

Lesson-24

Economies of Scale

Economies of scale can be of two kinds-- internal economies and external economies. Internal economies of scale are those which arise from the firm increasing its plant size. On the other hand, external economies arise outside the firm-from improvement (or, deterioration) in the environment in which the firm operates. The economies external to the firm may be realized from actions of other firms in the same or in another industry. While the internal economies of scale relate only to the long run and determine the shape of the long-run cost curve, the external economies affect the position of the long-run cost curves.

Internal Economies

Internal economies are given in a summary form in the figure given later in the chapter, where these are categorized into real and pecuniary economies. Real economies arise when the quantity of inputs used for a given level of output decreases. While pecuniary economies are those savings in expenses, which accrue to the firm in the nature of relatively, lower prices paid for inputs and lower costs of distribution. These savings arise due to bulk buying and selling by the growing firm.

Real Economies of Scale

Real economies are of four kinds:

- a. Production economies
- b. Marketing economies
- c. Managerial economies
- d. Transport and storage economies

a) Production Economies

Production economies arise from

- (a) Labor
- (b) Fixed capital
- (c) Inventory requirements of the firm.

These are as follows:

Labor economies-- Labor economies arise because of the following factors:

- (ii) Division of labor economies-- Larger output allows division of labor, which reduces cost by increasing specialization, by saving time (otherwise lost in passing from one operation to another), and providing good conditions for inventions of a great number of machines.
- (iii) Cumulative volume economies-- The technical personnel engaged in production tend to acquire significant experience from large-scale production. This 'cumulative volume' experience helps in higher productivity and, therefore, reduced costs

Technical economies-- These are associated with fixed capital, which includes machinery and equipment. Such economies arise because of the following:

- (iv) Specialized equipment. The production methods become more mechanized as the output scale increases. This would imply more specialized capital equipment and lower variable costs.
- (v) Indivisibility. The machinery and equipment generally have the property of indivisibility, which means that equipment is available only in minimum sizes or in definite ranges of size. When output is increased from zero to the maximum capacity level of the machine, the same machine and equipment are used. As a result the cost of machine is shared between more and more units of output. In short, as the output is increased, the machinery and equipment comes to be utilized more intensively and consequently the cost of production per unit declines.
- (vi) Integration of processes. The large size firms enjoy economies of large machines. Integration of processes occurs where one large automatic transfer or numerically controlled machine can carry out a series of consecutive processes, saving labor cost and time required to set up the work on each of a series of successive specialized machines.
- (vii) Economies of increased dimensions for many types of equipment both initial and running costs increase less rapidly than capacity (e.g., tanks, blast furnaces and other static and mobile containers). These result in economies of increased dimensions. Any container whose external dimensions are doubled has its volume increased eight times, but the area of its surface walls would have increased only four times. This reduces material costs and, where appropriate, heat loss and surface, air and water resistance per unit.
- (viii) Economies in set-up costs. The larger the scale of output, the

- more a multipurpose machinery is left to one set-up and, therefore, set-up costs of general purpose machines reduce.
- (ix) Economies of overhead costs. Obviously, the larger the scale of output, the lower the unit costs of initial fixed expenses which are need for a new business or a new product.
- II. Inventory economies.** Role of inventories is to meet the random changes in the input and output sides of the operations of the firm. It has been found that the input as well as output inventories increase at a rate lower than that of increase in output. These economies arise due to the phenomenon of massed resources.
- b) Marketing Economies.** These economies arise because:
- I.** The advertising expenditure is generally found to have increased less than proportionately with scale. Consequently, larger the output, smaller the advertising cost per unit. Similar situation prevails in case of other types of selling activities.
 - II.** The development and adoption of new models and designs involve considerable expenses in R&D. The larger the output, more thinly this R&D expenditure spreads over output.
- c) Managerial Economies.** Managerial economies arise because:
- I.** Larger the firms, greater are the opportunities for the division of managerial tasks. The division of managerial tasks helps managers to specialize in their own areas of responsibility, thus leading to greater efficiency.
 - II. Teamwork experience.** By working in a team, the managers of large firms tend to acquire a more comprehensive outlook as well as a quicker and better decision-making ability.
 - III.** In a large firm, with decentralization in decision-making, the delay in the flow of information is reduced, thereby increasing the efficiency of management.
 - IV. Modern managerial and organizational techniques.** Large firms provide opportunities for the introduction of modern managerial techniques and organizational restructuring. These help the management to increase efficiency.
- d) Transport and Storage Economies.** Storage costs obviously fall with the increase in the size of output, as it provides the economies of increased dimensions (discussed already). The transportation costs, on the other hand, involve an L-shaped average cost curve-transport unit costs falling up to the point of the full capacity and remaining constant thereafter.

Pecuniary Economies of Scale

These economies include the discounts that a firm can obtain due to its large size. These discounts may be in the nature of:

- i.** Lower raw material price due to bulk buying.
- ii.** Lower cost of capital, as banks usually place greater faith in the large firms and, therefore, charge lower rate of interest.

- iii. Offers of lower rates for advertising to large firms because of their large-scale advertising.
- iv. Lower transportation rates due to bulk transportation.
- v. In case the large firm is able to attain a size to gain monopolistic power or is able to create an image of prestige to be associated with the firm it may be in a position to save on labor costs by paying lower wages and salaries.

External Economies

Like internal economies, external economies also help in cutting down production costs. With the expansion of an industry, certain specialized firms also come up for working up the by-products and waste materials. Similarly, with the expansion of the industry, certain specialized units may come up for supplying raw material, tools, etc., to the firms in the industry. Moreover, they can combine together to undertake research, etc., whose benefit will accrue to all the firms in the industry. Thus, a firm benefits from expansion of the industry as a whole. These benefits are external to the firm, in the sense that these arise not because of any effort on the part of the firm but accrue to it due to expansion of industry as a whole. In this sense these economies are external to the firm. All these external economies help in reducing production costs.

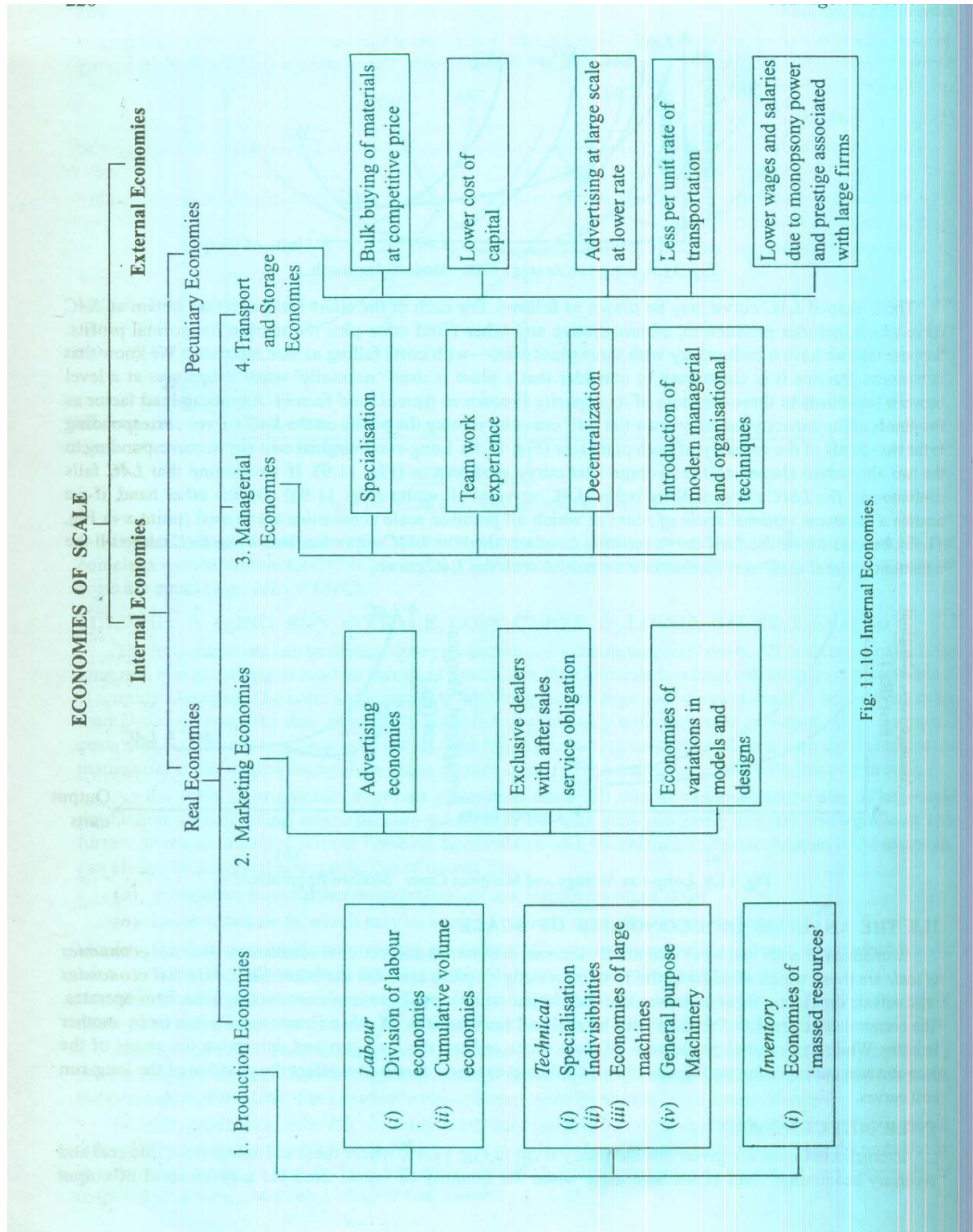


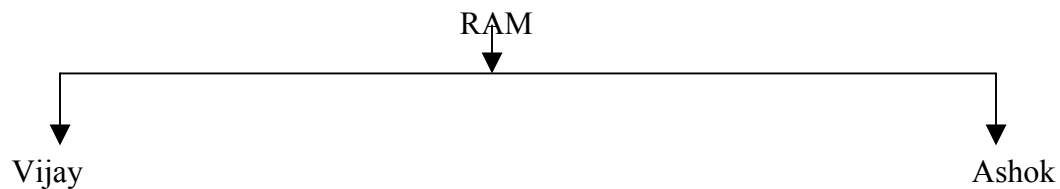
Fig. 11.10. Internal Economies.

Diseconomies of Scale

When a firm continues to expand its size, a stage comes when diminishing returns to scale set in. As a firm expands beyond a level, it encounters growing diseconomies. These diseconomies more than cancel out the economies of large-scale production and cause average costs of production to start rising. Let us discuss in detail reasons for such a phenomenon.

Technical factors are unlikely to produce diseconomies of scale. If inefficiencies arise as a result of over large plant size then they can be avoided by replicating units of plant of a smaller size. In fact, technical factors are more likely to 'limit' the sources of scale economies than to act as a source of diseconomies.

When diseconomies of scale arise they are more likely to be associated with the human and behavioral problems of managing a large enterprise. Let us understand this with the help of a highly simplified organization chart or a managerial hierarchy given in figure below. Both Vijay and Ashok (who may, for example, be the divisional managers) are responsible to Ram. If Vijay wants to communicate with Ashok he must follow the formal chain of command and pass his message through Ram, whose function is coordination. This will be a time-consuming process involving red-tapism but, given a large organization with a large number of managers, such indirect coordination may be the only practical method of communicating while avoiding disorganization and chaos.



Now, if the firm grows further, then another layer of management must be inserted between Ram, Vijay and Ashok. This increases the chain of command and Vijay, in order to communicate with Ram, must pass his message through an intermediary. This increases the costs of communication and also introduces the problems of possible message distortion and misinterpretation with corresponding implications for organizational efficiency.

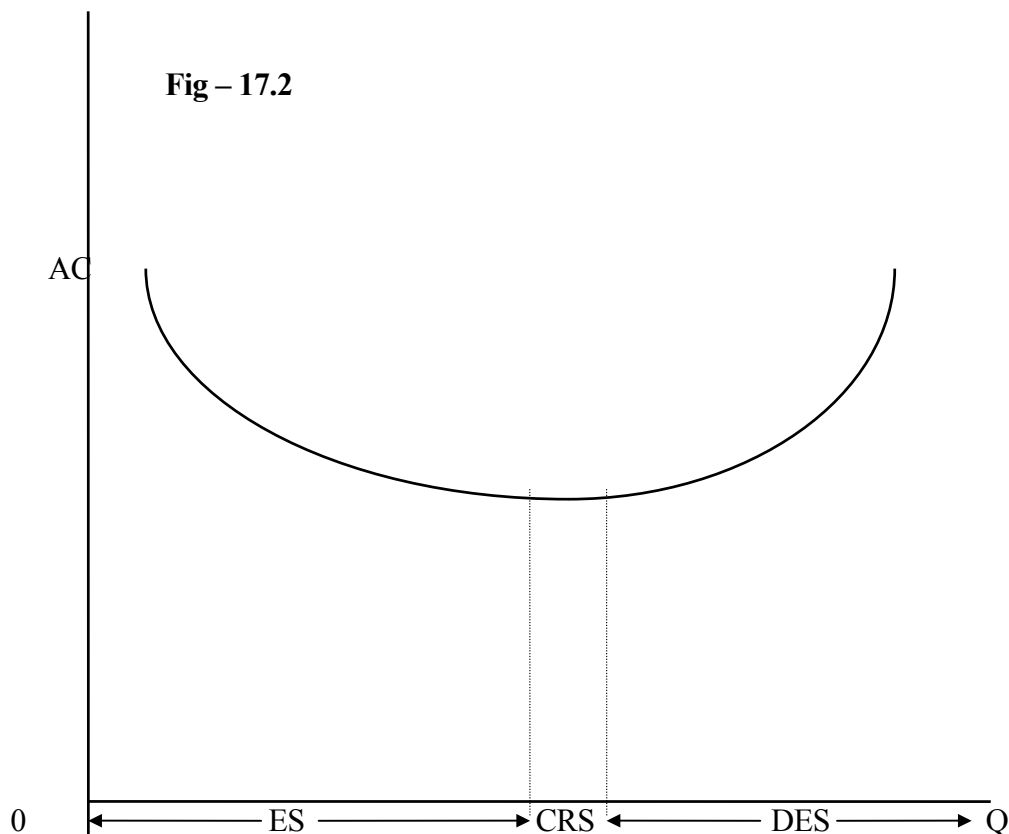
These arguments can be well explained with the help of Williamson's concept of 'control loss'. The decisions taken by a top executive must be based on information passed across a series of hierarchical levels. In turn, the instructions based on this information must be transmitted down through these successive stages. This transmission results in a serial reproduction loss or distortion, of both the information and instructions. This may occur even when the individuals forming the hierarchy have identical objectives. Increases in the scale of the hierarchy result in reduction of the quality of the information reaching the top coordinator and of the instructions passed down by him to lower-level personnel.

Moreover, since the capacity of the top administrator for assimilating information and issuing instruction is limited he can, after a point, only cope with an expansion of the hierarchy by sacrificing some of the details provided before the expansion. Thus, the quantity of information received and transmitted per unit of output will be less after expansion than before it. This is known as 'control loss'. As a result it can be argued that operating units will not adhere as closely to the top administrator's objectives of cost minimization as they did before the expansion.

Secondly, there is the problem of morale and motivation of both management and labor force. It is often argued that due to lack of personal touch the spirit in a large firm is less than that in a small firm. The labor force is more closely identified with small firm and this results in improved productivity and greater overall loyalty to the organization. Moreover, since management of a large firm may feel more secure they may become sluggish and develop lack of enterprise. This sluggishness is absent in managers of small firms who see the generally present threat of being put out of business

In short, we may say that decreasing returns to scale will become operative when management becomes a problem. This problem is more serious in agriculture than in industry: as their operations expand the law of decreasing returns becomes operative earlier in agriculture than in industry

Economies/Diseconomies of Scale



- ES: range of output encompassing economies of scale (decreasing unit costs; [includes increasing returns to scale])
- CRS: range of output encompassing constant returns to scale (constant unit costs)
- DES: range of output encompassing diseconomies of scale (increasing unit costs; [includes decreasing returns to scale])

The Concept of Learning Curve

The learning curve analysis is based on the assumption that workers improve with practice, so the per unit cost of additional output declines. The reduction in cost due to this learning process is known as the learning curve effect, where learning curve graphically depicts the relationship- between labor cost and additional units of output.

Learning curve is measured in terms of percentage fall in marginal labor cost when output doubles. The table presents data for an "80 per cent" learning curve. Each time output doubles, the cost of producing this additional output decreases to 80 per cent of the previous level. This implies 10 per cent reduction in addition to cost.

The pattern of reduction in factor cost is based on the following formula:

$$L_x = k \cdot X^n$$

where

x = production unit

L_x = units of labor hours for producing x th unit.

k = cost to produce first unit.

$n = \log \text{ slope} / \log 2$, where slope equals the rate at which cost of producing additional unit declines,

In a similar way we can find cumulative labor hours.

Table 17.1: Measurement of Learning Curve

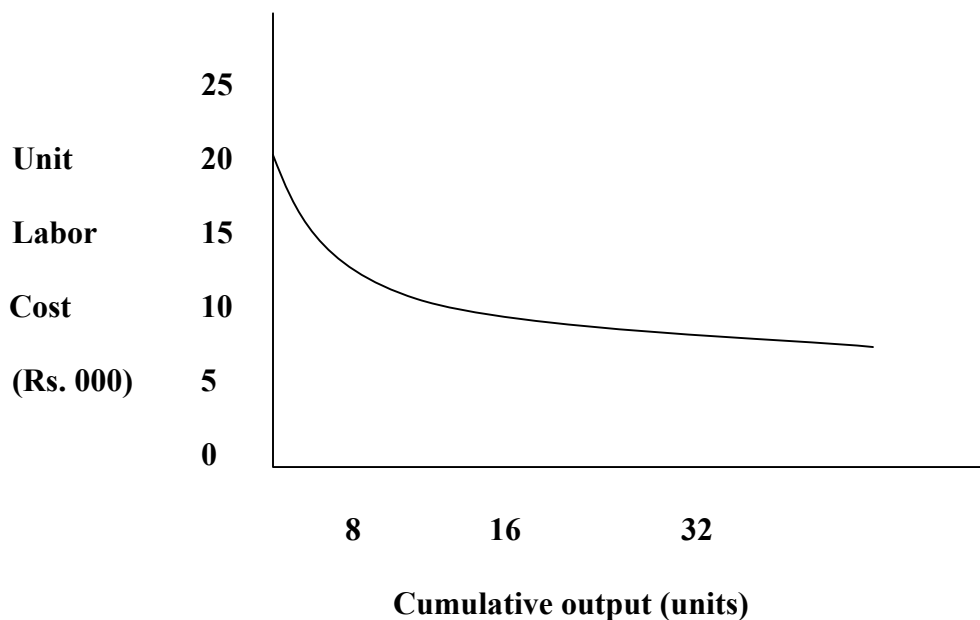
(Wage rate = Rs. 10 per hour)

Output unit	Labor hours	Cumulative Labor hours	Cumulative Average Labor hours	Cost of Labor hours = Col. 2 x Rs. 10	Cumulative Average labor Cost
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			= Col. 3 ÷ col. 1		= Col. 4 x Rs. 10
(1)	(2)	(3)	(4)	(5)	(6)
1	2,000	2,000	2,000.0	20,000	20,000
2	1,600	3,600	1,800.0	16,000	18,000
4	1,280	6,284	1,558.5	12,800	15,585
8	1,024	10,692	1,336.5	10,240	13,365
16	820	17,840	1,115.0	8,200	11,150
32	650	29,357	917.4	6,500	9,174
64	530	47,849	747.6	5,300	7,476

With the help of cols 1 and 5 in Table 17.1, we can plot the learning curve (Fig. 17.2).

The learning curve is expressed in terms of marginal labor cost. The average cost as expressed by cumulative average labor cost is also seen declining (col. 6, Table 17.6), showing the impact of improving efficiency of labor with practice.



Economies of Scope

While discussing the law of variable proportions and economies of scale, it was implicitly assumed that the firm produces only one product. In modern-day business we frequently encounter firms (like Hindustan Lever, P&G, Nestle, etc.), which produce more than one product. It has been observed that a multi-product firm often experiences economies or diseconomies of scope. If a single firm producing multiple products can together produce them cheaper compared to a situation where each product is produced by a separate firm, we say that the economies of scope exist in such a case. For example, if firm A produces 100 units of X and 500 units of Y per month at the total cost of Rs.1, 00,000. While, on the other hand, suppose X and Y were produced by two separate firms: the cost of

producing 100X by firm B being Rs.25, 000 and the cost of producing 500r by firm C being Rs.90, 000. Firm A then experiences economies of scope because its cost of producing both goods X and r together is Rs.1, 00,000, which is less than the cost of producing them separately (Rs.25, 000 + Rs.90, 000 = Rs. 1, 15,000). This difference in the cost of producing goods jointly by a firm and producing them separately by separate firms can be used to measure the degree of economies of scope.

$$\text{Degree of economies of scope} = \frac{\text{TC}(Q_1) + \text{TC}(Q_2) - \text{TC}(Q_1 + Q_2)}{\text{TC}(Q_1 + Q_2)}$$

where, TC (Q1) = total cost of producing Q1 units of good 1 only;

TC (Q2) = total cost of producing Q2 units of good 2 only;

TC (Q1 +Q2) = total cost of producing goods 1 and 2 jointly; producing Q1 units of goods 1 and Q2 units of goods 2.

Thus, in the case of Firm A in example above, the degree of economies of scope equals

$$\frac{\text{Rs. 25, 000} + \text{Rs. 90, 000} - \text{Rs.1, 00, 000}}{\text{Rs.1, 00, 000}} = 0.15$$

If the degree of economies of scope is positive it implies that economies of scope exist. When this measure becomes negative, it means that producing goods separately is cheaper than producing them together.

The main reasons for the existence of economies of scope are:

- i. In case a firm produces several products, it is very likely that many of them use common production facilities and inputs. For example, a firm producing electrical goods may make use of the same testing or assembly line facilities for geysers, food-warmers, fans, irons, etc.
- ii. It happens many a time that the production of one good results in by-products that can be sold by the producer, thereby gaining a cost advantage in the production of the main product. For example, a sugar mill gets molasses as a by-product, which it can sell directly in the market or can use in the production of liquor in its own distillery.

Summary

Economies of Scale

Are the factors that cause average cost to be lower in large-scale operations than in small scale ones

- Specialization with a larger workforce it is possible to divide up the work and recruit and train individuals who exactly match the requirements. They can then become specialists.
- Technical firms benefit from being able to use machinery. Some items are only worthwhile being purchased and used when the fixed costs can be spread over a larger output.
- Purchasing As firms grow they can benefit from being able to buy in bulk.

Diseconomies of Scale

Are the factors that cause costs per unit to increase as the scale of output increases.

- Communication-- In larger organizations people have to be hired to pass on communication, extra bits of paper are used and the message has more opportunity to get distorted as it passes through more layers.
- Co-ordination-- Problems occur as it is much more difficult to coordinate so many people. Empowerment might cause problems. The extra cost of meetings.
- Motivation-- Being part of a larger organization might cause a lack of motivation amongst some employees.

Are bigger firms therefore better?

The answer to that question is obviously 'it depends', as always! Clearly it depends on the opposing effects of the diseconomies and economies of scale. If the diseconomies outweigh the economies then the answer is 'no' and vice-versa. In some cases the small firm has advantages over the larger firm, especially in terms of service, closeness to the market and their ability to exploit niches that will just not be profitable for larger firms to pursue.