Answer Set 1

Question 1

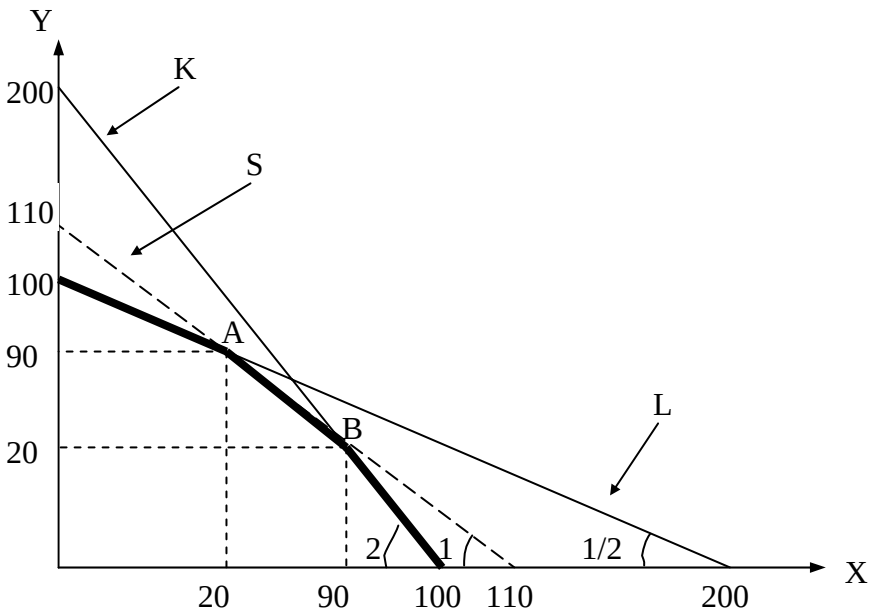
(1) This is a question which tests your understanding of the production possibilities frontier and the concept of efficiency. Two goods, x and y are produced by ***three*** means of production: labour, capital and storage. We have the following *three* constraints:

$$L: \quad \frac{1}{2}x + y \le 100$$

$$K: \quad x + \frac{1}{2}y \le 100$$

$$S: \quad x + y \le 110$$

where L, K, S stand for the labour, capital and storage constraints. The PPF, therefore, is of the following shape:



The heavy line above depicts the PPF.

You were then asked to find out the opportunity cost of x when the economy is producing 85 units of x efficiently. To find the answer one must first establish the exact intersection points between the storage constraint and the other two constraints (i.e. points A and B).

At A the two binding constraints are that of Storage and that of Labour. From S we isolate x so that x=110-y. We plug this into the labour constraint (as both have to hold simultaneously) and we get:

$$L: \quad \frac{1}{2}(110 - y) + y = 100$$

$$55 - \frac{1}{2}y + y = 100$$

$$\frac{1}{2}y = 100 - 55 = 45$$

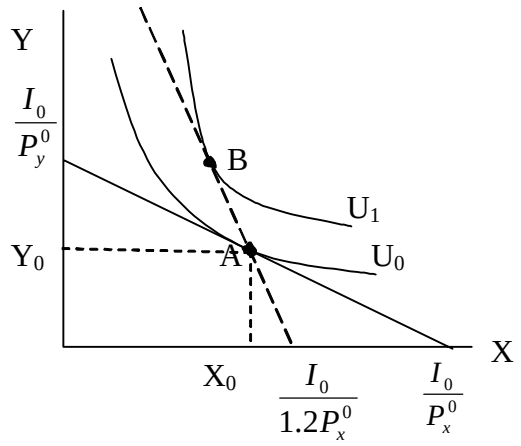
$$y = 90$$

As from S we know that x=110-y, x will then be equal to 20. So point A is therefore (20,90). By symmetry we can tell that point B will be (90,20).

Hence, when we produce 85 units of x efficiently, we are producing to the left of point B and to the right of point A. Here, the binding constraint is that of storage space and the slope of this constraint (and hence, the ***opportunity cost***) of x is 1 unit of y per x.

You were also asked about the opportunity cost of x when the economy is producing 10 units of y efficiently. This clearly means that we are producing to the right of point B where the binding constraint is that of L. Hence, the opportunity cost of x would be 2 units of y per x.

(2) At the heart of the analysis is the question of whether or not the initial bundle is on, below, or above, the new budget constraint. The answer whether or not the consumer is better or worse off could be given by means of revealed preferences but students were expected to use indifference curves analysis.



We begin at point A on the flatter budget constraint. At this point, the consumer spends .5 of his income (I_0) on each good. Hence,

$$p_x^0 x_0 + p_y^0 y_0 = I_0$$

$$.5I_0 + .5I_0 = I_0$$

Now, the price of x has gone up by 20% and the price of y fell by 20%. The question is whether the point (x_0,y_0) is *on* the new budget line.

$$p_x^1 x_0 + p_y^1 y_0 = I_0 \ ?$$

$$p_x{}^1 = 1.2\,p_x{}^0 \qquad p_y{}^1 = 0.8\,p_y{}^0$$

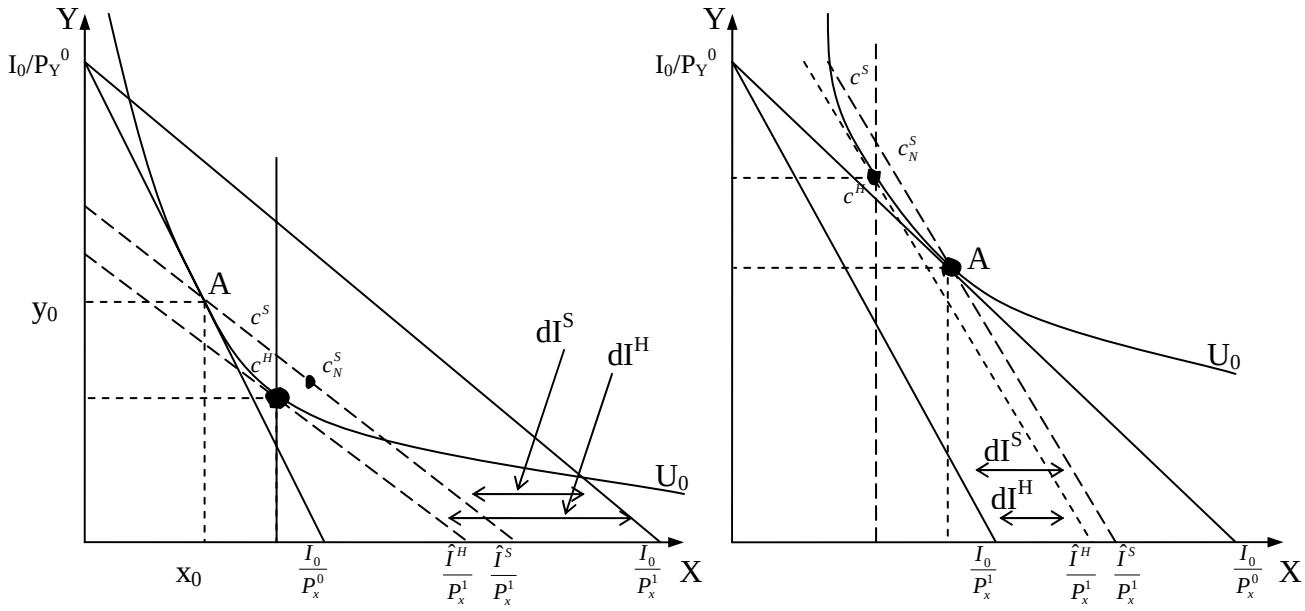
$$p_x{}^1 x_0 + p_y{}^1 y_0 = 1.2\,p_x{}^0 x_0 + 0.8\,p_y{}^0 y_0$$

$$= 1.2[0.5I_0] + 0.8[0.5I_0] =$$

$$I_0(1.2 \cdot 0.5 + 0.8 \cdot 0.4) = (0.6 + 0.4)\,I_0 = I_0$$

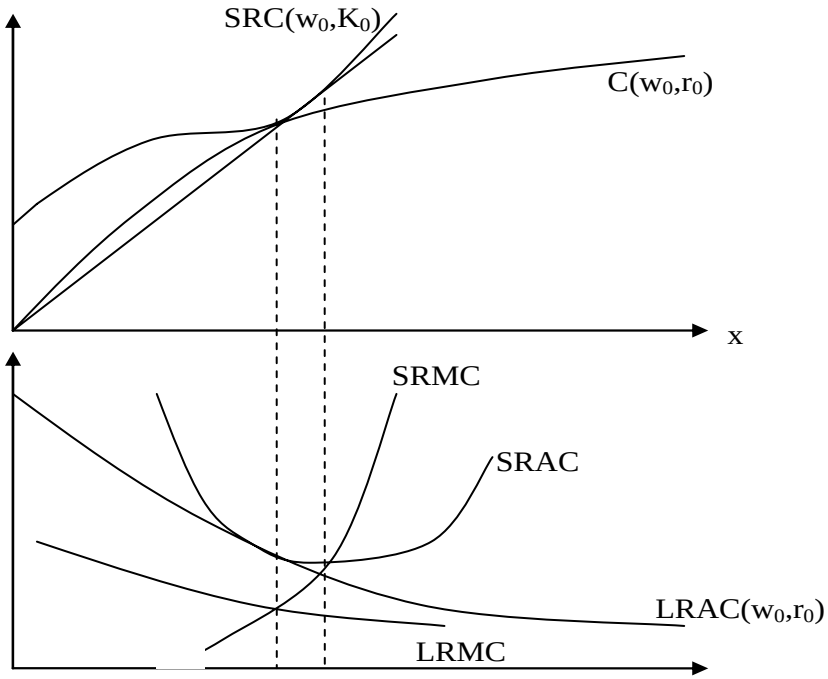
Therefore, point A is on the new (steeper) budget line. Consequently, the individual will move to point B which is on a higher indifference curve.

(3) Whether or not the income effect under the Hicksian definition of real income is greater or smaller than that under the Slutsky definition is independent on whether the good is normal or inferior.



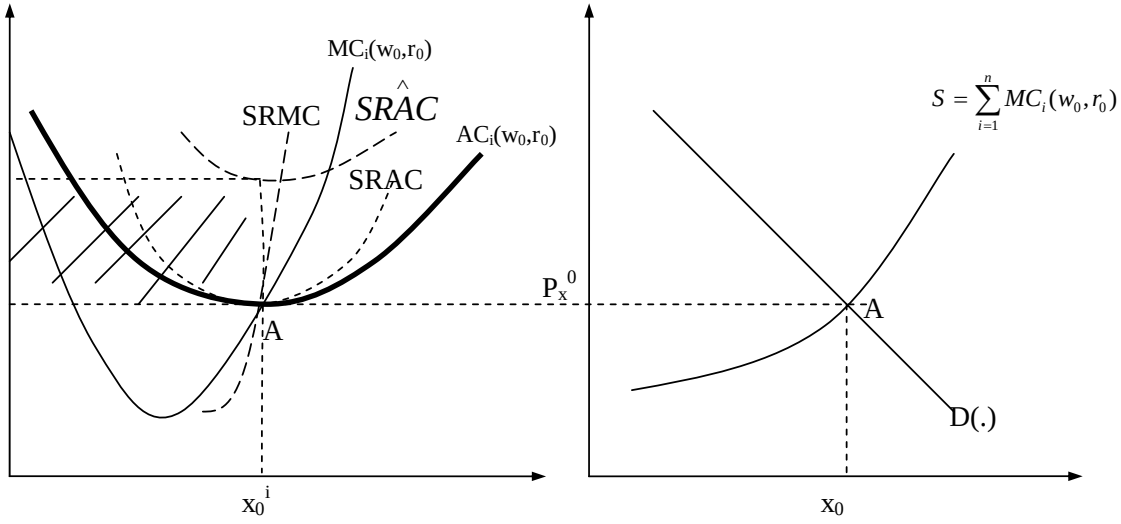
In the left hand diagram we see the case where the price of x falls and the right hand diagram shows the case when the price of x increases. We can see that the position of the two constructed lines depicting the amount of income needed to support the original level of real income is determined irrespective of whether the goods are normal or inferior. However, whether or not the effect is greater or smaller under any definition depends on whether we analyse an increase or a decrease in price.

(4) We expected the following diagrams:



The short run cost function will always intersect the long run cost function as the short run expansion path always intersects the long run expansion path. In other words, any particular combination of inputs could constitute an optimal choice even if we cannot vary one of them.

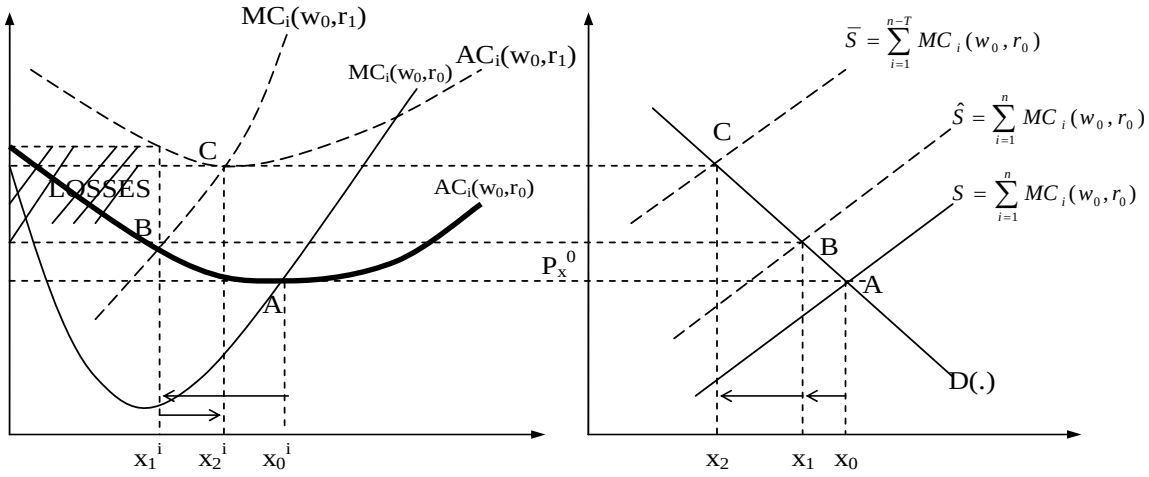
(5) We begin with the initial set up of a competitive industry:



Initially, we are at A. There is now an increase in the cost of capital. As capital is fixed in the short run, the effect that this will have on the short run cost function would be to shift the short run average costs up but to leave the short run marginal costs unaffected. As capital becomes more expensive, it costs more to produce the same amount of output as in A. Yet, as the stock of capital is fixed, the marginal product of labour (which determines the short

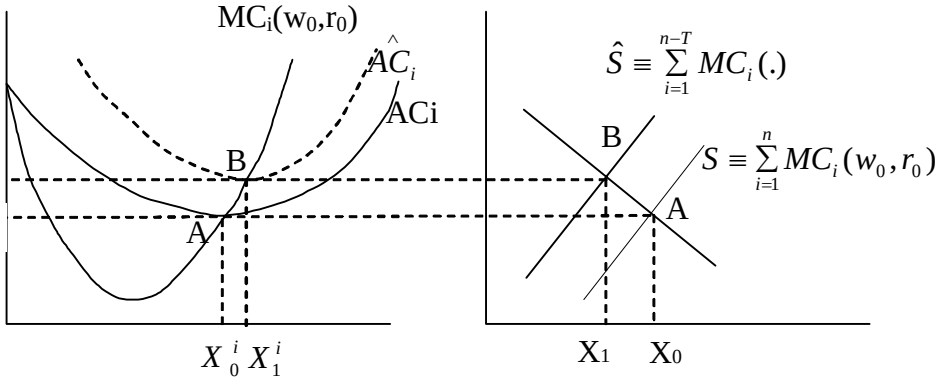
run marginal costs) will remain unchanged. Hence, in terms of the short run functions, the change is an equivalent to the influence of a change in the fixed costs.

As the marginal cost of the short run remained unchanged, there will be no immediate change in the market except that all firms will now make losses. However, this is only relevant to the immediate term. In the intermediate period, firms will be able to change both inputs and we move to discuss the effects of the change on the long-run costs function:



Here, as the cost of capital increase, both the average and the marginal costs will increase. (Will the increase in long run average costs of $x_0^{\,i}$ be greater or smaller than the increase in the short run costs?).
Here firms will adjust their production to match the profit maximisation condition where price equals marginal costs. Total output brought to the market would fall and price will increase. Firms would end up at point B. At this point firms are still making losses and some would leave the market. Supply will shift further to the back until new equilibrium is reached at point C where the number of firms in the market is smaller.

(6) A lump-sum tax on a competitive industry:



There will be no short run effect. In the long run the market price will rise by *more* than the average tax per unit. As ***price remains equal to marginal cost***, the benchmark of efficiency is not violated and the rest depends on the use to which the tax revenues are put.

(7) This question requires familiarity with the definition of monopolistic power and the monopolist's condition for profit maximization. To begin with we measure monopolistic

power by the ability of the firm to deviate from the competitive marginal cost pricing. The greater is the gap between price and marginal cost, the greater is the firm's power to exploit the market.

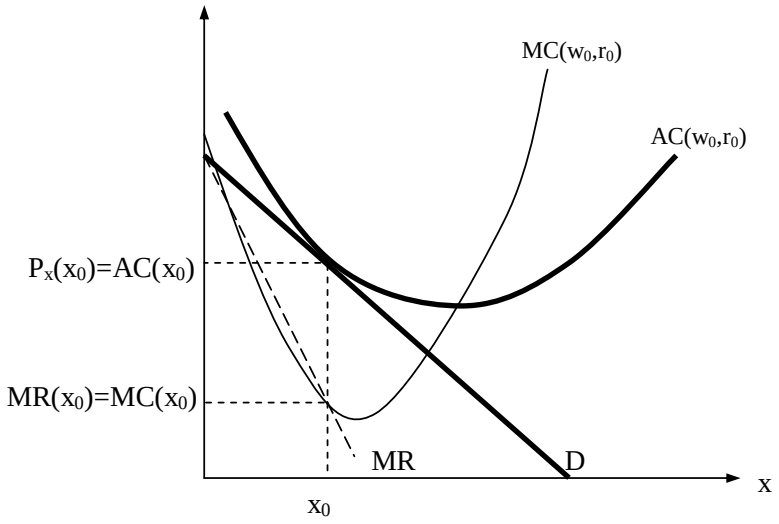
Consider the condition for profit maximization:

$$MR(x) = p[1-\frac{1}{|\eta|}] = MC(x)$$

$$DV = \frac{MC(x)}{p} = 1-\frac{1}{|\eta|}$$

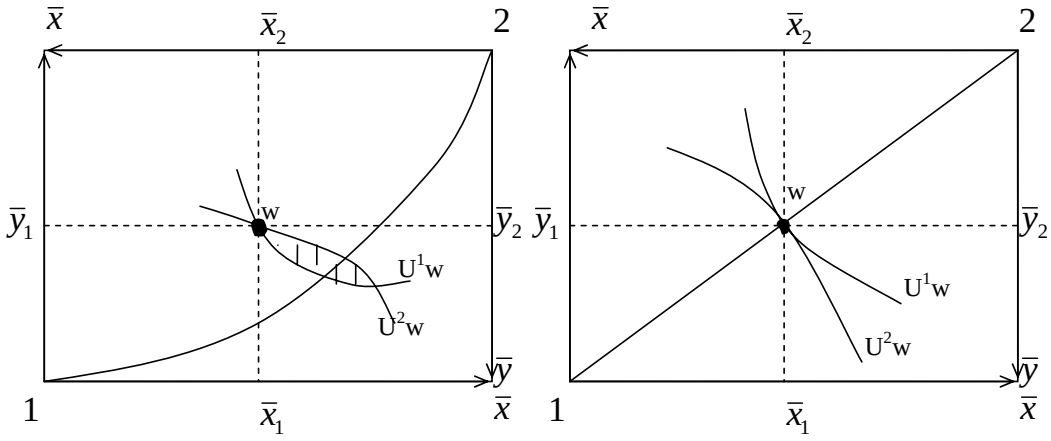
Where DV measures the deviation from marginal cost pricing. Clearly, when price equals marginal cost, DV=1 (no monopolistic power). The further is the price from marginal cost, the smaller is DV (the greater is the degree of monopolistic power). It is easy to see that only when $|\eta| \geq 1$, the monopolist can find a non-negative quantity for which profits would be maximized. However, the greater is price elasticity, the smaller will be the degree of monopolistic power. Indeed, the case where price elasticity which is facing the firm is infinite is the case of perfect competition.

(8) You were expected to show that they understand the long run configuration of a firm in monopolistic competition:



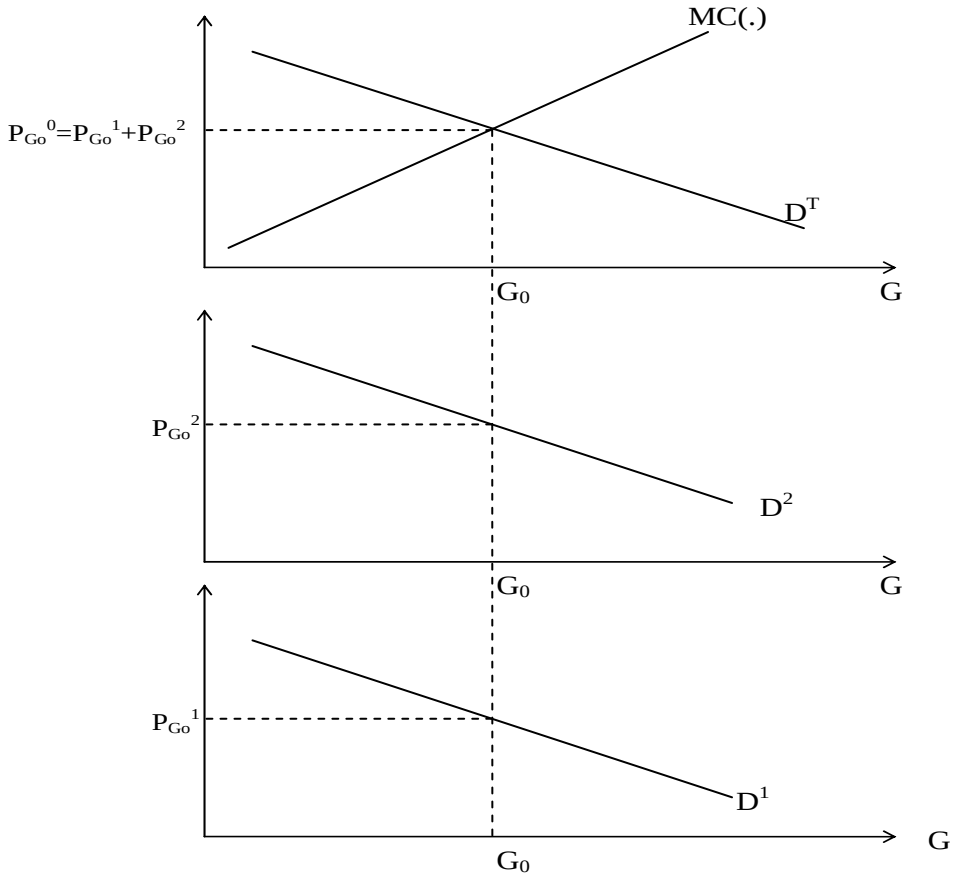
As efficiency requires that price should be equal to marginal cost, it is easy to see that the long run equilibrium for firms in monopolistic competition does not guarantee this.

(9) In this case you were expected to produce the following Edgeworth Box:



One can see that if the initial endowment is in the middle of the diagram then whether or not it would be in the interest of the agents to trade depends on whether the endowment is on the contract curve. The left hand diagram depicts the case where there would be trade while the right hand diagram depicts the case where the contract curve is the diagonal and thus, both agents would refuse to trade.

(10) This is a question about the vertical summation of demand:



Assuming that the marginal cost of providing the public good is rising, the greater will be the willingness to pay of one group, the greater would be the collective willingness to pay.

Efficient provision requires that the sum of willingness to pay should be equally to the marginal cost of production.

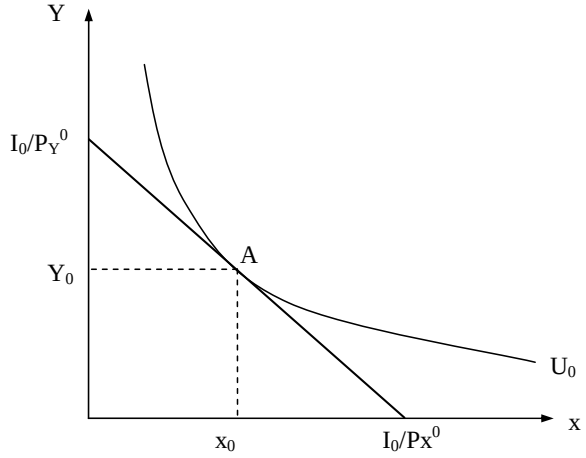
Question 2

In this question we test to see how well you command the model of individual's choice. The issue here is how to ensure that changes in fuel price will not have an adverse effect on a group of consumers (the elderly). Let x be the amount of heating consumed by a typical elderly person and let y represent all other goods. The government proposes that in the event of an increase in the cost of heating (due to a rise in fuel prices), it would ensure that they carry on heating at least as they did up to the increase in price by paying back to them the difference. Hence:

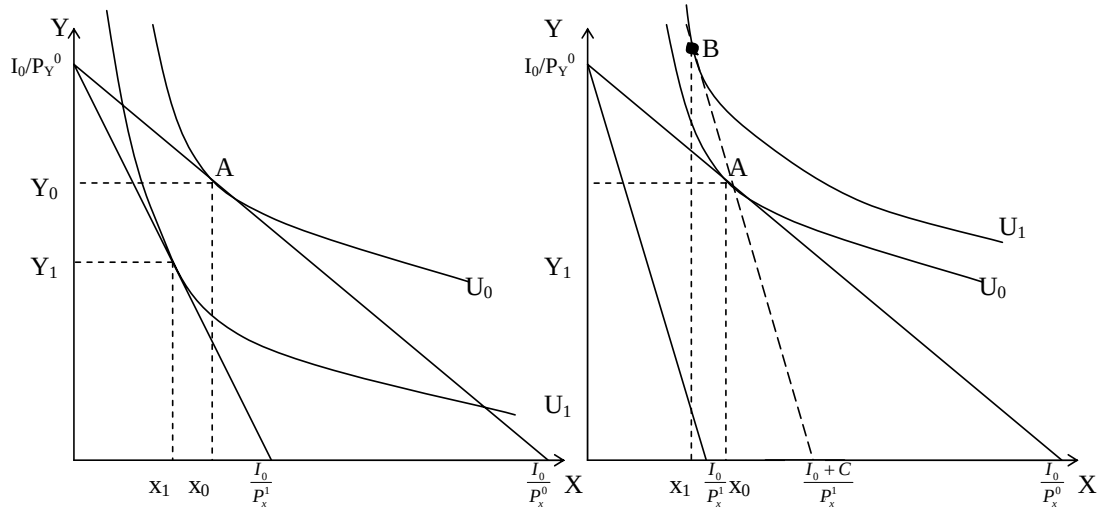
$$C = (p_x^{\,1} - p_x^{\,0})x_0$$

Where C represents compensation.

(a) The initial choice of heating is given below:



(b) +(c) To see the effects of the government policy we must assume that fuel prices have gone up and the cost of heating increased (i.e. $p_x^{\,1} > p_x^{\,0}$):



The left hand diagram depicts the case where the government is not compensating the consumers. Here, the increase in the price of heating will cause a decrease in the consumption of heating and a fall in welfare (and for the elderly, this may even be fatal).

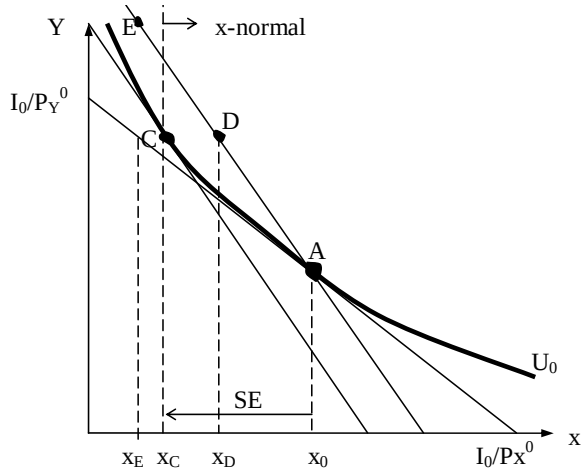
The right hand diagram depicts the effects of the change when the government implements its compensation policy. The first question we must ask ourselves is whether the new budget constraint would go through point A. Intuitively this is quite obvious. If the government pays the difference on the consumption of heating, the same amount of money will remain to consume the other goods.

Formally, it will go as follows: At A, the consumers choose A=(x_0, y_0). There is a new price for x as well as compensation, will A be on the new budget constraint?

$$At \quad A: \quad p_x{}^1 x_0 + p_y{}^0 y_0 = I_0 + C = I_0 + (p_x{}^1 - p_x{}^0)x_0$$
$$p_x{}^1 x_0 - p_x{}^1 x_0 + p_x{}^0 x_0 + p_y{}^0 y_0 = \mathrm{I}_0$$

This means that while individual would be better off (at point B in the right hand diagram), they would consume less heating!

(d) Would it matter if heating were a normal or inferior good?

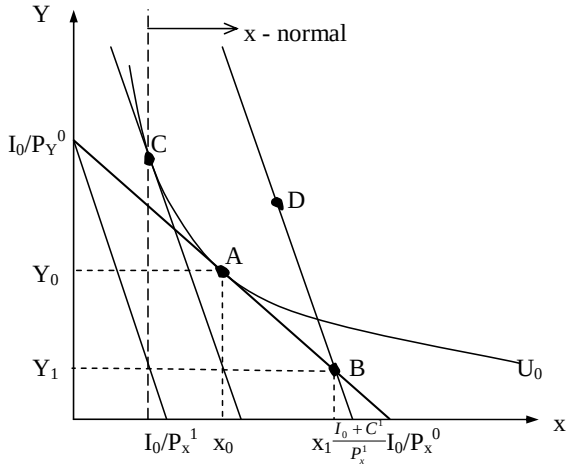


Clearly, had x been a normal good (point D), the fall in heat consumption would be much smaller than in the case of x being an inferior good (point E). However, either way, the consumption of heating will fall (left of point A).

(e) There are two alternatives to the government proposal. One is to provide a full subsidy. Namely, as the price consumers face remain unchanged the budget constrain stays in the same position and the heating habits of the elderly would remain the same. In terms of the original proposal, it simply means that the government would compensate for the difference at any proposed level of consumption. In terms of government spending there would also be no difference between an overall subsidy and the original proposal. In the case depicted above, the compensation per agent was: $C = (p_x{}^1 - p_x{}^0)x_0$. (as the government tried to ensure that the current level of heat consumption would not be reduced). Under a universal

subsidy, the spending per agent depends on their consumption. Hence, as there is no change in the position of the budget line, agents would carry on consuming x_0 units of heat. Therefore, total spending would be: $S = s \cdot x_0 = (p_x^{\ 1} - p_x^{\ 0})x_0$, which is exactly the same as with C.

The second proposal is to offer compensation according to a desired level of heat consumption ($x_1 > x_0$). Here the government is saying that it would pay the compensation in such a way so that the spending on the desired level of heating would not be affected by increases in fuel prices. The compensation function in this case is therefore: $C^1 = (p_x^{\ 1} - p_x^{\ 0})x_1$:



While in the original proposal we ensured that point A stays on both budget constraints, now we ensure that point B stays on both budget lines. The bundle at B is B=(x_1, y_1) and it is on the original budget line. There is now a new price for x as well as compensation, will B be on the new budget constraint?

$$At \quad B: \quad p_x^{\ 1}x_1 + p_y^{\ 0}y_1 = I_0 + C^1 = I_0 + (p_x^{\ 1} - p_x^{\ 0})x_1$$

$$p_x^{\ 1}x_1 - p_x^{\ 1}x_1 + p_x^{\ 0}x_1 + p_y^{\ 0}y_1 = \mathrm{I}_0$$

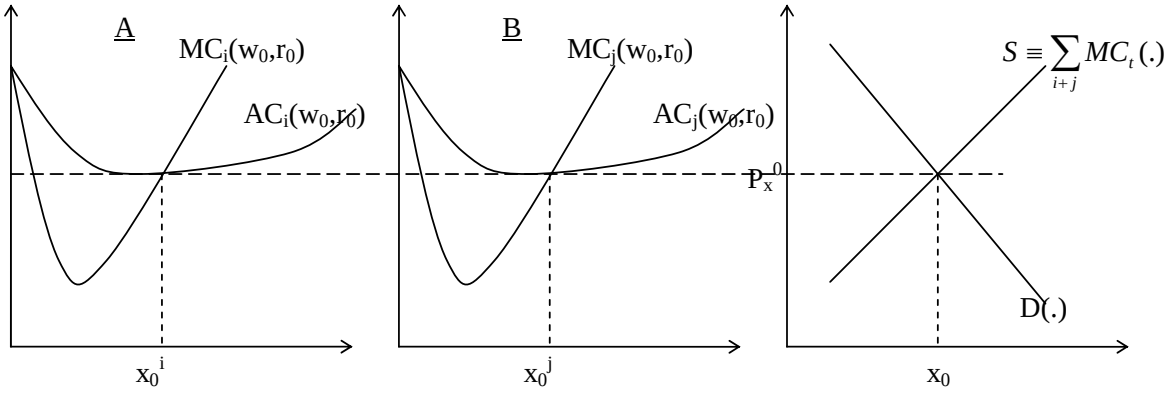
As before, the answer is positive.

In this case individuals would certainly be better off and if heating is a normal good, they may indeed end up consuming more heating than before. Had heating been an inferior good they would definitely consume less heating than before the change (left of A). In terms of government spending it is easy to see that the last scheme is also the most expensive one as $C^1 > C^0$.

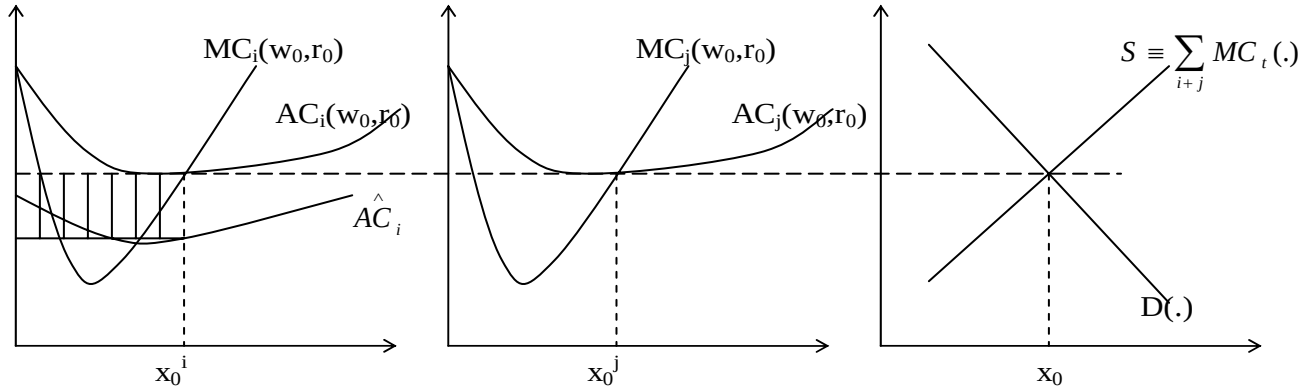
Question 3

In this question we examine the application of competitive market analysis. A market is supplied by two regions which are equidistance from it and where transportation costs are the same.

(a) Here is the initial set-up of the industry:



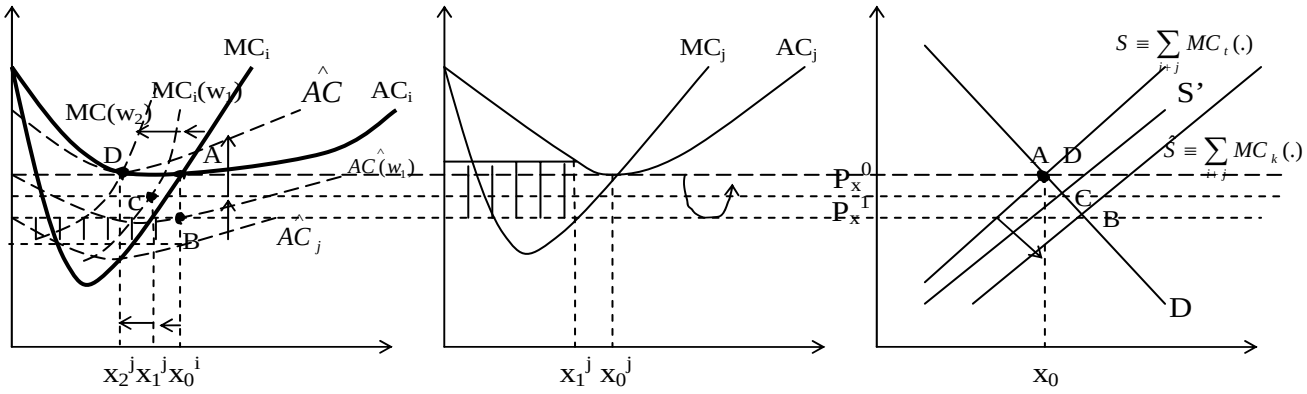
(b) The local government at A would like to encourage production by offering a bonus to the producers in its area. From an economic point of view this is an equivalent to a lump-sum subsidy:



The average cost will fall but there would be no change in the marginal costs. Thus, the only effect in the short run would be that firms in region A are now making profits above the normal.

(c) Assuming no labour mobility means that the supply of labour in each region is given. However, as there is more profits to be made in region A, firms from region B may choose to relocate (or, alternatively, capital from other industries may be drawn into the region). This, in turn, would increase demand for labour in region A and bring about an increase in nominal wages.

The rise in nominal wages would generate an increase in the marginal costs (and average costs) within this region as firms move to more capital intensive technologies:



There would thus be two major forces at work. On the one hand, the increase in marginal costs would cause profit maximising firms in region A to offer less at any given price. On the other hand, there are more firms which are doing so. To see what would happen in the market it is best to try to think about the sequence of events. At first, when bonuses are offered, capital would flow into the region and at given technologies, the supply in the market would increase (a move from A to B in the above diagrams). This would push down the price and reduce the level of profits above the normal to be had and slow the influx of firms. At the same time, firms would leave region B as they would be making losses.

The extra demand for labour would increase wages (we assume that capital moves free and therefore would not be affected by regional changes) which, in turn, would drive firms to adopt more capital intensive technologies. The outcome of this would be an increase in both marginal and average costs and the process would lead to a point like C.

Assuming that the new price (at C) is still below the original price level, firms in B would still make losses and leave the industry (or move to region A). As they do so, supply would fall further and price increase. Where will the process end very much depends on the magnitude of the bonus given to firms in region A. The bonus could be sufficiently large as to cause all firms from region B to move to region A. In this case, the new equilibrium would be at the minimum average costs (including the bonus and the higher wage rates) below the original level of the price. It is, however, possible that with a smaller bonus and a sharp increase in wages, the process will finish before all firms have left region B. In such a case, the equilibrium would be at the original level of the price. The story would thus end at point D.

There are now fewer firms in region B and many more firms in region A. Nominal wages would be higher in region A and its share in total revenues greater. Each firm in region A, however, would produce less than each firm in region B.

Question 4

This is a question about a monopolist who is facing a demand from two distinct groups of consumers: old aristocrats and wannabes. Naturally, the only way to distinguish between them is by allowing one section of demand represent only one group while the other (at lower prices) inevitably, represents both of them. The original intention was for the price elasticity of the aristocrats to be smaller than that of the wannabes. Unintentionally, we ended up saying that the price elasticity of the old aristocrats is less than unity. The wannabes have a price elasticity which is greater than unity. The monopolist cannot price

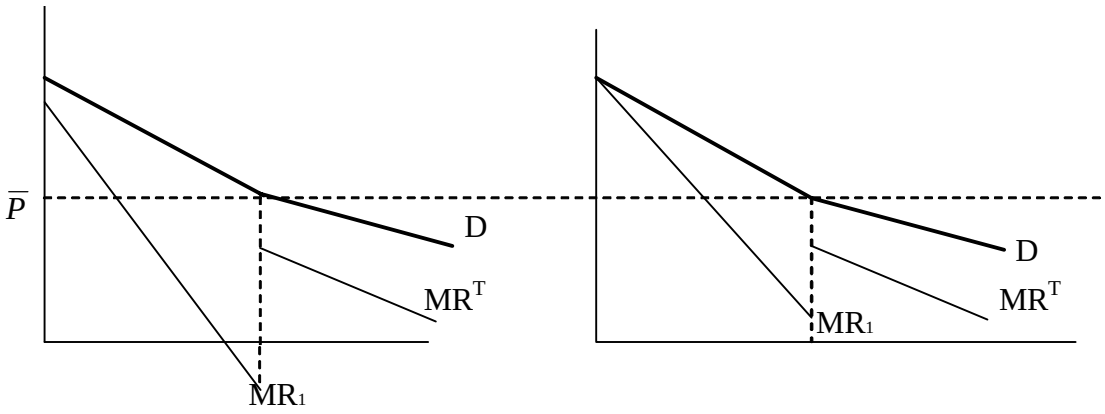
discriminate between the two groups.

The first thing to establish is the shape of the demand facing the monopolist. It is clear from the description in the question that there are some levels of price for which demand would be entirely comprised of the old aristocracy as the wannabes would not be able to afford such prices. When the price falls to, say $\bar{p}$, the wannabes would join the market. We therefore end up with a form of a kinked demand (something which is very likely if the range of prices for which the two groups join the market is not identical).

The main question now is what would be the price elasticity of demand in its two sections? We know that according to the question the price elasticity of the old aristocracy is less than unity. This means that above $\bar{p}$ price elasticity is less than unity while below, it depends on the relative size of the two groups. Assuming that the wannabes are much greater in number, the price elasticity of the lower part would be greater than unity.

Equally, we would allow a slightly different interpretation of the question. Namely, the price $\bar{p}$, divides those prices where the majority of consumers are old aristocrats from those where the majority of consumers are wannabes. In such a case, the price elasticity of both parts would be greater than unity but the demand below $\bar{p}$ would have greater price elasticity than the demand above.

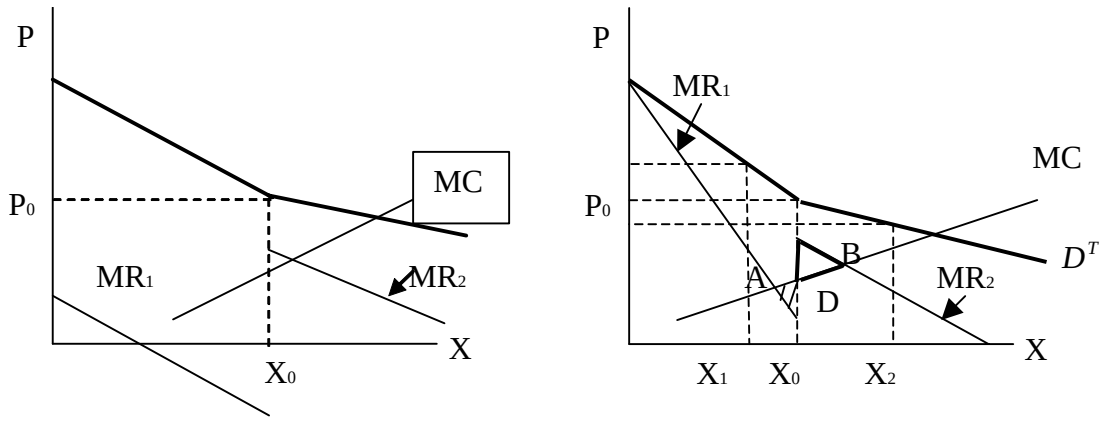
There are thus two possible description of the demand schedule:



In the left hand diagram we assume that above $\bar{p}$, demand is only comprised of old aristocrats while in the right hand diagram we assume that even at higher prices there are some wannabes who are in the market. Their number is sufficient to push price elasticity above unity but altogether, they are a tiny minority among the wannabes. Thus, we can still claim that is the price is above $\bar{p}$, wannabes (as a group) are excluded from the market. The price $\bar{p}$ denotes the point where the majority of the wannabes join. Hence, above it price elasticity is greater than unity (the influence of the wannabes who are willing to pay a lot) yet lower than the price elasticity below it where the majority of consumers are wannabes. In such a case, students were expected to explain the relative positions of the marginal revenues.

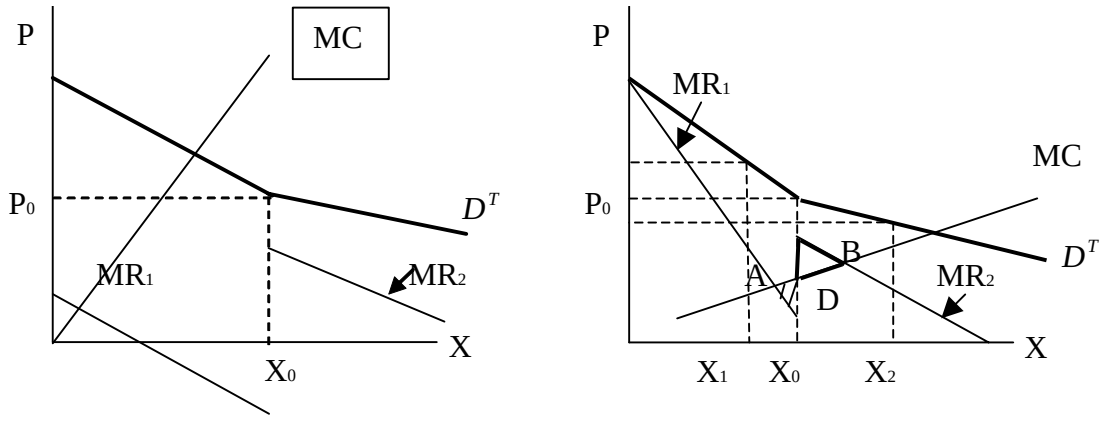
Notice that even in the case where price elasticity of demand above $\overline{p}$ is less than unity, we assume that there would be some section of it (at very high prices where the ratio of p/x is sufficiently high and assuming that the slope of the demand is never near infinity) where price elasticity is greater than unity.

(a) We must now examine the circumstances in which the evening would be offered to both groups:



In the left hand diagram this will happen as long as the marginal cost intersects only with the marginal revenue below $\overline{p}$. In the right hand diagram this is not a sufficient condition. We can see that the marginal cost cuts the marginal revenue twice. This creates two triangles. The first one (from left to right) denotes the losses on the production of the extra units for which the marginal costs are higher than the marginal revenue. The second triangle depicts the gains as for these extra units of output the marginal revenue is greater than the marginal costs. If the left triangle is greater than the right triangle, the monopolist would produce at A and exclude the majority of wannabes. If the right triangle is greater than the left triangle, the monopolist would produce at B and both groups would fully enjoy the special evening.

(b) Now we explore the conditions for the evening to be offered to only one group of consumers:



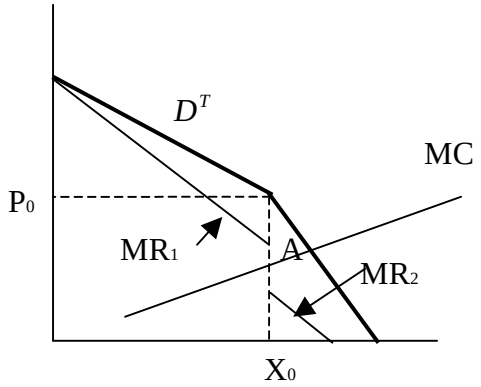
In the left hand diagram we can see that this would happen if the marginal revenue

intersects with the marginal costs on the left. We introduce this to better demonstrate the dilemma facing a monopolist who confronts a price elasticity which is less than unity. We can see here that the monopolist would only sell to the old aristocrats. The logic here is very simply. When price elasticity is less than unity then if someone is willing to pay an enormous price for one evening, it is worth the monopolist while to sell the good only to that person. Every extra unit the monopolist will sell will raise his cost and reduce his revenue. In this case, even if the marginal costs intersected with both marginal revenues, it is highly unlikely that the triangle of gains created would be sufficient to offset the losses from selling extra units in to those people who would carry on buying the good at almost any price.

Had the students assumed that the marginal revenue is negative all the way through, an answer according to which the monopolist would sell that the point where price equals marginal cost would also be acceptable.

In the right hand diagram we can easily see that this would happen either in the case where marginal costs only intersects with the marginal revenue of the old aristocrats or in the case (described) where it intersects twice but the size of the left triangle is greater than that of the right (gain) triangle.

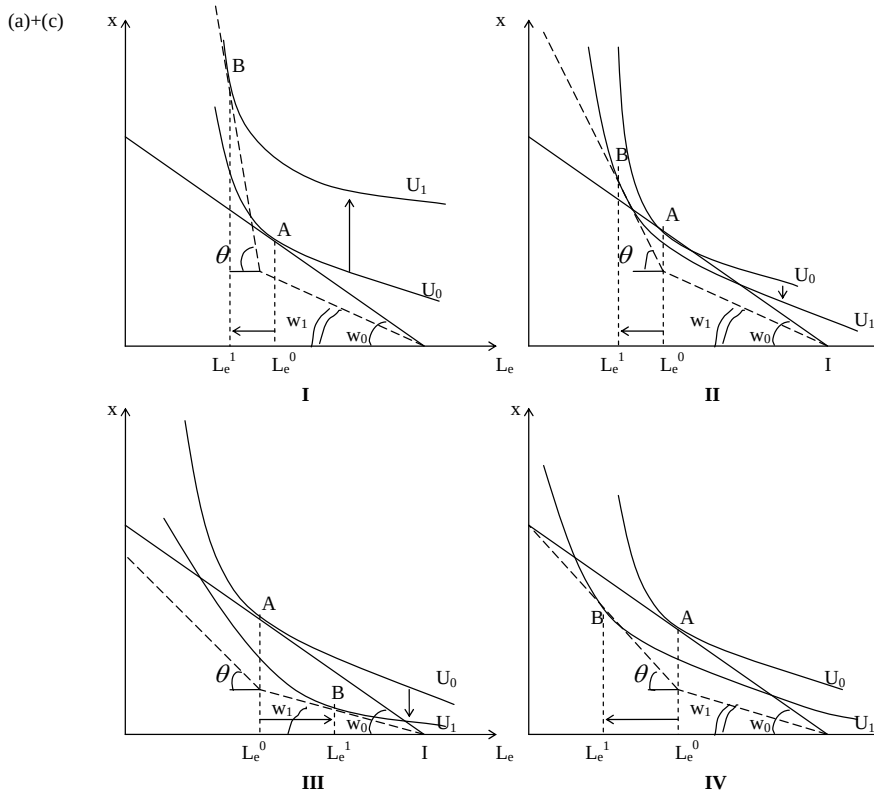
(c) The original intention of the question is well captured through this section. Here we asked what would happen had the price elasticity of the old aristocrats been greater than that of the wannabes.



Clearly, in this case, the marginal revenue of the old aristocrats at the kink would be higher than that of the wannabes. Thus, the answer to (a) would be that only when marginal cost intersects with the marginal revenue of the old aristocrats alone (not described), or when it goes through the gap (described), there would be no incentive for the monopolist to sell more as the marginal cost of the extra unit will always be greater than the marginal revenue. The answer to (b) would be for the marginal cost to cuts through the combined marginal revenue.

Question 5:

This is a rather simple question regarding the labour supplied by an individual. It is not a question about the shape of the labour supply and it must therefore be analysed in the context of an individual's choice of leisure.



There are basically four possible situations:

I. the individual will supply more working hours and will be better off. The cost of this worker to the firm (in real terms) before the change will be:

$\omega_0(\bar{L} - L_e^0)$

which is the vertical line from the horizontal axis to point A.

Now we have a lower wage rate ώ$_1$ to be paid for the normal working hours and θ is the overtime pay. In such a case, the spending by the firm on the individual in case I will be:

$\omega_1(\bar{L} - L_e^0) + \theta(L_e^0 - L_e^1)$

which is the vertical line to point B. This is clearly an increase in the cost of the worker.

II. Here point B indicates a greater supply of working hours but the individual will be worse off. As in the previous case, the vertical line to point B is greater than the line to A.

III. Point B indicates a reduction in hours of work supplied together with a fall in the worker's welfare. Evidently, in such a case, the spending on this worker will fall.

IV. Here the supply of working hours will increase together with a fall in the worker's welfare but the cost to the firm will fall too!.

(b) It is fairly clear that the fact that we are at the upward sloping segment of the labour supply or the backward bending segment of it has only limited influence on the result. Most of it really depends on the extent of the fall in regular wages and the size of the overtime pay. One possible way of making sense of this is to look at the average wage per hour (the ray to point B from the origin.

In case I and II the average wage per hour has increased. In I the person is better off which means that his real income increased. Therefore, the substitution effect should have induced him to work more while the income effect should have encouraged more leisure. As he ends up working more, his substitution effect seems more dominant and it is likely that the individual is on the upward sloping segment of his labour supply.

In case of II average wage per hour increased but the individual is worse off. Substitution effect suggests an increase in labour supplied and so does the income effect. It is possible that leisure is an inferior good and we must therefore be at the upward sloping section of the labour supply.

In case III average wage per hour fell. Substitution effect directs the individual to work less but a fall in real income will increase his supply of labour if leisure is a normal good. As substitution effect dominates income effect, we must be at the upward sloping section of the labour supply.

In case IV average pay per hour fell but the individual offers more labour. Substitution effect direct the individual to reduce his labour supply while income effect proposes an increase if leisure is a normal good. Here, income effect dominates the substitution effect so we may say that the individual is at the backward bending section of his labour supply.

Question 6

(1) To analyse the effects on output of an increase in government spending we must examine the multiplier. We compare the multipliers of an open economy where there are no taxes (left hand side)with a closed economy with a proportional tax system:

$$when \quad m = ct$$

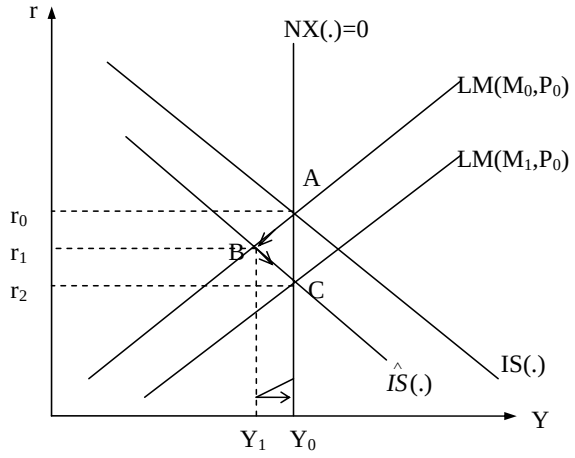
$$\frac{1}{1-c+m} = \frac{1}{1-c(1-t)} = \frac{1}{1-c+ct}$$

(2) In equilibrium the actual capital formation equation is the same as the planned one.

In a closed economy: $I = S_p + T - G$. Hence, private savings does not have to be equal to investment as long as $T-G \neq 0$ is consistent with being in equilibrium.

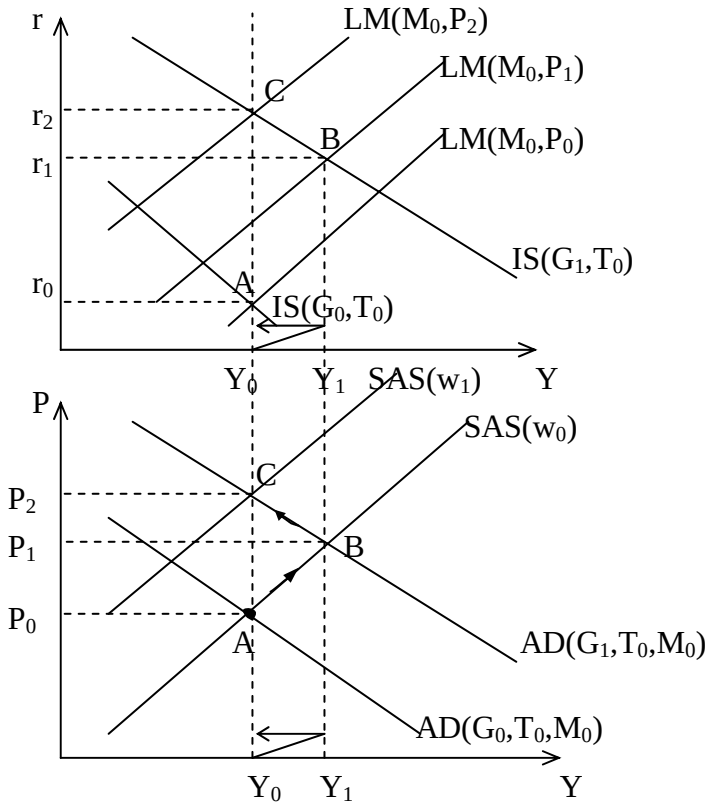
In an open economy: $I = S_p + (T - G) + (IM-X)$. Hence, if $G-T=IM-X$ or $-(T-G)=IM-X$ investment will equal to private savings. However, this does not mean that it only depends on it as that which may affect savings may also affect the other elements of the equation.

(3) An open economy without capital mobility and with a fixed exchange rate:



The 'paradox of thrift' suggests that increase in savings will cause a fall in income and a subsequent fall (or no change in) savings. An increase in the propensity to save means a fall in demand for consumption. IS shifts to the left and income falls. Demand for imports will fall and we have excess supply of foreign currency. With a fixed exchange rate, the central bank will buy the extra foreign currency and bring about an increase in the supply of real balances. LM shifts to the right and we end-up at point C. Increased propensity to save will bring about an increase in savings (as income is unchanged at C) and an increase in investment. There is no paradox of thrift.

(4) A closed economy with flexible wages and prices. There is an increase in government spending which is financed by borrowing from the public:



An expansionary fiscal policy will shift the IS to the right (A to B) and as prices increase too,

the LM will shift a bit to the left. This implies a fall in real wages and when wage negotiations re-open workers will demand a compensation in accordance with the expected further increase in price that will follow their negotiation. With correct expectations, the economy will move to point C where there will be crowding out of investment to pay for the extra demand for public consumption.

(5) True. The supply of liquid assets is: M = PC + D where PC is cash held by the public and D the total amount of deposits. From the analysis of liquid assets supply we know that D = K (1/α) where K is the actual money deposited in commercial banks and α is the reserve ratio. When the public chooses to hold less cash this will increase K. Hence, M too will increase.

(6) In an open economy: I = S_p + (T - G) + (IM-X). Hence, if G-T=IM-X or -(T-G)=IM-X actual
investment will equal to private savings

(7) Here you were expected to argue first that the price of such a deal must be its present value. Secondly, you were expected to show how to calculate the present value of such a deal:

$$PV\{T\}_{i=0}^{\infty} = q\frac{T}{1-q} = \frac{1}{1+r}T\left(\frac{1}{1-\frac{1}{1+r}}\right) = \frac{T}{r} = \frac{10}{r} > 1$$

For all r<1.

(8) True. We know that L = K(1-DM). Initially, deposit multiplier was 5, loan multiplier is therefore, 4. As L=400, K must be 100.
Now K has been increased to 150. The higher reserve ratio (25%) means a deposit multiplier of 4 and a loan multiplier of 3. Thus, the new L = 150x3 = 450. This is an increase of 50 in the total provision of loans.

(9) See *Subject Guide*

Question 7

This is a question about a fundamental change in the tax system. In order to encourage savings, the government proposes to move from an income tax to a tax on consumption.

(a) We assume a closed economy and we examine the effects of the change on the multiplier. Initially, we had the following system:

$$C(Y) = C_0 + c_1(1-t)Y$$
$$I(r) = I_0 - I_1 r$$
$$G = G_0$$
$$\Rightarrow [C_0 + I(r) + G_0] + c_1(1-t)Y = Y$$
$$Y^{IT} = A(r)\frac{1}{1-c_1(1-t)}$$

After the change, the system becomes the following:

$C(Y) = [C_0 + c_1 Y](1-t)$

$I(r) = I_0 - I_1 r$

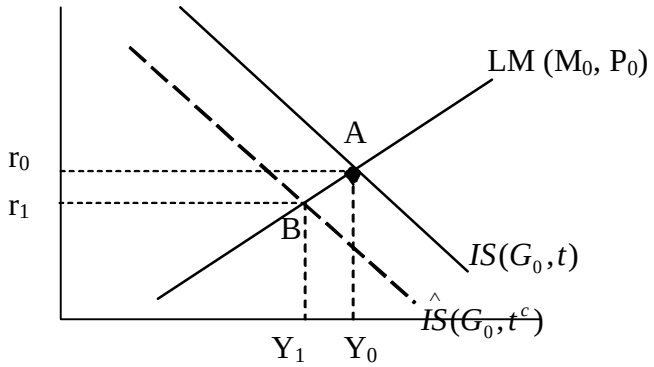
$G = G_0$

$\Rightarrow [C_0(1-t) + I(r) + G_0] + c_1(1-t)Y = Y$

$Y^{ct} = \hat{A}(r)\frac{1}{1-c_1(1-t)}$

This means that the multiplier will be unaffected by the change.

(b) When prices and wages are fixed, the following will occur:



As the autonomous component under IT (income tax) is greater than the one under CT (consumption tax) ($A(r) > \hat{A}(r)$), at any given level of r, there will be equilibrium in the good market at a lower level of income (a shift to the left of the IS).

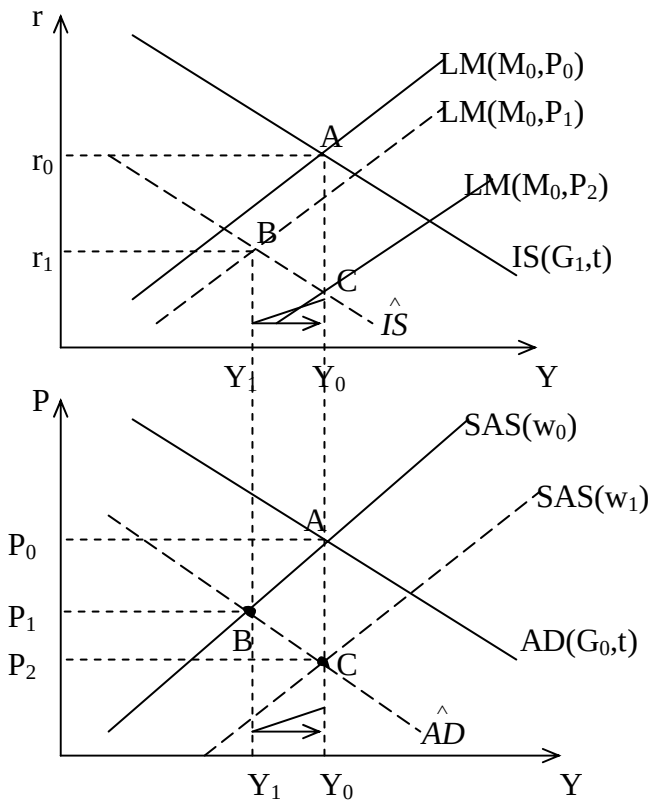
Consumption at the new equilibrium will fall too. Not only is consumption under the CT smaller that under IT for any given level of income:

$C^{IT}(Y) - C^{CT}(Y) = C_0 + c_1(1-t)Y - (C_0(1-t) + c_1(1-t)Y) = C_0 - C_0(1-t) > 0$

But the equilibrium level of income after the change will be smaller too. Thus, in this case, the effect of the shift towards a consumption tax will result in a reduced level of consumption (and income).

The effect on savings may not be straightforward as while consumption fell, so did income. However, we know that investment is a function of interest rate alone (in our case). Hence, as interest rate fell, demand for investment would be greater. For the planned investment to be the same as the planned savings (equilibrium condition), I=S + T –G. Before the change, T(Y)=tY, now T(Y)=tC(Y) As I increase, Y fell (and thus, C(Y) as well as tC(Y)) and G remained unchanged, the only way for this equation to hold would be for S to increase.

(c) With flexible prices and wages we know that the long run level of equilibrium will be at the same level of national income. This time, this will lead to a lower level of nominal wages and prices:



In the short run the economy will move from A to B where the fall in the prices will also cause an increase in the supply of real balances (LM shifts downwards). In the long run, wages and prices will adjust and the economy will end up at point C.

In terms of consumption, there will be no change to our conclusion from before. We saw in (b) that the demand for consumption at any given level of income will be lower under the CT scheme than under normal IT.

Savings too will increase. Recall that I = S +T-G, as interest rates are lower demand for I is higher. For planned investment to be the same as planned savings, S+T-G must increase too. However, G is unchanged and $T^{CT}(Y_0) = tC^{CT}(Y_0) < tY_0 = T^{IT}(Y_0)$. This means that S must have increased.

Question 8

The conditions in this case are clearly stipulated:

(i) Balanced budget with a proportional tax system: G=tY;
(ii) A known fraction, α, of government spending is purchased abroad.

Before we can analyse the effects of an increase in the tax rate, we must examine the complete model. Notice that by implication, an increase in the tax rate means an increase in government spending.

The complete model is thus as follows:

$C(Y) = C_0 + c_1(1-t)Y$

$I(r) = I_0 - I_1 r$

$G = tY$

$X(\frac{E \cdot P^*}{P}) = X_0(\frac{E_0 P^*_0}{P_0})$

$IM(\frac{EP^*}{P}, Y) = IM_0(\frac{E_0 P^*_0}{P_0}) + m_1 Y + \alpha(tY)$

$\Rightarrow AE(Y, r, \frac{EP^*}{P}) = [C_0 + I(r) + (X_0 - IM_0)(\frac{E_0 P^*_0}{P_0})] + [c_1(1-t) + t - \alpha t - m_1]Y = Y$

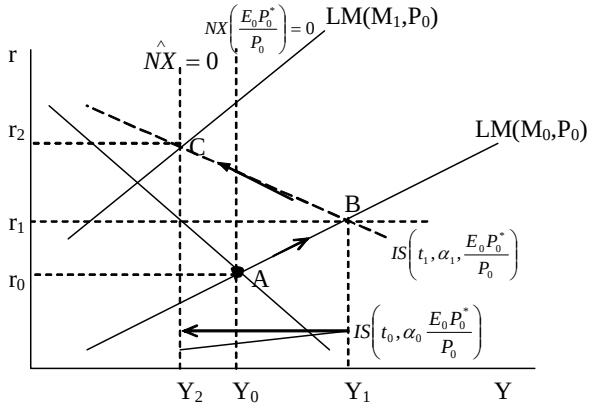
$Y = A(r, \frac{EP^*}{P})\frac{1}{1-[c_1(1-t) + t(1-\alpha) - m_1]} = A(r, \frac{EP^*}{P})\frac{1}{1-M}$

In the equilibrium condition, t is an element of M. Thus, to analyse the effects of a change in t we must examine its influence on M (and the multiplier). Clearly, an increase in M corresponds to an increase in the multiplier.

$\frac{\partial M}{\partial t} = 1 - \alpha - c_1$

Hence, if $1-\alpha > c_1$, an increase in t will cause a greater increase in government demand for *local* output than the loss of demand from the fall in consumption. In other words, 1-α is the government's marginal propensity to spend locally. If it is greater than the marginal propensity to consume, a transfer from consumers to the government will raise aggregate demand. We shall assume this to be the case but the alternative conclusion was also accepted provided that it was derived from the analysis above and not simply assumed by the virtue of the general claim that raising taxes is a contracting fiscal policy.

(a) An open economy without capital mobility and a fixed exchange rate:



Assuming that the effect of the increase in tax was expansionary, this means that for any given level of interest rate, there would now be equilibrium at a higher level of income. As the change is due to the increase in the multiplier, this means a shift to the right of the IS AND a flatter slope. However, an increase in the rate of tax would generate an increase in demand for imported goods at any level of income. This means that the level of income in which the initial demand for net export would be off set, is now lower. In other words, the NX

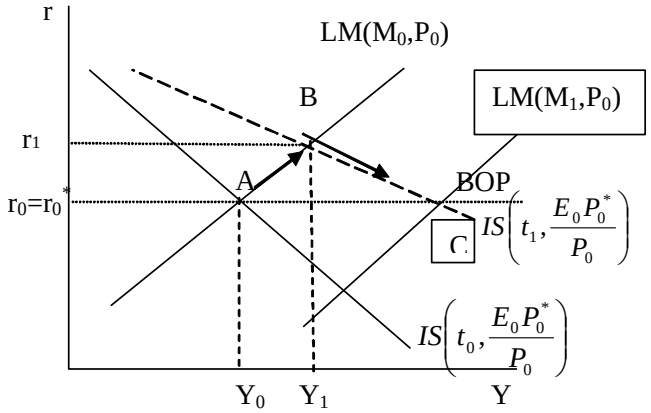
line shifts to the left:

$$NX(\frac{E_0 P^*_0}{P_0}, Y) = (X_0 - IM_0)(\frac{E_0 P^*_0}{P_0}) - (m_1 + \alpha t)Y = 0$$

$$Y^{NX=0} = \frac{(X_0 - IM_0)(\frac{E_0 P^*_0}{P_0})}{m_1 + \alpha t} \quad \Rightarrow \frac{dY^{NX=0}}{dt} = -\frac{\alpha(X_0 - IM_0)(\bullet)}{(m_1 + \alpha t)^2} < 0$$

If we start at A we can see that there will now be excess demand for local goods and a deficit in the current account. The economy will start moving towards point B which will exacerbate the deficit in the current account. The excess demand for foreign currency will be met by decline in Central Bank's reserves which will lead to a fall in the supply of liquid assets. The LM will thus shift upwards (for any given level of income there will be equilibrium at a higher interest rate). This will carry on until we reach equilibrium at point C where output falls below its original level and the interest rate increases.

(b)+(c) Perfect capital mobility:



The initial change in this case is simply the shift of the IS to the right and flatter. (A to B). This will raise local interest rates above the international level of return rates on assets and subsequently, cause an inflow of capital (foreigners wishing to hold local assets). This, in turn, will cause excess supply of foreign currency. In the case of a flexible exchange rate, E will decrease (appreciation) and the demand for net export will diminish. The IS will shift back to its original position at A. where the increase in government spending has crowded out export.

In the case of a fixed exchange rate, the excess supply of foreign currency will be absorbed by the Central Bank and cause an increase in the supply of liquid assets. LM will shift downwards and the new equilibrium will be at point C.

(d) We must now re-examine the effect of the increase in tax (in the case of (a)) when the tax system is based on a lump-sum tax. We must first re-write the model:

$$C(Y) = C_0 + c_1(Y - T)$$
$$I(r) = I_0 - I_1 r$$
$$G = T$$
$$X(\frac{E \cdot P^*}{P}) = X_0(\frac{E_0 P^*_0}{P_0})$$
$$IM(\frac{EP^*}{P}, Y) = IM_0(\frac{E_0 P^*_0}{P_0}) + m_1 Y + \alpha T$$
$$\Rightarrow \hat{AE}(Y, r, \frac{EP^*}{P}) = [C_0 + I(r) + (X_0 - IM_0)(\frac{E_0 P^*_0}{P_0}) + T(1-\alpha) - c_1 T] + [c_1 - m_1]Y = Y$$
$$Y = \hat{A}(r, \frac{EP^*}{P})\frac{1}{1-[c_1 - m_1]} = A(r, \frac{EP^*}{P})\frac{1}{1-M^T}$$

In this case, an increase in taxes (T) (driven by the desire to increase G) will not affect the multiplier. Instead, it will change the autonomous component:

$$\frac{\partial \hat{A}}{\partial T} = 1 - \alpha - c_1$$

Namely, under the same conditions that an increase in proportional tax would cause an increase in aggregate demand for domestic output (shift of the IS to the right), an increase in a lump sum tax will cause a shift to the right of the IS. Equally, an increase in T will cause an increase in demand for imports at any given level of income and therefore, shift the NX=0 constraint to the left. Thus, the answer at (a) remains unchanged under a lump-sum tax system.

Question 9

There are two elements to the information given in this question. Firstly, an increase in the number of old age pensioners means a fiscal expansion (the increase in transfer payments reduces tax revenues (T)). The second element is the fact that old age pensioners tend to travel abroad more than the young. This means that there are offsetting effects to this change as the increase in transfers shifts IS to the right while the increase in demand for imports shifts it to the left. To examine the effects we shall assume that old age pensioners only derive their income from the government transfers. We shall also assume a proportional tax and the fraction which is transferred to old age pensioners is β:

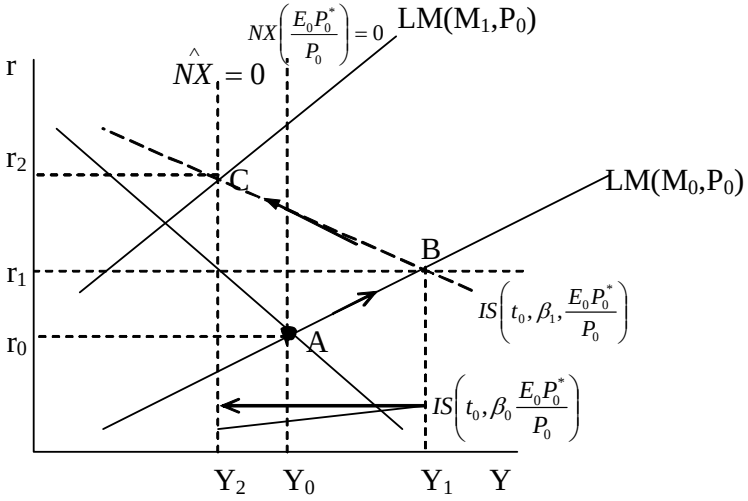
$$C(Y) = C_0 + c^{Y}{}_1(1-t)Y + c^{0AP}{}_1\beta tY$$
$$I(r) = I_0 - I_1 r$$
$$G = G_0$$
$$X(\frac{E \cdot P^*}{P}) = X_0(\frac{E_0 P^*{}_0}{P_0})$$
$$IM(\frac{EP^*}{P}, Y) = IM_0(\frac{E_0 P^*{}_0}{P_0}) + m^{Y}{}_1 Y + m^{OAP}{}_1\beta tY$$
$$\Rightarrow AE(Y, r, \frac{EP^*}{P}) = [C_0 + I(r) + (X_0 - IM_0)(\frac{E_0 P^*{}_0}{P_0})] + [c^{Y}{}_1(1-t) + c^{OAP}{}_1\beta t - m^{Y}{}_1 - m^{OAP}{}_1\beta t]Y = Y$$
$$Y = A(r, \frac{EP^*}{P})\frac{1}{1-[c^{Y}{}_1(1-t) + t\beta(c^{OAP}{}_1 - m^{OAP}{}_1) - m^{Y}{}_1]} = A(r, \frac{EP^*}{P})\frac{1}{1-M}$$

Clearly, an increase in the number of old age pensioners means an increase in β which is only an argument of the multiplier:

$$\frac{\partial M}{\partial \beta} = t(c^{OAP}{}_1 - m^{OAP}{}_1)$$

Hence, if the marginal propensity to spend locally by the old age pensioners is greater than their marginal propensity to spend abroad, the multiplier will increase and the overall effect of the change will be expansionary.

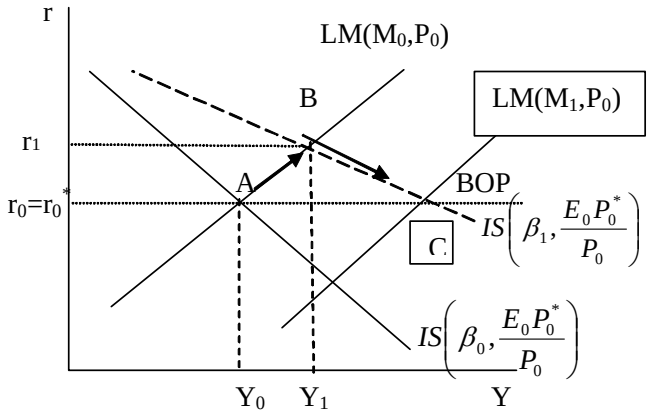
(a) An open economy without capital mobility and a fixed exchange rate:



Assuming that the effect of the increase in β was expansionary, this means that for any given level of interest rate, there would now be equilibrium at a higher level of income. This is a shift to the right of the IS AND it becomes flatter. However, an increase in β would generate an increase in demand for imported goods at any level of income. This means that the level of income in which the initial demand for net export would be off set, is now lower. In other words, the NX line shifts to the left.

If we start at A we can see that there will now be excess demand for local goods and a deficit in the current account. The economy will start moving towards point B which will exacerbate the deficit in the current account. The excess demand for foreign currency will be met by decline in Central Bank's reserves which will lead to a fall in the supply of liquid assets. The LM will thus shift upwards (for any given level of income there will be equilibrium at a higher interest rate). This will carry on until we reach equilibrium at point C where output falls below its original level and the interest rate increases.

(b)+(c) Perfect capital mobility:



The initial change in this case is simply the shift of the IS to the right. (A to B). This will raise local interest rates above the international level of return rates on assets and subsequently, cause an inflow of capital (foreigners wishing to hold local assets). This, in turn, will cause excess supply of foreign currency. In the case of a flexible exchange rate, E will decrease (appreciation) and the demand for net export will diminish. The IS will shift back to its original position at A. where the increase in government spending has crowded out export.

In the case of a fixed exchange rate, the excess supply of foreign currency will be absorbed by the Central Bank and cause an increase in the supply of liquid assets. LM will shift downwards and the new equilibrium will be at point C.