

- per unit tax increases the price because it creates a shift upwards to the supply curve.
- price support (as long as it is binding and creates an increase in price) will create an increase in price



Be sure to take a look at the others answers – a price control can be a price ceiling or a price floor. However, a price ceiling such as a rent control that decreases price below equilibrium will not fit any of the answers. So the only answer that fits is a.

## QUESTION 2

Assume that initially the market demand curve is  $Q_D = 1200 - 4P$  and market supply curve is  $Q_S = 2P$ . Then, suppose the government imposes a per-unit tax (an excise tax) of six dollars per unit produced on each firm in the industry.

- What is the equilibrium price and equilibrium quantity before the imposition of the tax?
- What is the consumer's surplus and producer's surplus at the initial equilibrium price?
- Suppose a government bureaucrat sets the price at \$210. What is the loss of consumer's surplus at that price?
- What is the equilibrium price and equilibrium quantity after the imposition of the tax?
- What is the loss of consumer's surplus because of this tax imposition?
- What is the deadweight loss because of this tax imposition?

(a) The equilibrium price and equilibrium quantity are \$200 per unit, and 400, respectively.

(b) Consumer's surplus is \$20000 ( $= \frac{1}{2} * 400 * 100$ )  
 Producer's surplus is \$40000 ( $= \frac{1}{2} * 400 * 200$ )

(c) Consumer's surplus at the price of 210 is \$16,200 ( $= \frac{1}{2} * 90 * 360$ )  
 Thus, the loss in consumer's surplus is \$3800 ( $= 20000 - 16200$ )

(d) Since the new supply curve is  $P = (1/2)Q + 6$  or  $Q = 2P - 12$ , the new equilibrium price is \$202 per unit and the new equilibrium quantity is 392 units.

(e) The new consumer's surplus is \$19208 ( $= \frac{1}{2} * 98 * 392$ )  
 Thus, the loss in consumer's surplus is \$792 ( $= 20000 - 19208$ )

(f) Deadweight loss  $= \frac{1}{2} * 6 (= \text{tax}) * (400 - 392) = \$24$

### QUESTION 3

Assume that the market demand curve for oats is  $QD = 30 - 0.5P$  and the market supply curve of oats is  $QS = -15 + P$ .

- (a) What is the equilibrium price and equilibrium quantity?
- (b) Suppose the government decides to have a "price support program" with a price floor set at  $PF = 40$ . What is the excess supply in this market? What is the cost of this program to the government?
- (c) Suppose, instead, the government decides to have a "government subsidy program" with a guaranteed (or target) price of  $PT = 35$ . What is the price to consumers? What is the subsidy per unit the government must pay? What is the cost to the government for this program?

(a) The equilibrium price and equilibrium quantity are \$30 per unit and 15, respectively.

(b) At the floor price of \$40 per unit, excess supply is 15 ( $= 25 - 10$ ).

Government expenditure = (Excess supply) \* (Floor price) = 15 units \* \$40 per unit = \$600

Government buys all the excess amount of oats or else this would not

(c) At the guaranteed price of \$35

Put  $P = 35$  into the equation  $QS = -15 + 35 = 20$  Quantity supplied is 20.

Because Price is maximized

Put  $Q = 20$  into the  $QD = 30 - 0.5P$  and Consumer's price is \$20

Because that is the max quantity supplied in the market.

Cost to Government =

subsidy per unit (\$35 less \$20 paid by consumer = \$15 per unit)

X 20 units sold

= \$300 cost to the government of this program

#### QUESTION 4

If there is a negative production externality in the market for good X, then

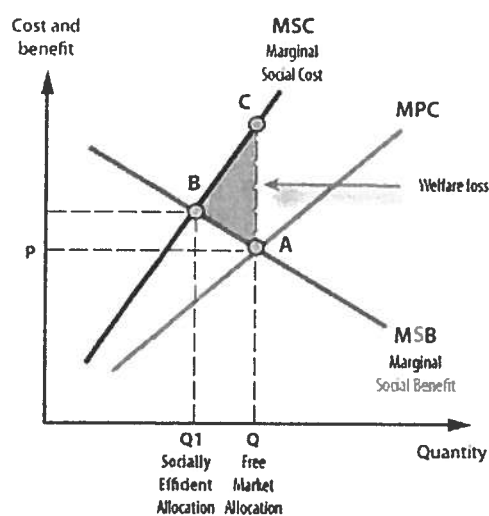
- a. good X should never be produced.
- b. good X will be underproduced in the market.
- c. **good X will be overproduced in the market.**
- d. the government should give a subsidy to the producers of good X.
- e. the government should subsidize the consumers of good X.

Select your answer, give reasons for your answer and use a well labelled graph.

The answer is C

good X will be overproduced in the market.

The reason is that marginal private cost does not include the negative externality and thus the costs are too low and the firm produces at a level of Q free market allocation (too much Q produced or overproduction). If the negative externality was included, then the cost would be higher (marginal social cost), equating this marginal social cost with the marginal benefit then Q1 socially beneficial amount would be produced and that mean more efficient allocation of resources.



### QUESTION 5

Consider the demand in the cabbage market

Price	Quantity Demanded
1	9
2	8
3	7
4	6
5	5
6	4
7	3
8	2
9	1
10	0

- i) Compute the price elasticity when the price changes from \$6 to \$5 (use the arc elasticity formula). What is the change in total revenue from this price change?
- ii) Compute the price elasticity when the price changes from \$4 to \$5 (use the arc elasticity formula). What is the change in total revenue from this price change?
- iii) Using the terms normal good and inferior good, explain why KLW, an aspiring vegetarian, might expect to consume less cabbage and more organic red peppers after graduating from college.
- iv) Using the terms complement good and substitute good and your knowledge of these concepts, explain KLW's (an aspiring cook) purchase patterns.

i) Elasticity =  $[(5-4)/(5+4)]/[(5-6)/(5+6)] = -1.2$  or an absolute value of 1.2. Total revenue changes =  $25 - 24 = \$1$  increase.

ii) Elasticity =  $[(6-5)/(6+5)]/[(4-5)/(4+5)] = -9/11 = -.82$  or an absolute value of .82. Total revenue changes =  $25 - 24 = \$1$  increase.

iii) The terms, Normal and Inferior, are associated with the concept of income elasticity that measure the responsiveness of a Qd of a good with a change of income.

If income increases and Qd of the good increases, then the good is considered normal

If income increases and Qd of the good decreases, then the good is considered inferior.

If KLW graduates and her income rises, she will eat less cabbage because it is an inferior good and more red pepper as it is a normal ( maybe even a luxury) good.

iv) The terms, Complement and Substitute, are associated with the concept of cross price elasticity that measure the responsiveness of a Qd of a good X with a change of P of another good.

If Price of a good increases and Qd of second good increases, then the good is considered a substitute.

Example. If a price of red peppers increases, then KLW may move out of that market and buy yellow peppers as a substitute.

If Price of a good increases and Qd of second good decreases, then the good is considered a complement.

Example. If a price of cookbooks increase then KLW may move out cooking and decrease vegetable purchases because these two goods are complements.

### QUESTION 6

Consider the following two markets with different demand functions but similar supply functions

$$Q_D^1 = 10 - P$$

$$Q_D^2 = 30 - 5P$$

$$Q_S = P$$

Now suppose that government levies a tax of \$1.2 per unit on consumers.

- i) Find the equilibrium price and quantity before and after the tax in both markets.
- ii) Which market has higher tax revenue? Explain?
- iii) Compare tax incidence for consumers and producers in the two markets.

i) Before imposing tax, equilibrium price is \$5 and equilibrium quantity is 5.

a. After excise tax of \$1.2 per unit.

- In the first market the new equilibrium price is \$5.6 and the new equilibrium quantity is 4.4.
- In the second market, the equilibrium price is \$5.2 and the equilibrium quantity is 4.

ii) Tax revenue in the first market is  $1.2 \times 4.4 = \$5.28$ . Tax revenue in the second market is  $1.2 \times 4 = \$4.8$ .

ii) In the first market, tax incidence for the

- consumer =  $4.4 \times (5.6 - 5) = \$2.64$ .
- producer =  $(5 - 4.4) \times 4.4 = \$2.64$ .
- So the portion of the tax paid by the consumer versus the producer is 1:1.

In the second market, the tax incidence for the

- consumer =  $(5.2 - 5) \times 4 = 0.8$ .
- producer =  $(5 - 4) \times 4 = 4$ .
- portion of the tax paid by the consumer versus the producer in the second market is 1:5.

Therefore, the consumer has the greater tax burden in the first market.

iv) The first market has more inelastic demand than the second market.

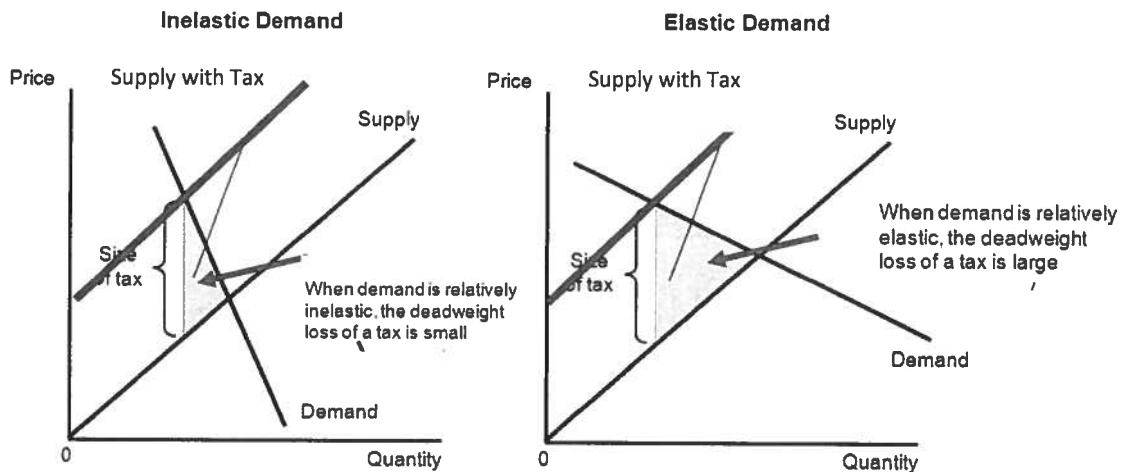
### QUESTION 7

Which of the following statements is true?

- a. When supply is relatively inelastic, the deadweight loss from an excise tax is relatively large.
- b. When demand is relatively elastic, the deadweight loss from an excise tax is relatively large.**
- c. When supply is more elastic than demand, the tax incidence falls more heavily on producers than on consumers.
- d. When demand is more elastic than supply, the tax incidence falls more heavily on consumers than on producers.

Please select your answer. Explain your answer and use a well labelled graph as part of your answer.

**B is the answer. When demand is relatively elastic, the deadweight loss on tax is large .The more elastic the demand curve – the more the dead weight loss.**



Others are incorrect because: (you do not have to explain why the others are incorrect but it would be good to know for the exam)

- When supply or demand is relatively inelastic, the deadweight loss of tax is small since the equilibrium quantity does not change much.
- When supply is more elastic than demand, the tax incidence falls more heavily on consumer
- When demand is more elastic than supply, the tax incidence falls more heavily on producers as the shift in supply curve does not change equilibrium price in a large amount.

### QUESTION 8

Suppose demand for cigarettes in Vancouver is given by  $Q_d=20-P$  while supply is given by  $Q_s=0.25P$ .

- a. Find the equilibrium quantity and price.
- b. Consider the same cigarette market and now suppose that a city decides to impose an excise tax of \$5/pack on cigarette producers.
- c. Write down the new supply equation as  $P =$  rather than  $Q_s =$ .
- d. Find the equilibrium quantity and price after the tax.
- e. What would be the net price received by the cigarette producers? Paid by consumers?
- f. Find the consumer surplus & producer surplus before and after the tax, graphically and algebraically.
- g. Find the taxes paid by consumers (consumer tax incidence) and taxes paid by producers (producer tax incidence).
- h. Compute the tax revenue collected by a city of Vancouver, graphically and algebraically.
- i. Find the deadweight loss of this tax policy,
- j. Suppose the smokers in Vancouver were more addicted to cigarettes, so their demand (assume this demand curve still passes through the equilibrium point you found in (a)), is less responsive to the price change. Would the consumers pay a higher or lower share of the total taxes collected? Illustrate with a new diagram.
- k. What if the smokers are less addicted? Would the consumers pay a higher or lower share of the total taxes collected? Illustrate with a new diagram.
- l. Using a well labelled graph, show the implications of the tax.

Ques/ a)  $Q_D = Q_S$   
 $20 - P = 0.25P$   
 $20 = 1.25P$   
 $P = 16$   $Q = 4$  w/o TAX

b) c)  $Q_D = 20 - P$   
 $P = 20 - Q_D$  DEMAND  


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 $Q_S = 0.25P$   
 $P = 4Q_S$  SUPPLY  


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 $P = 5 + 4Q_S$  WITH TAX

d) WITH TAX

e)  $20 - Q_D = 5 + 4Q_S$   
 $15 = 5Q$   
 $3 = Q$

CONSUMER PRICE

$P = 20 - 3$   
 $= 17$

PRODUCER PRICE

$P = 4(3) = 12$   
 $= 12$

~~8~~ 9) TAX INCIDENCE: WHO PAYS FOR <sup>\$</sup>5 TAX?

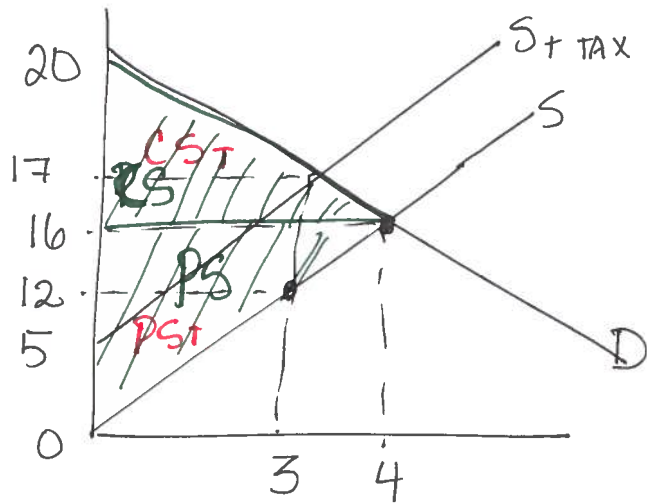
g)

PRICE W/O TAX  $P = 16$   $\rightarrow P = 17$  WITH TAX CONSUMER  $\Delta = +1$   
 $\rightarrow P = 12$  WITH TAX PRODUCER  $\Delta = -4$

Thus, consumers pay 1\$ + producers pay 4\$ of 5\$ TAX



Q8 f)



$CST > WITH TAX$   
 $PS >$

$CS > W/O TAX$   
 $PS$

BEFORE TAX

$$CS = \frac{1}{2}(4)(20-16) = 8$$

$$PS = \frac{1}{2}(4)(16-0) = \underline{32}$$

$$ES \leq = 40$$

AFTER TAX

$$CS = \frac{1}{2}(3)(20-17) = 4.5$$

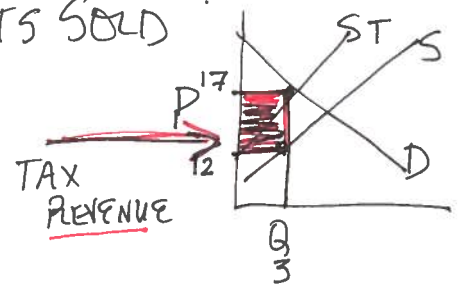
$$PS = \frac{1}{2}(3)(12-0) = \underline{18}$$

$$ES \leq = 22.5$$

$$CS \text{ CHANGE} = 3.5 \downarrow$$

$$PS \quad \downarrow = 14 \downarrow$$

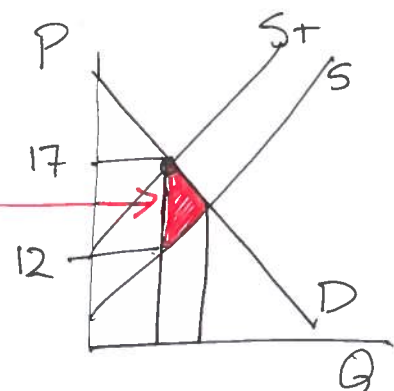
h) ~~h~~)  $TAX = 5/\text{UNIT} \times \# \text{ OF UNITS SOLD}$   
 $= 5 \times 3 = 15$



1)  $DWL = \text{loss of economic surplus due to tax policy imposition}$

$$= \frac{1}{2}(17-12)(4-3) = 2.5$$

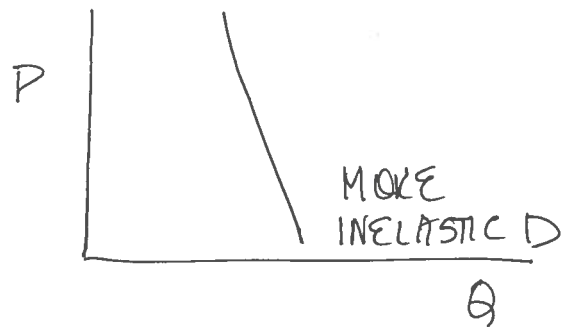
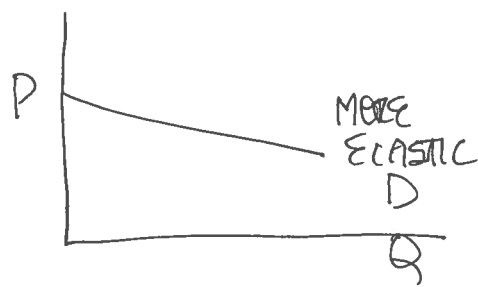
DWL



Q8 j) MORE ADDICTED  $\Rightarrow$  LESS RESPONSE TO PRICE  $\Delta$   
 $\hookrightarrow$  less elastic (more inelastic) demand curve

k)

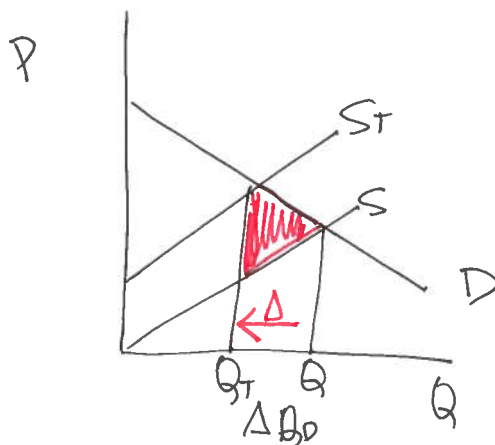
l)



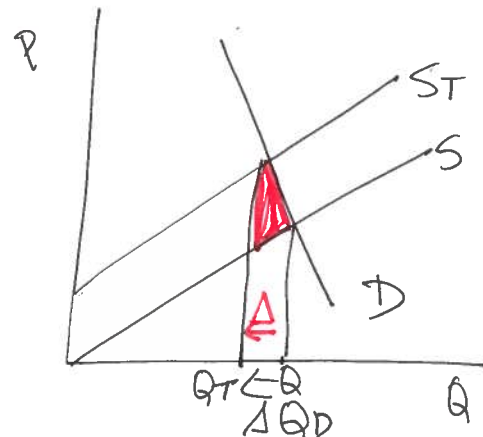
TAX IS A PRICE  $\Delta$  TO CONSUMER, SO

WITH  $>$  INELASTIC DEMAND CURVE THEN

TAX WILL NOT HAVE A BIG  $Q$   $\Delta$  RESPONSE



TAX EFFECT  
 $> \Delta Q$   
 $> DNL$   
ELASTIC D  
LESS ADDICTED



TAX EFFECT  
 SMALL  $\Delta Q$   
 SMALL DNL  
INELASTIC D  
MORE ADDICTED

**QUESTION 9**

Suppose demand for cigarettes in Vancouver is given by  $Q_d=9-P$  while supply is given by  $Q_s=0.5P$ .

- a. Find the equilibrium quantity and price.
- b. Suppose that the city has decided to impose a price floor of \$7. How many cigarettes are traded in the market now? And will there be a shortage or a surplus?
- c. Using a well labelled graph, show the implications of a part a and then the price floor.

Qa/  $Q_D = 9 - P$      $Q_S = 0.5P$

a)  $9 - P = 0.5P$

$9 = 1.5P$

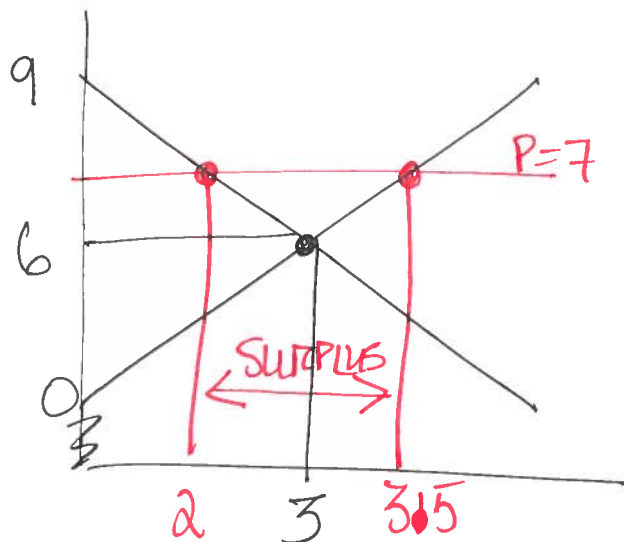
$P = 6$      $Q = 3$

b) Price Floor = \$7

LOWEST PRICE A COMMODITY CAN BE SOLD  
TO BE BINDING, MUST BE  $>$  EQUIL P

At  $P = \$7$      $Q_D = 2$      $> 1.5$  SURPLUS  
 $Q_S = 3.5$

c)



$P = 0 + 2Q_S$  (SUPPLY)

$P = 9 - Q_D$  (DEMAND)

### QUESTION 10

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Suppose that market demand for Canuck jerseys is given by  $Q^D = -2P + 140$  and market supply of the shirts is given by  $Q^S = P - 10$ .

- a. Find the equilibrium price and quantity in this market.
- b. Suppose the City of Vancouver obtains evidence that students who wear Canuck jerseys perform worse on their final exams. The government would like to reduce the number of shirts exchanged to improve final exam performance.
  - a. If the government wishes to create a price floor to accomplish its objective, what is the minimum price it would have to set to make sure no shirts are bought by consumers?
  - b. Say the City sets a price of \$55 for the shirts. What is the excess quantity supplied in this case? Give a general expression for excess quantity supplied in this market. (hint:  $Q^S - Q^D$ , where  $P >$  equilibrium price found in part a)
- c. Suppose now that market demand for Canuck jerseys has changed to  $Q^D = -2P + 170$ . Give a possible explanation for the change. What do you expect to happen to the equilibrium price (relative to that of part a)? What do you expect to happen to the equilibrium quantity (relative to that of part a)? Find the new equilibrium to verify your answers.

Q10/a)

$$Q_D = -2P + 140$$

$$Q_D = Q_S$$

$$-2P + 140 = P - 10$$

$$150 = 3P$$

$$\underline{P = 50 \quad Q = 40}$$

$$Q_S = P - 10$$

b)

$$Q_D = -2P + 140$$

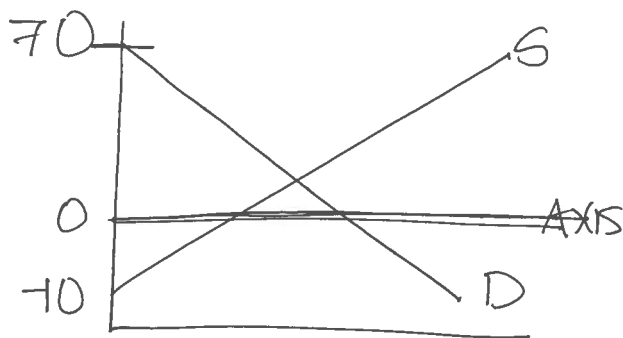
$$2P = 140 - Q_D$$

$$P = 70 - 0.5Q_D$$

$$Q_S = P - 10$$

$$Q_S - 10 = P$$

$$P = -10 + Q_S$$



a) SET  $P > 70$

b) SET  $P = 55$

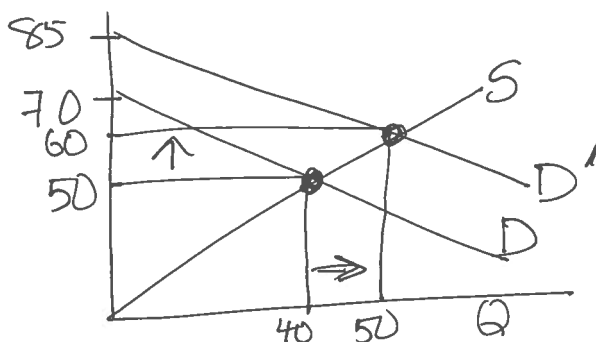
$$\begin{array}{l} Q_D = 30 \\ Q_S = 40 \end{array} \begin{array}{l} \text{Excess Supply} \\ = 15 \end{array}$$

c)

$$Q_D = -2P + 170$$

$$2P = 170 - Q_D$$

$$P = 85 - 0.5Q_D \quad (D')$$



$$\Rightarrow \underline{P^* = 60 \quad Q^* = 50}$$

→ ANY ELEMENTS THAT SHIFT DEMAND.

LIKELY.  $\Delta$  TASTE/PREF

-  $\uparrow$  POPULATION

-  $\Delta$  COMP/SUBS

-  $\Delta$  INCOME.

PROVE STWASL WRONG.