Queen's University
Department of Economics
ECON 111*S

Suggested Solutions to
Take-Home Midterm Examination
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PART A TRUE/FALSE/UNCERTAIN QUESTIONS 20 MARKS

Explain why each of the following statements is TRUE, FALSE, or Uncertain according to economic principles. Use diagrams where appropriate. Unsupported answers will receive no marks. It is the explanation that is important.

Each question is worth 5 marks.

A-1. A simultaneous increase in the price of steel *and* station wagons will lead to a rise in the equilibrium price *and* quantity of minivans.

Uncertain

Steel is used as an input in the production of minivans. So, an increase in the price of steel will raise the cost of production of minivans. As a result, the profitability of steel productions will decrease. Firms will respond by decreasing the supply of minivans in the market. The supply curve of minivans will shift to the left (from S_0 to S_1 in Figure A-1). At the same time, an increase in the price of station wagons will increase the demand of minivans which are close substitutes of station wagons. So, the demand curve of minivans will shift rightward (from D_0 to D_1 in Figure A-1). Because of the leftward shift in the supply curve and the rightward shift in the demand curve, the equilibrium price of minivans will definitely increase. But the ultimate effect on the equilibrium quantity is ambiguous. The equilibrium quantity of minivans can increase, decrease or remain unchanged depending on the actual magnitude of the shifts in the demand and supply curves.

I have shown three different cases in Figure A-1. Initially the equilibrium was at E_0 with the equilibrium price, P_0 and the equilibrium quantity, Q_0. In Figure A-1(a), the leftward shift in the supply curve (S_0 to S_1) is larger than the rightward shift in the demand curve (D_0 to D_1). As a result, the equilibrium moves from E_0 to E_1 leading to an increase in the equilibrium price and a decrease in the equilibrium quantity of minivans.
In Figure A-1(b), the leftward shift in the supply curve is equal in size to the rightward shift in the demand curve. As a result, the equilibrium price has increased but the equilibrium quantity has remained unchanged. In Figure A-1(c), the leftward shift in supply curve (S_0 to S_1) is smaller than the rightward shift in demand curve (D_0 to D_1), leading to an increase in both the equilibrium price and quantity of minivans. The equilibrium price of minivans has increased in all the three cases. However, the ultimate effect on the equilibrium quantity of minivans has varied in these three cases. Therefore, we can conclude that the statement is uncertain.

A-2. An individual household's saving supply curve is upward sloping.

Uncertain

An individual household's saving supply curve, which shows the relationship between the interest rate and an individual household's saving supply, can be upward or downward sloping. It depends on the actual magnitudes of the substitution and income effects of an increase in the interest rate (assuming that both present consumption and future consumption are normal goods). An increase in the interest rate raises the opportunity costs of present consumption. In other words, present consumption becomes relatively more expensive than future consumption. Thus, the substitution effect implies that an individual household should decrease present consumption and increase future consumption in response to an increase in the interest rate. An increase in the interest rate also increases the life-time income of the household. So, the income effect implies that the household should increase both present consumption and future consumption because both are assumed to be normal goods. To sum up, with the substitution effect favouring less present consumption and the income effect favouring more present consumption, we cannot be sure whether present consumption will rise or fall in the face of an interest rate increase. This also means that we cannot be sure whether an individual household's saving supply will rise or fall in the face of an interest rate increase. In other words, we cannot be sure whether an individual household's saving supply is upward or downward sloping.

See page Part III-46 and Figure S2-3 of the Course Notes for a graphical explanation.

A-3. Payroll taxes lead employers to hire fewer workers.

Uncertain

With a relatively inelastic labor supply and an elastic labor demand, payroll taxes will lead employers to hire fewer workers. In Figure A-3 (a) and Figure A-3(b), in the absence of any payroll taxes, the equilibrium wage is w_0 and the equilibrium level of employment is E_0. Assuming that payroll taxes are imposed on firms, the labor demand curve will shift to the left because of payroll taxes, resulting a wedge between the wage paid by the firm (w_F) and the wage received by the worker (w_W). In Figure A-3 (a), with a payroll tax of t dollars per hour, w_F rises above w_0 and w_W falls below w_0. Since the total cost that firms must pay for each unit of labour services (wage rate paid by the firm) has increased, payroll taxes naturally lead firms to hire fewer workers. As a result, employment falls from E_0 to E_1 in Figure A-3 (a).

However, if the labor supply curve is perfectly inelastic, the entire burden of the tax would fall on workers. There will be no change in wage paid by the firm (w_F). But the wage received by the worker (w_W) will decrease by the full amount of the payroll tax, t dollars per hour. This case is illustrated in Figure A-3(b). Since the total cost that firms

must pay for each unit of labour services (wage rate paid by the firm) remains unchanged, payroll taxes, in this case, will NOT lead firms to hire fewer workers. Employment will remain unchanged at E_0.

A-4. The following table shows how many units of wheat *or* corn can be produced with a unit of resources in Brazil and Mexico. If both countries trade based on the principle of comparative advantage, we can conclude that Brazil will export corn *and* Mexico will export wheat.

Units of Wheat *or* Corn Produced Per Unit of Resources

	Wheat	**Corn**
Brazil	**90 bushels**	**30 bushels**
Mexico	**50 bushels**	**20 bushels**

False

The following table shows the opportunity costs of producing wheat and corn in Brazil and Mexico:

	Wheat	**Corn**
Brazil	**1/3 bushels of corn**	3 bushels of wheat
Mexico	2/5 bushels of corn	**5/2 bushels of wheat**

Brazil has a comparative advantage in wheat because it has lower opportunity costs of producing wheat (1/3 bushels of corn) than Mexico (2/5 bushels of corn). On the other hand, Mexico has a comparative advantage in the production of corn because it can produce corn with lower opportunity costs (5/2 bushels of wheat) compared to Brazil (3 bushels of wheat). Therefore, based on the principle of comparative advantage, Brazil should export wheat and Mexico should export corn in a mutually beneficial trade.

PART B PROBLEM SOLVING QUESTION 20 MARKS

Read each part of the question very carefully. Answer all parts of the question and show all steps of your calculations to get full marks. Use diagrams where required.

B-1.

Consider the following demand and supply relationships in the market for a particular product:

Demand: $Q^d = 200 - 15P$

Supply: $Q^s = 10 + 5P$ **.**

a. With no government intervention, what are the equilibrium price and quantity in this market? Illustrate your results using a diagram. Clearly identify the vertical and horizontal intercepts of the demand and supply curve, and the market equilibrium values on the diagram. [5 marks]

a) The equilibrium price (P^*) and quantity (Q^*) of are found by equating the quantity demanded and quantity supplied.

Equilibrium condition:

$Q^D = Q^S$
or, $200 - 15P = 10 + 5P$
or, $20P = 190$
or, $P = 9.5$

So, the equilibrium price, P^*, is 9.5.

Substituting $P = 9.5$ into the demand function, $Q^D = 200 - 15P$,

$Q^D = 200 - 15(9.5)$
or, $Q^D = 57.5$

So, the equilibrium quantity, Q^*, is 57.5.

Demand Curve:

To find the horizontal intercept, set P = 0 in the demand function,

$Q^d = 200-15(0)$

$Q^d = 200$

To find the vertical intercept, set $Q^d = 0$ in the demand function,

$0 = 200- 15(P)$

$P = 200/15 = 13.3$

Supply Curve:

To find the horizontal intercept, set P = 0 in the supply function,

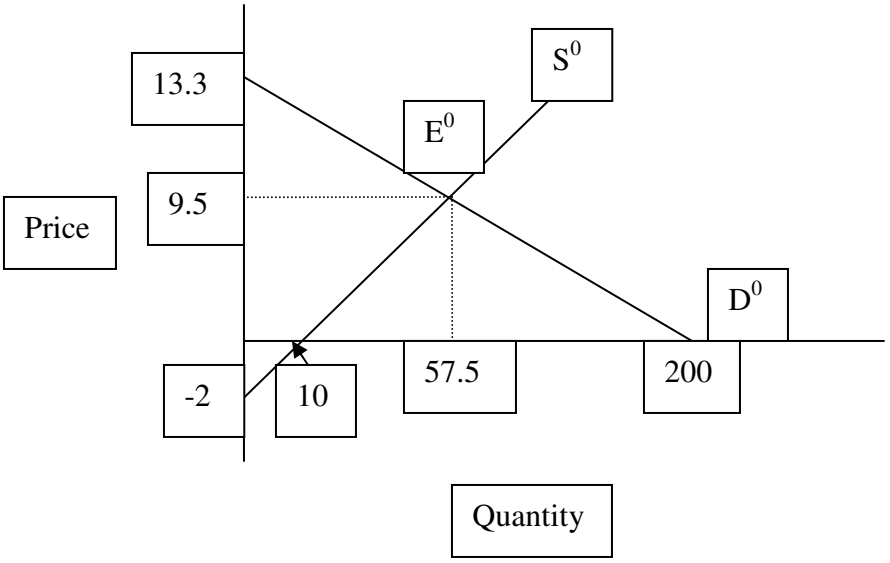
$Q^s = 10 + 5(0)$

$Q^s = 10$

To find the vertical intercept, set $Q^s = 0$ in the supply function,

$0 = 10+5(P)$

$P = -2$



b. At the "no-government-intervention" market equilibrium, calculate the price elasticities of both demand and supply using either point elasticity or arc elasticity method. [5 marks]

Using the arc elasticity method, the price elasticity of demand or supply can be calculated by the following formula:

$$\eta = \frac{Q_1 - Q_0}{P_1 - P_0} \times \frac{(P_0 + P_1)/2}{(Q_0 + Q_1)/2}$$

where Q_0, Q_1, P_0 and P_1 are quantities and prices around the equilibrium quantity and price.

For the price elasticity of demand, choose $P_0 = 9.4$ and $P_1 = 9.6$ so that the average of P_0 and P_1 is equal to the equilibrium price 9.5. Substitute these values of P into the demand function to obtain Q_0 and Q_1:

$Q_0 = 200 - 15(9.4) = 59$, $Q_1 = 200 - 15(9.6) = 56$

$$\eta_D = \frac{56 - 59}{9.6 - 9.4} \times \frac{(9.4 + 9.6)/2}{(59 + 56)/2}$$

or, $$\eta_D = \frac{-3}{0.2} \times \frac{9.5}{57.5}$$

or, $\eta_D = -2.478$

So, at the equilibrium the price elasticity of demand is -2.478.

To calculate the price elasticity of supply substitute $P_0 = 9.4$ and $P_1 = 9.6$ into the supply function in order to first find Q_0 and Q_1.

$Q_0 = 10 + 5(9.4) = 57$, $Q_1 = 10 + 5(9.6) = 58$

$$\eta_D = \frac{58 - 57}{9.6 - 9.4} \times \frac{(9.4 + 9.6)/2}{(57 + 58)/2}$$

or, $$\eta_S = \frac{1}{0.2} \times \frac{9.5}{57.5}$$

or, $\eta_S = 0.826$

So, at the equilibrium the price elasticity of supply is 0.826.

c. Now suppose that government sets a quota of 50 units. With this quota, what would the new equilibrium quantity be? What price would consumers pay? What price would sellers receive? Illustrate your results using a diagram. Clearly identify the new market equilibrium quantity, consumer price and seller price on the diagram. [5 marks]

Since the amount of quota (50) is less than the "no-government-intervention" equilibrium quantity (57.5), the quota will be binding. It means that with the quota the new equilibrium quantity will be equal to 50.

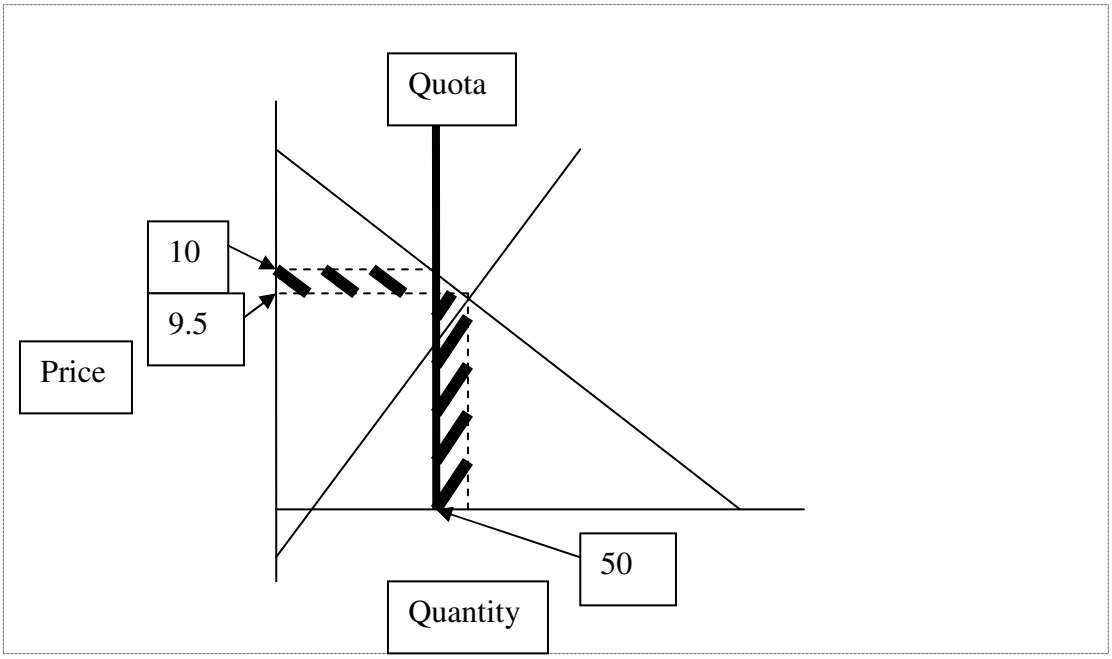
Substituting Q=50 into the demand function we can get the consumer price,

$Q^d = 200-15P$

Or, $50= 200-15P$

Or, $P = 10$

Unlike taxes, quota does not create a wedge between the consumer price and seller price. So, seller would also receive 10.



d. In the short-run, how would the total revenue of sellers respond to this quota? Calculate the total revenue both with and without quota, and then compare your results. Is the change in total revenue resulting from the imposition of quota consistent with the implication of the price elasticity of demand which you found in part (b)? [5 marks]

Revenue with quota:

$$Q^*P = 50*10 = 500$$

Revenue without quota:

$$Q^*P = 57.5*9.5 = 546.25$$

The total revenue with quota is 500 and without quota is 546.25. The total revenue has decreased because of quota. This change in total revenue is consistent with the implication of the price elasticity of demand. Here the price elasticity of demand is -2.478, which means that the demand is elastic. With an elastic demand, a 1% increase in price leads to more than 1% decrease in quantity demanded, resulting into a decrease in total revenue. In this case, quota has lead to an increase in the equilibrium price. Consequently, the quantities have decreased by a relatively higher amount, resulting into a decrease in total revenue.