**NTU SSS Economics HE2001**  
**Tutorial 8 (Simple Welfare Analysis)**

1) Let us now consider the case of a per unit subsidy.   
Assuming that we have linear supply curves and demand curves. Illustrate using a diagram:

1. The effects of a per unit subsidy of on *producers*.
2. The effects of a per unit subsidy of on *consumers*.

For a) and b), indicate in the diagram(s) consumer surplus, producer surplus and amount of deadweight welfare loss.

1. How do you think the elasticity of supply and demand will affect the incidence of benefits of a per unit subsidy on producers?

a) Yellow: cost of subsidy. Green: CS. Pink: PS. Blue: DWL.

*s*

Note: With a subsidy, .   
 is the demand curve in terms of the before subsidy prices ( here).

(New producer surplus is equal to shaded pink portion which gives the area between the consumer’s prices and the new supply curve. This is also equal to the dotted red area which gives the area between the seller’s prices and the old supply curve. This is because you can either compare Ps with S or Pb with S' to get the producer surplus. This is because Ps is the actual amount received per unit by sellers and S is the actual costs. On the other hand, S' is the supply curve taking into account that later they will have to pay some additional tax, so it needs to be compared with the price which doesn't include tax, Pb. The new consumer and producer surplus can be compared with the old consumer and producer surplus at to obtain the deadweight welfare loss.)

b) Yellow: cost of subsidy. Green: CS. Pink: PS. Blue: DWL.

*s*

Note: D is the demand curve in terms of the before subsidy prices here).

The outcome is exactly the same as in part a).

c) Similar to our analysis on taxes, we look at the gap between the initial prices and the prices faced by producers and consumers to get the incidence of benefits. (Subsidy accruing to consumer is , subsidy accruing to producer is .)

The more inelastic demand is, the greater the benefit on consumers. (e.g. when demand is perfectly inelastic, a subsidy purely lowers the price faced by consumers.)

The more inelastic supply is, the greater the benefit. (e.g. when supply is perfectly inelastic, a subsidy just raise the price faced by the producer.

Intuitively, this is because a consumer/producer who has more inelastic supply/demand is more “reliant” on consuming/producing the good, and thus will receive more benefits.

2) In the market for cars, the market demand curve is given by while market supply curve is given by

1. Suppose that there is an ad-valorem (percentage) sales tax of 5 percent paid by consumers. I.e. where is the price paid by buyers and is the price received by sellers. Solve for the equilibrium and and quantity in the market.
2. Illustrate the effects of the ad-valorem tax above in a diagram, indicating the consumer surplus, producer surplus and deadweight welfare loss.

a)

Setting quantity supplied equals to quantity demanded, we have

The perfect competition equilibrium without taxes was and .

b) Green: CS with tax. Red: PS with tax. Yellow Tax collected. Blue: DWL.

Note that in this diagram, consumer surplus must be derived from a comparison of with the original (and not with ). The reason is that does not capture the consumers actual valuations from consuming . This is because once the equilibrium prices and q’ are determined by the intersection of with , the resultant tax for all quantities consumed is always constant at 0.05.

3) In the bubble tea market, there are 2 consumers with different preferences and 10 homogeneous firms. Consumer 1 has inverse demand function while Consumer 2 has inverse demand function . Each of the firms has inverse supply function .

1. Derive the (aggregate) market supply curve and market demand curve.
2. What is the equilibrium quantity and price in the market? Calculate the amount of producer and consumer surplus in the market.
3. Suppose there is a per-unit tax on firms of $0.5. What is the deadweight welfare loss from the tax?

(a) Take the horizontal summation of all supply curves.

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Take the horizontal summation of both the demand curves.

For there is no positive demand.  
For 15, demand only comes from Consumer 1, .  
For demand comes from both Consumer 1 and 2, .

(b) Assume the equilibrium price is between 15 and 20, then gives .   
. Hence our assumption is wrong.

Hence the equilibrium price is less than 15. gives . .  
The equilibrium quantity is .  
Both consumers have positive demand here.

Producer Surplus is the area between the price line and the inverse market supply curve .

图表, 折线图

描述已自动生成

Consumer Surplus is the sum of the areas between the inverse demand curves and the price line, which is the green area (triangle) plus yellow area (trapezium)

(57.175.

图表, 折线图

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(c) With a tax on firms,

In equilibrium, we need

Assume the equilibrium price is between 15 and 20, then we solve:

Hence our assumption about price is wrong.

For , we solve

图表, 折线图

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The deadweight loss is the triangle area ABC.

The coordinate of B is , C is , and A is .

Deadweight Loss = = 0.0675

4) In this question, let us try out some comparative statics methods as in the lecture.   
  
Let the supply of bubble tea be and the demand for bubble tea be .

Here, we want to investigate the effects of demand elasticity on economic outcomes.   
Recall that to have a proper comparison of how elasticity affects outcomes, we need to fix the initial no-tax equilibrium price and quantities (even if changes); this involves changing depending on values of .

1. To keep the no-tax equilibrium price and quantities constant at $5, and 2500 units respectively, show that
2. Suppose there is now an excise tax of dollars. Write out the equilibrium prices faced by consumers and producers, and the equilibrium quantity in terms of elasticity .
3. Using part (b), for a positive tax , how does the elasticity of demand affect the equilibrium quantity?
4. Using the above parts, show that the deadweight welfare loss increases with the elasticity of demand for a fixed tax .

Deadweight welfare loss

DWL

Taking the derivative wrt to , you can get

**Sample Questions**

1) In Quasitown, there are 1000 consumers with identical utility function: , where is the number of cups of bubble tea consumed, and is the consumer’s holding of money. Suppose each consumer has an income of 15 and that the price of bubble tea is .

On the supply side, there are 100 perfectly competitive firms (price takers) with identical production cost functions: , where is the number of bubble tea produced.

1. Derive i) the individual and market demand functions, and ii) the firm’s supply function, as well as the market supply function for bubble tea. **(12 marks)**
2. What is the competitive equilibrium price and quantities of bubble tea (consumed by each consumer and produced by each firm)? **(7 marks)**

A politician in Quasitown hates bubble tea, and decides to implement a consumption tax of 0.3 dollars per cup of bubble tea.

1. Show that the price of bubble tea for consumers (including the tax), increases to 5.05.

**(8 marks)**

1. Discuss whether the consumption tax imposed is socially efficient. **(8 marks)**

2) Consider the market for wallets. The *market* supply curve is given by There are consumers with *individual* demand curves given by

1. Derive the market demand curve in terms of . **(5 marks)**
2. Suppose there is a per-unit tax of $50 on the producers. For , draw out the market supply and demand curves *with* and *without* tax, indicating and explaining the deadweight welfare loss from the tax. **(9 marks)**
3. For the same per-unit tax on producers, calculate the deadweight welfare loss as a function of the number of consumers in the market . **(10 marks)**
4. How does the deadweight welfare loss change with the number of consumers? Explain the intuition behind this. **(6 marks)**