ECONOMIES OF SCALE AND SCOPE

- There are **economies of scale** when average cost declines as the scale of production increases.
  - Consider the production of a product X. If the cost of producing n units of X is C, and the cost of producing 2n units of X is less than 2C, then there are economies of scale.
- There are **economies of scope** when average cost declines as the scale of production increases, even if increased production consists of new brands or models.
  - Now consider also the production of Y, which is a similar product to X, but not identical. If the cost of producing n units of X (alone) is C, and the cost of producing n units of Y (alone) is C, but the cost of producing n units of X and n of Y (together) is less than 2C, then there are economies of scope (eg. petrol and diesel).

Categories of scale economy

It is useful to distinguish three categories of scale/scope economy:

1) **Product-specific economies**: the group of scale economies that are associated with the total volume produced of a particular product

2) **Plant-specific economies**: relates to the total output (of perhaps several different products) made at one particular plant

3) **Multi-plant economies**: are those economies enjoyed by a company that operates several plants

Product-specific scale economies

Consider the difference between custom manufacture and production-line manufacture.

- In **custom manufacture**, a skilled worker will use a general purpose machine to run off a small batch. The set-up time is minimal, even if the time taken to machine one product is a good deal longer than could be achieved on a production line.

- In **production-line manufacture**, a specialised machine will be programmed and used. The set-up time (including programming) would be considerably higher, but when this is done the time taken to produce product thereafter is much smaller. Moreover, the labour input required is less skilled – and hence less costly. Unlike custom manufacture, where the average time taken (and hence cost) per product is essentially independent of the number to be produced, **here the average cost per product falls as the total batch size increases** – essentially because the fixed cost of setting up the production line is diluted by a larger total output.

Product-specific scale economies: an example

a skilled worker (tailor) will use a general purpose machine (sewing machine) to run off a small batch

production-line manufacture, a specialised machine will be programmed and used

Plant-specific scale/scope economies

Plant-specific scale economies are most obvious in the context of chemical and metallurgical process industries – such as petroleum, the synthesis of chemicals, iron and steel, and cement.

The output of a production unit in such industries is roughly proportional to the volume of the processing facilities, while the investment cost of the facilities is nearer to being proportional to the surface area of the facilities.

When a single plant enjoys economies of scale in producing several different products above those that would be enjoyed by a group of different plants producing one each of these different products, then we can say that the single plant enjoys economies of scope. In this case it is cheaper for plant 1 to produce x units of X and y units of Y than it would be for plant 2 to produce x of X and plant 3 to produce y of Y.

Multi-plant scale/scope economies

Multi-plant economies of scale apply where the cost of producing x in plant 1 and y in plant 2 are less when these two plants are owned by the same company than if the plants are separately owned.

They arise when the multi-plant enterprise can employ a richer diversity of talent than the single-plant company.

The multi-plant enterprise may be able to spread its production, market and financial risks over a larger value of production, and thus reduce its risk and cost of capital.

It may also be able to get more out of sales and marketing expenditure.

Learning Curves

- The learning curve is a particular sort of scale economy. It is a dynamic sort of scale economy in that it arises from a history of production rather than the current scale of production.
- The learning curve principle asserts that the unit cost of production for a product declines with the accumulated experience of production of that product.
- It is usually described as the unit cost of production is measured to fall by x per cent with each doubling of the cumulative volume of production of the product.

Learning Effects

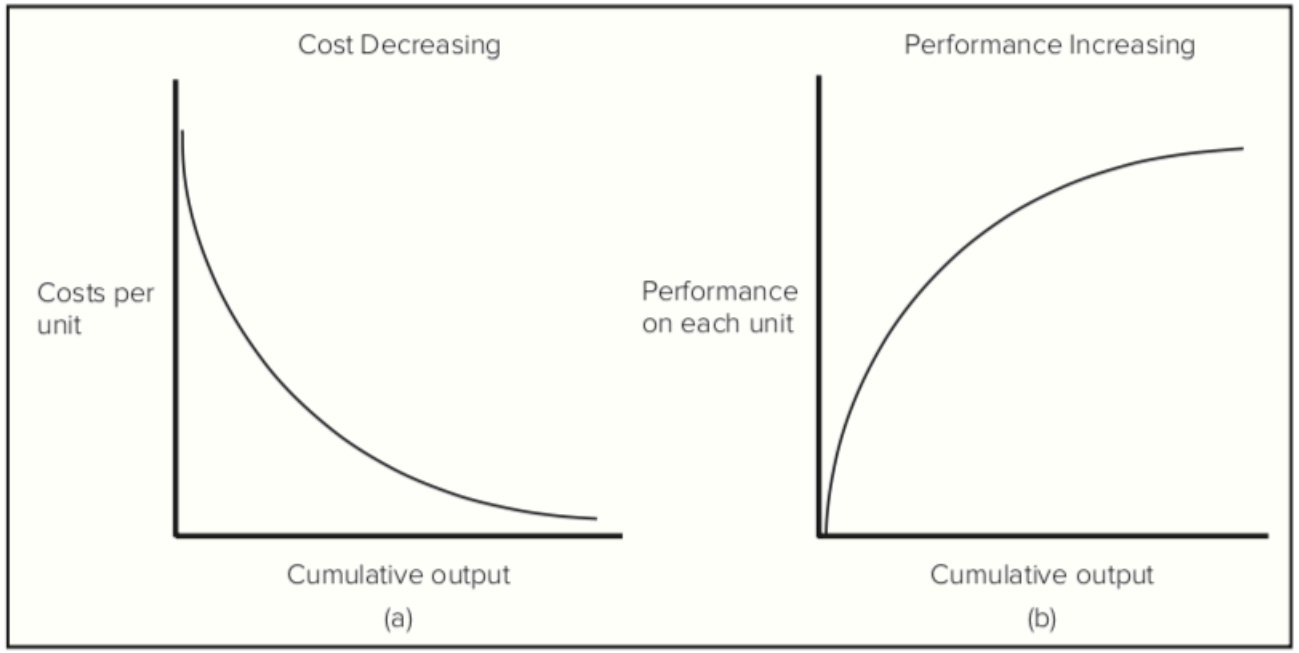
The more a technology is used, the more it is developed and the more effective and efficient it becomes.

As a technology is adopted, it generates sales revenues that can be reinvested in further developing and refining the technology.

As firms accumulate experience with the technology, they find ways to use the technology more productively, including developing an organizational context that improves the implementation of the technology. $\Rightarrow$ The more a technology is adopted, the better it should become.

Learning curve

As individuals and producers repeat a process, they learn to make it more efficient, often producing new technological solutions that may enable them to reduce input costs or waste rates.



The standard form of the learning curve

The standard form of the learning curve is formulated as:

$$y = ax^{-b}$$

y= the number of direct labor hours required to produce the x^{th} unit;

a= the number of direct labor hours required to produce the first unit;
x= the cumulative number of units produced, and *b* is the learning rate;

b= the learning rate