Topic 3 Part II
The Cost Functions of the Firm

1) **Defining Costs**
   -E_____ costs
   -Opportunity _____

2) **The Short and Long Runs**

3) **The Short-Run Cost Functions of the Firm**
   - Graphing
   - Marginal and _____ Cost Functions
   - Area under the MC Function

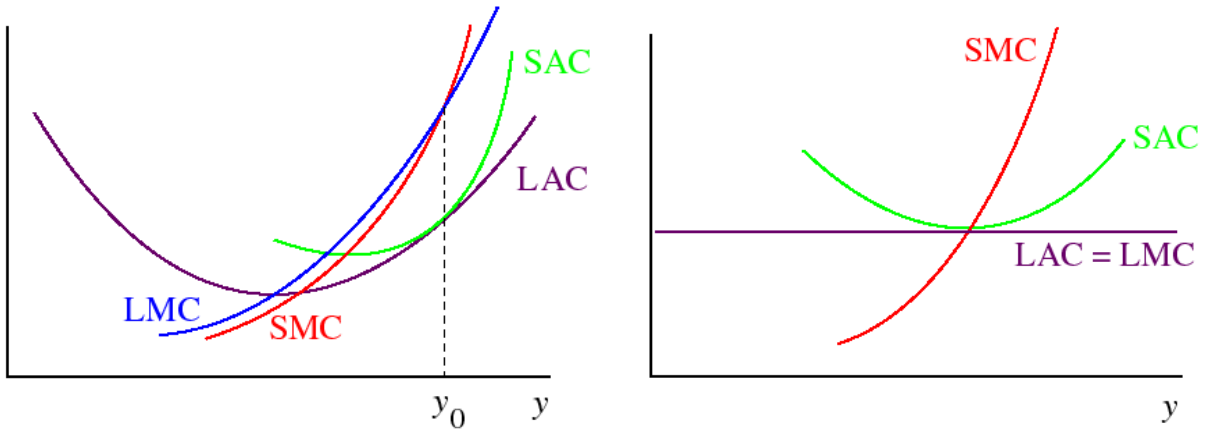
4) **Deriving LAC Function**

- LAC & _____ Choice of Plants
- LAC & Continuum of Plant Sizes

5) **The Number of Firms & Long Run Cost Function**

-Diseconomies of Scale & Industries with Many Firms

-Economies of _____ & Industries with Few Firms



Introduction:

This section examines the costs of the firm. Economists and accountants define _____ differently. Thus, we must adjust the way we think and define "____" when determining the _____ of the firm.

Defining Costs

Explicit Costs: are costs for factors of production.

Examples: ◆Wages ◆Mortgage Payments ◆Insurance
◆Lumber ◆Computers ◆Electricity ◆Rent

Opportunity Cost: the _____ income when a firm uses a resources for a specific use.

- The cost of the ____ best alternative use of the resource.

Example: Suppose you own your own business.

If working for someone else is your next best alternative, your _____ earned from another firm is your opportunity cost.

Assumption: The total cost for the firm includes all **explicit** and **opportunity costs**.

Economists assume that:

1) A firm **breaks even** when total _____ equals the sum of all explicit costs and opportunity costs.

2) A firm earns a **profit** if total _____ is greater than total explicit costs and opportunity costs.

The Short and Long Runs

Short run and long run costs differ. In the long run all factors of production are v_____, whereas, in the short run, the firm must operate with at least one fixed factor of production.

Realistically, the distinction between short run and long run time frames is not easily defined. The short run could mean a day, or a week or a month or 5 years.

In order to build the model, we will simply define the short run as a time period where some factors of production are not v_____.

The Short-Run Cost Functions of the Firm

Fixed Cost: is a ___that does not change with the quantity of output p_____.

A Sunk Cost: a p_____ expenditure that a firm cannot avoid.

The short run total cost function, $C_S(q)$ represents the total cost of producing each quantity with a given plant size.

The short-run total cost function is the sum of the fixed and variable ____ functions:

$$\mathbf{C_S(q) = F + V(q)}$$

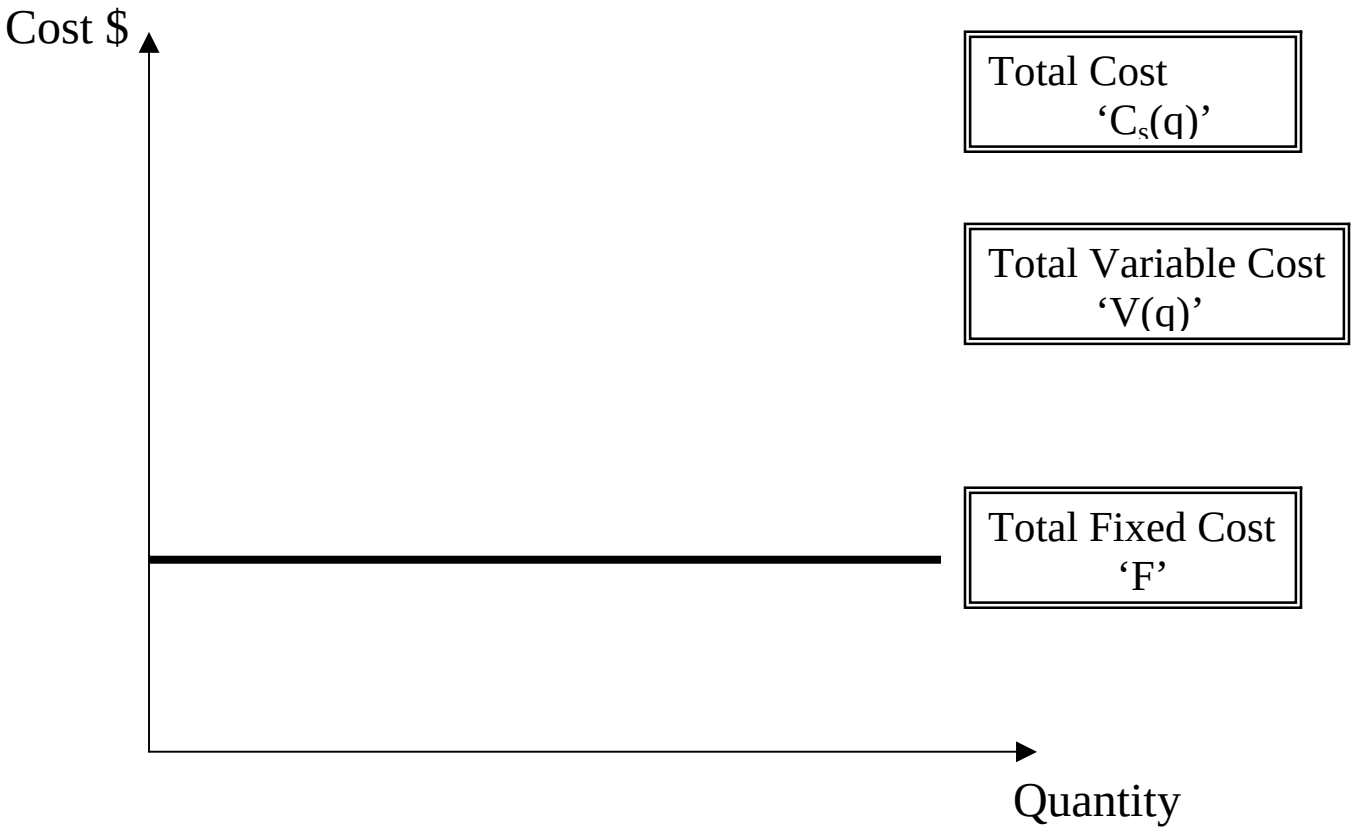
where: F = fixed cost

V(q) = variable cost (costs that change with output produced.)

The short-run total cost function shows the _____ total cost of producing each quantity when at least one factor is fixed.

Graphing:

To derive the short-run total cost function, we can graph total fixed and total variable costs and then sum them vertically.



Next, we can derive the average costs function and the marginal cost function from these curves.

There are seven cost functions you need to know:

The first three we have already discussed.

1) Short-run total cost: $C_S(q)$
2) Short-run total variable cost: $V(q)$
3) Total fixed cost: F
4) Short-run marginal cost: $MC_S(q)$
5) Short-run average cost: $AC_S(q)$
6) Average variable cost: $AVC(q)$
7) Averaged fixed cost: $AFC(q)$

5) The Short-Run Average Cost Function:

$$AC_S(q) = \frac{C_S(q)}{q} = \frac{F}{q} + \frac{V(q)}{q} = AFC(q) + AVC(q)$$

At each quantity of output produced, the SAC is the sum of average fixed cost and average variable cost.

6) Average Variable Cost:

$$AVC(q) = \frac{V(q)}{q}$$

4) The Short Run Marginal Cost Function:

MC_S is the change in ___ cost when quantity changes by Δq. Since the change in total cost is the change in fixed cost (which is _____) plus the change in variable cost, we can express MC in the following ways:

$$MC_S(q) = \frac{\Delta C_S(q)}{\Delta q} = \frac{\Delta V(q)}{\Delta q}$$

The short-run marginal cost is the _____ of either the short-run total cost function or the variable cost function.

Deriving Functions 4-7: The Short-Run Cost Function of The Firm

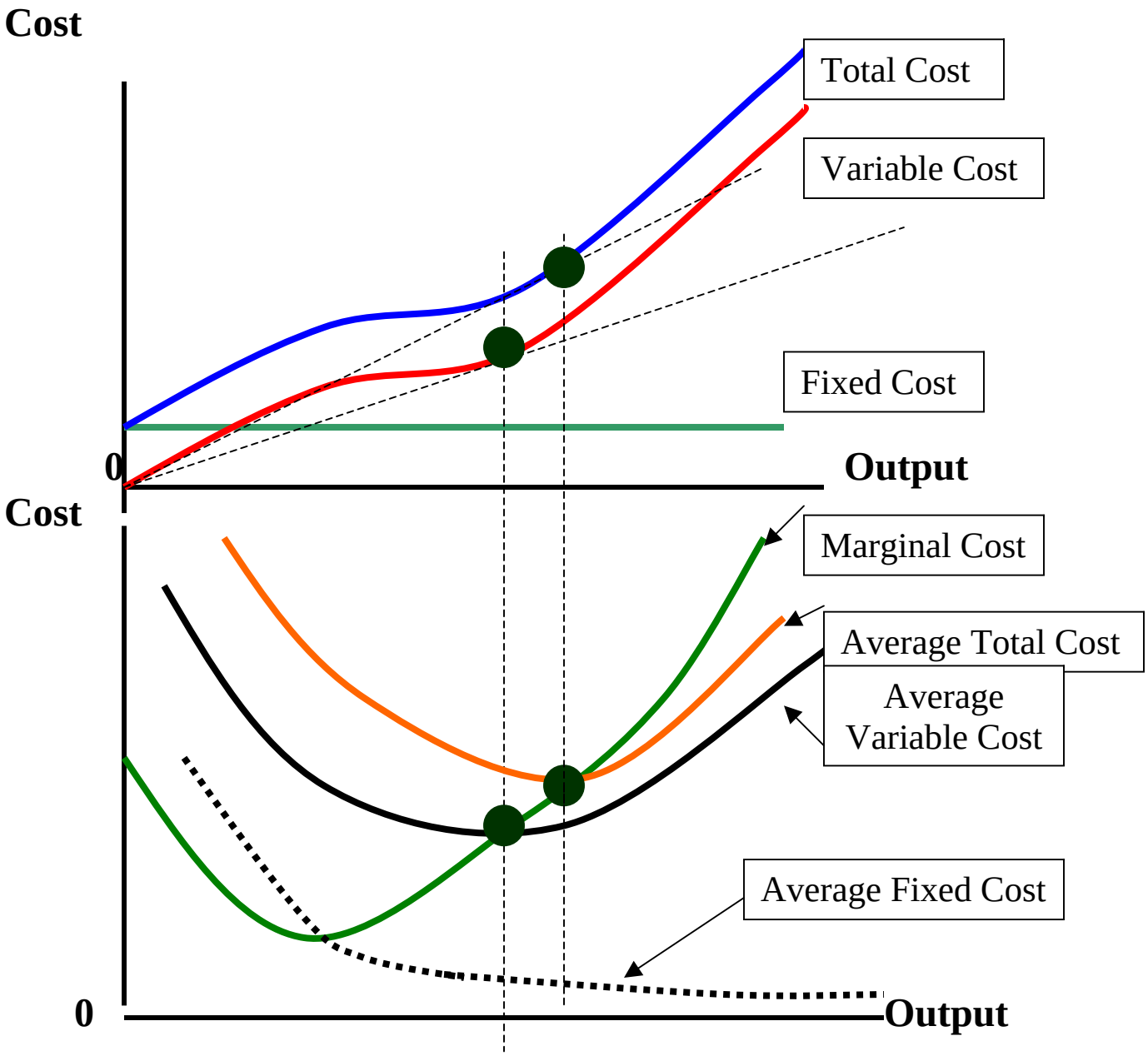
The SAC at any quantity of output is the _____ of a straight line drawn from the _____ to the point on Cs(q) associated with that output.

To determine if ACs is increasing or decreasing as quantity produced changes, simply determine how the slopes of successive rays to different points on the total cost curve change.

The ACs reaches a minimum when the _____ of the ray from the origin to the _____ cost curve is tangent.

AVC is the slope of a ray from the _____to the total variable cost function. When the slope of the ray from the origin to the V(q) curve is tangent, AVC is at a m_____.

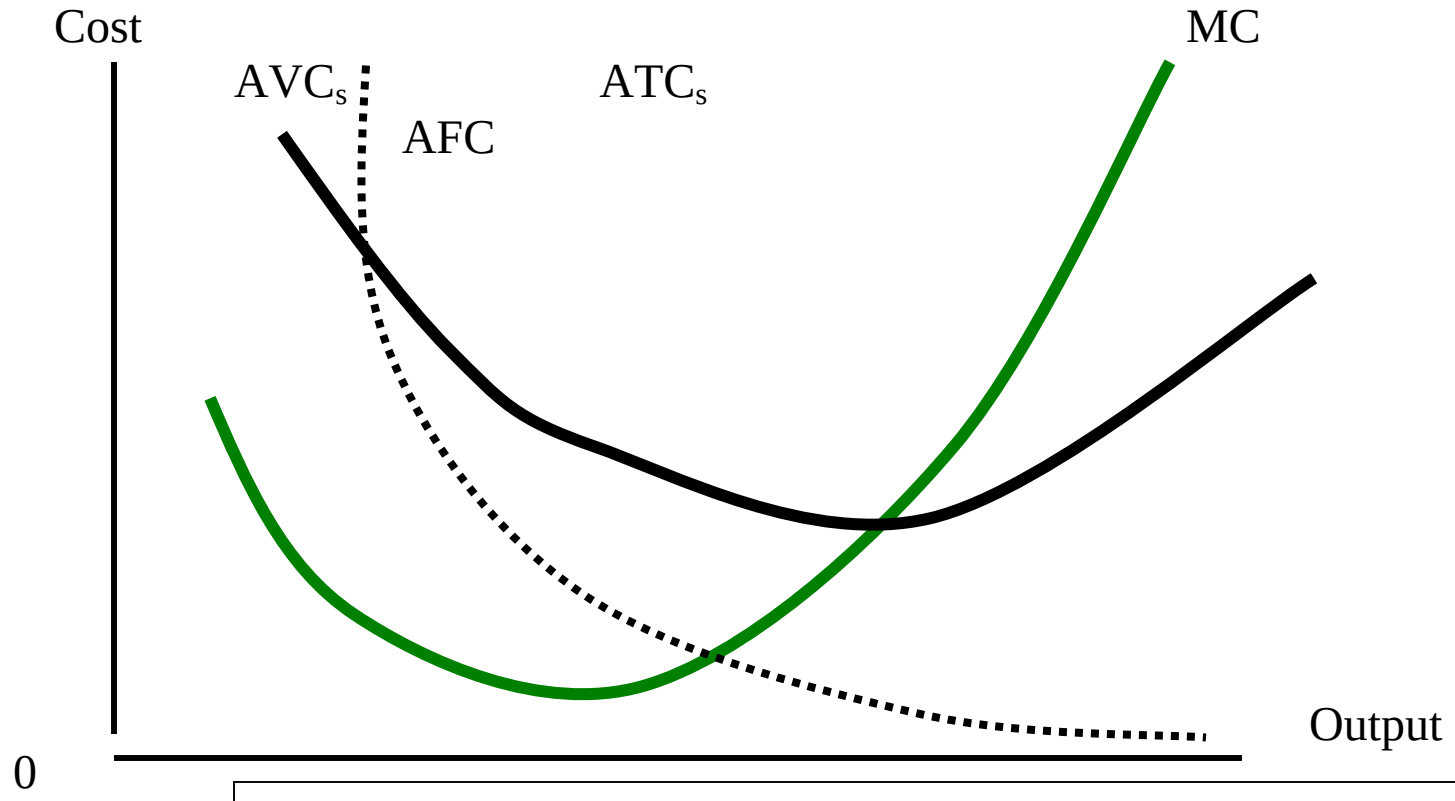
The difference between AC and AVC _____ as the quantity increases because AFC=F/q decreases.


Cost
Total Cost
Variable Cost
Fixed Cost
0
Output
Cost
Marginal Cost
Average Total Cost
Average
Variable Cost
Average Fixed Cost
0
Output

The Relationship Between Marginal and Average Costs

1) When MC < AC: AC is decreasing.
2) When MC = AC: AC is constant.
3) When MC > AC: AC is increasing.

The marginal cost function goes through the minimum points of the average variable cost and short-run average cost functions.



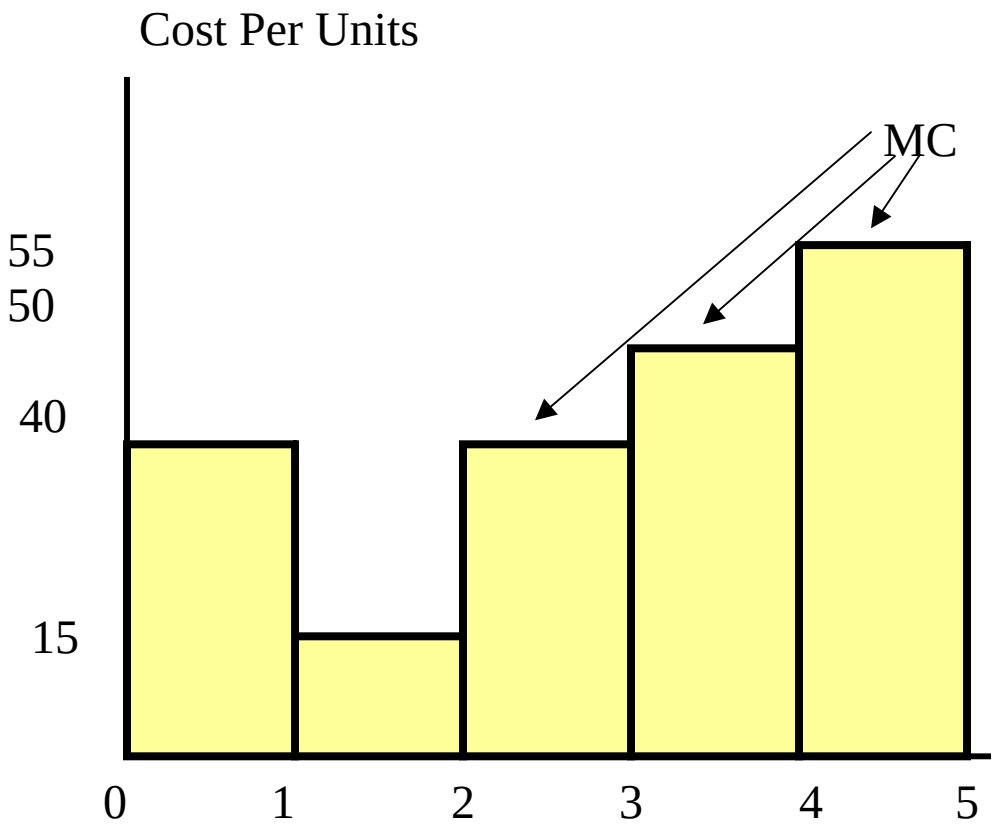
Short-Run Marginal Cost and Short Run Average Cost

The Area Under the Marginal Cost Function

The area under the marginal cost function between any two quantities equals the increase in _____cost when the firm's output increases from one quantity to the other.

1) Discrete Case:

Quantity	Total Variable Cost	Short-Run MC	Sum of Short-Run MC
1	40		40
2	55		55
3	95		95
4	145		145
5	200		200



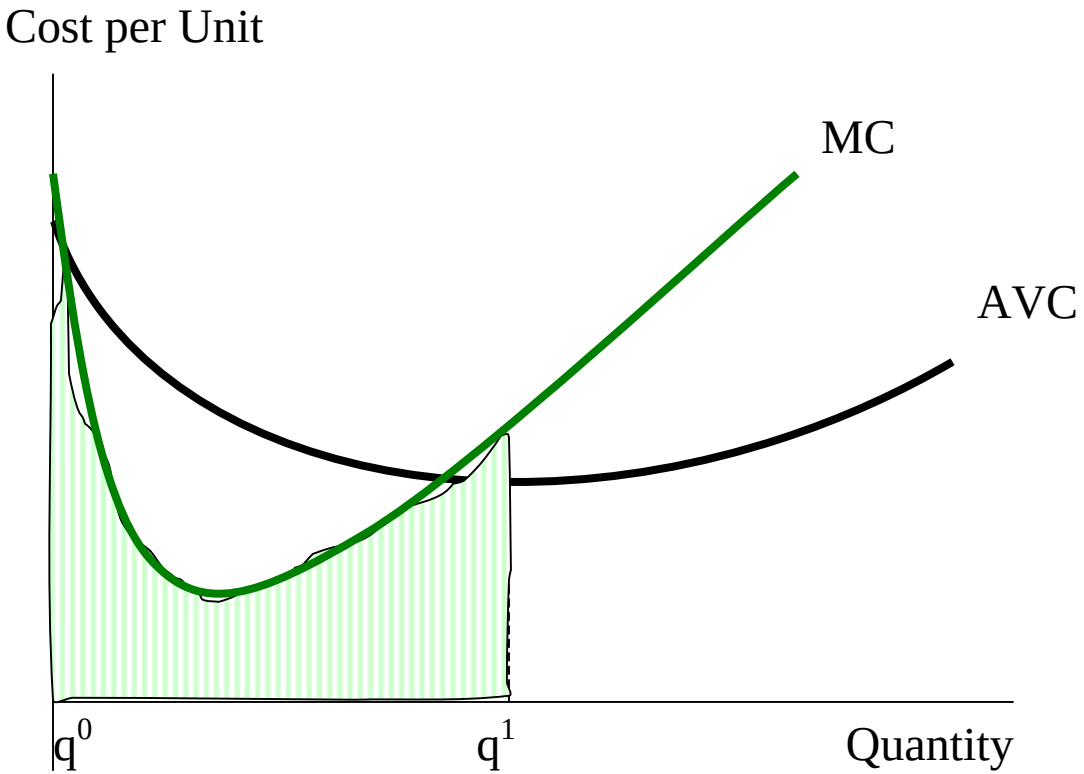
The area under the rectangles is the variable cost of producing that quantity.

2) Continuous Case:

Let q^0 and q^1 be two points under the MC curve. The ____ under the marginal cost function between these two points is:

$$\int_{q^0}^{q^1} \mathrm{MC(q)}\partial \mathrm{q} = \int_{q^0}^{q^1} \frac{\partial V(q)}{\partial q} = V(q^1) - V(q^0)$$

The area under the marginal cost function equals the change in total variable cost when _____ increases from q^0 to q^1:



The increase in variable cost from increasing output is the area under the _____cost function.

Deriving the LAC Function from the SAC Function

In the long run a firm operates by choosing a plant size and the amount of labour that produces a quantity of product at the lowest possible total ____.

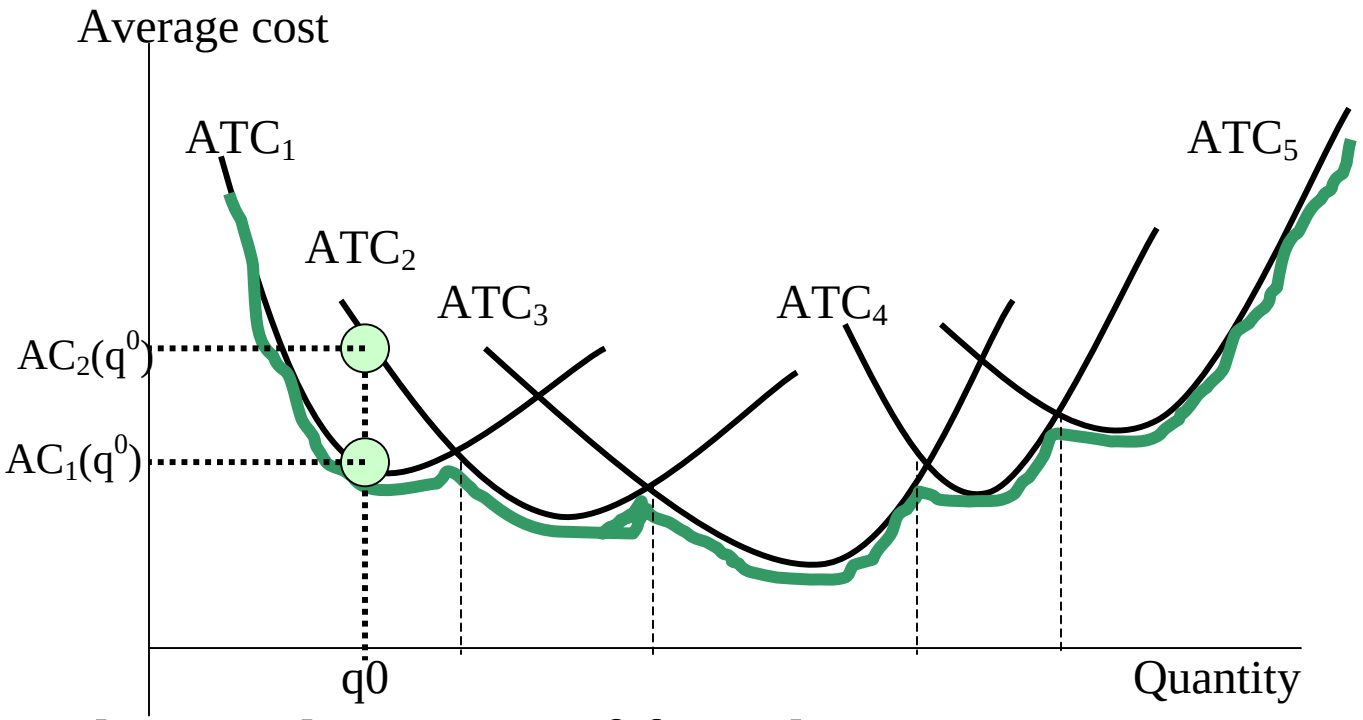
The question we will address is: “How does the firm determine its size to attain the lowest long-run total and average costs?”

1) The Long-Run Average Cost Function with a Limited

Choice of Plants:

Suppose we have 5 plants of 5 different sizes.

- Let plant 1 represent the smallest plant.
- Let plant 5 represent the largest plant.
- Let plants 2-4 represent plants of a size in between small and large.



The graph consist of five short-run average cost functions representing the five firms' ACs.

If the firm decides to produce q^0 units, the average cost of producing q^0 with the first plant is lower than the second plant.

The firm should build a small firm if it chooses to produce q^0.

To find the long-run average cost from the firm's short-run average cost functions, for each quantity produced, simply move up vertically until you reach the first short-run average cost function.

The plant with ***that*** average cost function produces that quantity at the lowest average and total costs in the long run.

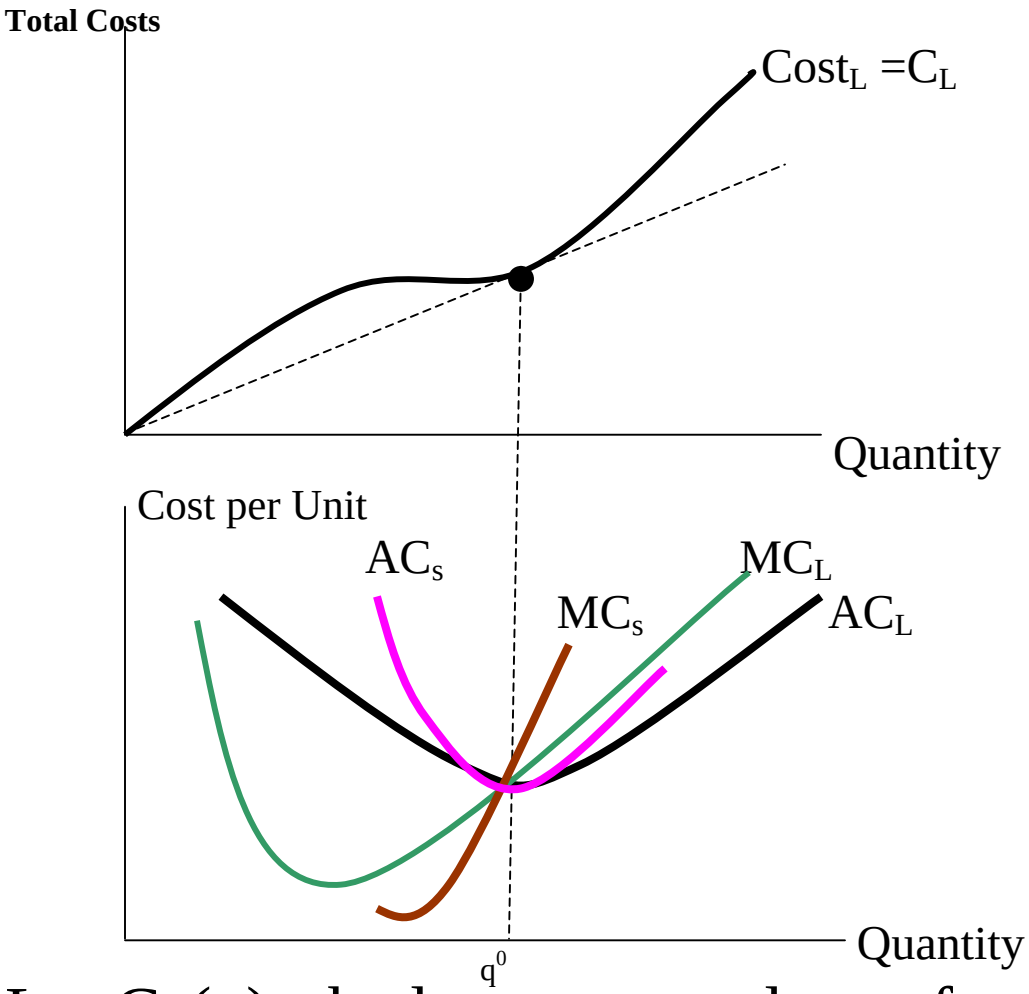
The long run average cost function becomes the *scalloped* average cost function.

2) The Long-Run Average Cost Function With A Continuum of Plants Sizes:

Now suppose the firm is no longer limited to five plant sizes. It can build any size plant it chooses.

We can derive the ***long run total cost*** function by connecting all the points that identify the minimum _____ cost of producing each quantity.

That is, each plant produces a certain _____ at a minimum point. By connecting each of these minimum points, we can derive a curve representing these minimum cost-quantity points: the long-run total cost curve:



Let $C_L(q)$=the long run total cost function, (representing the minimum total cost of producing each quantity) in the top diagram.

We can derive the long-run AC and marginal cost function from the long run total cost function.

The long run AC function is the 'U' shaped curve labelled AC_L.
⇨The long run MC function is labelled MC_L.

When there is a continuum of plant sizes, each plant has the lowest average cost for producing a unique quantity.

Only one plant can produce a specific quantity at the lowest possible cost. That point will be along the long-run average cost curve.

For that plant, there is only one point where the SAC will touch the LAC.

To derive the LAC, simply find the plant with the lowest SAC. By connecting all these points, we form the LAC function.

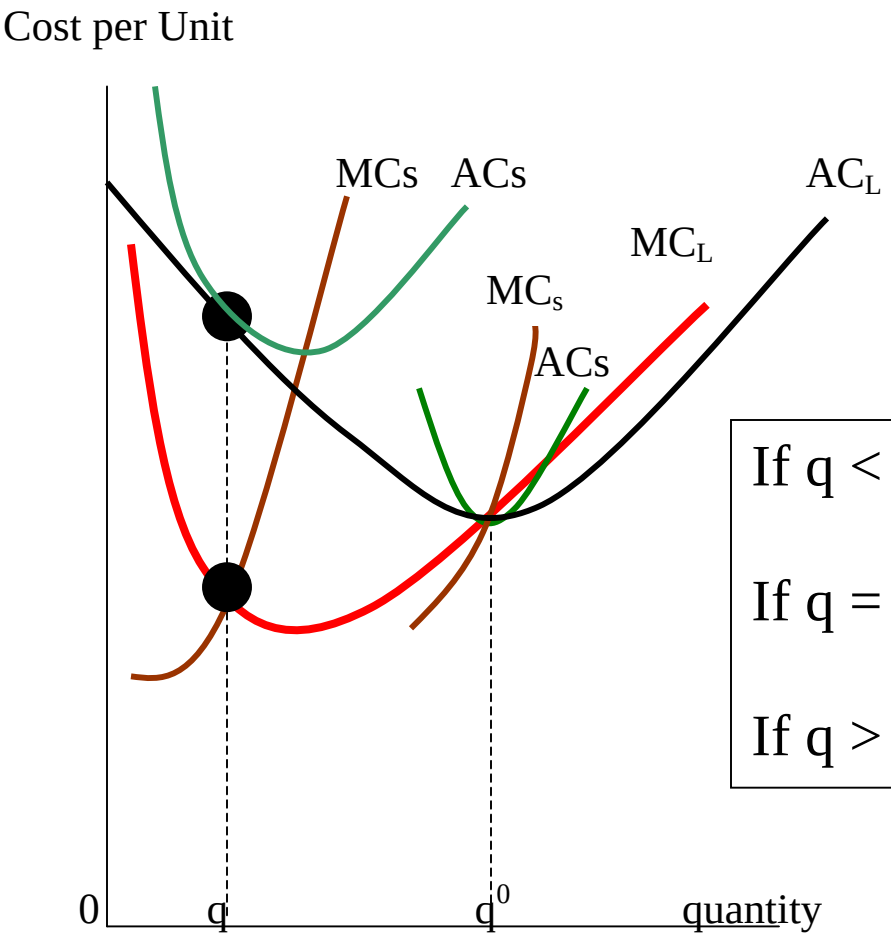
The long run average cost function shows the lowest average cost of producing each quantity.

The long run marginal cost function shows the incremental cost of producing another unit.

The long-run MC will equal the long run AC when LAC is at a minimum.

Note:

Let q^0= the quantity of output at the **minimum** point along the LAC function. Then:



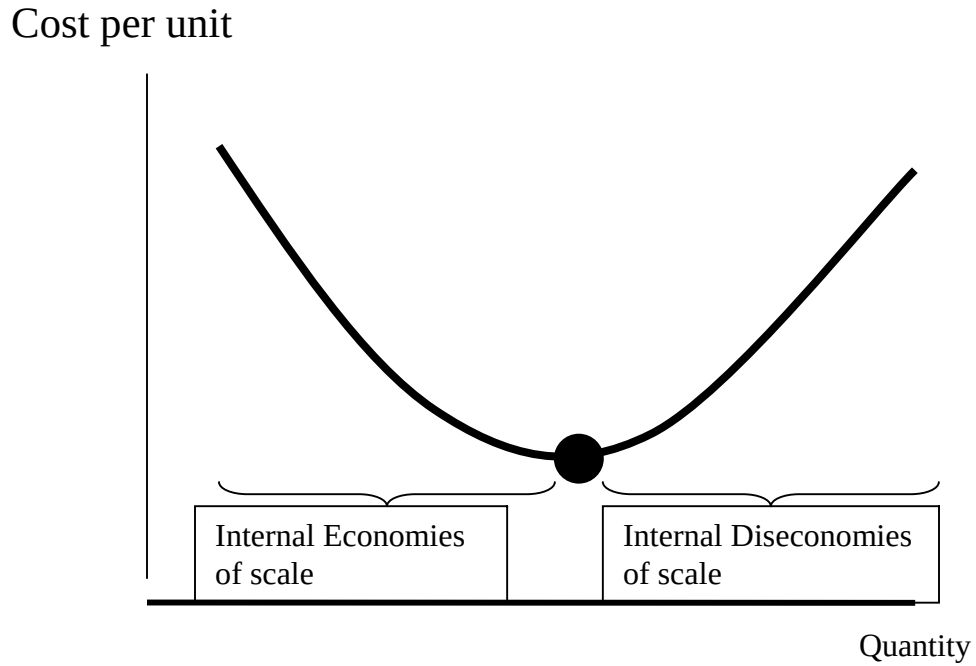
If $q < q^0$, $AC_L = AC_S > MC_L = MC_S$

If $q = q^0$, $AC_L = AC_S = MC_L = MC_S$

If $q > q^0$, $AC_L = AC_S < MC_L = MC_S$

The Number of Firms and the Long-Run Cost Function

The number of firms that operate in a particular industry depends on the ***s*** ____ of the long-run _____ cost function. The shape places a limit on the number of firms that can efficiently operate in the market and achieve **minimum cost** of production.



When the LAC decreases, the firm is experiencing ***internal e_____ of scale.*** I.e. as output increases by increasing inputs, the average cost is falling.

Eventually, the firm will hit a minimum and any other increases in output will increase _____ cost. Here the firm will experience ***internal diseconomies of scale***.

Avoiding diseconomies of scale

A number of economists are skeptical about diseconomies of scale. They believe that effective management techniques and the appropriate incentives can do much to reduce the risk of rising long run average costs. Here are three reasons to doubt the persistence of diseconomies of scale:

1. Developments in **human resource management** (HRM) are an attempt to avoid the risks and costs of diseconomies of scale. HRM is a horrible phrase to describe improvements that a business might make to any of its core procedures involving worker recruitment, training, promotion, retention and support of faculty and staff. This becomes critical to a business when the skilled workers it needs are in short supply. Recruitment and retention of the most productive and effective employees makes a sizeable difference to corporate performance in the long run (as does the flexibility to fire those at the opposite extreme!)
2. Likewise, **performance-related pay schemes** (PRP) can provide appropriate financial incentives for the workforce leading to an improvement in industrial relations and higher productivity. Another aim of PRP is for businesses to reward and hang onto their most efficient workers.
3. Increasingly companies are engaging in **out-sourcing** of manufacturing and distribution as they seek to supply to ever-distant markets. Out-sourcing is a tried and tested way of reducing costs whilst retaining control over production.

Diseconomies of Scale and Industries with Many Firms

There are ***indicators*** whether there are internal diseconomies of scale.

Many firms, where even a large firm holds only a small market share, is an indicator that diseconomies of scale limit the ____ of any one firm.

Economies of Scale and Industries With Few Firms

In some industries there are persistent economies of scale.

This is because:

1) Indivisibility of a factor of production: there may be a minimum level of output that the plant size cannot be scaled back to.
2) Volume and area connection: _____ cost increases less proportionately with output.
3) Specialization within the firm: large firms can _____ tasks within the firm to operate more efficiently.

Natural Monopoly: a single firm can produce a given output at the lowest total cost.

This occurs when a firm experiences **continual _____ economies of scale.**

The total cost of producing a given quantity increases when there is more than one firm.

Example: B.C. Hydro

Regulation [edit]

Enforcement authorities and organizations

- International Competition Network
- List of competition regulators

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As with all monopolies, a monopolist who has gained his position through natural monopoly effects may engage in behavior that abuses his market position, which often leads to calls from consumers for government regulation. Government regulation may also come about at the request of a business hoping to enter a market otherwise dominated by a natural monopoly.

Common arguments in favor of regulation include the desire to control market power, facilitate competition, promote investment or system expansion, or stabilize markets. In general, though, regulation occurs when the government believes that the operator, left to his own devices, would behave in a way that is contrary to the government's objectives. In some countries an early solution to this perceived problem was government provision of, for example, a utility service. However, this approach raised its own problems. Some governments used the state-provided utility services to pursue political agendas, as a source of cash flow for funding other government activities, or as a means of obtaining hard currency. These and other consequences of state provision of services often resulted in inefficiency and poor service quality. As a result, governments began to seek other solutions, namely regulation and providing services on a commercial basis, often through private participation.[10]

As a quid pro quo for accepting government oversight, private suppliers may be permitted some monopolistic returns, through stable prices or guaranteed through limited rates of return, and a reduced risk of long-term competition. (See also rate of return pricing). For example, an electric utility may be allowed to sell electricity at price that gives it a 12% return on its capital investment. If not constrained by the public utility commission, the company would likely charge a far higher price and earn an abnormal profit on its capital.

Regulatory responses:

- doing nothing
- setting legal limits on the firm's behaviour, either directly or through a regulatory agency
- setting up competition *for* the market (franchising)
- setting up common carrier type competition
- setting up surrogate competition ("yardstick" competition or benchmarking)
- requiring companies to be (or remain) quoted on the stock market
- public ownership

Since the 1980s there is a global trend towards utility deregulation, in which systems of competition are intended to replace regulation by specifying or limiting firms' behaviour; the telecommunications industry is a leading example.

The Commissioner of Competition [edit]

The current Commissioner of Competition is Melanie Aitken. She served as Interim Commissioner of Competition since December 2008 and was formally appointed to the position on August 5, 2009.[2]

The Commissioner is responsible for the administration and enforcement of the *Competition Act* and three labelling statutes, the *Consumer Packaging and Labelling Act*, the *Precious Metals Marking Act* and the *Textile Labelling Act*.

Under the *Competition Act*, the Commissioner can launch inquiries, challenge civil and merger matters before the Competition Tribunal, make recommendations on criminal matters to the Attorney General of Canada, and intervene as a competition advocate before federal and provincial bodies.

As head of the Canadian Competition Bureau, the Commissioner leads the Bureau's participation in international fora such as the Organization for Economic Cooperation and Development (OECD) and the International Competition Network (ICN), to develop and promote coordinated competition laws and policies in an increasingly globalized marketplace.

Organization [edit]

- **Melanie L. Aitken** — Commissioner of Competition
  - **Paul Collins** — Senior Deputy Commissioner of Competition, Mergers
  - **John Pecman** — Senior Deputy Commissioner of Competition, Criminal Matters and Acting Deputy Commissioner of Competition, Fair Business Practices
  - **Richard Taylor** — Deputy Commissioner of Competition, Civil Matters
  - **Lise Davey** — Deputy Commissioner of Competition, Compliance and Operations
  - **Ron Corvari** — Chief Economist, Economic Policy and Enforcement
  - **Kim Peterson** — Acting Deputy Commissioner of Competition, Public Affairs
  - **Mollie Johnson** — Deputy Commissioner of Competition, Legislative and International Affairs