ECONOMICS 2

Tutorial 3

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Questions: 4,6,8,11,13,15

- The shutdown decision in the short run

Q4 True or false: If marginal cost lies below average fixed cost, the firm should shut down in the short run. Explain.

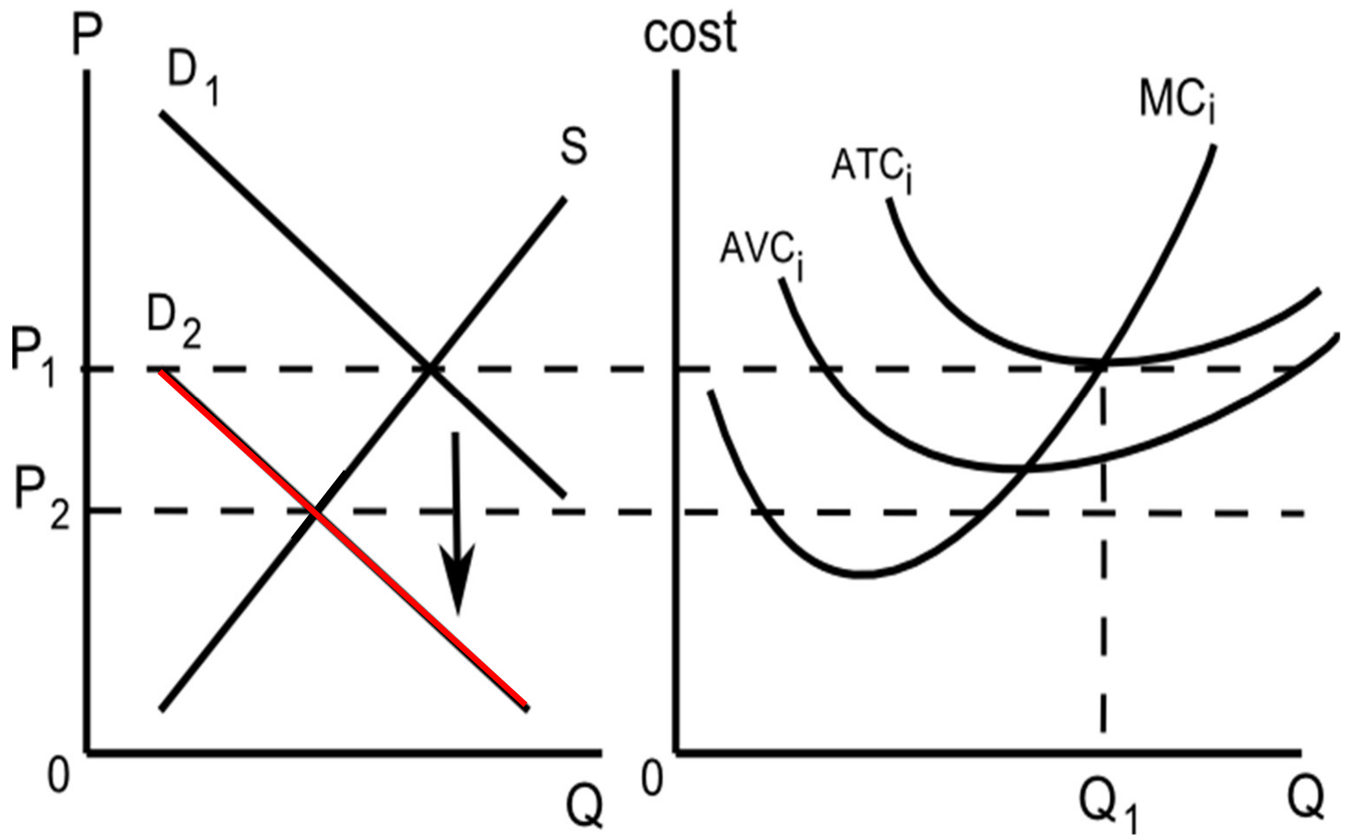
False

Shut down if and only if $P < AVC$

Fixed costs (total or avg.) are irrelevant in this decision because they must be paid even if firm shuts down

- The shutdown decision in the short run

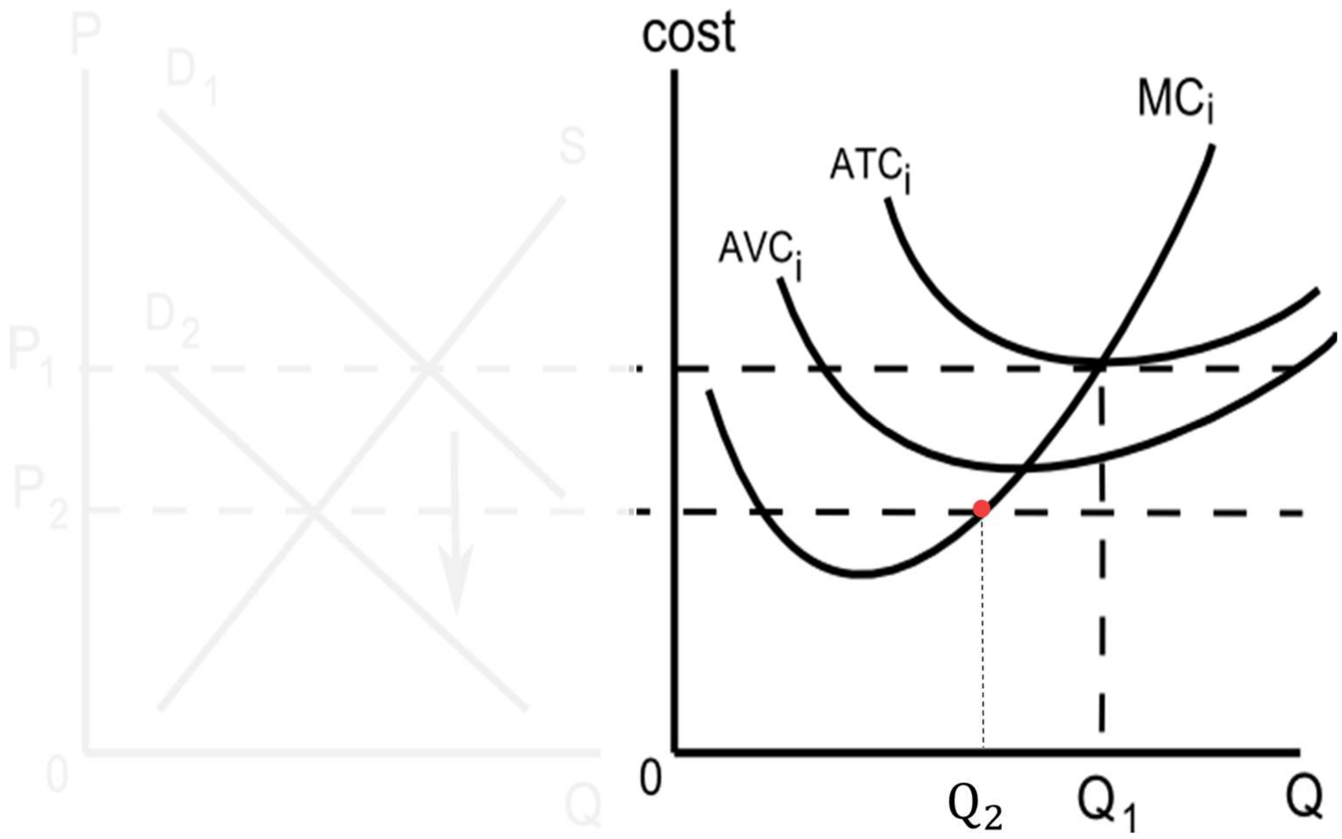
Q6



What should the firm do after this drop in price?

- The shutdown decision in the short run

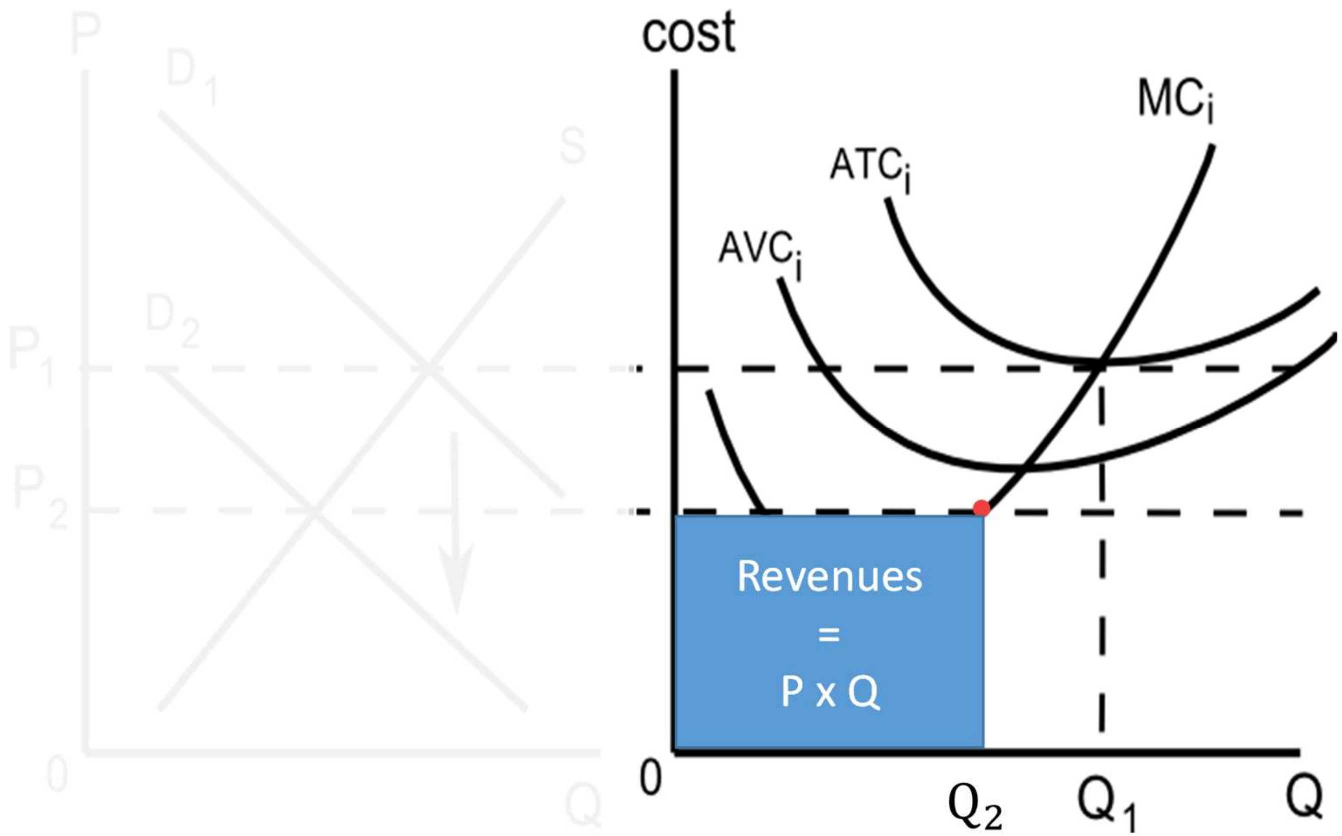
Q6



Suppose firm follows the rule P = MC and produces Q_2

- The shutdown decision in the short run

Q6



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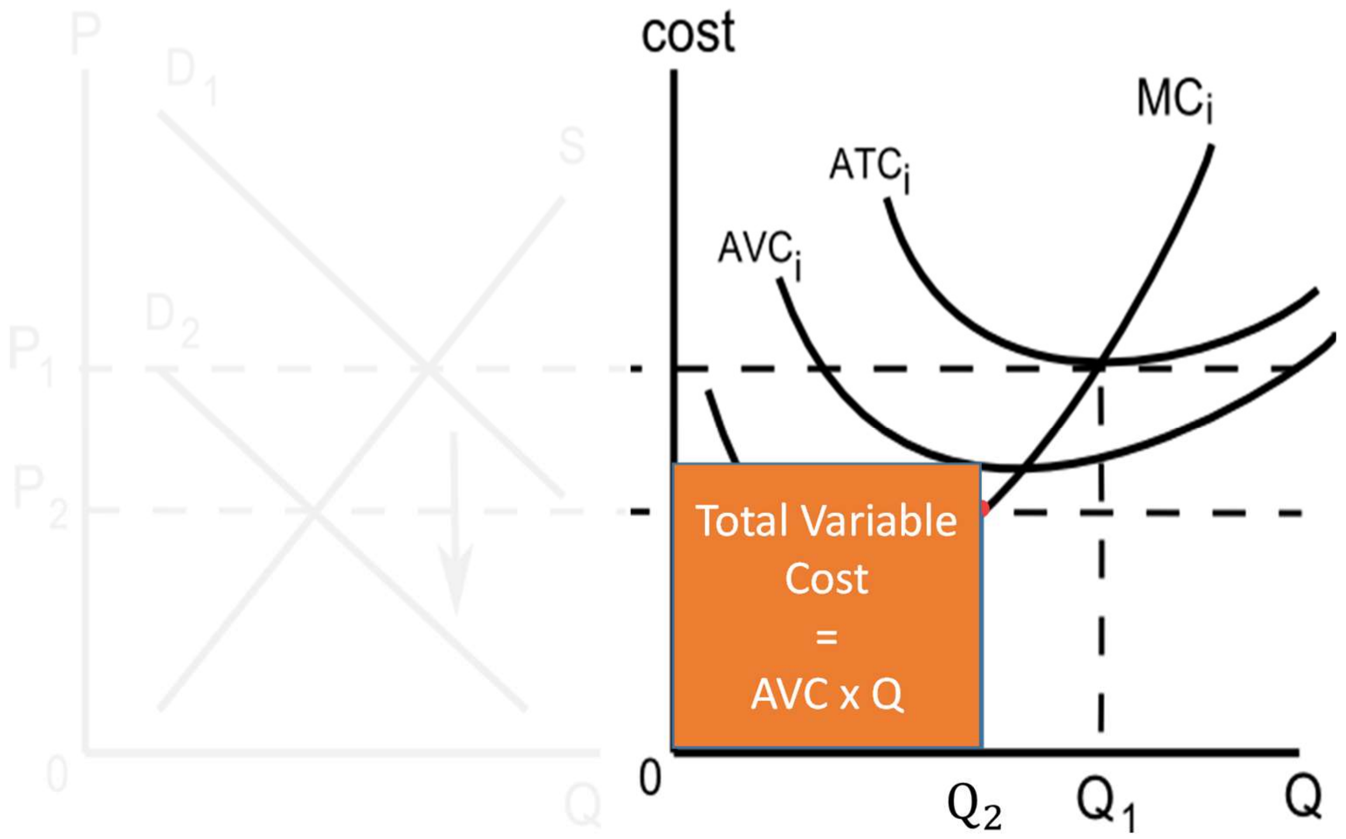
- The shutdown decision in the short run

Q6



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- The shutdown decision in the short run

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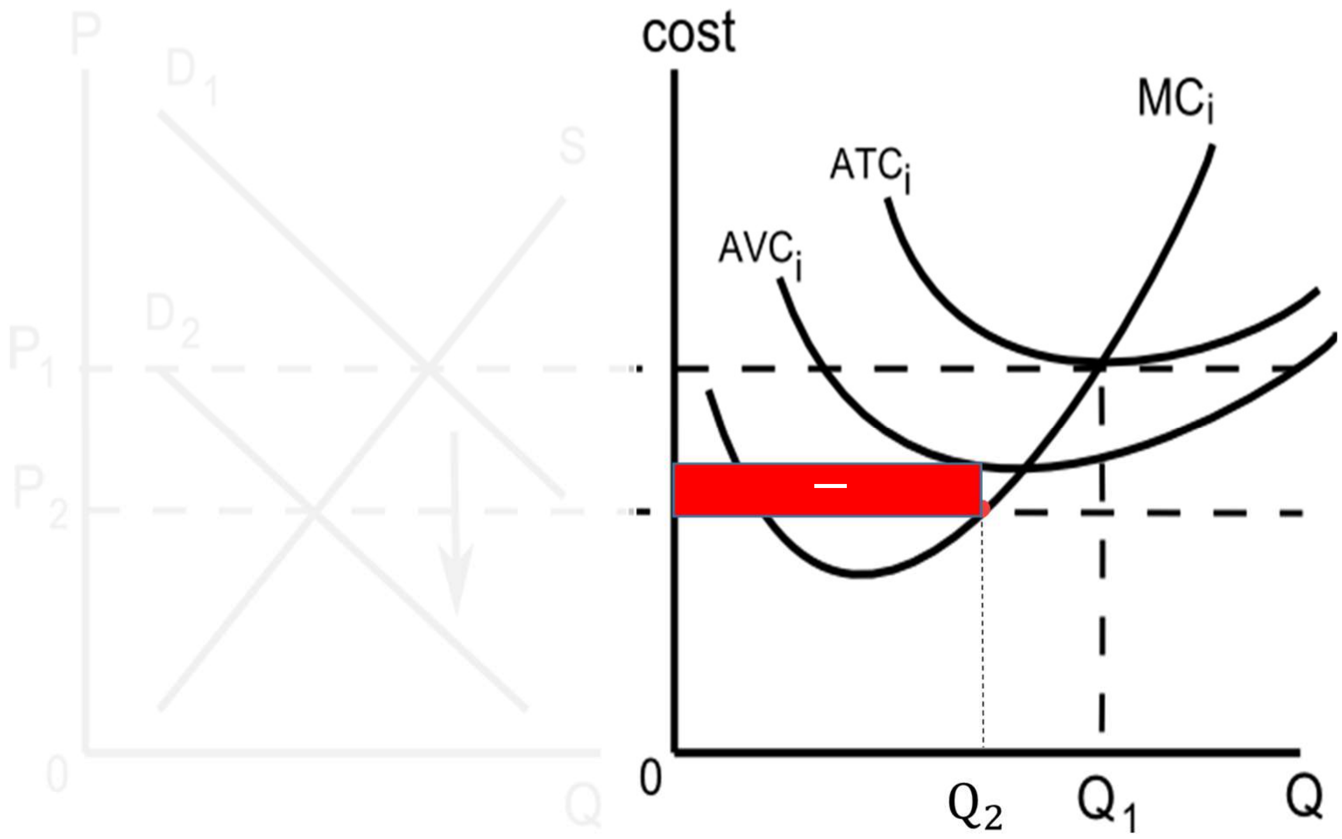
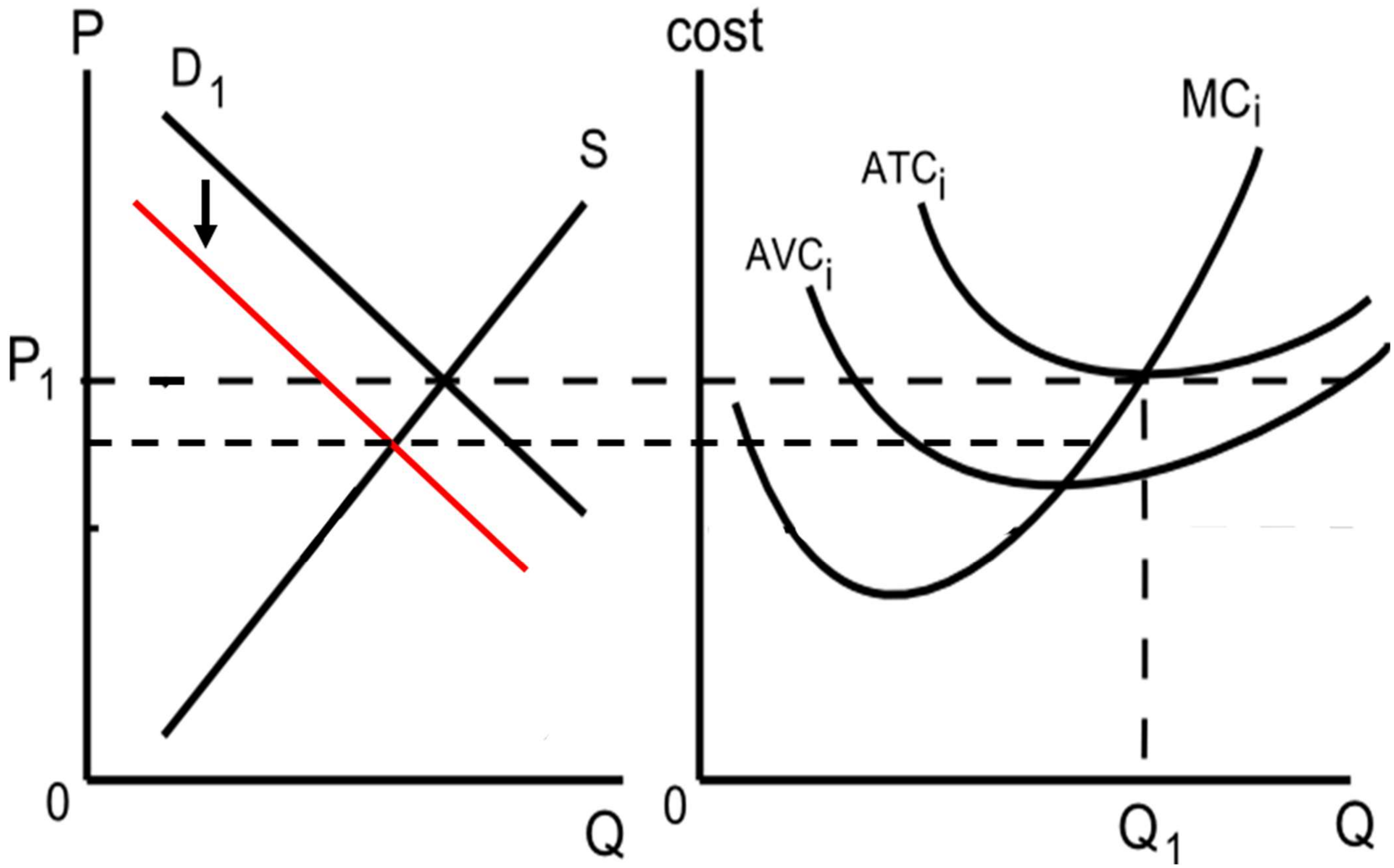


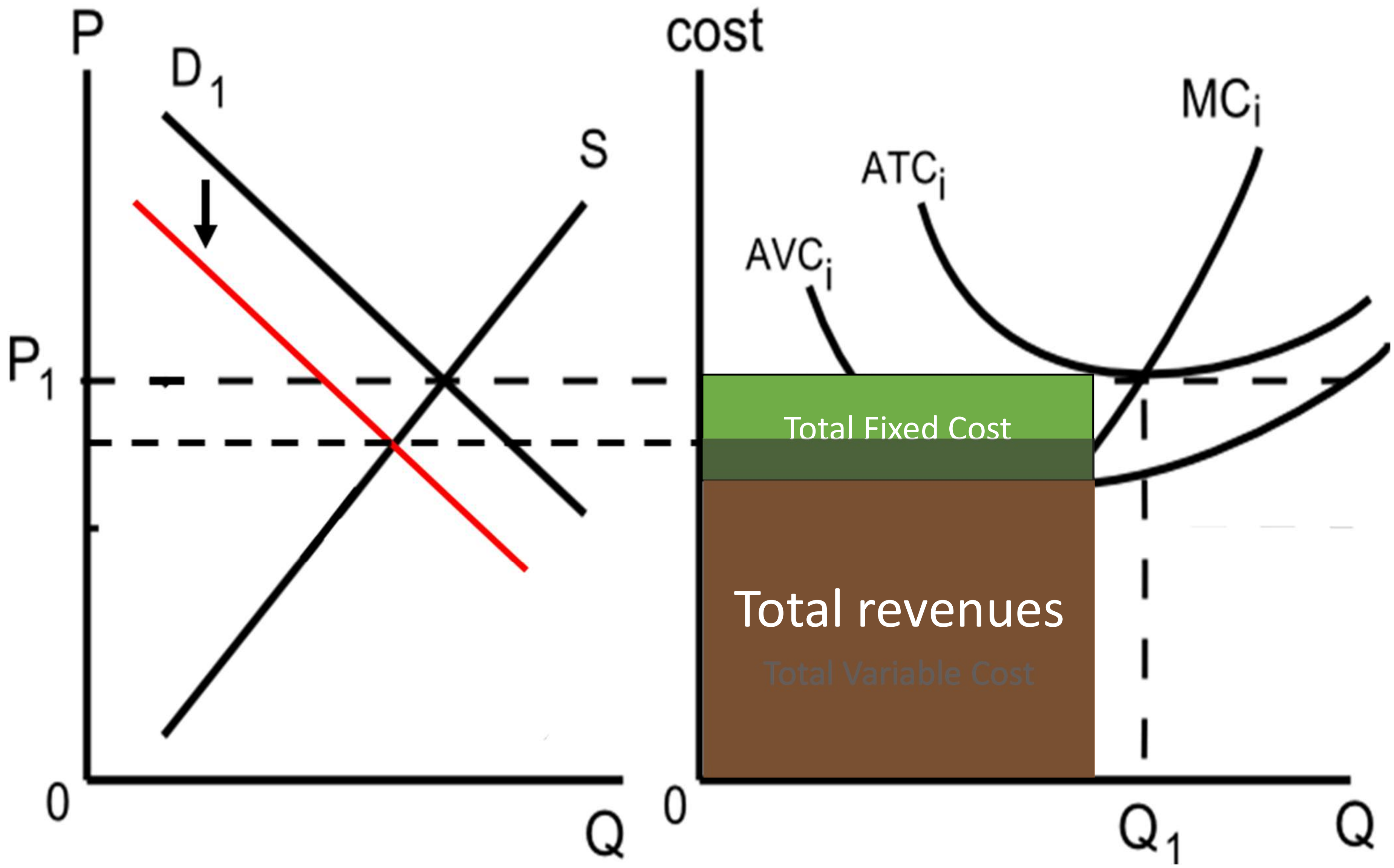
Firm can avoid the negative red area by producing zero instead (shut down). Fixed costs have to be paid anyway, so they don’t matter

Digression: What would happen in this situation?



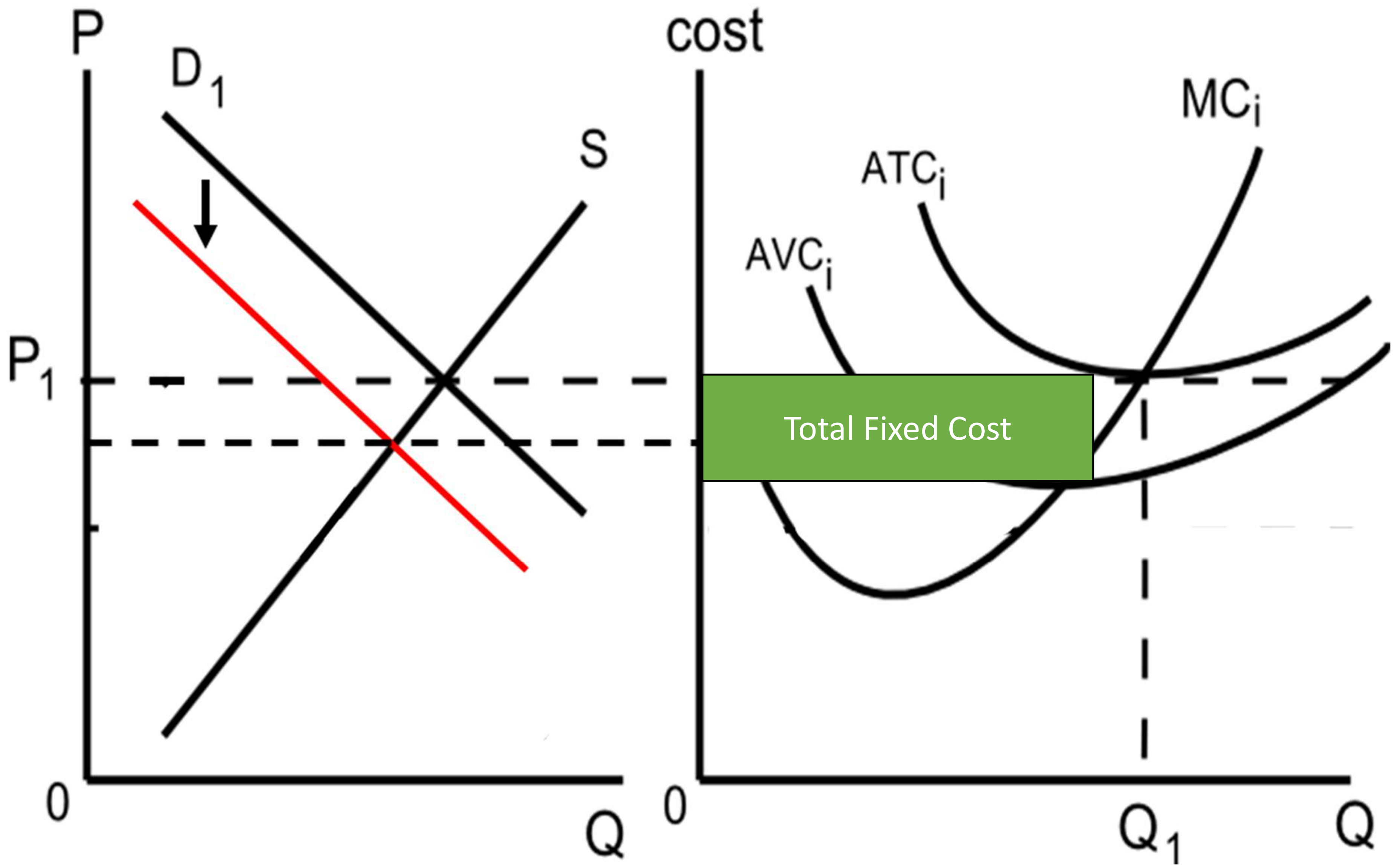
Digression: What would happen in this situation?

If the firm produces:



Digression: What would happen in this situation?

If the firm shuts down, still have to pay Fixed Cost



Q8

Suppose that bicycles are produced by a perfectly competitive, constant-cost industry. Which of the following will have a larger effect on the long-run price of bicycles: (1) a government program to advertise the health benefits of bicycling, or (2) a government programme that increases the demand for steel, an input into the manufacture of bicycles that is produced in an increasing cost industry.

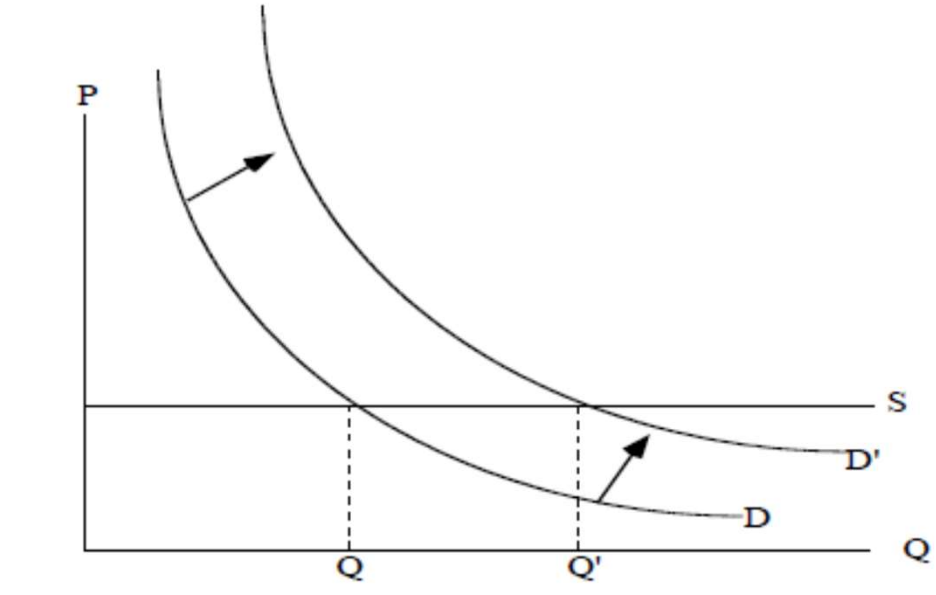
Key info:

- Constant (mg) cost
- Perfect competitive market

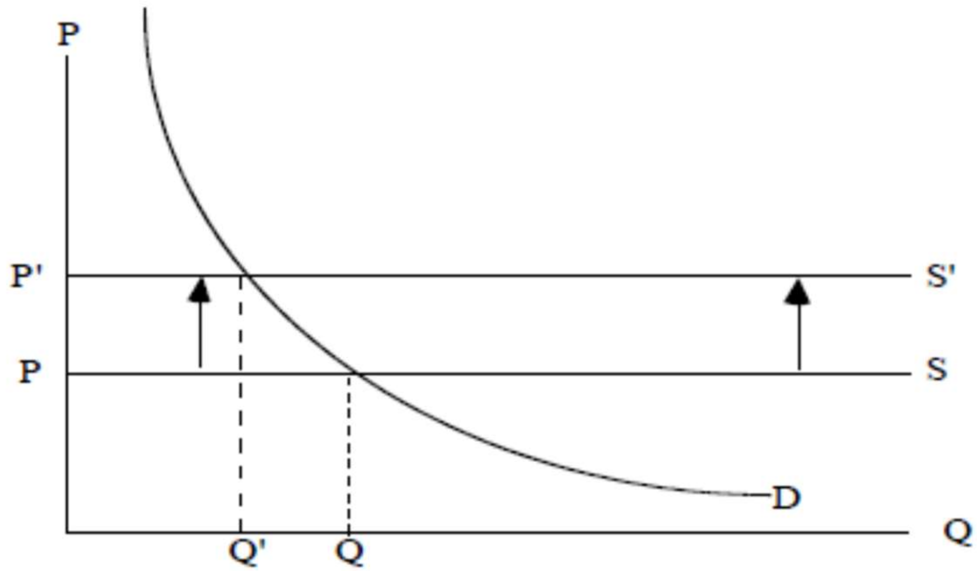
1) advertise benefits → increase demand
2) increase cost of labour → shift MC upwards

Q8

1)



2)



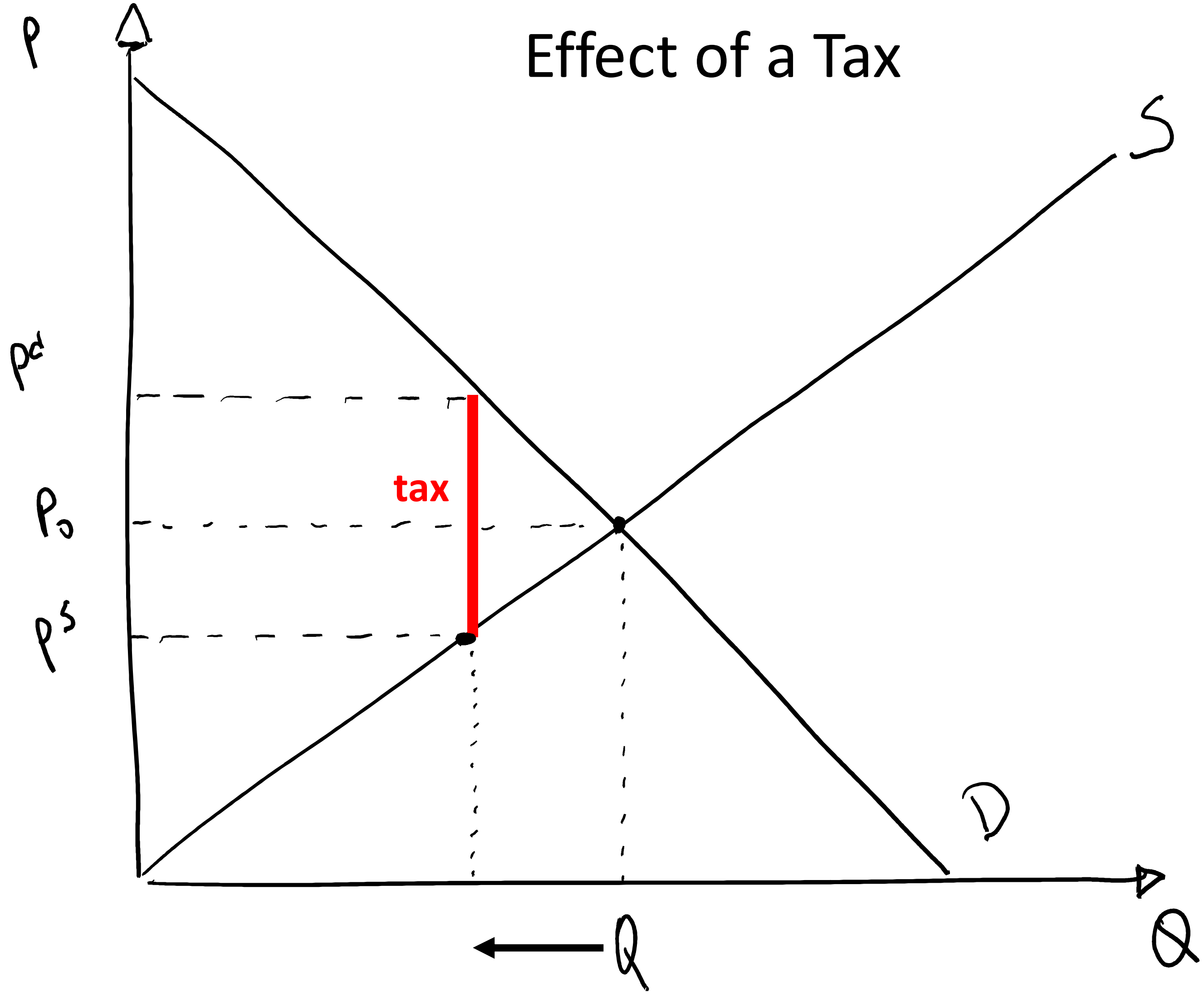
Q11

The demand for petrol is $P = 5 - 0.002Q$ and the supply is $P = 0.2 + 0.004Q$, where P is in pounds and Q is in litres. If a tax of £1.20 per litre is placed on petrol, what are the effects? What is the lost consumer surplus? What is the lost producer surplus? What is the deadweight loss?

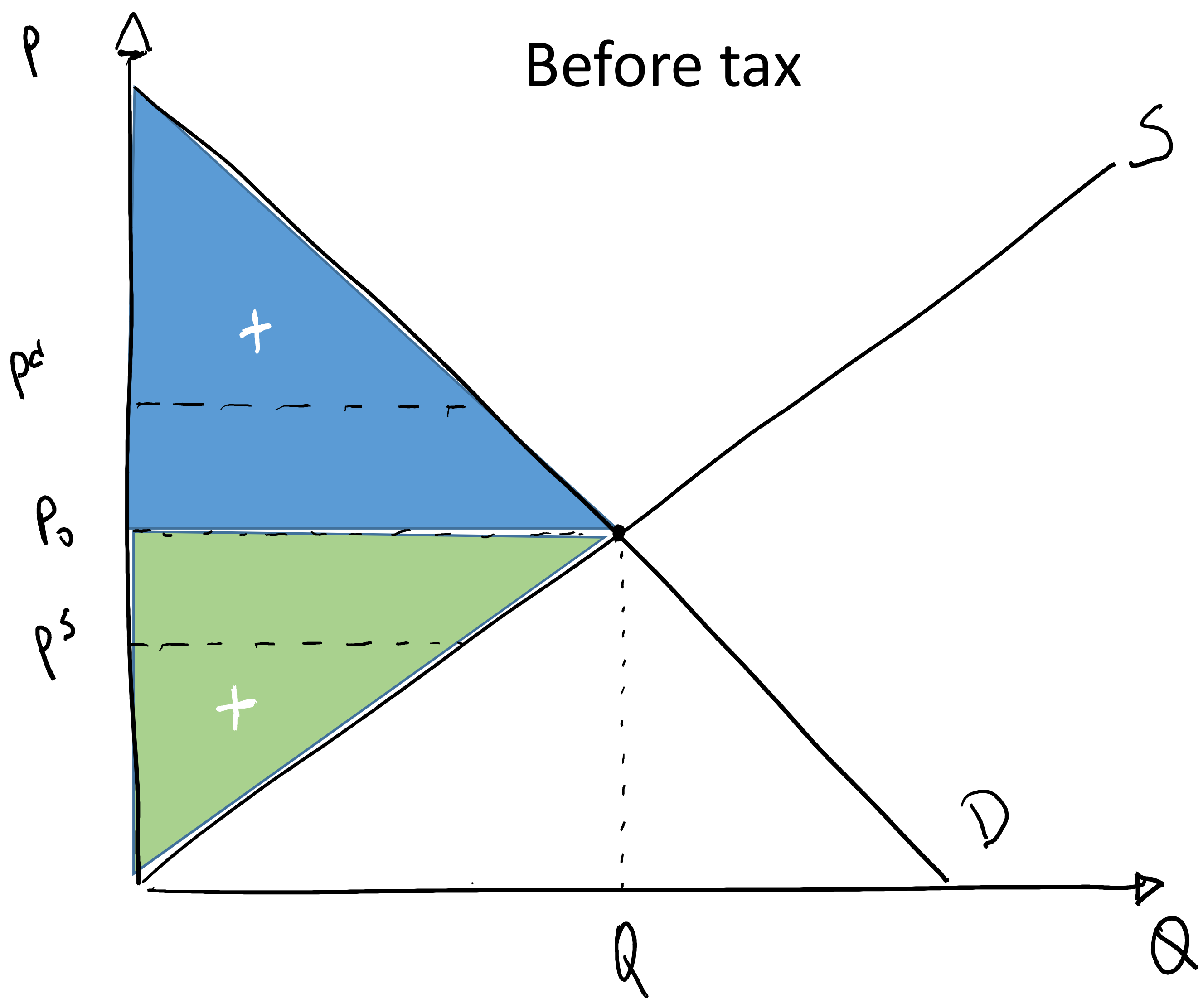
Info:

- Demand: $P = 5 - 0.002Q$
- Supply: $P = 0.2 + 0.004Q$
- Tax: $t = 1.2$

Effect of a Tax

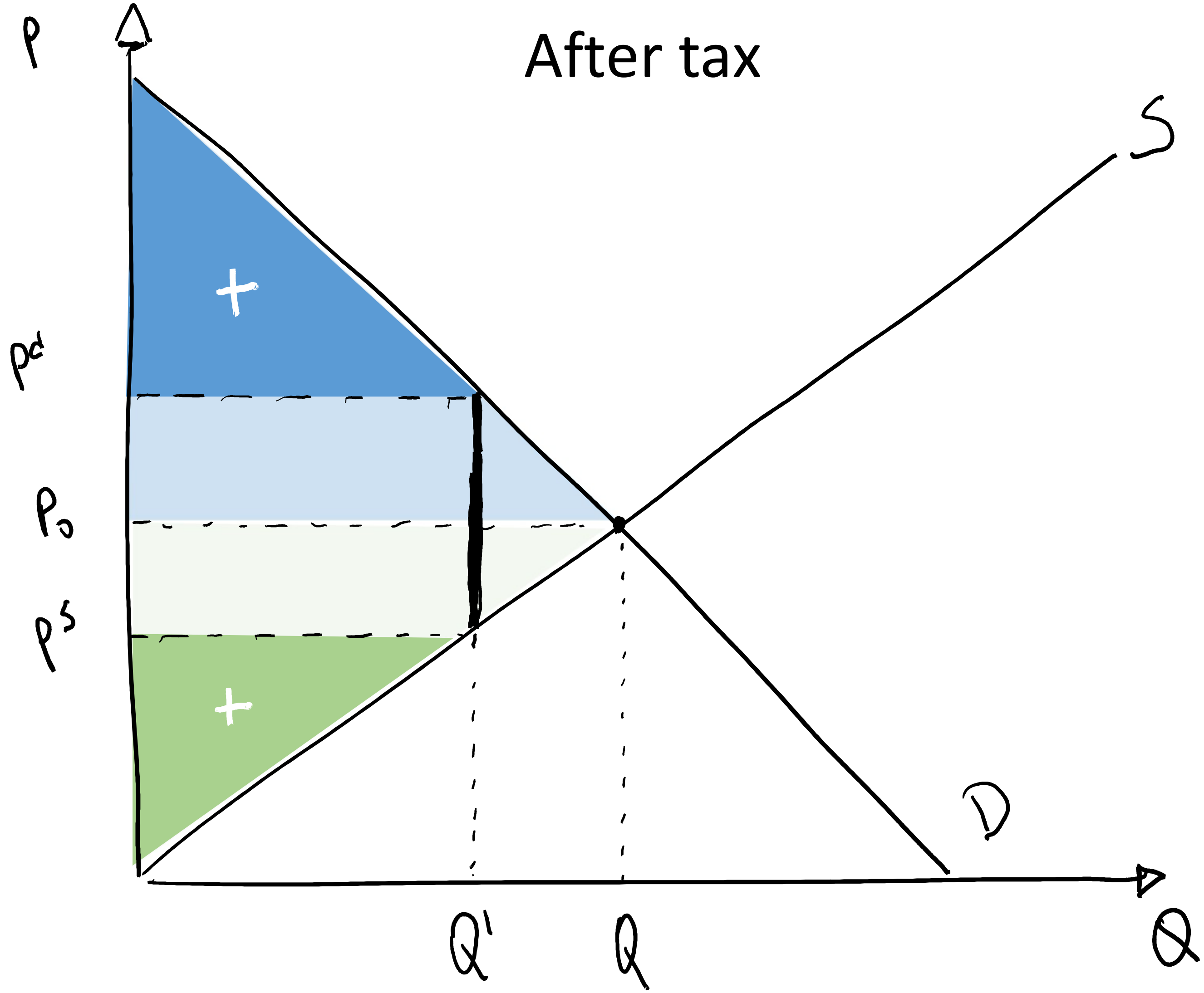


Price consumers = Price producers + t

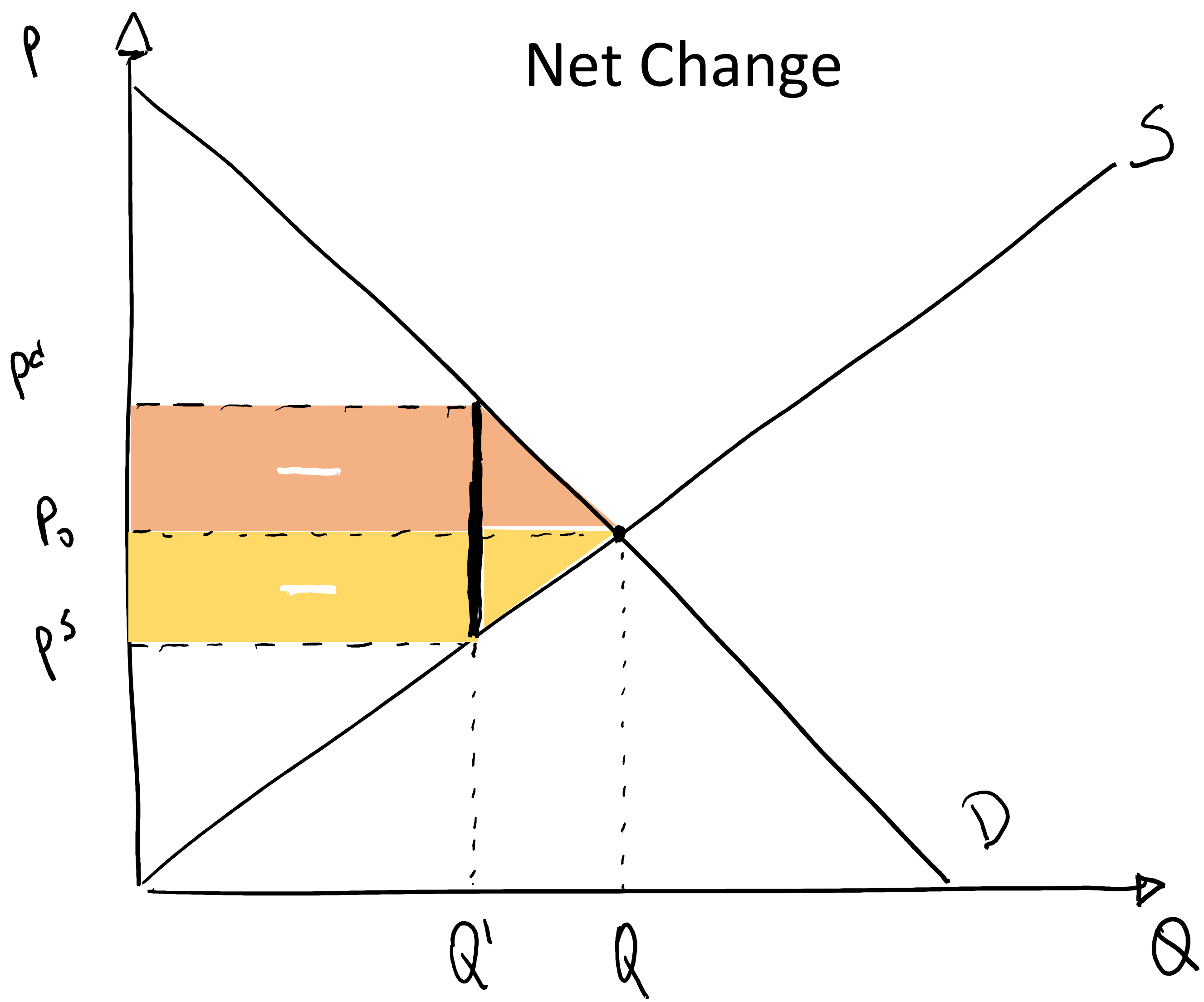


Before tax
P
S
p^d
+
P_0
p^s
+
D
Q
Q

After tax

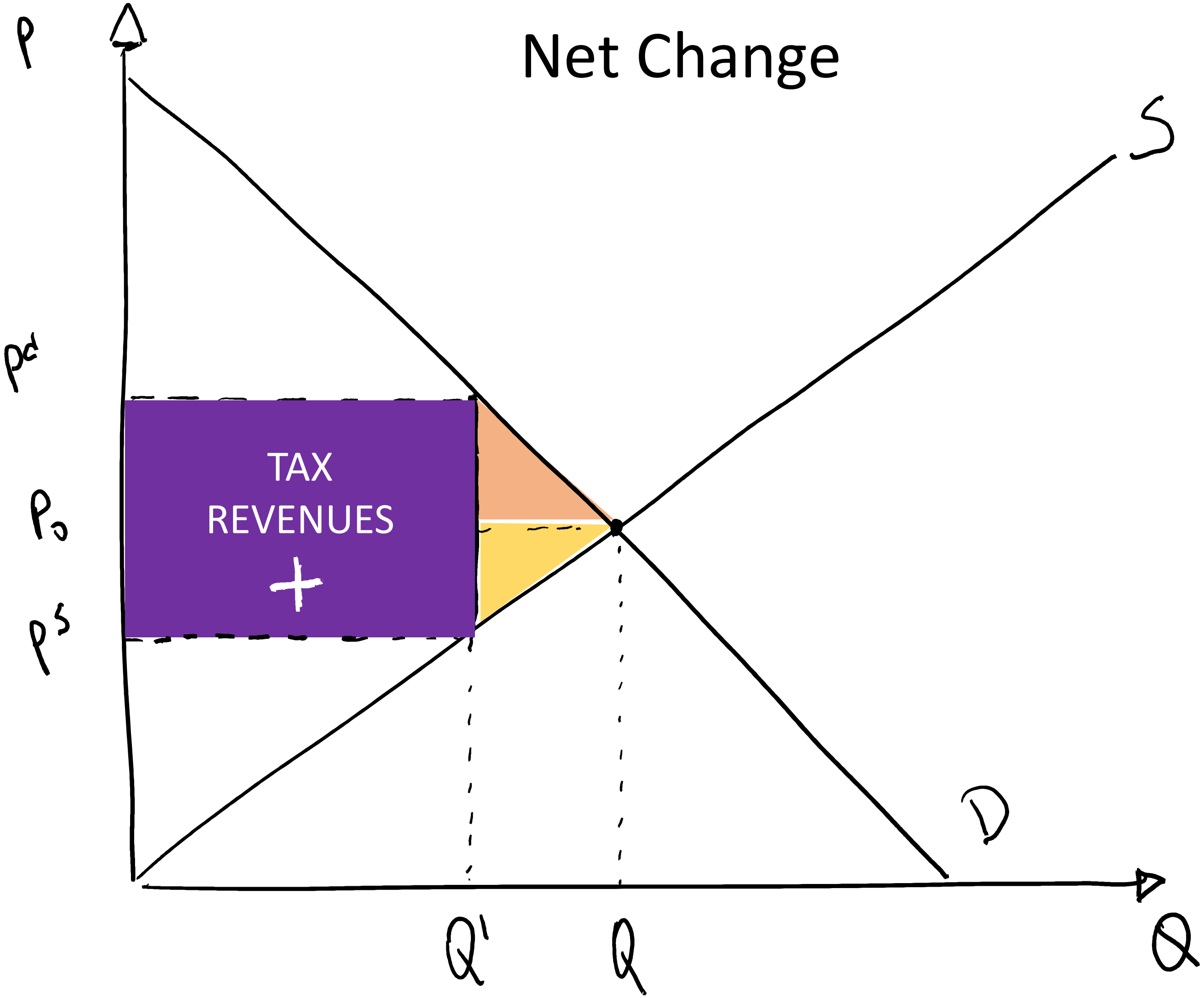


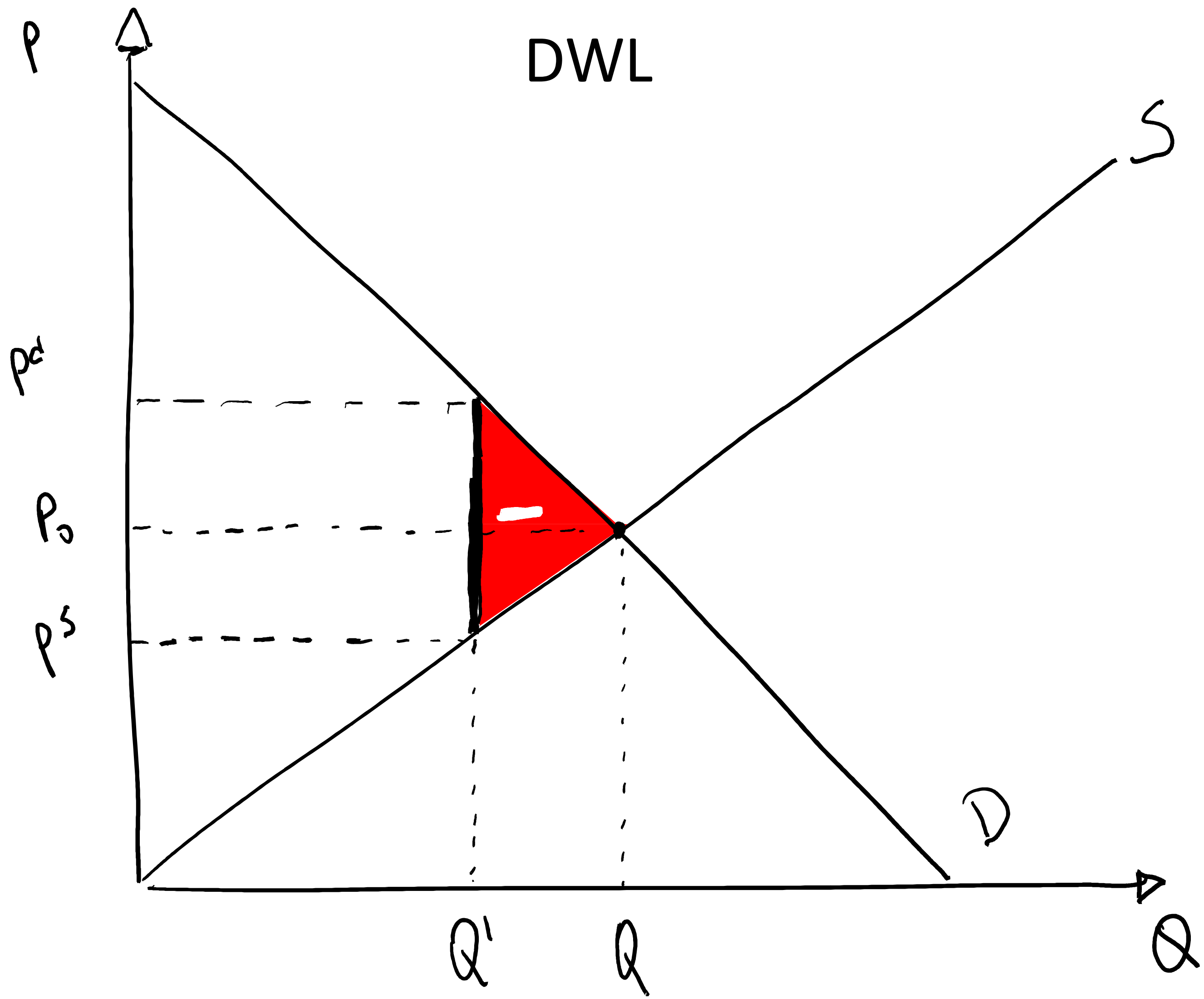
Net Change



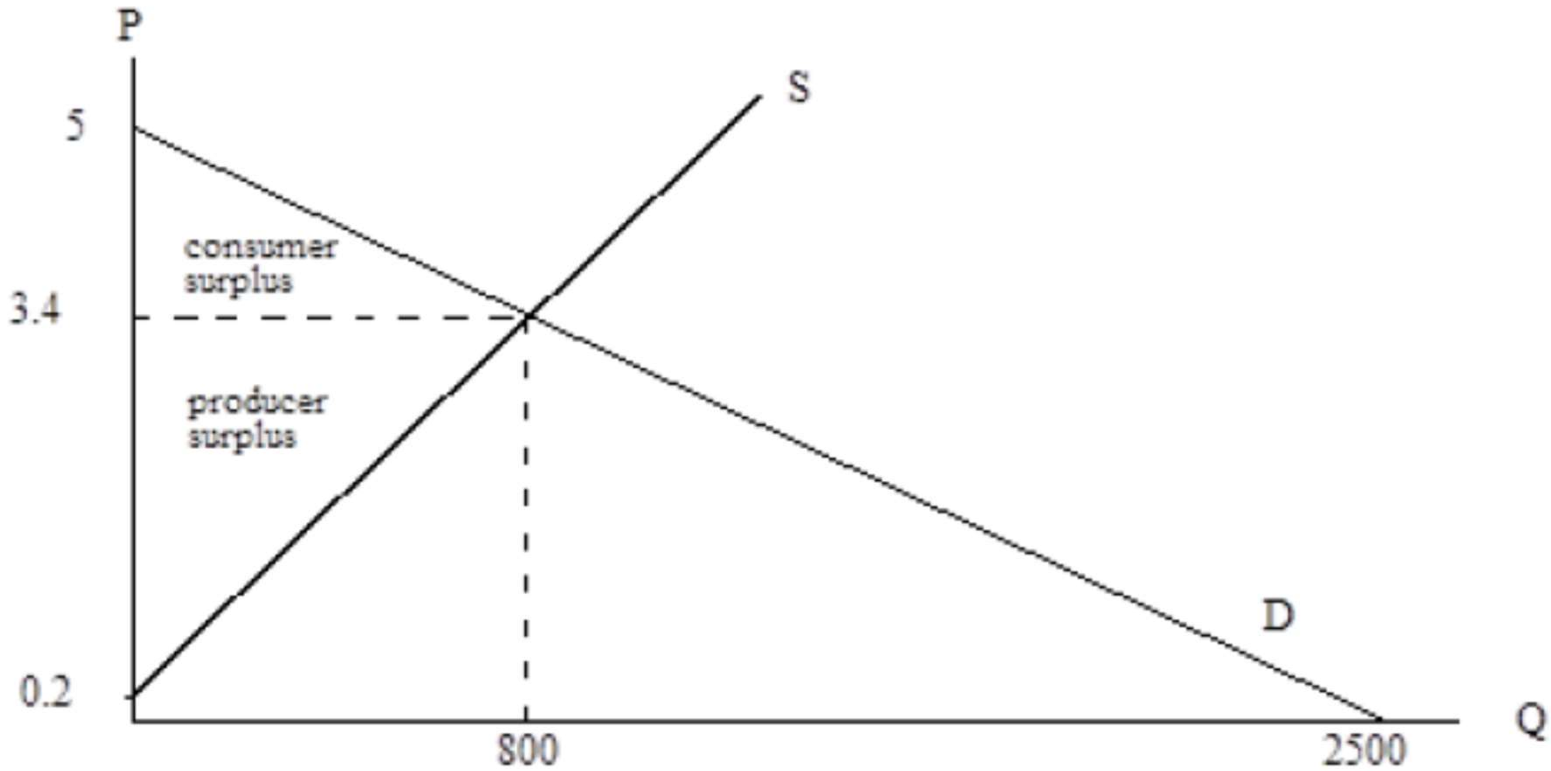
BUT NOT ALL THESE AREAS ARE LOST…

Net Change



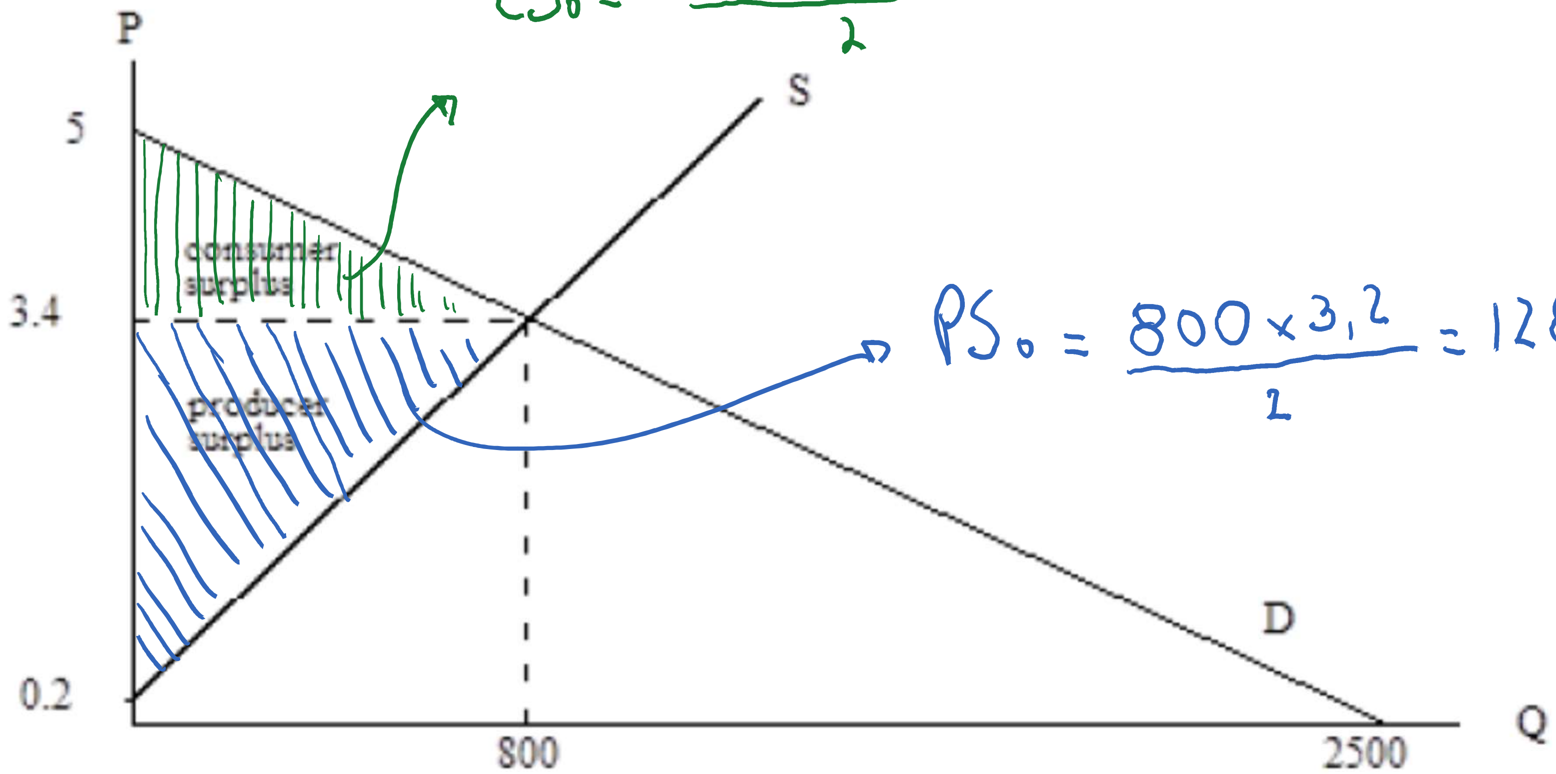

DWL
P
S
pd
P0
ps
D
Q'
Q
Q

Q11 ..back to the exercise



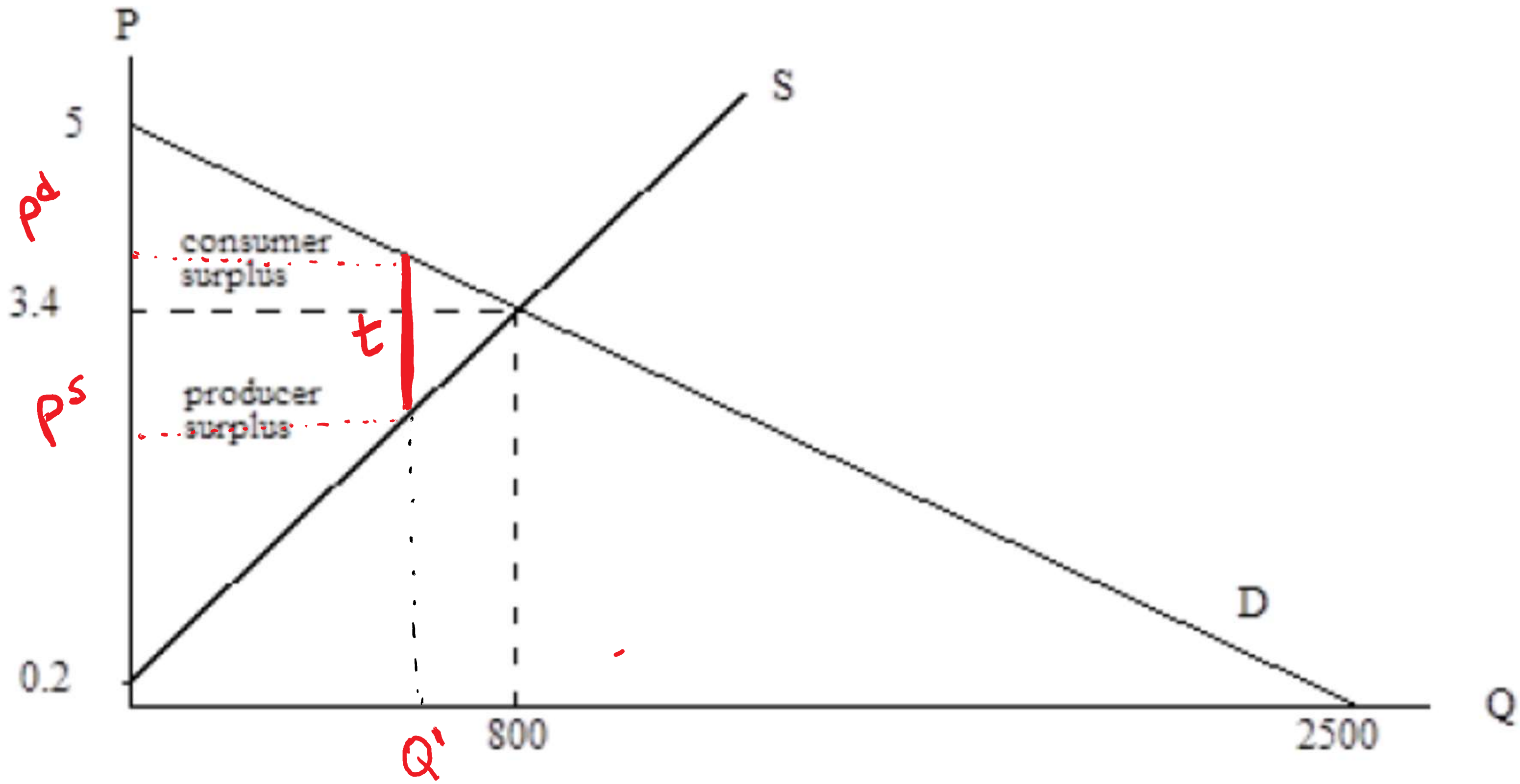
Q11

$$CS_0 = \frac{800 \times 2{,}6}{2} = 640$$



$$PS_0 = \frac{800 \times 3{,}2}{2} = 1280$$

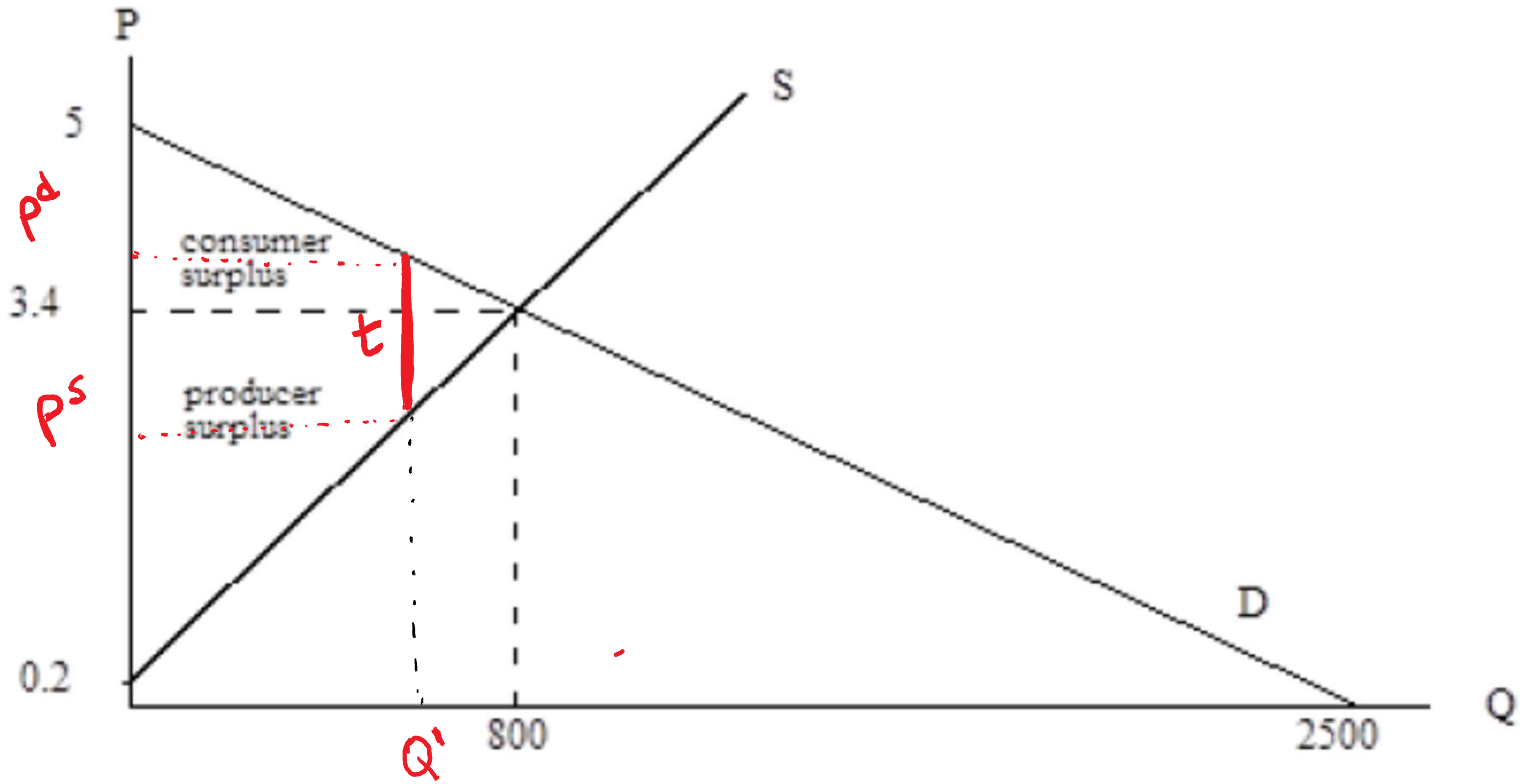
Q11 with the tax



Q11

Key: Find the quantities P^d P^s Q'

$$P^d = P^s + t$$



Q11

Key: Find the quantities P^d P^s Q'

$$P^d = P^s + t$$

$$5 - 0{,}002\,Q' = 0{,}2 + 0{,}004\,Q' + 1{,}2$$

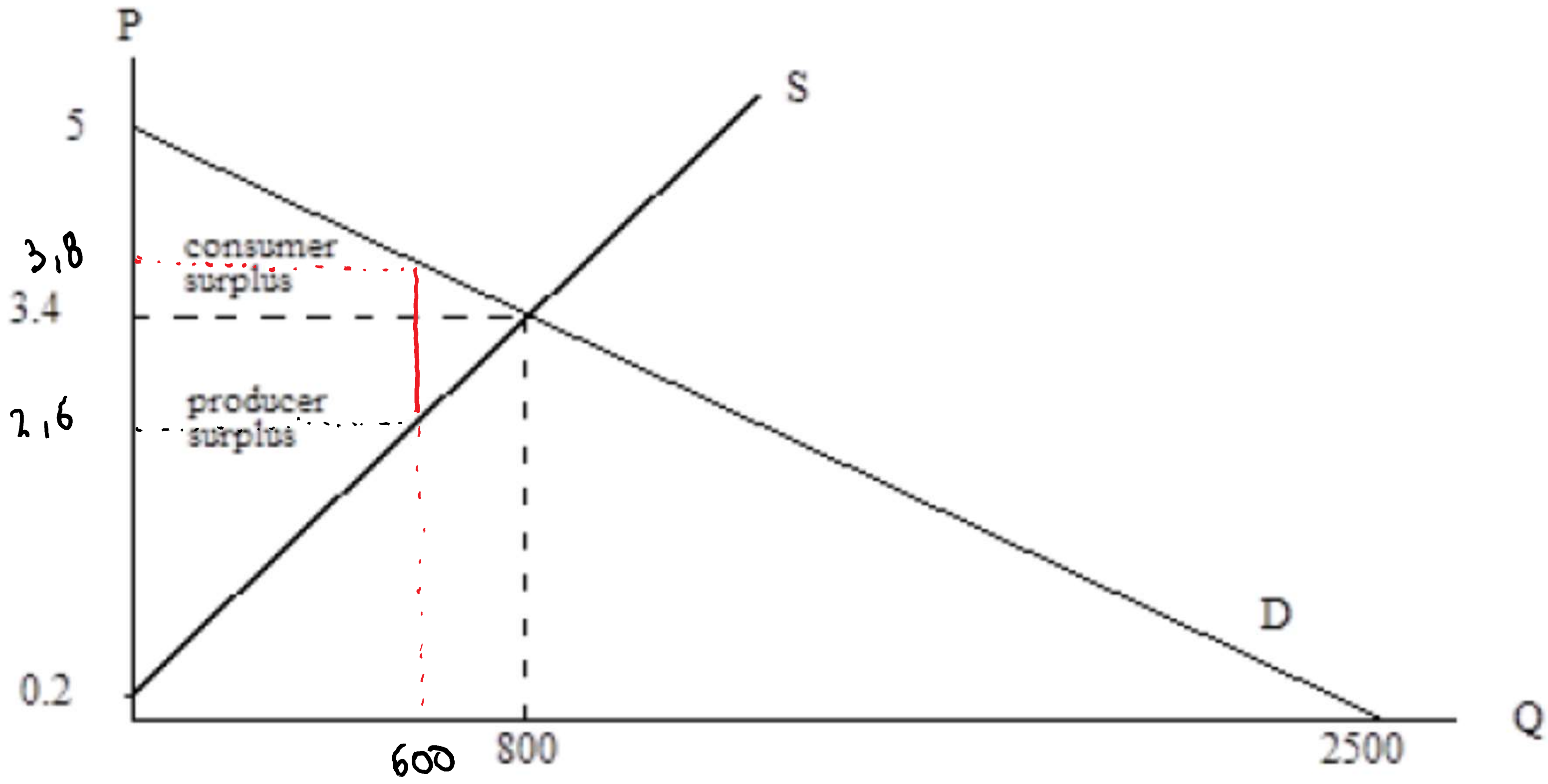
$$\boxed{Q' = 600}$$

→ in the demand : $\boxed{P^d = 3{,}8}$

→ in the supply : $\boxed{P^s = 2{,}6}$

Q11

Key: Find the quantities P^d P^s Q'



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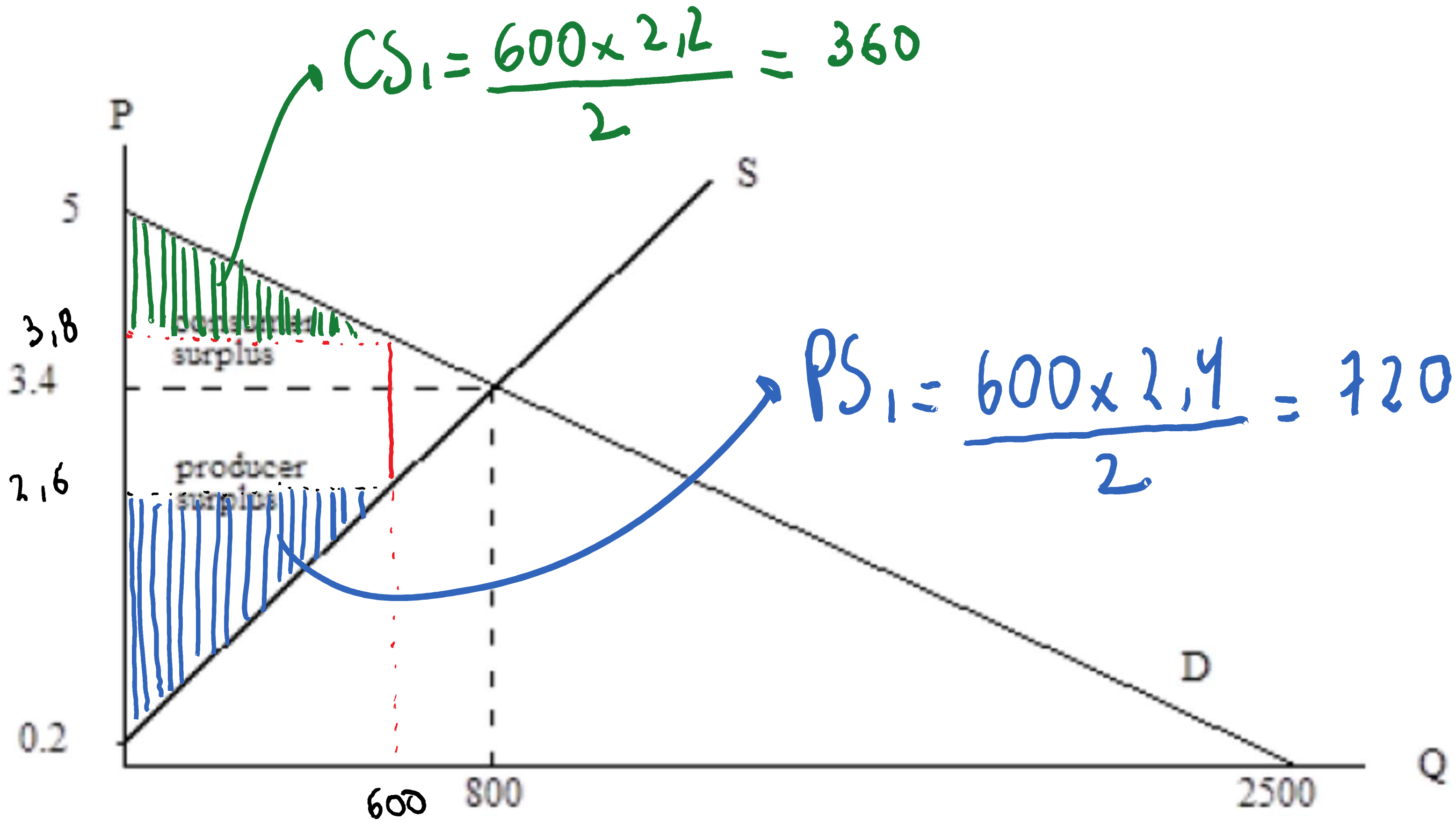
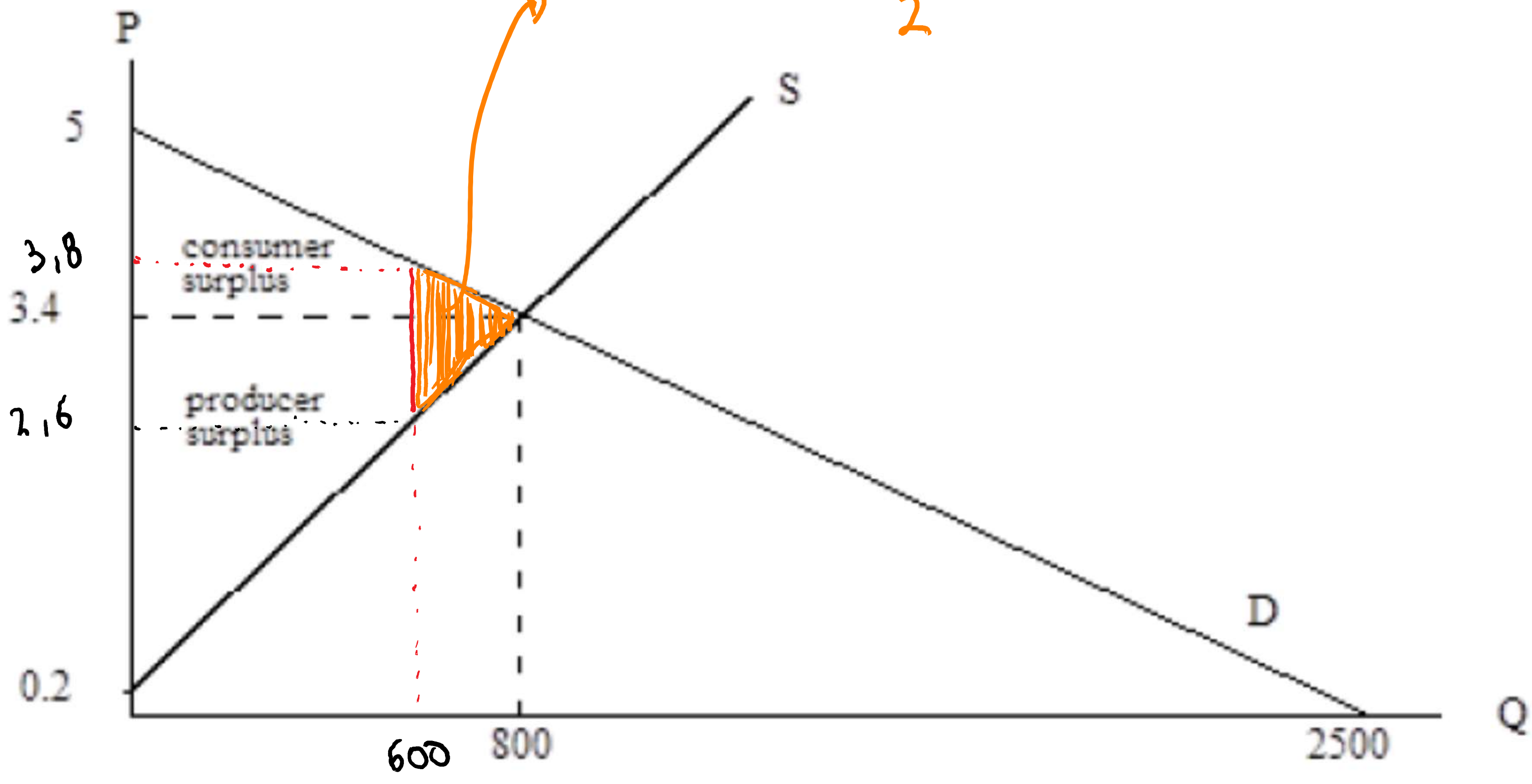


Q11

Key: Find the quantities P^d P^s Q'

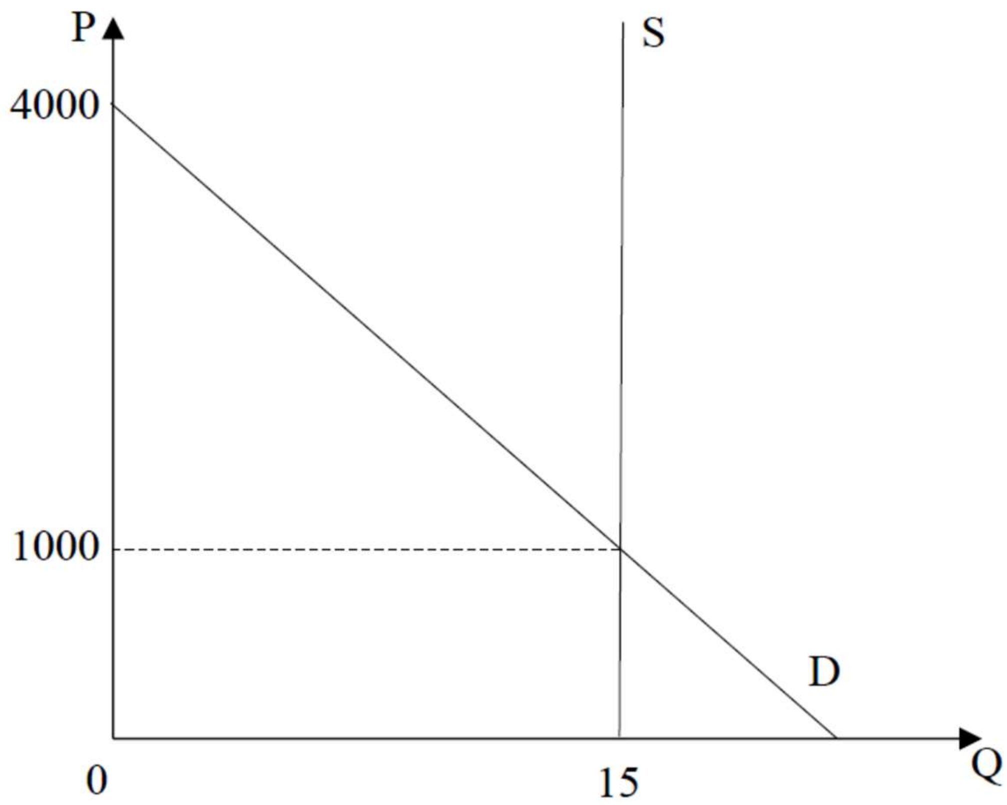
$$DWL = \frac{200 \times 1{,}2}{2} = 120$$



Q13

Suppose the market for Wimbledon tickets is perfectly competitive. Suppose the demand for Centre Court tickets is given by $Q = 20 - 0.005P$, where Q is the number of tickets in thousands and P is the price in pounds. Centre Court's capacity is known to be equal to 15000 people. → KEY INFO

a. What is the consumer and producer surpluses in equilibrium? What is the total surplus? What is the deadweight loss?



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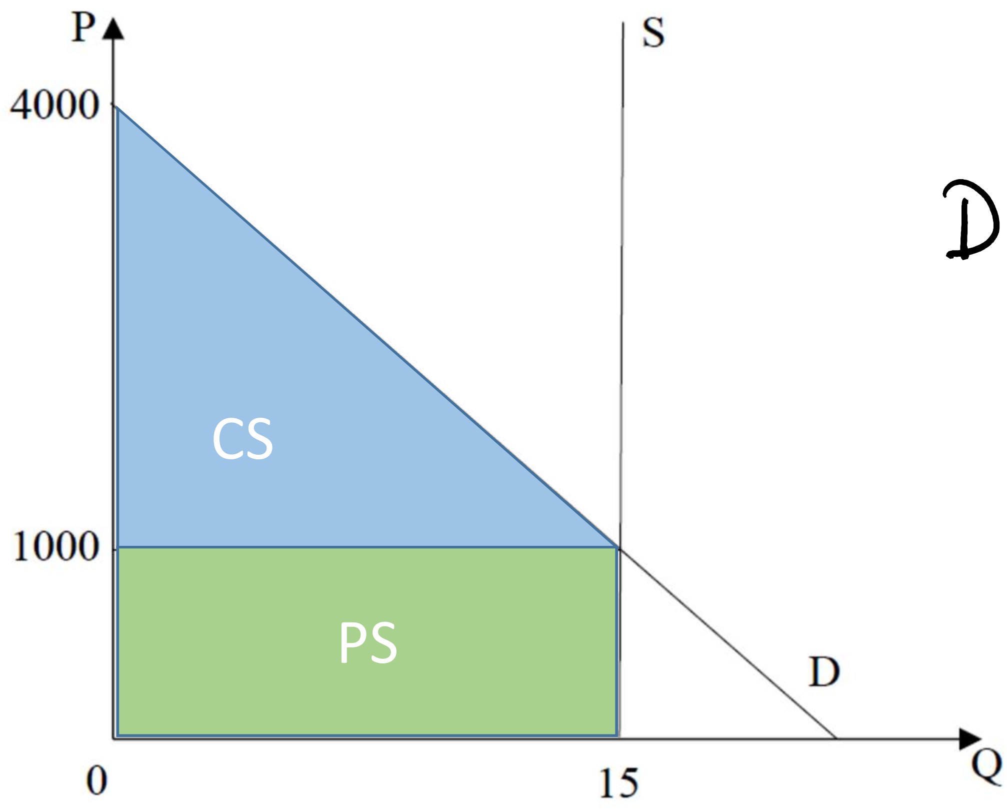
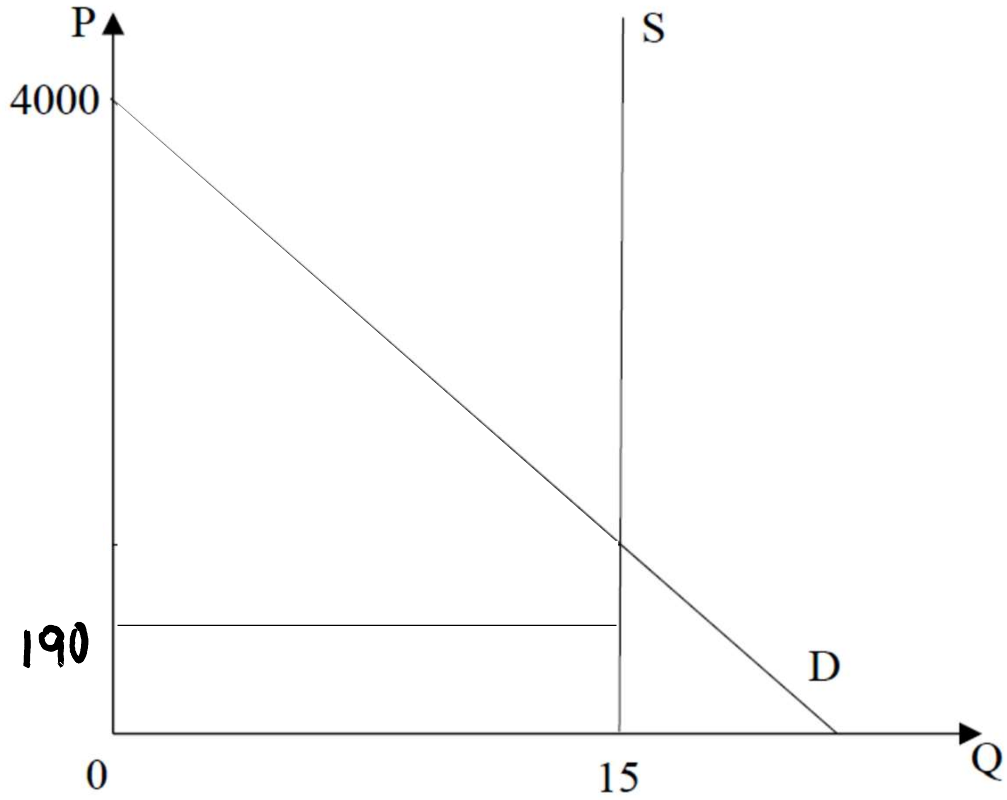


DWL?

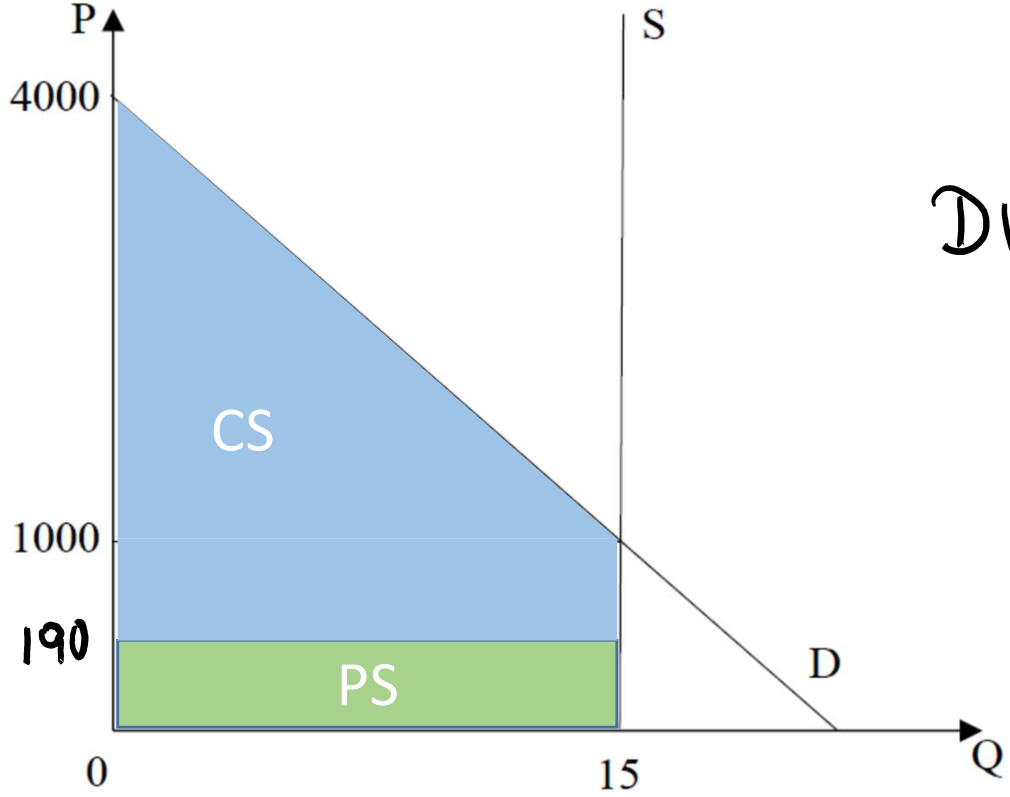
Part b) Set a price of £190 and allocate the 15,000 tickets randomly.
What is Producer surplus?

Part c): Set a price of £190 and allocate the tickets to the 15,000 consumers with the “highest willingness to pay”

Find DWL

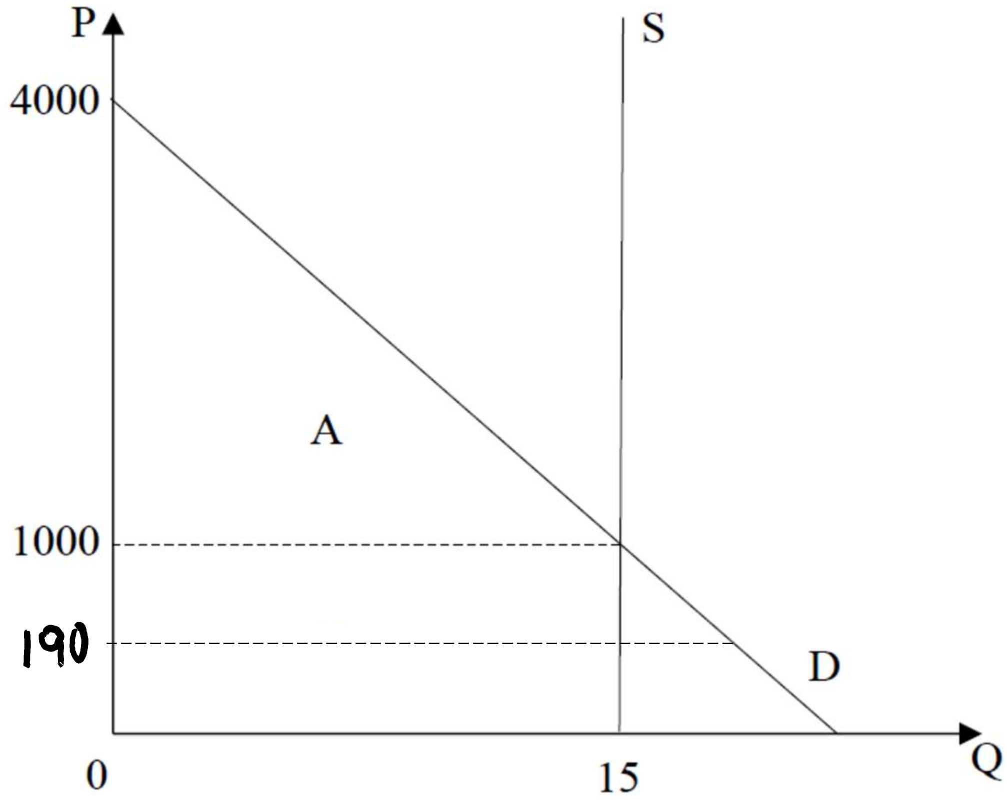


Part c): Set a price of £190 and allocate the tickets to the 15,000 consumers with the “highest willingness to pay”



DWL?

Part d): The 15,000 tickets allocated to the consumers with the "lowest willingness to pay" (above £190 obviously)



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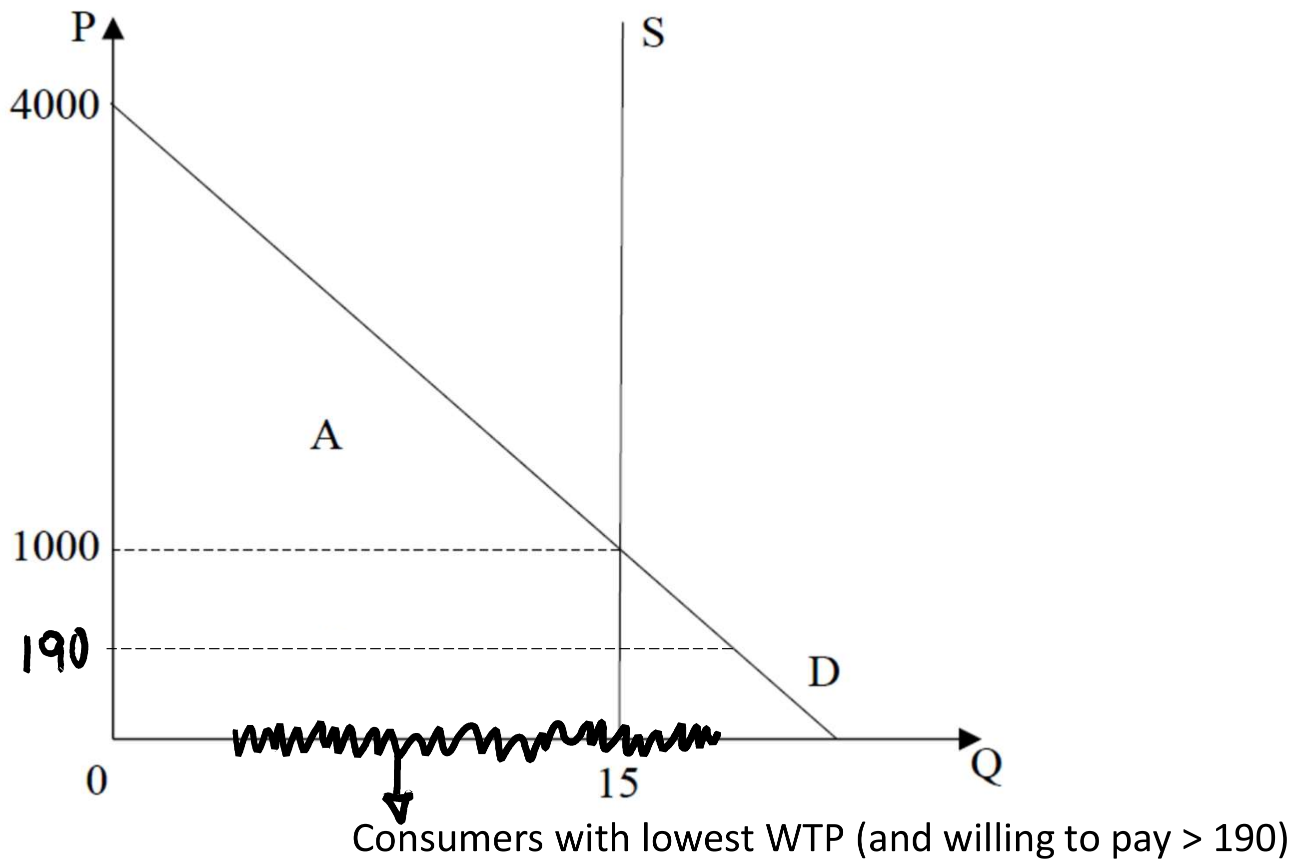

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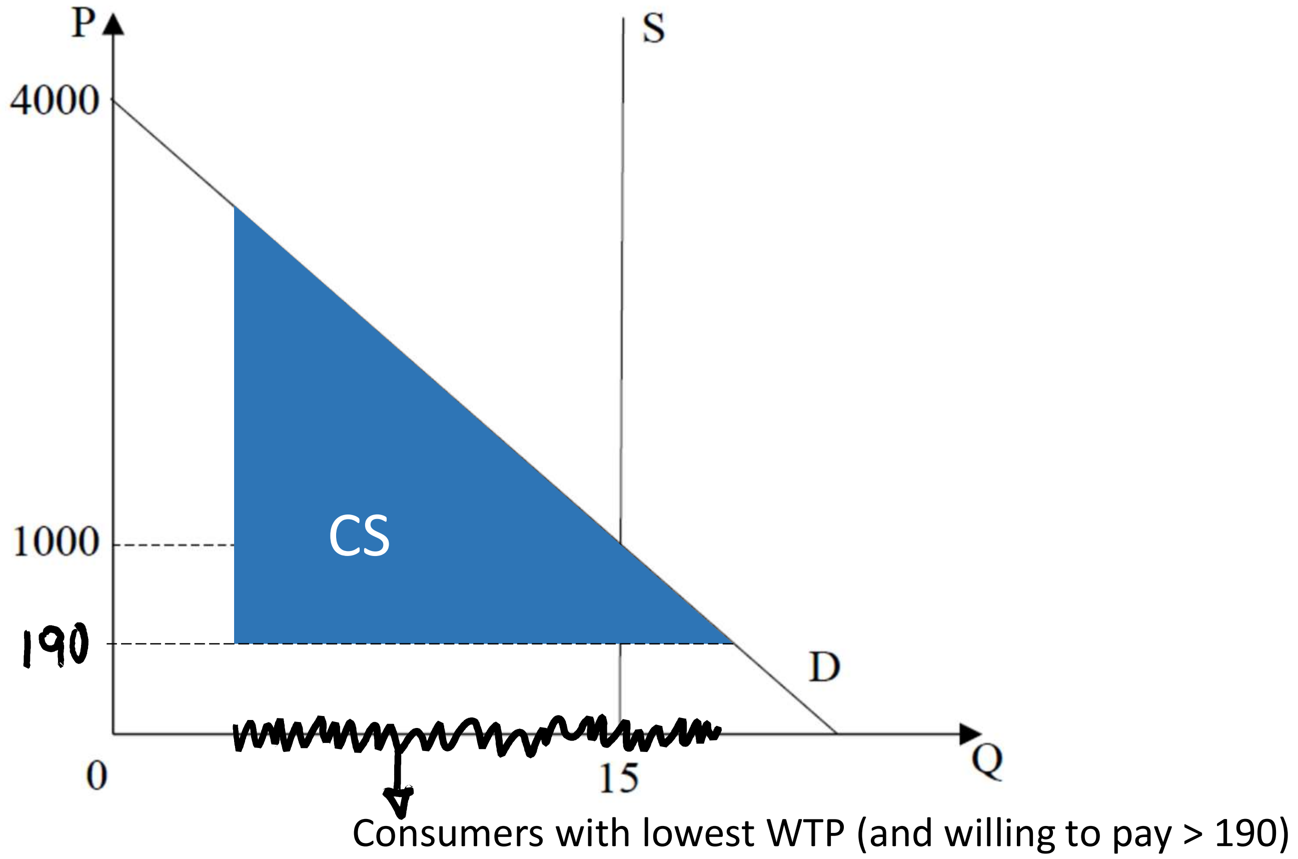

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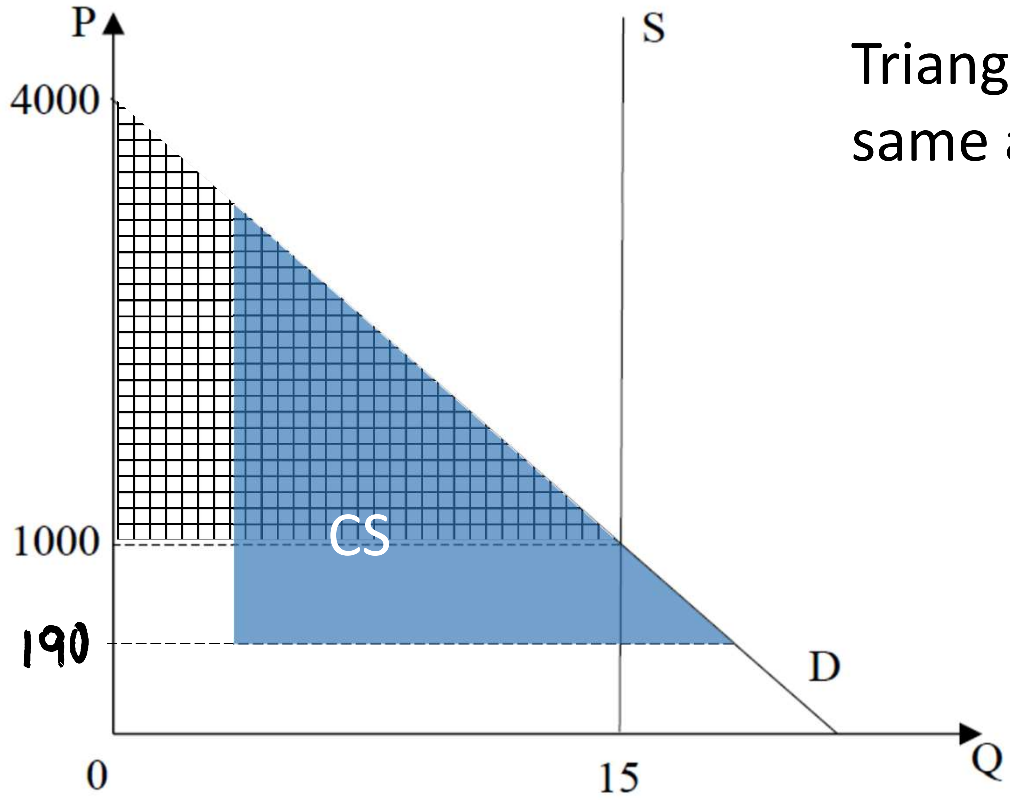
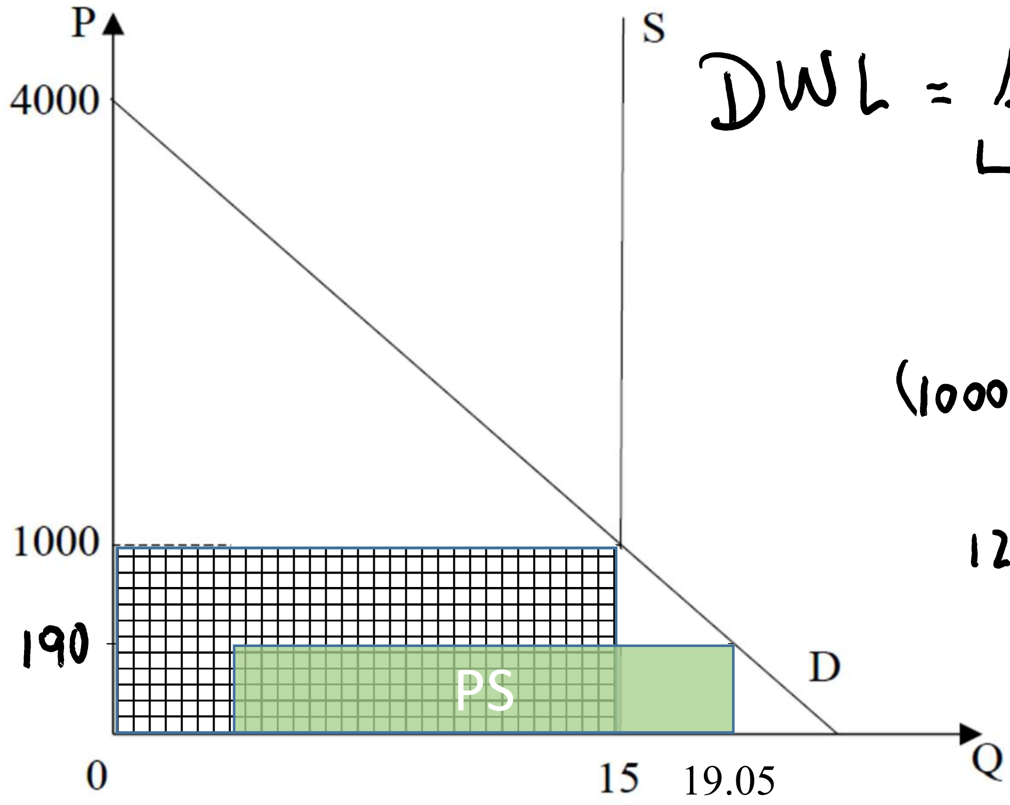
Compare with CS in competitive equilibrium



Triangles have same areas

Part d): The 15,000 tickets allocated to the consumers with the "lowest willingness to pay" (above £190 obviously)

Compare PS with competitive equilibrium



$$DWL = \underbrace{\Delta CS}_{0} + \underbrace{\Delta PS}$$

$$(1000-190) \times 15000$$

$$= 12{,}150{,}000$$

Q15

$$Minimize \quad TC = 2.5K + 7.5L$$

subject to: $Q = 4.5 = K^{0.5}L^{0.25}$

a) Lagrange method

$$\mathcal{L} = 2.5K + 7.5L + \lambda(4.5 - K^{0.5}L^{0.25})$$

Now, just take derivatives = 0 with respect to the THREE variables K,L,λ

a) Lagrange method

$$(1)\ \mathcal{L}_K = 2.5 - 0.5\lambda K^{-0.5}L^{0.25} = 0$$

$$(2)\ \mathcal{L}_L = 7.5 - 0.25\lambda K^{0.5}L^{-0.75} = 0$$

$$(3)\ \mathcal{L}_\lambda = 4.5 - K^{0.5}L^{0.25} = 0$$

Rearrange to get:

$$(1)\ 2.5 = 0.5\lambda K^{-0.5}L^{0.25}$$

$$(2)\ 7.5 = 0.25\lambda K^{0.5}L^{-0.75}$$

Divide (1) by (2): $\dfrac{2.5}{7.5} = \dfrac{0.5}{0.25}\dfrac{K^{-0.5}L^{0.25}}{K^{0.5}L^{-0.75}} \Leftrightarrow \boxed{K = 6L}$

a) Lagrange method

Substitute $K = 6L$ into (3)

$$4.5 = (6L)^{0.5} L^{0.25}$$

$$\boxed{L = 2.25}$$

..and we get K from condition $K = 6L = 13.5$

b) Find optimal K and L by equating slope of the constraint (isoquant)with slope of objective function

We already did this last tutorial!

(remember condition $MRTS = \frac{w}{r}$)

c) Solve by direct substitution of the constraint

Rewrite the constraint: $4.5 = K^{0.5}L^{0.25} \Leftrightarrow \boxed{K = \frac{(4.5)^2}{L^{0.5}}.}$

Substitute into the objective function

$$TC = 7.5L + 2.5\frac{(4.5)^2}{L^{0.5}}$$

Now we have a function that depends on L only

$$\Rightarrow \frac{dTC}{dL} = 0$$

c) Solve by direct substitution of the constraint

$$\frac{dTC}{dL} = 7.5 - 0.5 \cdot 2.5 \cdot (4.5)^2 \cdot \frac{1}{L^{3/2}} = 0$$

$$\boxed{L = (3.375)^{\frac{2}{3}} = 2.25}$$

And we finally get K from condition $K = \frac{(4.5)^2}{L^{0.5}} = 13.5$

Extra: Get the TC function and find if AC increasing or decreasing

Start from condition $K = 6L$

Replace into “generic” constraint:

$$Q = K^{0.5}L^{0.25}$$

$$Q = (6L)^{0.5}L^{0.25} = 6^{0.5}L^{3/4}$$

From that, write L as a function of Q:

$$\left.\begin{aligned} L &= 0.303Q^{4/3} \\ \Rightarrow K &= 1.82Q^{4/3} \end{aligned}\right\}$$

Finally, replace into Cost definition

Extra: Get the TC function and find if AC increasing or decreasing

$$TC = 2.5K + 7.5L$$

$$TC = 2.5\left(1.82Q^{4/3}\right) + 7.5\left(0.303Q^{4/3}\right)$$

$$= 6.8Q^{4/3}$$

$$AC = \frac{TC}{Q} = 6.8Q^{1/3}$$

Increasing as we expected due to DRS!