Math 211-2015 S-W11-~~Wed~~ Friday

Review

Definite Integral as average

$\frac{1}{b-a}\int_a^b f(t)dt$ is the

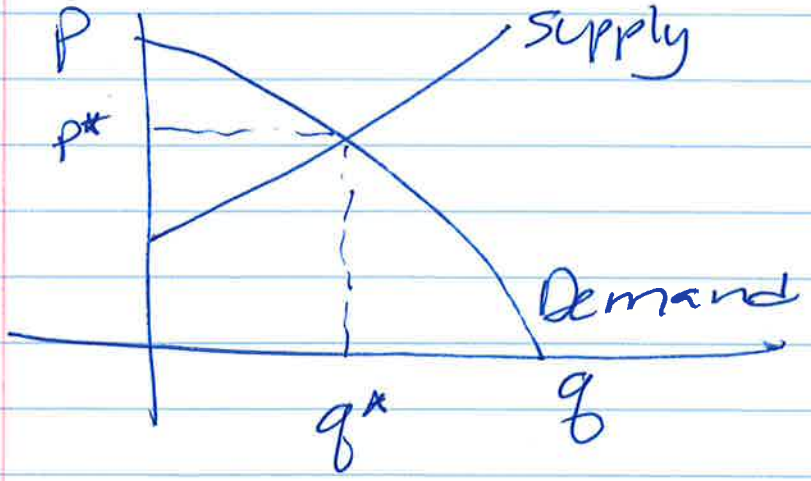
average value of $f(t)$ on

interval from a to b,

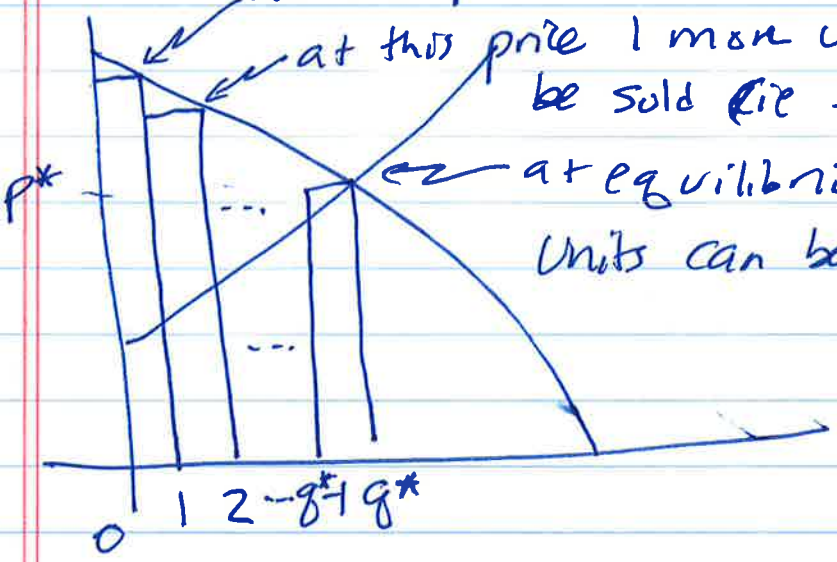
New §62

Consumer and Producer Surplus

Recall supply and demand



Market settles at quantity q^* and price p^*



The consumers surplus measures the consumer's gain from trade. It is the total amount gained by consumers by buying an item at the current price (ie. ~~market~~ equilibrium price, if in equilibrium) (eg barring price controls) rather than the price they would have been willing to pay

p^*q^* is the amount paid by consumers by buying good a current price.
The area of rectangles is the amount they would have been willing to pay

Rectangles are appropriate if q must be an integer. Otherwise (eg pounds of butter) we can subdivide further

Amount willing to be paid is area under demand curve (could even if units must be integers)

If the demand curve is

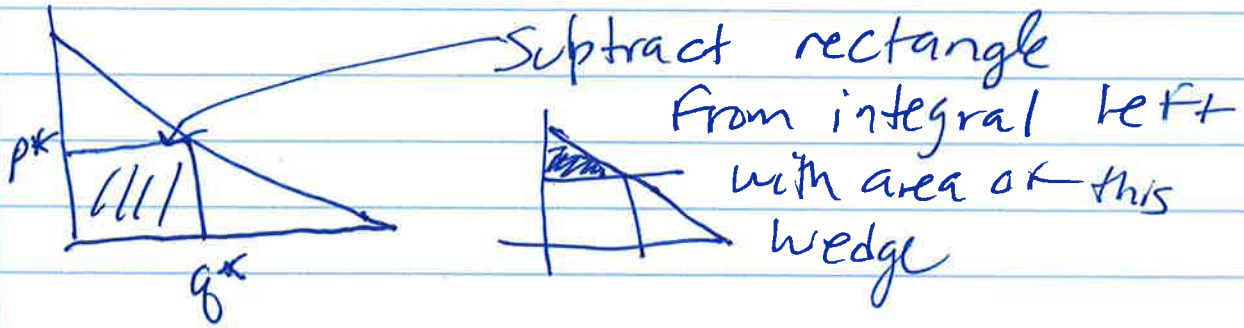
$$p = F(q)$$

Then the amount consumers would have been willing to pay is

$\int_0^{q^*} F(q)\,dq$ called the consumer expenditure

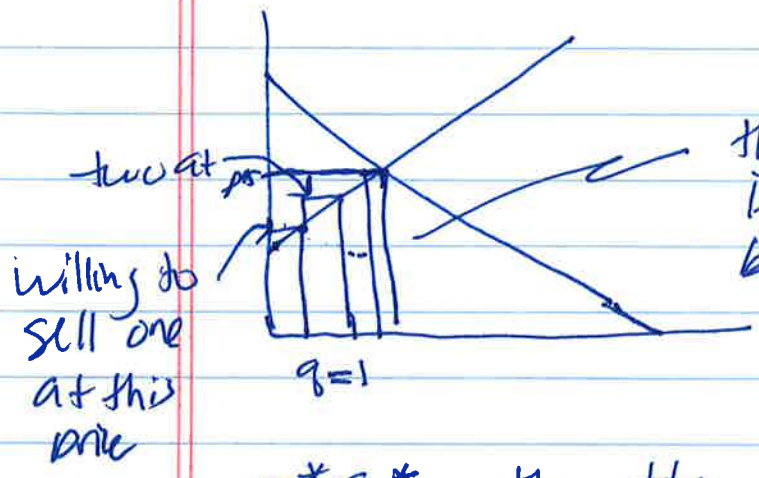
To get the consumer surplus we need to subtract the amount consumers actually paid

$$\text{Consumer Surplus} = \int_0^{q^*} F(q)\,dq - p^* q^*$$



Consumer surplus is area between demand curve and horizontal line at p^*. Area stops at q^* (i.e. integral $\int_0^{q^*}$ because that is what is actually sold),

Producer surplus — The producer surplus measures suppliers gain from trade. It is the total amount gained by ~~producers~~ producers by selling at the current price rather than at the price they would have been willing to accept.

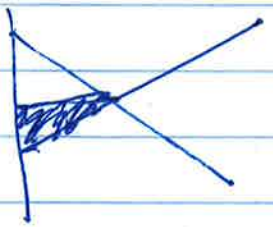


the area of these rectangles is what suppliers would have been willing to accept.

p^*q^* the the total amount of money collected by suppliers. It is more than they would have been willing to accept. What they would have been willing to accept is $\int_0^{q^*} g(q)\,dq$

Where $g(q)$ is the supply curve

Producers surplus $= p^*q^* - \int_0^{q^*} g(q)\,dq$

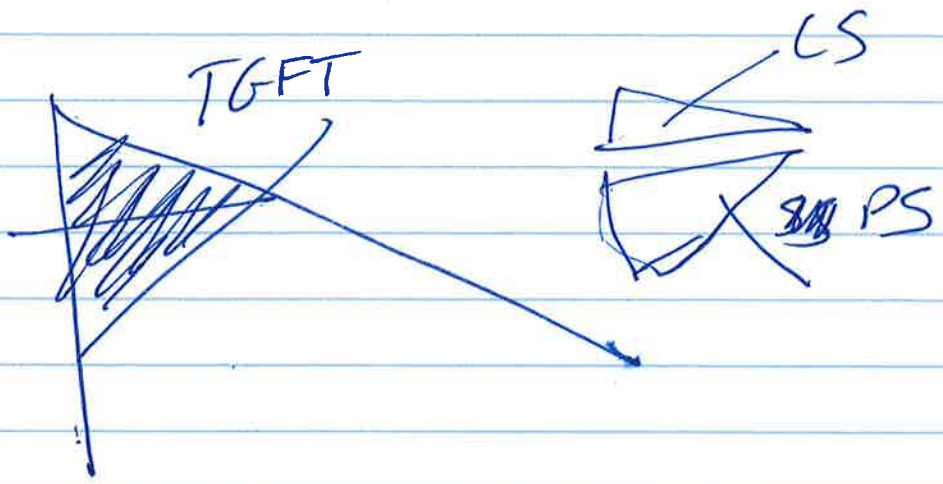


= area between the horizontal line at p^* and the supply curve.

The total gain from trade is the sum of the consumers surplus and the producers surplus

$$TGFT = CS + PS$$
$$= \int_0^{q^*} F(q)\,dq - p^*q^* + p^*q^* - \int_0^{q^*} g(q)\,dq$$
$$= \int_0^{q^*} \left(F(q) - g(q)\right) dq$$

In other words it is the total area between the current price q (this will have to be reinterpreted Caution: when the market is not in equilibrium)



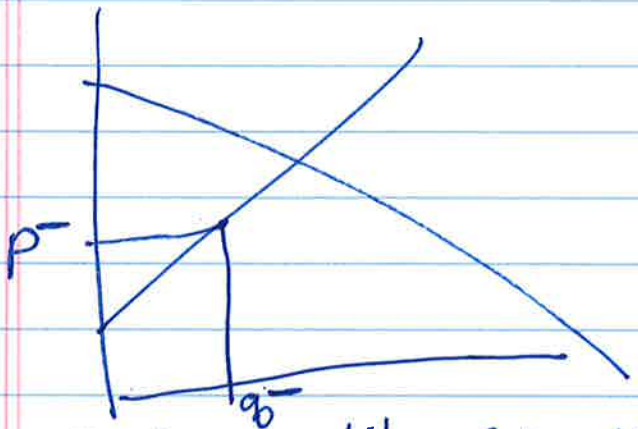
Wage and Price Controls

(p^* and q^* are not the current price and quantity

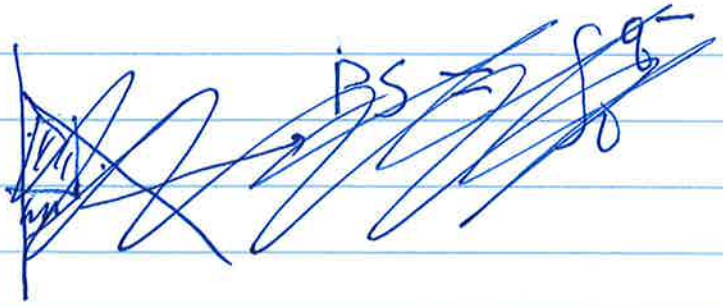
Price below equilibrium

Eg rent control

Quantity limited by supply curve / suppliers



QS all the quantity suppliers are willing to supply at that price $\bar{p}$



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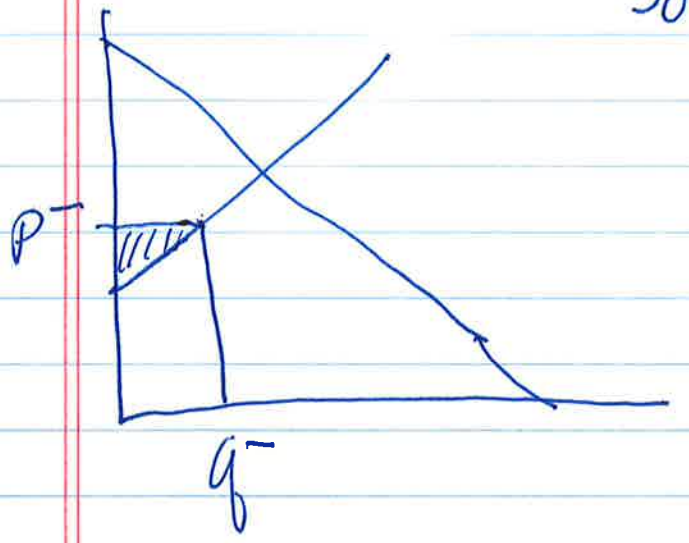
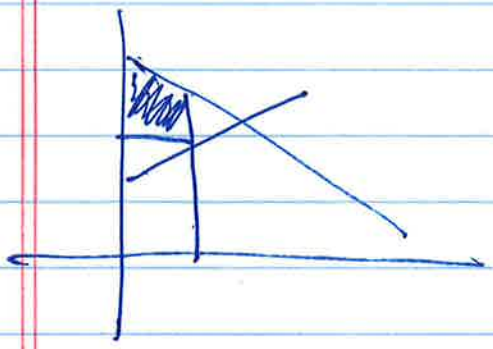
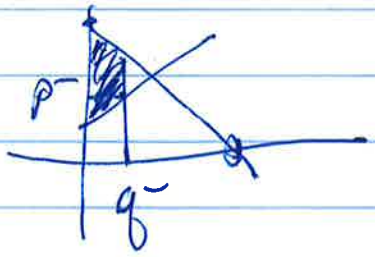
$$PS = \bar{p}\bar{q} - \int_0^{\bar{q}} g(q)\,dq$$



$$CS = \int_0^{\bar{q}} F(q)\,dq - \bar{p}\bar{q}$$



$$TGFT = \int_0^{\bar{q}} (F(q) - g(q))\,dq$$

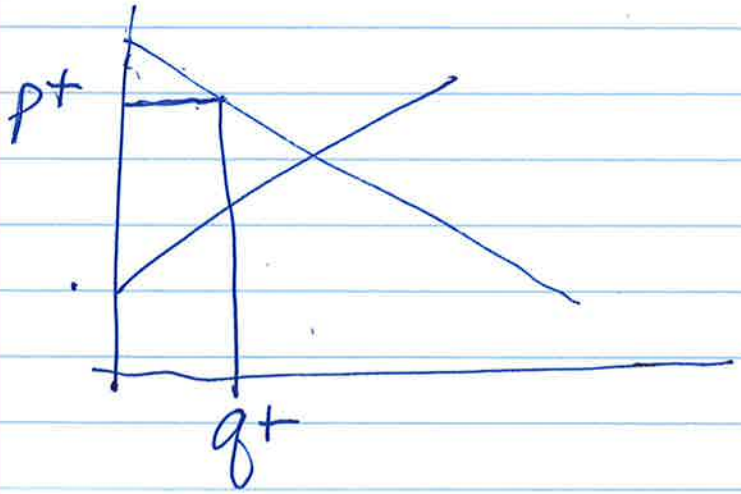


TGFT is less because price is below equilibrium,
PS is lower
CS could be higher or lower

Price above equilibrium

Eg. cartel pricing or minimum wage laws

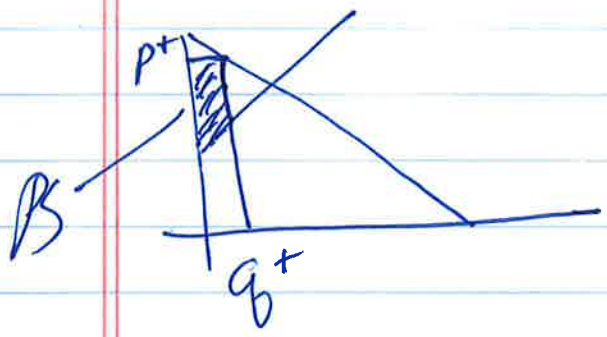
Quantity limited by Demand curve / Consumers



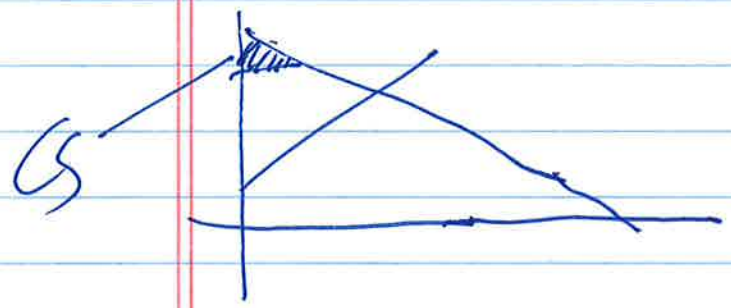
q^+ is all the quantity that consumers are willing to buy at that price p^+

Pg 90

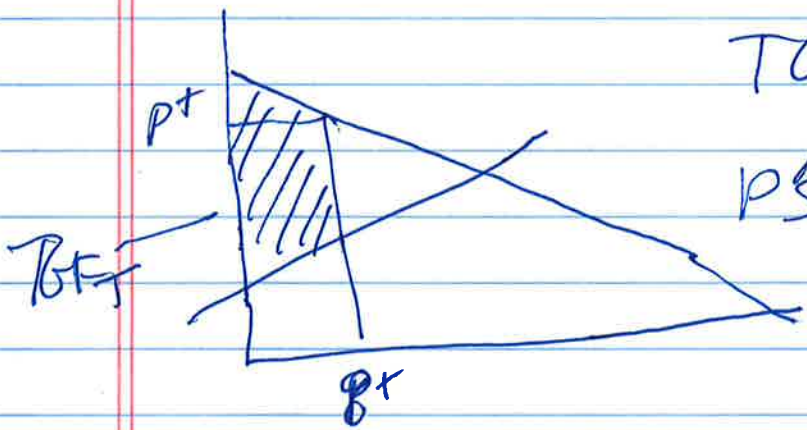
$$PS = p^+ q^+ + \int_0^{q^+} g(q)\,dq$$



$$CS = \int_0^{q^+} F(q)\,dq - p^+ q^+$$



$$TGFT = \int_0^{q^+} \left(F(q) - g(q)\right) dq$$



TGFT is lower because price is high

PS could be higher or lower

CS is lower