

*Business Economics 3E1*

*2012-2013*

CRIBS

Exam setter: Dr. Andrea Mina

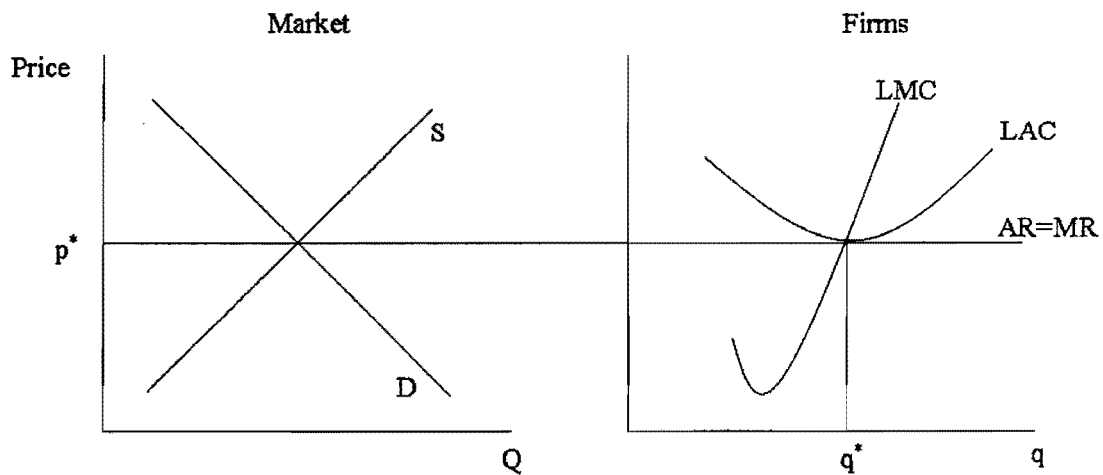
Exam checker: Prof. Alan Hughes

## BUSINESS ECONOMICS 3E1

### CRIBS

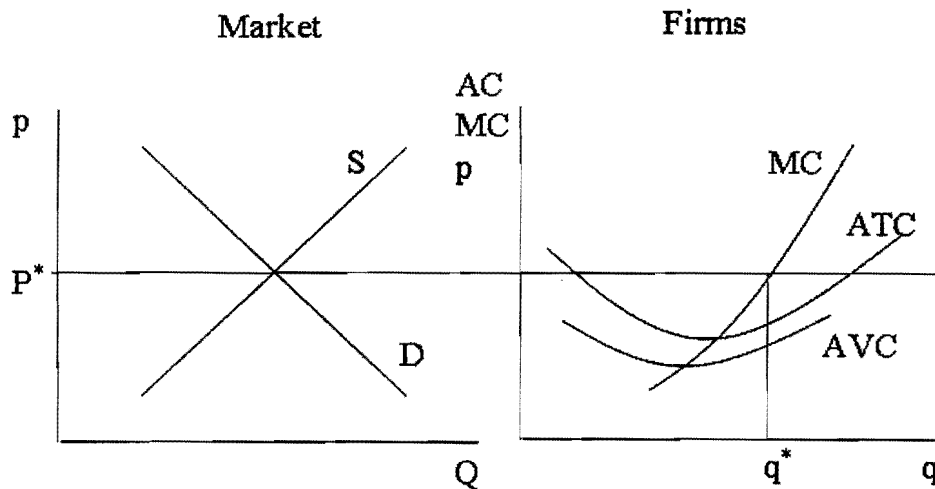
- 1) (a) Under what condition in a perfectly competitive industry will firms necessarily operate at their minimum efficient scale? [25%]

In long-run equilibrium adjustments in scale by existing firms and/or entry by new firms will ensure that the market price in a perfectly competitive market is driven down to the minimum value of firms' long run average costs ( $p^*$  in the diagram below). This is the unique equilibrium price in the long-run, since any other market price would create incentives for firms to enter or exit the industry (or existing firms to alter their scale).



Since each firm will take the market price,  $p^*$ , as given and profit maximise by producing at  $q^*$ , it follows that each firm will operate at its minimum efficient scale.

In the short-term, however, where there is no entry or exit and existing firms have fixed factors, the equilibrium market price needs not be driven down to min LAC as above. The following, for example, is compatible with short-term equilibrium:



In this case firms are not operating at their MES. Indeed each firm is making a positive profit, which in the long-run would be eroded (and the price driven down) by the entry of new firms. Thus firms may not be operating at their MES in short-run equilibrium.

(b) What are the axioms of choice and what is their significance in the rational agent model of the consumer? [25%]

The axioms of choice are three fundamental assumptions made about individuals' preferences in the rational agent model of consumer choice. The axioms are completeness, transitivity and reflexivity.

Completeness requires that any pair of consumption bundles can be compared, such that for any pair of bundles A and B either: A is preferred to B, B is preferred to A, or A is indifferent to B.

Transitivity is a consistency requirement. It states that given any three bundles A, B and C, if A is considered at least as good as B, and B at least as good as C, then A must be at least as good as C.

Reflexivity requires that any bundle is at least as good as itself.

In formal terms:

- Completeness
  - For any pair of bundles  $\underline{x}'$  and  $\underline{x}''$  either
    - $\underline{x}' \succ \underline{x}''$ , or
    - $\underline{x}'' \succ \underline{x}'$ , or
    - $\underline{x}' \sim \underline{x}''$
- Transitivity
  - Given any three bundles  $\underline{x}', \underline{x}'', \underline{x}'''$ 
    - If  $\underline{x}' \succeq \underline{x}''$  and  $\underline{x}'' \succeq \underline{x}'''$  then  $\underline{x}' \succeq \underline{x}'''$
- Reflexivity
  - For any bundle  $\underline{x}'$ 
    - $\underline{x}' \sim \underline{x}'$

The role of the three axioms is to ensure that a consumer can generate a complete and consistent ranking of all possible consumption bundles. This ranking is called a preference ordering and summarises the consumer's tastes in the rational agent model.

(c) Outline the Prisoners' Dilemma game [20%]

The classic description of the game sees two ex-convicts arrested by the police on suspicion of carrying out a spate of burglaries in a particular neighbourhood. The police lack the evidence to charge the pair with the burglaries immediately so instead hold them in separate cells and offer each the chance to confess to the crimes in return for a reduced sentence. Each is told that if they both continue to deny the crimes, they will be charged with the lesser crime of possessing stolen goods, which carries a 1-year prison sentence. If both confess, each will receive a 5-year sentence for the multiple burglaries. However, if one confesses to the crimes while the other denies, then the one who confesses will be released without charge while the other will be sentenced to the maximum term of 10 years.

The normal form representation of the game (with payoffs shown as utilities rather than years in jail) is as follows:

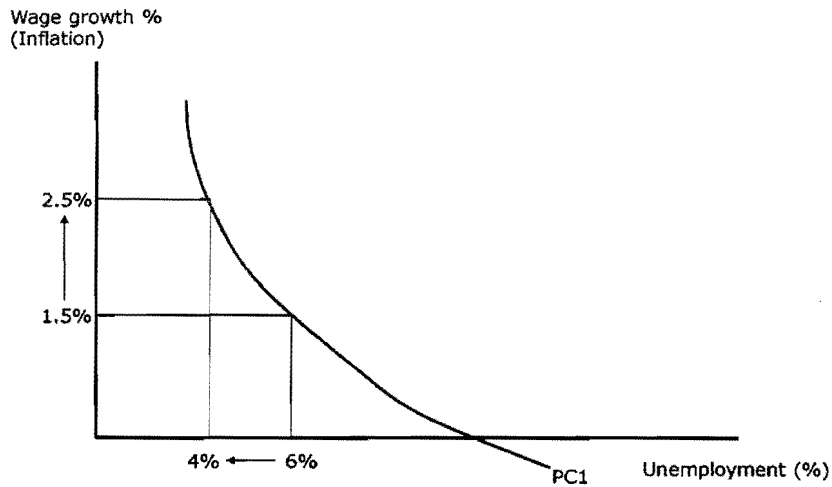
		1	
		Deny	Confess
2	Deny	2,2	0,3
	Confess	3,0	1,1

(d) Define the concept of externality [10%]

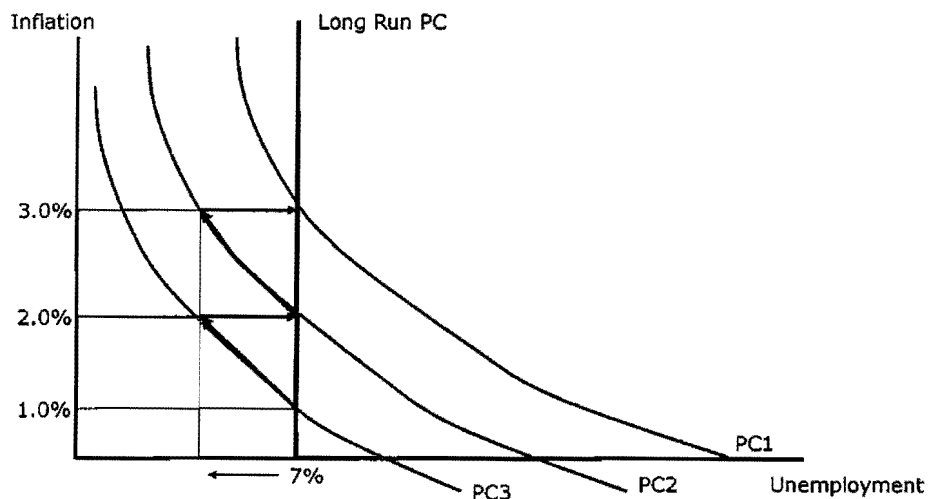
An externality refers to a situation in which the actions taken by one agent in an economic transaction affect the welfare (either positively or negatively) of another who is not directly involved in the transaction. In such situations prices do not reflect the full societal costs or benefits in production or consumption of a product or service, leading to market failure.

(e) What is the Phillips Curve and how does it differ from the Augmented Phillips Curve? [20%]

The Phillips Curve shows an inverse relationship between inflation and unemployment. It suggested that if governments wanted to reduce unemployment it had to accept higher inflation as a trade-off (see below).



In the 1970s the Phillips curve relationship broke down as there was rising unemployment and rising inflation (stagflation). An alternative explanation was developed by the Monetarist school: the expectations augmented Phillips curve (see below). With this model there is only an inflation/unemployment trade-off in the short run but not in the long run. A long-run equilibrium can occur at any rate of inflation, provided that the expected rate of inflation is equal to the actual rate. Attempting to push unemployment below the equilibrium rate of unemployment will lead to accelerating inflation. Lowering the rate of inflation requires a period of sustained unemployment above the Equilibrium rate until expectations of inflation have been revised downwards.



2) (a) Define:

(i) Increasing returns to scale to the firm [10%]

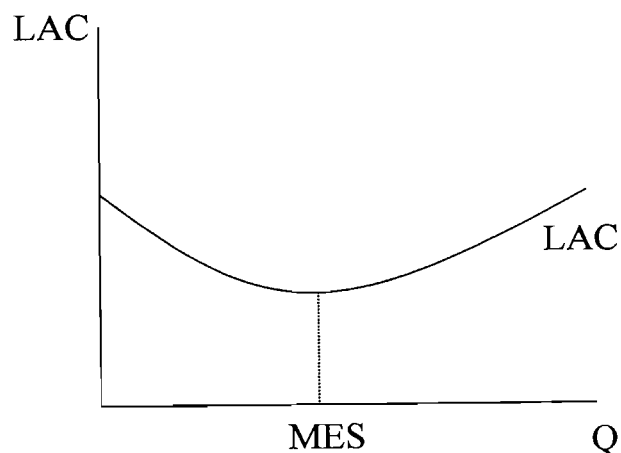
Increasing returns to scale is a property of a firm's technology, according to which a proportionate increase in all factors of production leads to a more than proportionate increase

in output. If technology is expressed in terms of a simple two-factor production function,  $Q = f(K, L)$ , increasing returns to scale require that if all inputs are scaled up by  $t$ , then:

$$tf(K, L) < f(tK, tL)$$

(ii) Minimum efficient scale of the firm [10%]

The minimum efficient scale (MES) of a firm is the lowest level of output at which long run average costs are minimised. Graphically:



(b) Define the ‘shut down’ condition for a profit maximising firm in the short run. Explain the rationale behind this shut down condition. [25%]

The SR shut down condition states that a firm should cease operating in the short-run if it is unable to pay for its variable costs. The rationale for this is that in the short-run a firm will incur its fixed costs regardless of whether it produces any output or not. Thus a firm that produces nothing will make a loss equal to its fixed costs. If, by producing a positive output, the firm can generate sufficient revenue to at least cover its variable costs of production, then its losses will be smaller than its fixed costs (since its revenues cover variable costs and some part of fixed costs). Otherwise losses will exceed fixed costs and the firm should therefore cease production.

(c) Outline the theory of comparative advantage. Under what conditions might a country find it beneficial to introduce trade protection? [30%]

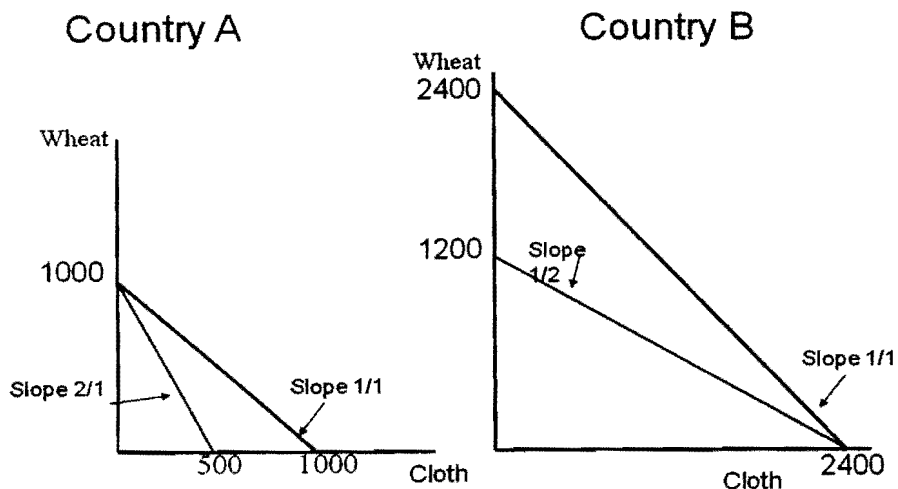
The theory of comparative advantage states that the consumption possibilities of a country are maximised if it specialises in the production of goods in which it has a comparative advantage and trades for the goods it does not produce. The theory can be illustrated by way of a simple numerical example. Suppose there are two countries A and B with the following production possibilities:

		Kilos of Wheat		Metres of cloth
Country A	either	1000	or	500
Country B	either	1200	or	2400

The pre-trade exchange ratios of wheat for cloth are then:

Country A	2 for 1
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Although country B has an *absolute advantage* in the production of both goods, country A has a *comparative advantage* in the production of wheat. Providing that the countries can trade at an exchange ratio somewhere between 2:1 or 1:2 they will both gain from trade. Suppose that exchange occurs at a rate of 1:1 and assume that the opportunity costs of cloth in terms of wheat do now vary with output, i.e. that the production possibilities frontiers will be straight lines.



Suppose that before trade country A was consuming 200 units of wheat and 400 units of cloth, and that country B was consuming 400 units of wheat and 1600 units of cloth. By specialising in the product in which they have a comparative advantage and then trading, both countries could do better than this. For example, if they specialised completely and country A exchanged 600 units of wheat for 600 units of cloth produced by country B we would have:

#### CONSUMPTION BEFORE AND AFTER TRADE

	before trade	after trade
Country A	200W & 400C	400W & 600C
Country B	400W & 1600C	600W & 1800C

Various arguments have been given as to why it may nevertheless be necessary to implement protectionist policies, e.g.:

- the infant industries argument
- to ensure security of supply of essential goods that could otherwise only be sourced as imports
- to avoid the risk of specialising in (and having to rely on the trade in) goods that may have volatile prices or for which future demand is not assured
- to stimulate industries with a view to the positive externalities and industrialisation might bring

(d) Define the terms nominal and real exchange rate. [10%]

The nominal exchange rate is the price of one currency in terms of another currency (or in terms of 'basket' of other currencies). The real exchange rate is the real purchasing power of a currency and is the price of currency adjusted for cross-country differences in prices of goods and services.

(e) What are the implications of the neoclassical endogenous model of economic growth for government policy? [15%]

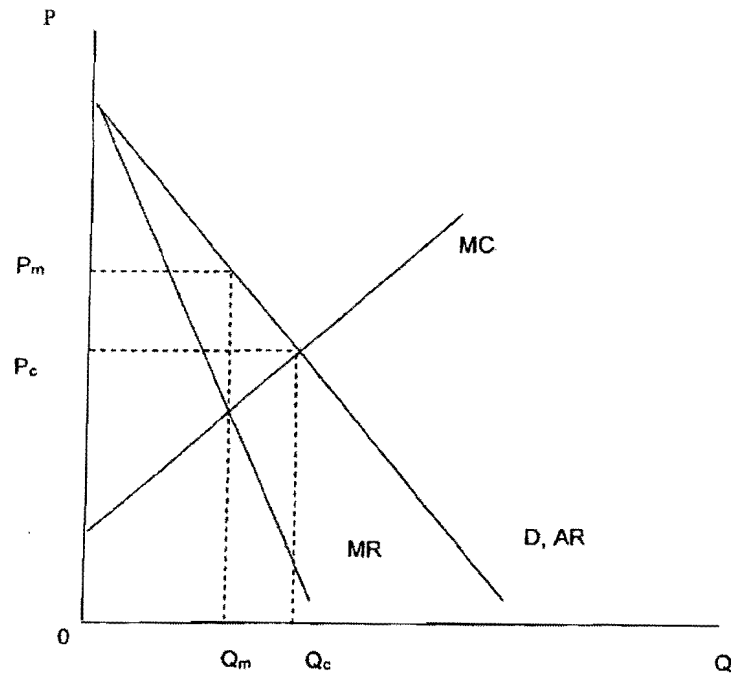
Endogenous growth models may suggest divergences in growth: with fast growth in countries that invest in the key areas (e.g. education, skills, R&D and so on), which have strong spillover effects. The problem is that policy makers have to identify the key factors and how to measure the extent and form of externalities from investing in these factors.

3) (a) What is first degree price discrimination? If a monopolist exercises first degree price discrimination, what is the impact on the efficient level of industry output? Use an appropriate diagram to explain. [35%]

Price discrimination is a situation where a monopolist sells different units of output at different prices. Under first degree price discrimination each unit of the good is sold to the individual who values it most highly, at the maximum price this individual is willing to pay for it.

To explain the efficiency point the most helpful framework is a standard monopoly diagram:





Start by explaining that the (non-discriminating) monopoly outcome is  $Q_m, P_m$ . Then explain that this outcome is inefficient because for the units of output between  $Q_m$  and  $Q_c$ , the price someone is prepared to pay exceeds the additional costs of production. Therefore if traded at a price,  $P$ , such that  $AR > P > MC$ , both the firm and consumer would be better off exchanging these units. Hence a Pareto improvement is possible.

Next explain that first degree price discrimination allows a firm to charge a different price for a unit of the good. It follows that if the firm in the diagram is allowed to employ first degree price discrimination, the profit maximising output will be  $Q_c$ , with each unit sold at the highest reservation price (as indicated by the AR curve).

The outcome under first degree price discrimination is efficient because all units for which  $AR > MC$  are exchanged (hence the inefficiency associated with the single price monopolist disappears).

(b) Explain what is meant in game theory by the term 'backward induction' and provide an example [25%]

In game theory, the branch of economics that studies decision-making in strategic situations, backward induction is a technique that is used to solve extensive form games (games with sequential choices). It proceeds by first working out what is likely to happen at the possible end points of the game (the terminal nodes) and then working backwards. It yields a plausible solution to the game if players are rational and the rules of the game are common knowledge.

Candidates can choose to present the Trust Game, an Entry Game, the Battle of the Sexes or Matching Pennies.

(c) Explain the impact of the following on the level of consumption

- (i) A temporary decrease in the rate of income tax [20%]

According to normal income hypotheses (such as the LCH) this will have little impact on consumption as there will be little impact on long-run income. This contrasts with the conventional Keynesian consumption function, according to which a temporary reduction in income tax will lead to an increase in consumption. Better candidates will note the implications for fiscal policy.

- (ii) A fall in import prices. [20%]

This should stimulate consumption through both an income effect *and* a substitution effect. It will also lead to lower costs of production which may stimulate consumption if the cost savings are passed on to consumers in term of prices. Candidates could consider the impact of low-priced imports from SE Asia and Eastern Europe.

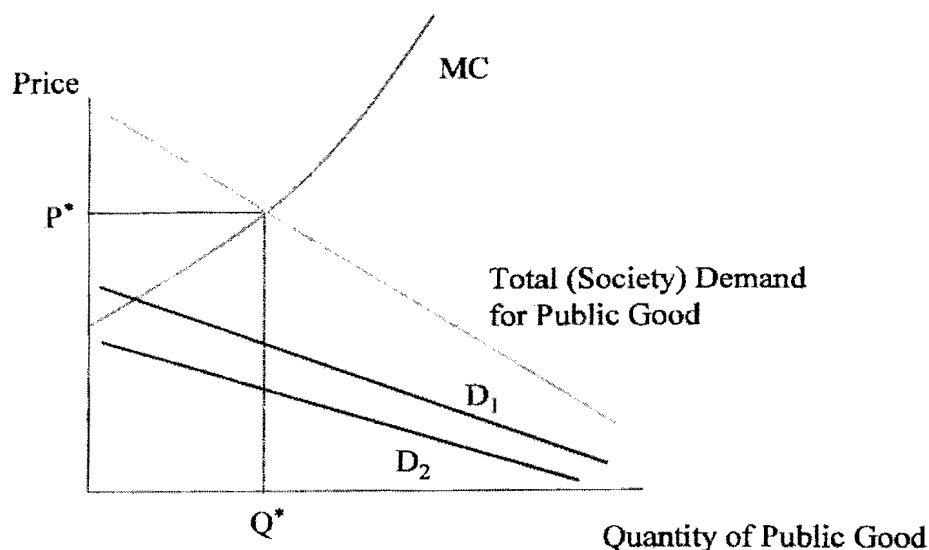
- 4) (a) Consider the concept of public goods.

- (i) What are their defining characteristics? (15%)

Public goods have two defining characteristics: non-rival and non-excludable use. Non-rival use means that consumption by one person does not reduce the amount available for consumption by any other person (e.g. a radio broadcast). Non-excludability means that it is impossible (or at least prohibitively expensive) to prevent any person from consuming it once it has been produced. Public goods may be contrasted with private goods, which are both rival and excludable.

- (ii) How do they result in market failure? (25%)

The characteristics of non-rival and non-excludable use are likely to result in an inefficient level of provision of the good (i.e. result in market failure). This provides the rationale for government determining the level of provision. To explain why public goods generate market failure, first characterise the efficient level of provision of a public good. See the following diagram.



Society's demand curve for a public good is the vertical summation of individual consumer's demand curves (since the non-rival property implies each consumer's marginal willingness to pay (MWP) for the good should be added up to obtain society's MWP for each unit). Efficient provision occurs at  $Q^*$ , where the societal demand curve and the MC curve intersect.

Why is the market unlikely to provide  $Q^*$ ? First, individuals have an incentive to free-ride and to personally purchase little (if any) of the good knowing that (because of the two properties) they will be able to consume the units purchased by others. If such free-riding is the dominant strategy for all consumers, little of the good is likely to be provided.

Second, even without such free-riding, a private market does not provide a mechanism for aggregating individual consumer's preferences (i.e. their MWP for each unit). In the above diagram, if the supplier acts competitively and supplies along the MC curve, consumer 1 will purchase a small amount of the good and consumer 2 nothing. Yet in order for the efficient level of provision ( $Q^*$ ) to be obtained there needs to be some mechanism for aggregating consumers' preferences, that is, taking into account the fact that both (or all) consumers may consume each unit provided.

(b) What is a Nash equilibrium? [15%]

A Nash equilibrium is a set of strategies, one for each player, such that each player's strategy is a best response to the other players' strategies. To find the NE of a game we need to determine each player's best response to each possible opposition strategy. The intuition behind NE is simply the idea that the solution to a game must not leave any player with an incentive to change what they are doing, given the actions of their opponents. In other words, the strategy each player plays must be the strategy he wants to play, given what his opponents are doing. Better students may note that a game can have many, one or no NE; and that to find compelling solutions we need to make strong assumptions (i.e. rationality; common knowledge).

(c) Why is monetary policy unlikely to be effective with fixed exchange rates [10%]

Under fixed exchange rates the money supply must adjust to ensure that the exchange rate stays at its pegged level. Attempting to reduce (or raise) interest rates to stimulate (or damp down) the economy will then be ineffective. For example, an interest rate reduction will decrease the demand for the domestic currency on foreign exchange markets, and the monetary authorities will then be forced to buy the domestic currency to maintain the pegged exchange rate. The attempt to increase the money supply via lower interest rates will thus be thwarted.

(d) Explain the main differences between neoclassical exogenous and endogenous growth theory [35%]

The neoclassical exogenous growth model investigates how economic growth is determined by: growth of the labour force (L); investment in human capital (H); investment in physical capital (K) and technological change. Often presented as aggregate production function:

$$GDP = A(L, H, K)$$

This approach builds on key assumptions: the aggregate production function displays decreasing returns to any single factor; the aggregate production function displays constant returns when all factors are increase in the same proportion.

At any moment the capital stock is a key determinant of the economy's output but the capital stock can change and this can lead to economic growth. If the savings rate is high, the economy will have a large capital stock and a high level of output but if the saving rate is low, the economy will have a small capital stock and low level of output. Higher savings lead to faster growth – but only temporarily: an increase of the rate of saving raises growth until the economy reaches the new steady state.

A population increase will increase output. In the steady state with population growth capital per worker and output per worker are constant. But countries with high population growth (with no change in capital) will have lower capital per worker and so lower levels of output per person. Improvements in the quality of labour will increase output, even at current levels of physical capital and labour. Only technological change can explain persistent increases in per capita growth. The simplest assumption about technological progress is that it increases the efficiency of labour – it is labour-augmenting technological progress. In this model technology is considered exogenous ('manna from heaven').

There are many alternative forms of endogenous growth theory. In the early models the key intuitive idea behind them was the absence of diminishing returns to capital (in contrast to exogenous growth models). Many later models have retained the notion of diminishing returns to a factor but have stressed the importance of externalities or spillovers which can lead to endogenous growth. In the exogenous model, savings lead to growth temporarily, but diminishing returns to capital force the economy to the steady state growth path that depends on exogenous technological change. In contrast, with endogenous growth, investment can lead to persistent growth and the notion of capital encompasses knowledge assets.

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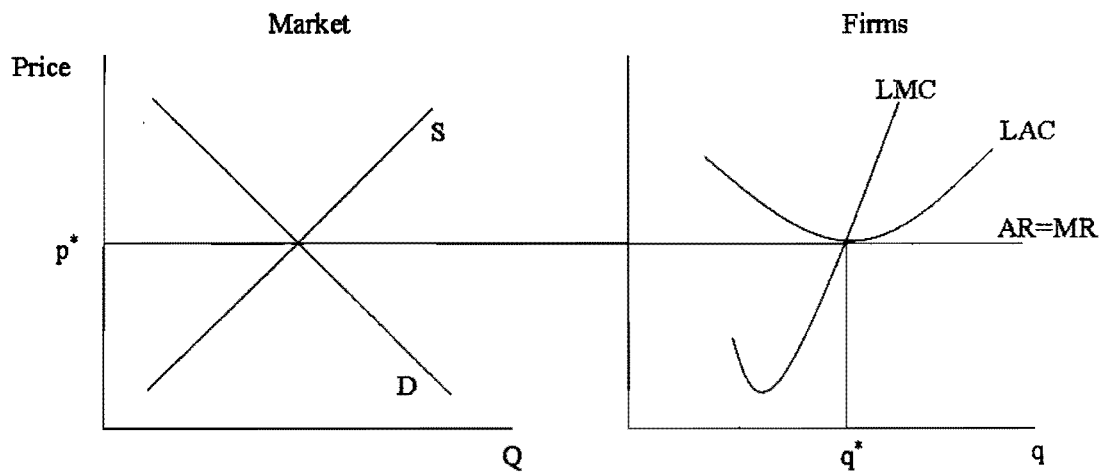
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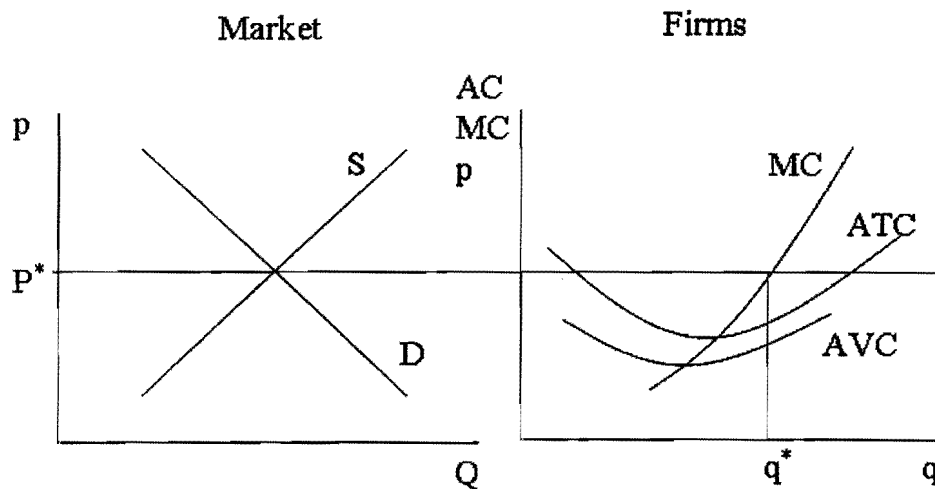
- 1) (a) Under what condition in a perfectly competitive industry will firms necessarily operate at their minimum efficient scale? [25%]

In long-run equilibrium adjustments in scale by existing firms and/or entry by new firms will ensure that the market price in a perfectly competitive market is driven down to the minimum value of firms' long run average costs ( $p^*$  in the diagram below). This is the unique equilibrium price in the long-run, since any other market price would create incentives for firms to enter or exit the industry (or existing firms to alter their scale).



Since each firm will take the market price,  $p^*$ , as given and profit maximise by producing at  $q^*$ , it follows that each firm will operate at its minimum efficient scale.

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In this case firms are not operating at their MES. Indeed each firm is making a positive profit, which in the long-run would be eroded (and the price driven down) by the entry of new firms. Thus firms may not be operating at their MES in short-run equilibrium.

(b) What are the axioms of choice and what is their significance in the rational agent model of the consumer? [25%]

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Transitivity is a consistency requirement. It states that given any three bundles A, B and C, if A is considered at least as good as B, and B at least as good as C, then A must be at least as good as C.

Reflexivity requires that any bundle is at least as good as itself.

In formal terms:

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- Transitivity
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The classic description of the game sees two ex-convicts arrested by the police on suspicion of carrying out a spate of burglaries in a particular neighbourhood. The police lack the evidence to charge the pair with the burglaries immediately so instead hold them in separate cells and offer each the chance to confess to the crimes in return for a reduced sentence. Each is told that if they both continue to deny the crimes, they will be charged with the lesser crime of possessing stolen goods, which carries a 1-year prison sentence. If both confess, each will receive a 5-year sentence for the multiple burglaries. However, if one confesses to the crimes while the other denies, then the one who confesses will be released without charge while the other will be sentenced to the maximum term of 10 years.

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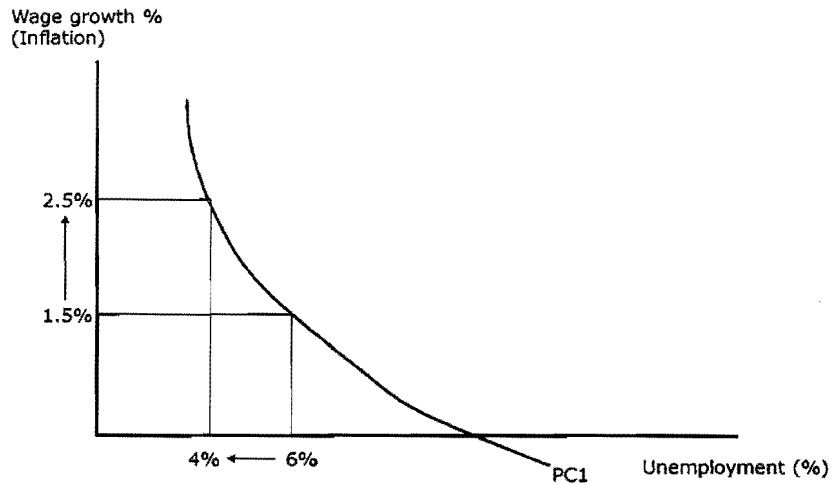
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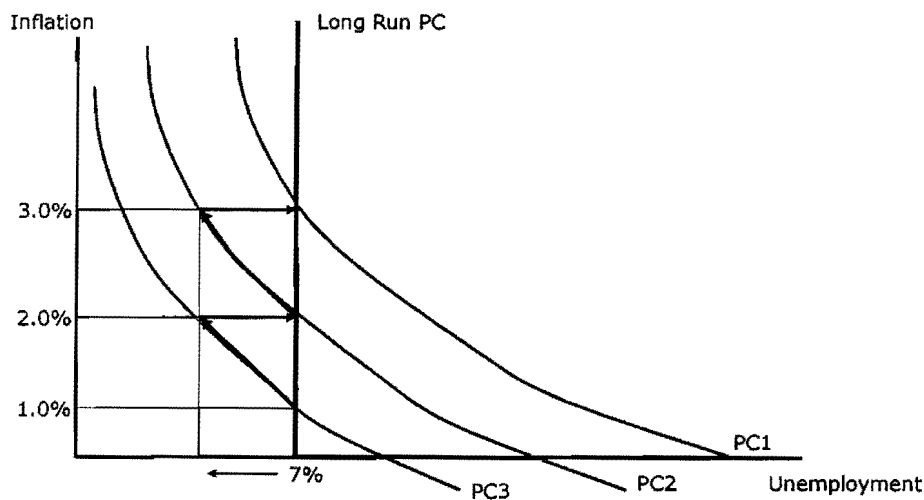
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2) (a) Define:

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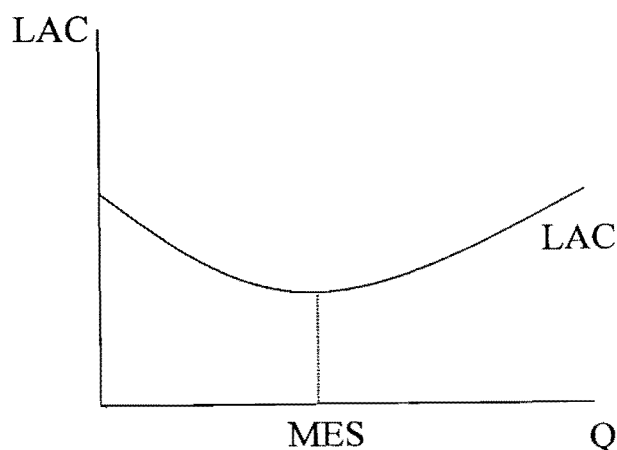
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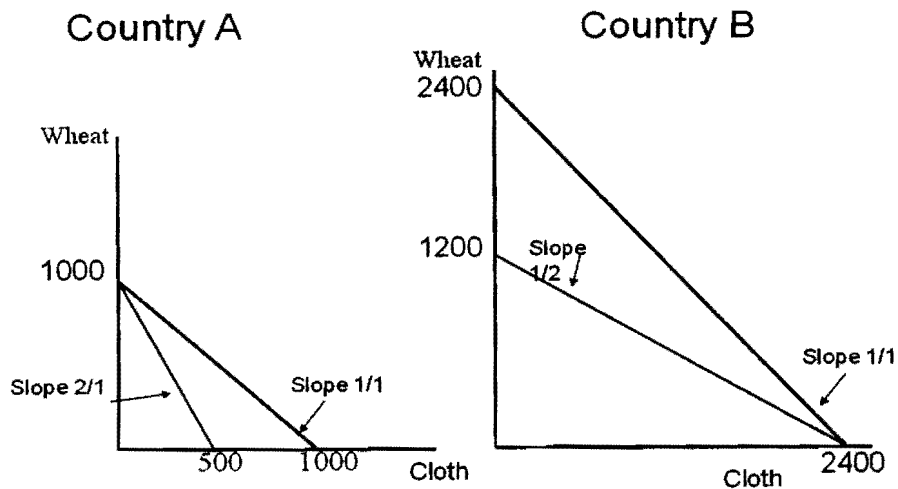
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Various arguments have been given as to why it may nevertheless be necessary to implement protectionist policies, e.g.:

- the infant industries argument
- to ensure security of supply of essential goods that could otherwise only be sourced as imports
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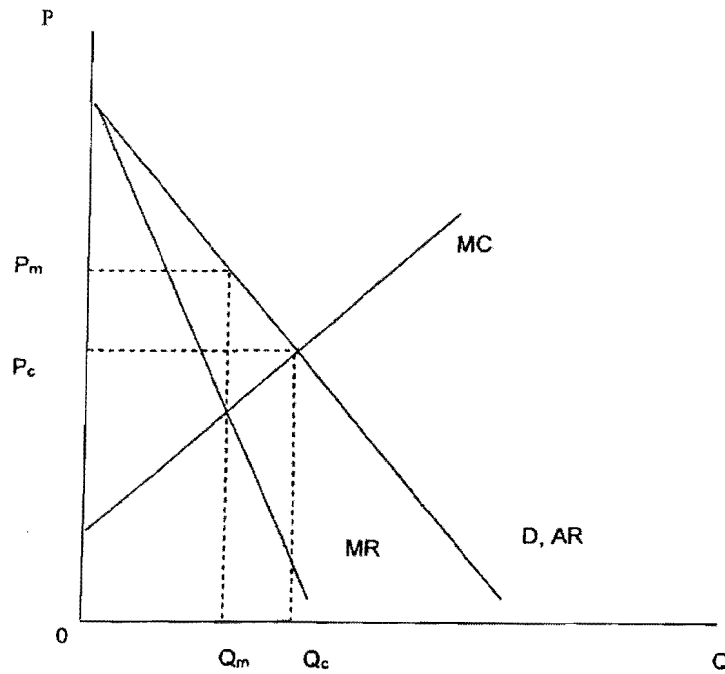
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Price discrimination is a situation where a monopolist sells different units of output at different prices. Under first degree price discrimination each unit of the good is sold to the individual who values it most highly, at the maximum price this individual is willing to pay for it.

To explain the efficiency point the most helpful framework is a standard monopoly diagram:



Start by explaining that the (non-discriminating) monopoly outcome is  $Q_m, P_m$ . Then explain that this outcome is inefficient because for the units of output between  $Q_m$  and  $Q_c$ , the price someone is prepared to pay exceeds the additional costs of production. Therefore if traded at a price,  $P$ , such that  $AR > P > MC$ , both the firm and consumer would be better off exchanging these units. Hence a Pareto improvement is possible.

Next explain that first degree price discrimination allows a firm to charge a different price for a unit of the good. It follows that if the firm in the diagram is allowed to employ first degree price discrimination, the profit maximising output will be  $Q_c$ , with each unit sold at the highest reservation price (as indicated by the AR curve).

The outcome under first degree price discrimination is efficient because all units for which  $AR > MC$  are exchanged (hence the inefficiency associated with the single price monopolist disappears).

- (b) Explain what is meant in game theory by the term 'backward induction' and provide an example [25%]

In game theory, the branch of economics that studies decision-making in strategic situations, backward induction is a technique that is used to solve extensive form games (games with sequential choices). It proceeds by first working out what is likely to happen at the possible end points of the game (the terminal nodes) and then working backwards. It yields a plausible solution to the game if players are rational and the rules of the game are common knowledge.

Candidates can choose to present the Trust Game, an Entry Game, the Battle of the Sexes or Matching Pennies.

- (c) Explain the impact of the following on the level of consumption

- (i) A temporary decrease in the rate of income tax [20%]

According to normal income hypotheses (such as the LCH) this will have little impact on consumption as there will be little impact on long-run income. This contrasts with the conventional Keynesian consumption function, according to which a temporary reduction in income tax will lead to an increase in consumption. Better candidates will note the implications for fiscal policy.

- (ii) A fall in import prices. [20%]

This should stimulate consumption through both an income effect *and* a substitution effect. It will also lead to lower costs of production which may stimulate consumption if the cost savings are passed on to consumers in term of prices. Candidates could consider the impact of low-priced imports from SE Asia and Eastern Europe.

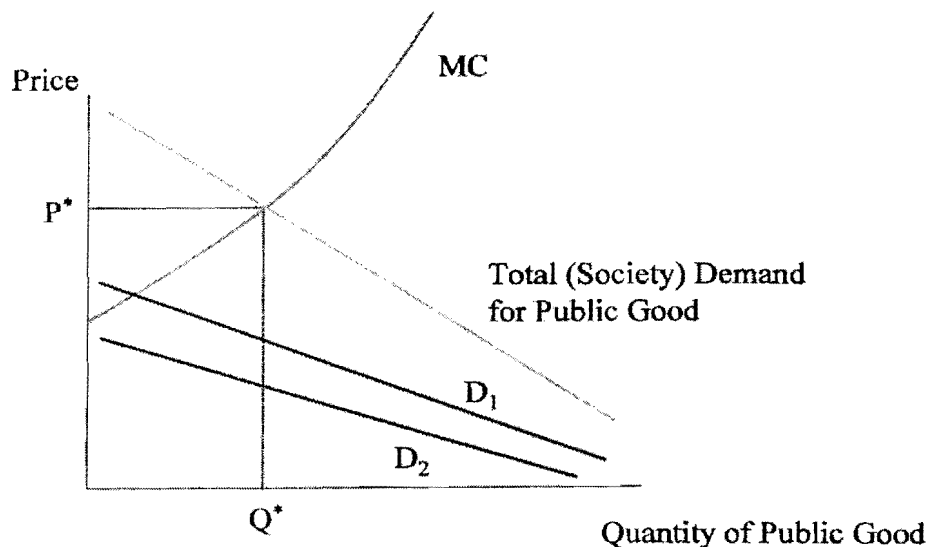
- 4) (a) Consider the concept of public goods.

- (i) What are their defining characteristics? (15%)

Public goods have two defining characteristics: non-rival and non-excludable use. Non-rival use means that consumption by one person does not reduce the amount available for consumption by any other person (e.g. a radio broadcast). Non-excludability means that it is impossible (or at least prohibitively expensive) to prevent any person from consuming it once it has been produced. Public goods may be contrasted with private goods, which are both rival and excludable.

- (ii) How do they result in market failure? (25%)

The characteristics of non-rival and non-excludable use are likely to result in an inefficient level of provision of the good (i.e. result in market failure). This provides the rationale for government determining the level of provision. To explain why public goods generate market failure, first characterise the efficient level of provision of a public good. See the following diagram.



Society's demand curve for a public good is the vertical summation of individual consumer's demand curves (since the non-rival property implies each consumer's marginal willingness to pay (MWP) for the good should be added up to obtain society's MWP for each unit). Efficient provision occurs at  $Q^*$ , where the societal demand curve and the MC curve intersect.

Why is the market unlikely to provide  $Q^*$ ? First, individuals have an incentive to free-ride and to personally purchase little (if any) of the good knowing that (because of the two properties) they will be able to consume the units purchased by others. If such free-riding is the dominant strategy for all consumers, little of the good is likely to be provided.

Second, even without such free-riding, a private market does not provide a mechanism for aggregating individual consumer's preferences (i.e. their MWP for each unit). In the above diagram, if the supplier acts competitively and supplies along the MC curve, consumer 1 will purchase a small amount of the good and consumer 2 nothing. Yet in order for the efficient level of provision ( $Q^*$ ) to be obtained there needs to be some mechanism for aggregating consumers' preferences, that is, taking into account the fact that both (or all) consumers may consume each unit provided.

(b) What is a Nash equilibrium? [15%]

A Nash equilibrium is a set of strategies, one for each player, such that each player's strategy is a best response to the other players' strategies. To find the NE of a game we need to determine each player's best response to each possible opposition strategy. The intuition behind NE is simply the idea that the solution to a game must not leave any player with an incentive to change what they are doing, given the actions of their opponents. In other words, the strategy each player plays must be the strategy he wants to play, given what his opponents are doing. Better students may note that a game can have many, one or no NE; and that to find compelling solutions we need to make strong assumptions (i.e. rationality; common knowledge).

(c) Why is monetary policy unlikely to be effective with fixed exchange rates [10%]

Under fixed exchange rates the money supply must adjust to ensure that the exchange rate stays at its pegged level. Attempting to reduce (or raise) interest rates to stimulate (or damp down) the economy will then be ineffective. For example, an interest rate reduction will decrease the demand for the domestic currency on foreign exchange markets, and the monetary authorities will then be forced to buy the domestic currency to maintain the pegged exchange rate. The attempt to increase the money supply via lower interest rates will thus be thwarted.

(d) Explain the main differences between neoclassical exogenous and endogenous growth theory [35%]

The neoclassical exogenous growth model investigates how economic growth is determined by: growth of the labour force (L); investment in human capital (H); investment in physical capital (K) and technological change. Often presented as aggregate production function:

$$GDP = A(L, H, K)$$

This approach builds on key assumptions: the aggregate production function displays decreasing returns to any single factor; the aggregate production function displays constant returns when all factors are increase in the same proportion.

At any moment the capital stock is a key determinant of the economy's output but the capital stock can change and this can lead to economic growth. If the savings rate is high, the economy will have a large capital stock and a high level of output but if the saving rate is low, the economy will have a small capital stock and low level of output. Higher savings lead to faster growth – but only temporarily: an increase of the rate of saving raises growth until the economy reaches the new steady state.

A population increase will increase output. In the steady state with population growth capital per worker and output per worker are constant. But countries with high population growth (with no change in capital) will have lower capital per worker and so lower levels of output per person. Improvements in the quality of labour will increase output, even at current levels of physical capital and labour. Only technological change can explain persistent increases in per capita growth. The simplest assumption about technological progress is that it increases the efficiency of labour – it is labour-augmenting technological progress. In this model technology is considered exogenous ('manna from heaven').

There are many alternative forms of endogenous growth theory. In the early models the key intuitive idea behind them was the absence of diminishing returns to capital (in contrast to exogenous growth models). Many later models have retained the notion of diminishing returns to a factor but have stressed the importance of externalities or spillovers which can lead to endogenous growth. In the exogenous model, savings lead to growth temporarily, but diminishing returns to capital force the economy to the steady state growth path that depends on exogenous technological change. In contrast, with endogenous growth, investment can lead to persistent growth and the notion of capital encompasses knowledge assets.