ECON10004: Introductory Microeconomics // Assignment—1 (15%)

Due date: April 1st by 4.00pm // Word limit:1000 words (does not include diagrams) // Good luck!

Logistics:

- please submit your assignment via the LMS subject page;
- the assignment is due by 4.00pm on April 1st;
- after you have submitted your assignment, please remember to also keep a local copy;
- there is a maximum limit of 1000 words (not including diagrams);
- parts 1, 2, and 3, are all compulsory;
- problems **must** be solved in the order in which they appear, and answers have to be clearly labelled (e.g., write "**Part 1, B – Maximizing Net Benefits, 2:**" as the title to your second answer of the second problem);
- a maximum of 100 points are awarded according to the quality of the answers.

PART 1 ---------- [20 points]

A - *Opportunity Costs (5 points):*

Linda considers purchasing the paperback edition of *War and Peace* from Amazon, at a price of $15.

Linda knows that she could either read, or work; these are the only two possible alternatives, and they are mutually exclusive. Linda works as a casual, and she earns $20 per hour. To read the whole book, she would need to read for 25 hours.

What is the opportunity cost to Linda of purchasing and reading *War and Peace*?

Opportunity Cost of War & Peace

$$OC = C(book) + C(lost\ income)$$
$$= (15) + (20)(25)$$
$$= \$515$$

B - *Maximizing Net Benefits (5 points):*

Suppose the Hookturnistanian Government is considering how much to invest in expanding public transport to reduce traffic congestion. An expert committee has advised the government that the total benefits TB, and the total costs TC, of attracting more public transport passengers (which we express in millions of passengers and denote by N) are given by

$TB = 100N - N^2$, and
$TC = 4 + 40N + 2N^2$.

1: Derive expressions for the marginal benefits and marginal costs.
2: What is the number of new passengers, N*, that maximises net benefits?

1) $MB = \frac{dTB}{dN} = 100 - 2N$

$MC = \frac{dTC}{dN} = 40 + 4N$

2) Max NB at $MB = MC$

$100 - 2N = 40 + 4N$

$6N = 60$

$N = 10$ million passengers

C - *Price Elasticity of Demand (10 points):*

The demand for pumpkins in Halloweenstan is given by:

$$Q_D = 60 - 2P$$

1: Compute the price elasticity of demand first when the quantity of pumpkins demanded is $Q^1 = 20$, and then when the quantity demanded is $Q^2 = 5$.
2: Is demand inelastic or elastic at each point (that is, at $Q^1 = 20$ and at $Q^2 = 5$)?
3: What is the total revenue at $Q^1 = 20$ and then at $Q^2 = 5$, respectively?
4: Is the total revenue maximised at either $Q^1 = 20$ or $Q^2 = 5$? Why?

1) $\varepsilon_D = \left| \frac{dQ_D}{dP} \cdot \frac{P}{Q_D} \right| = \left| (-2)\frac{P}{60-2P} \right| = \frac{2P}{60-2P}$

At $Q_D = 20$, $P = 20$, $\varepsilon_D = \frac{2(20)}{20} = 2$

At $Q_D = 5$, $P = \frac{55}{2} = 27.5$, $\varepsilon_D = \frac{55}{5} = 11$

2) At $Q_D = 20$, demand is elastic $(\varepsilon_D = 2)$

At $Q_D = 5$, demand is elastic $(\varepsilon_D = 11)$

3) $TR = PQ_D$

At $Q_D = 20$, $TR = (20)(20) = \$400$

At $Q_D = 5$, $TR = (\frac{55}{2})(5) = \$137.50$

4) TR not maximised at $Q_D = 20$ or $Q_D = 5$, as $\varepsilon_D \neq 1$.
To maximise TR, lower the price.

PART 2 ---------- **[45 points]**

A - *Closed Economy (10 points):*

The demand and the supply for broccoli[1] in Veganstan's *closed economy* are given by

$Q_D = 60 - 2P$, and
$Q_S = 38P$.

We assume the market is perfectly competitive.

1: Compute the closed economy equilibrium price P^{CE} and quantity Q^{CE}.
2: Plot on a graph: the demand, the supply, and the equilibrium price and quantity.
3: Using the demand and supply graph/diagram, analyse the impact on the equilibrium price and quantity, under each one of the following scenarios:

a) a hailstorm damages the crop;
b) a new type of manure becomes available, which increases the yield per acre;
c) a hailstorm damages the crop while at the same time a new type of manure becomes available.

1) Equilibrium at $Q_D = Q_S$

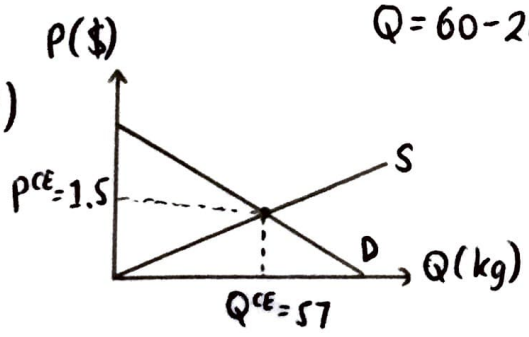
$60 - 2P = 38P$

$40P = 60$

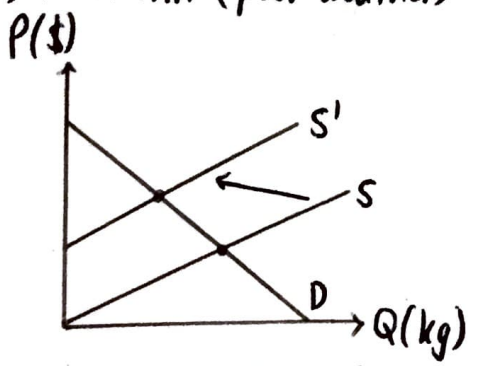
$P = \$\frac{3}{2} = \$1.50 = P^{CE}$

$Q = 60 - 2(\frac{3}{2}) = 57\,kg = Q^{CE}$

2)

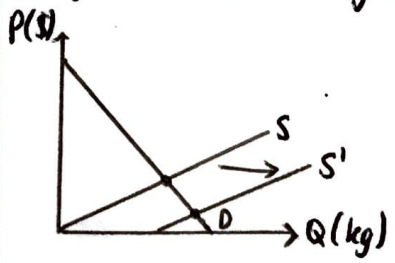


3a) Hailstorm (poor weather)



Price increases, quantity decreases

3b) Manure (technological advancement)



Price decreases, Quantity increases.

3c) Both occur.

Price and quantity unable to be determined, depend on the magnitude of supply shifts.

[1] Both demand and supply are expressed in kilograms (kg), and all prices are in dollars ($).

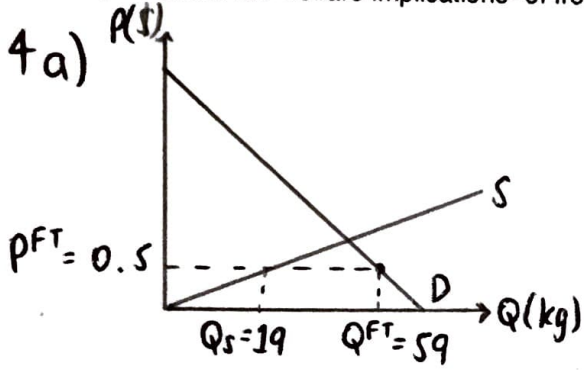
B - *Open Economy (35 points: 7,7,14 and 7 points for questions 4,5,6 and 7, respectively):*

For the following questions, we assume that Veganstan's policy makers open up the country's economy for trade. Veganstan's neighbouring country, Beefland, can produce and sell unlimited quantities of broccoli at 0.5$ per kilogram – which happens to be also the world price P^W for broccoli.

4: Assume that there is *free trade* between Veganstan and Beefland. For Veganstan:

a) graphically show the free trade equilibrium price P^{FT} and quantity Q^{FT};[2]
b) briefly discuss how P^{FT} and Q^{FT} compare to P^{CE} and Q^{CE};
c) discuss the welfare implications[3] of free trade relative to the closed economy.

4a)



$P^{FT} = \$0.50$

$Q_D = 60 - 2(\frac{1}{2}) = 59kg = Q^{FT}$

$Q_S = 38(\frac{1}{2}) = 19kg.$

4b) $P^{FT} < P^{CE}$. This lower price from Beefland increases quantity demanded to 59kg, and decreases local production to 19kg.

4c) In closed economy, $CS = \frac{1}{2}(30-1.5)(57) = \$812.25$

$PS = \frac{1}{2}(1.5)(57) = \$42.75$

$TS = \$855$, $DL = 0$.

With free trade, $CS = \frac{1}{2}(30-0.5)(59) = \$870.25$

$PS = \frac{1}{2}(0.5)(19) = \$4.75$

$TS = \$875$,

Free trade decreases PS by \$38 to \$4.75, and increases CS by \$58 to \$870.25. This increases TS by \$20 to \$875, increasing overall welfare.

2 By "graphically show", we mean that you should use the demand and supply graph/diagram analisys.

3 Recall that by "welfare implications" we mean: consumer surplus, producer surplus, deadweight loss, and overall welfare (including e.g. tax revenue or subsidy costs, if relevant).

5: Assume that while allowing trade with Beefland, Veganstan's policy makers place a *tariff* of 0.5$ per kg on all broccoli imported from Beefland. For Veganstan:

a) graphically show the post tariff equilibrium price P^T and quantity Q^T.
b) briefly discuss how P^T and Q^T compare to P^{FT} and Q^{FT}.
c) discuss the welfare implications of the tariff relative to free trade.

5a) ~~$t = P_D - P_S$, $P_D = P_S + 0.5$~~

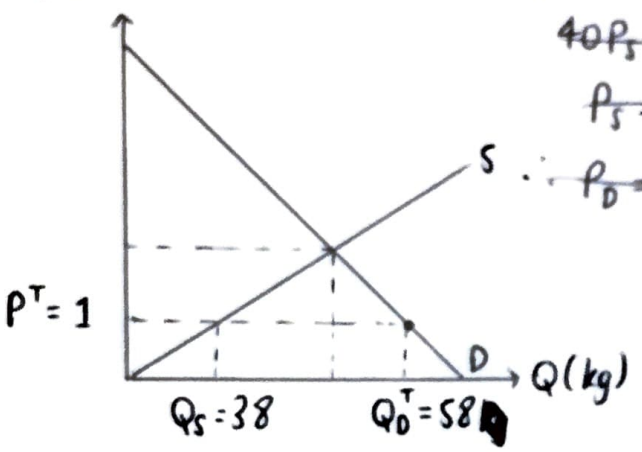
~~Equilibrium at $Q_D(P_D) = Q_S(P_S)$~~

~~$60 - 2(P_S + 0.5) = 3P_S$~~

~~$40P_S = 59$~~

~~$P_S = \frac{59}{40} = \$1.475$~~

~~$\therefore P_D = \$1.975$, $Q = 56.05\,kg = Q^T$~~



20kg imported from Beefland.

b) $P^T = 1$ is \$0.50 greater than $P^{FT} = 0.5$.

$Q^T = 58$ is 1kg less than $Q^{FT} = 59$.

c) With tariff, $CS = \frac{1}{2}(30-1)(58) = \$841$

$PS = \frac{1}{2}(1)(38) = \$19$

$R_{tariff} = (20)(0.5) = \$10$

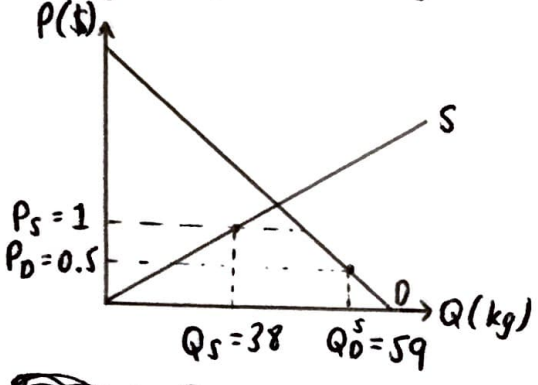
$TS = \$870$

Relative to free trade, the tariff increases PS by \$14.25 to \$19 and decreases CS by \$29.25 to \$841. The tariff revenue is \$10. This decreases TS by \$5 (deadweight loss) to \$870, decreasing overall welfare.

6: Assume that while allowing for free trade with Beefland, Veganstan's policy makers decide to give to all broccoli producers in Veganstan a *subsidy* of 0.5 $ per kg produced. For Veganstan:

a) graphically show the post subsidy equilibrium price P^S and quantity Q^S;
b) briefly discuss how P^S and Q^S compare to P^{FT} and Q^{FT};
c) discuss the effect of the subsidy on the quantity of broccoli that is being supplied domestically, as well as on the quantity that is being imported from Beefland;
d) discuss the welfare implications of the subsidy relative to free trade.

6a) $P_S = \$1$, $P_D = \$0.5$.



21kg imported from Beefland

b) Producers recieve $P_S = \$1$, and consumers pay $P_D = \$0.50$, which is the same as $P^{FT} = \$0.50$.
Quantity demanded $Q_D^S = 59kg$, the same as $Q^{FT} = 59kg$.
Local production however is increased to $Q_S = 38$ kg.

c) The subsidy increases the local production from 19kg to 38kg. The quantity demanded remains $Q_D = 59kg$, resulting in 21kg imported from Beefland to meet demand.

d) With subsidy, $CS = \frac{1}{2}(30-0.5)(59) = \$870.25$
$PS = \frac{1}{2}(1)(38) = \$19$
$C_{subsidy} = (0.5)(38) = \$19$
$TS = \$870.25$

Relative to free trade, the subsidy leaves CS unchanged, and increases PS by \$14.25 to \$19.
The subsidy costs $C_{subsidy} = \$19$.
This decreases TS by \$4.75 to \$870.25, (deadweight loss), decreasing overall welfare.

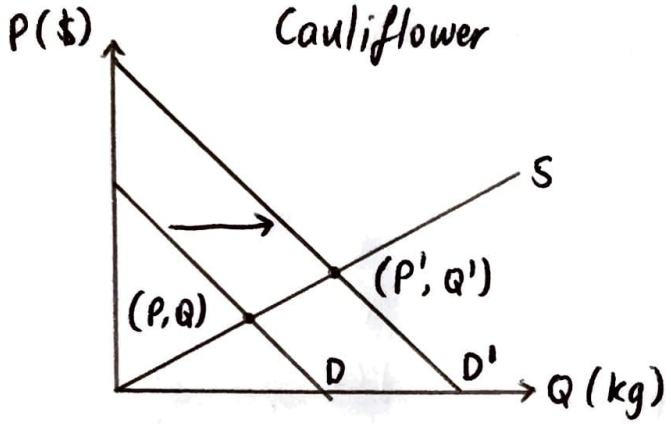
7: For this question only, we assume that cauliflower is a substitute for broccoli.

Beefland can produce virtually unlimited quantities of cauliflower at a lower price than Vegastan; furthermore, Beefland's production price for cauliflower coincides with the world price for it.

Assume that we start from a situation where there is free trade between Veganstan and Beefland in both the broccoli and cauliflower markets, but then Veganstan's policy makers introduce a tariff of 0.5$ per kilogram on all of the broccoli that is being imported from Beefland.

Discuss the effect that you would expect the tariff on broccoli to have on Veganstan's equilibrium price and quantity in the cauliflower market.

7)



The tariff of \$0.5/kg of broccoli imported would increase broccoli consumer price to \$1, and increase local broccoli production from 19kg to 38kg.

Since broccoli and cauliflower are substitutes ($\varepsilon_{AB} > 0$) the increase in broccoli price will increase demand for cauliflower.

This increase in cauliflower demand (right shift) will increase cauliflower price and quantity.

The greater the cross price elasticity ε_{AB}, the greater the right shift in cauliflower demand.

PART 3 ----------**[35 points]**

A - *Initial Economy (4 points):*

The demand and the supply for pork meat[4] in Meatistan are given by

$Q_D = 9 - 0.25P$, and
$Q_S = 2P$

We assume that the market for pork meat is perfectly competitive.

1: Compute the equilibrium price P^E and quantity Q^E.
2: Plot on a graph: the demand, the supply, and the equilibrium price and quantity.

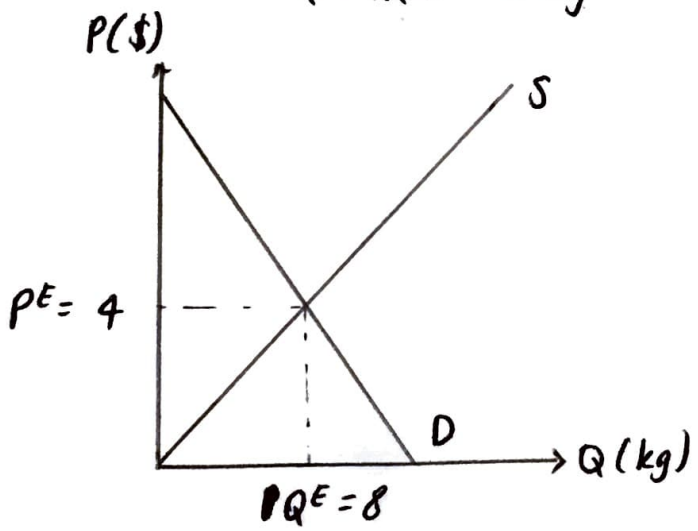
1) Equilibrium at $Q_D = Q_S$

$9 - 0.25P = 2P$

$P = \$4.$

$Q = 2(4) = 8\ kg$

2)



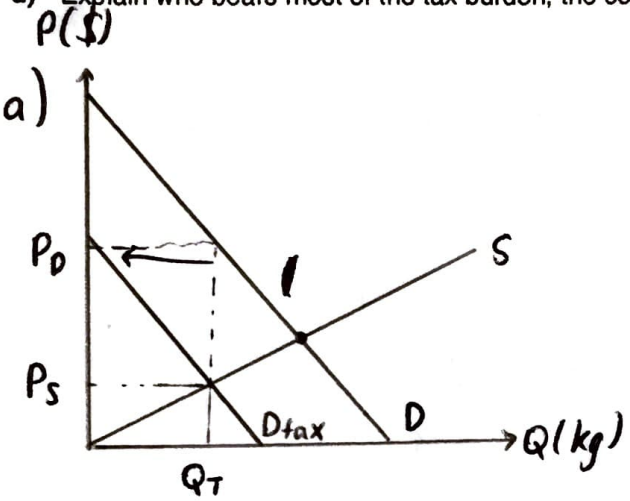
[4] Both demand and supply are expressed in kilograms (kg), and all prices are in dollars ($).

B - *Tax on Consumption (14 points):*

3: Assume that the Government puts a tax of 10$ per kg on all pork meat consumption.

a) Graphically show the effect of the consumption tax on the equilibrium price and quantity.
b) Compute the price paid by consumers P_D, the price received by producers P_S, and the quantity traded Q^T, after the Government's tax has been instituted.
c) Discuss the welfare implication of the tax.
d) Explain who bears most of the tax burden, the consumers or the suppliers? Why?

3a)



3b) $t = P_D - P_S$, $P_D = P_S + 10$

$Q_D(P_D) = Q_S(P_S)$

$9 - 0.25(P_S + 10) = 2P_S$

$P_S = \frac{26}{9} \approx \$2.89$

$P_D = \frac{116}{9} \approx \$12.89$

$Q = \frac{52}{9} \approx 5.78$ kg

3c) At equilibrium, $CS = \$128$
$PS = \$16$
$TS = \$144$

At tax, $CS = \frac{1}{2}(36 - 12.89)(5.78)$
$\approx \$66.79$
$PS = \frac{1}{2}(2.89)(5.78)$
$\approx \$8.35$
$R_{tax} \approx \$57.80$
$TS \approx \$132.94$

The tax decreases CS and PS, while generating tax revenue $R_{tax} \approx \$57.80$. This decreases TS from \$144 to \$132.94, causing deadweight loss $DL \approx \$11.10$, decreasing overall welfare.

3d) $\varepsilon_D = \left| \frac{dQ_D}{dP} \cdot \frac{P}{Q_D} \right| = \frac{0.25P}{Q_D} \approx 0.56$. | $\varepsilon_S = \left| \frac{dQ_S}{dP} \cdot \frac{P}{Q_S} \right| = \frac{2P}{Q_S} = 1$.

Since demand is more inelastic than supply ($\varepsilon_D < \varepsilon_S$), consumers bear most of the tax burden.

4: For this question only, we assume that chicken meat is a substitute for pork meat. Discuss how the chicken meat market's equilibrium price and quantity are affected by the Government's tax on pork.

4) The tax on pork decreases pork quantity traded, and increases consumer pork price.

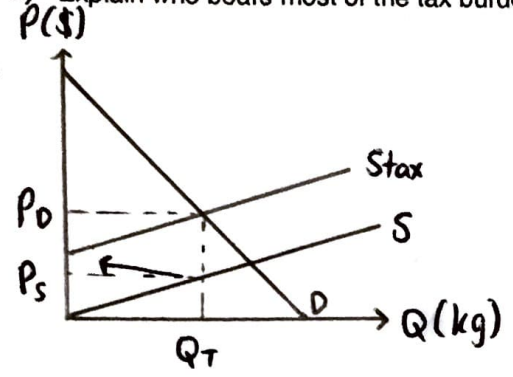
Since chicken and pork are substitutes ($\varepsilon_{AB} > 0$), the increase in consumer pork price will increase demand for chicken (right shift), increasing chicken price and quantity.

C - Tax on Sales (12 points):

5: Assume that instead of taxing the meat consumption, the Government puts a tax of 10$ per kilo of pork meat sold.

a) Graphically show the effect of the consumption tax on the equilibrium price and quantity.
b) Compute the price paid by consumers P_D, the price received by producers P_S, and the quantity traded Q^T, after the Government's tax has been instituted.
c) Discuss the welfare implication of the tax.
d) Explain who bears most of the tax burden, the consumers or the suppliers? Why?

5a)



5b) $t = P_D - P_S$, $P_D = P_S + 10$

$Q_D(P_D) = Q_S(P_S)$

$9 - 0.25(P_S + 10) = 2P_S$

$P_S \approx \$2.89$

$P_D \approx \$12.89$

$Q_\bullet \approx 5.78\,kg.$

5c) At equilibrium, $CS = \$128$, $PS = \$16$, $TS = \$144$

After tax, $CS \approx \$66.79$, $PS \approx \$8.35$, $R_{tax} \approx \$57.80$, $TS \approx \$132.94$

The tax decreases CS and PS, while generating tax revenue $R_{tax} \approx \$57.80$. This decreases TS from \$144 to \$132.94, causing deadweight loss $DL \approx \$11.10$, decreasing overall welfare.

3d) $\varepsilon_D = \left|\frac{dQ_D}{dP} \cdot \frac{P}{Q_D}\right| \approx 0.56$ | $\varepsilon_S = \left|\frac{dQ_S}{dP} \cdot \frac{P}{Q_S}\right| \bullet = 1$

Since demand is more inelastic than supply ($\varepsilon_D < \varepsilon_S$), consumers bear most of the tax burden.

D - Comparing the two Taxes (5 points):

6: Which one of the two policies, a tax on pork meat consumption, or a tax on pork meat production, is more efficient? Why?

6) Both taxes are equally efficient, as they result in the same quantity traded $Q_T \approx 5.78$ kg.

They are both inefficient allocations compared to no tax, as both have $TS \approx \$132.94$ and deadweight loss $DL \approx \$11.10$.

In general, a left shift of the more inelastic side is more effective for reducing quantity traded.