

Assignment 3

Solutions.

1. Firm's supply curve is part of MC curve above the minimum of average total cost: it does not make sense to produce if total revenue is less than total cost and firm will make a loss. Is this statement true or false? Provide full explanation and use a diagram to support your answer.

False. Firm's supply is part of MC above AVC curve and it is possible that a competitive firm will find it worthwhile to stay open and produce output even if the profit is negative. Since the FC is sunk, the minimum revenue required to make production worthwhile is equal the avoidable cost, which is VC (not the total cost part of which is sunk).

If $TR > VC$ firm is earning a rent and is better-off compared to not producing anything at all. In case when $\min AVC < P < \min ATC$ firm is inevitably making a loss, but if firm produces the profit maximizing output the loss will be smaller compared to the loss incurred if the firm shuts down. If firm shuts down the loss = FC. If firm produces profit maximizing level of output then the loss = FC - rent (this is because profit = $TR - TC = TR - FC - VC$; rent = $TR - VC$, therefore profit = rent - FC and the loss is of course the negative profit, loss = -profit.)

3. **Market A:** demand curve is perfectly elastic and supply curve is upward sloping.
Market B: supply curve is perfectly inelastic and demand curve is downward sloping.
 Compare impact of a 1 dollar per unit tax levied on producers in these 2 markets.
- These two situations represent extreme cases when entire tax burden will be borne by one side of the market. Since in both cases it is supply that is relatively inelastic, the firms will pay the entire tax. This means that none of the tax is shifted to the consumers and after the tax consumers pay exactly the same price as before the tax. As for the firms, after the tax is imposed, the price they receive falls by the tax.
 - The outcome is different when we compare welfare loss associated with the tax. $DWL = \frac{1}{2}t(Q^* - Q_t)$; recall that larger elasticities will result in larger change in quantity after tax. There is no DWL in market B because one of the curves is perfectly inelastic. In market A both demand and supply are more elastic compared to market B, that is why DWL is larger in market A:
 In **market A** supply is upward-sloping, which means that Q falls after tax as firms reduce quantity supplied in response to the lower price they receive.
 In **market B** supply curve is perfectly inelastic which means that the firms will supply the same quantity regardless of the market price; when firms receive lower price after the tax they do not reduce the quantity supplied.

4. Consider a competitive market with demand given by $P = 120 - Q$ and supply given by $P = .5Q$.

- a) Find competitive equilibrium price and quantity P^* and Q^* . What are the consumer and producer surplus?
 $P^* = 40$, $Q^* = 80$, $CS = 3,200$, $PS = 1,600$.

- b) Suppose government introduces a unit tax of $t = 15$ on producers. Find the quantity traded in the market after tax Q_t . Find the price paid by consumers P_t and price received by producers after tax P_S .
 $Q_t = 70$, plug into D to find $P_t = 50$, plug Q_t into supply to find $P_S = 35$,
 check: $P_S = P_t - t = 50 - 15 = 35$
- c) Calculate consumer and producer surplus, tax paid by consumers, tax paid by producers, and the total tax revenue to the government, find the deadweight loss associated with the tax.
 $CS=2,400$, $PS=1,225$, $GR = t \times Q_t = 1,050$,
 consumers pay $(P_t - P^*)Q_t = 700$
 firms pay $(P^* - P_S)Q_t = 350$
 $DWL = \frac{1}{2}t(Q^* - Q_t) = 75$
 Check: after tax $CS+PS+GR+DWL= PS+CS$ before tax. This is because they sum up to the same area on your diagram.
- d) Calculate price elasticity of demand and supply in the competitive market equilibrium using point elasticity formula. Now calculate what percentage of tax revenue is paid by the consumers and what percentage is paid by the producers. What can you say about the relationship between the elasticity of supply and demand and the shares of tax paid by consumers and producers?
 Point elasticity of demand is -0.5 and elasticity of supply is 1 in the competitive equilibrium. Consumers pay $\frac{2}{3}$ of the tax and firms pay $\frac{1}{3}$ of tax. Demand is inelastic compared to supply, consumers bear more of the tax burden.
- e) Show your results on a diagram. In particular indicate competitive equilibrium, after tax quantity and prices, after tax consumer and producer surplus, government revenue and the deadweight loss.