Cost of production and profit

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Contents

- Profits

- Opportunity costs

- Production cost

- Profit maximization level of output

Profits

- Profit $\pi = TR - RC$

- **Total Revenue (TR)** is the amount of money received when the producer sells the product

$$TR = P_Y * Y$$

- **Total Costs (TC)** are the sum of all payments that a firm must make to purchase the factors of production

- The goal of a business enterprise in a market-based economy is to **maximize profits**

The maximum level of profits differs from the highest level of production

- Producing the maximum output requires large amounts of scarce inputs and can be a costly activity; total costs may be much higher than total revenue.

- Producer should weigh the benefits and the costs of producing a higher yield with a full understanding that the maximum yield does not automatically bring the highest level of profits. It costs too much to achieve the maximum yield.
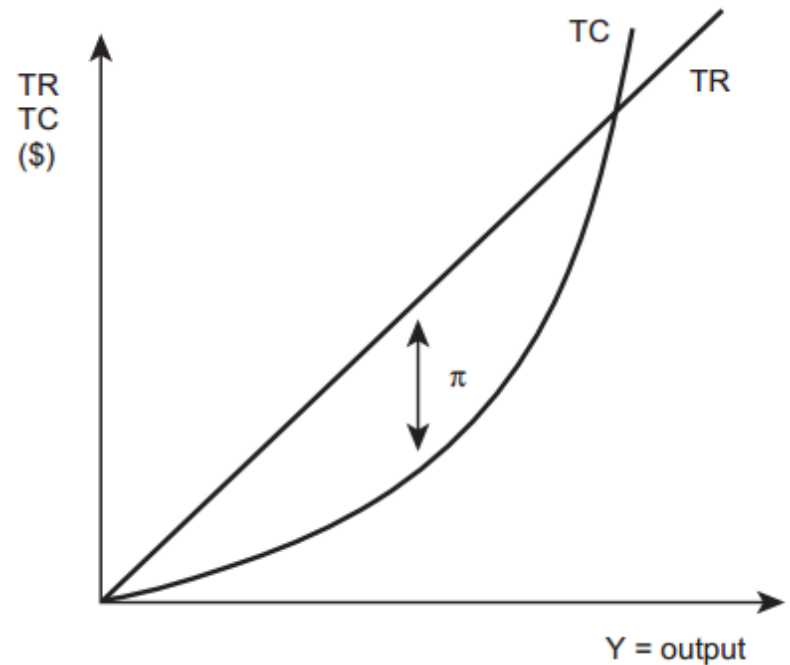
Figure 3.1 Total revenues, total costs, and profits.

Think like an economist

- In every activity, an economist will ask the question, **"Do the benefits of this activity outweigh the costs?"**

- If the rewards of the activity are larger than the costs, then the activity should be undertaken

- This approach to decision making is enormously useful, and the approach is valuable

Opportunity costs

- Total costs include two types of costs:
- **Accounting Costs** are explicit costs of production; costs for which **payments are required**
- **Opportunity Costs** are the value of a resource in its next-best use. What an individual or firm must give up in order to do something

Opportunity costs exist for every human activity

What is your opportunity cost of attending this class?

Economic profit

- The key idea is that in economics, total costs (TC) always include both the accounting (or explicit) costs, and the opportunity costs, or what must be given up to use the resource

- **Accounting Profits** (π_A) are total revenue minus explicit costs.

$$\pi_A = TR - TC_A$$

- **Economic Profits** (π_E) are total revenue minus both explicit and opportunity costs.

$$\pi_E = TR - TC_A - \text{opportunity costs}$$

Exercise!

- Case 1: suppose a wheat farmer grows and sells 25,000 bushels of wheat at a price of $4/bu. Also wheat production requires 10 months of managerial labor each year; wheat producer could earn $1,000/month in town as a salesperson with a farm implement dealer.

- Case 2: if the cost of hired workers increases to $15,000

Table 3.1 Oklahoma wheat producer production costs

Input	CASE ONE (USD)	CASE TWO (USD)
Chemicals	20,000	20,000
Machinery	20,000	20,000
Seed, Fertilizer	20,000	20,000
Land (rent)	20,000	20,000
Hired Labor	10,000	15,000
—	—	—
Total Accounting Costs		
Opportunity Costs		
Total Economic Costs		
Total Revenues		
Accounting Profits		
Economic Profits		

Should farmer stay in business?

Table 3.1 Oklahoma wheat producer production costs

Input	CASE ONE (USD)	CASE TWO (USD)
Chemicals	20,000	20,000
Machinery	20,000	20,000
Seed, Fertilizer	20,000	20,000
Land (rent)	20,000	20,000
Hired Labor	10,000	15,000
—	—	—
Total Accounting Costs	90,000	95,000
Opportunity Costs	10,000	10,000
Total Economic Costs	100,000	105,000
Total Revenues	100,000	100,000
Accounting Profits	10,000	5,000
Economic Profits	0	−5,000

Production cost

- Recall, in short run, it is a period of time during which the quantity of at least one input cannot change. Some inputs are fixed and some are variable, so costs break down into two categories:

- **Total Fixed Costs** (TFC) are the total costs of inputs that do not vary with the level of output

- **Total Variable Costs** (TVC) are the total costs of inputs that vary with the level of output

- **Total Costs** (TC) are the sum of Total Fixed Costs and Total Variable Costs

$$TC = TFC + TVC.$$

Cost curves

- The shape of the TVC curve is due to the "typical" shape of the production function.

- The total variable costs increase at a decreasing rate, then at an increasing rate (law of diminishing marginal returns).
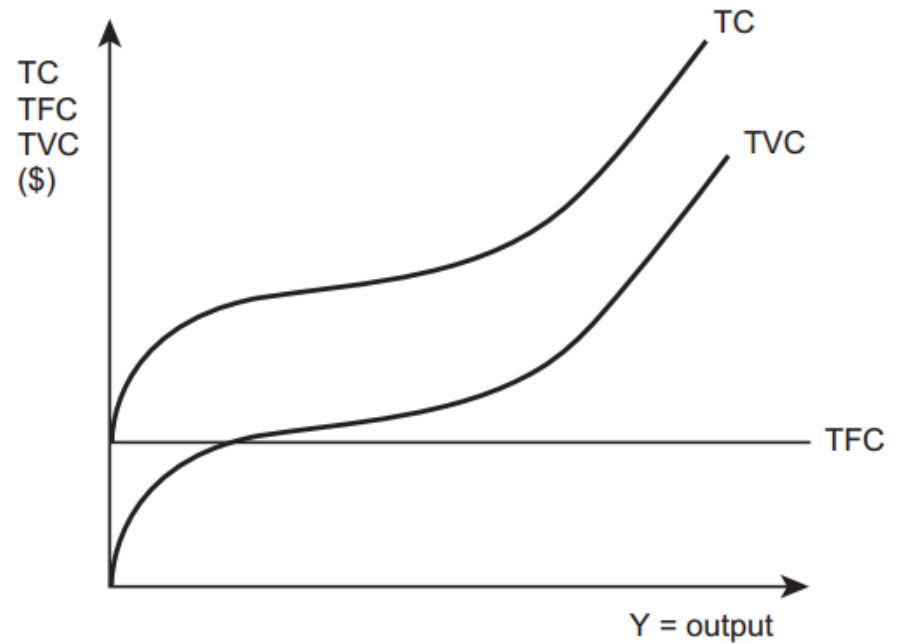

Figure 3.2 Total cost, total fixed costs, and total variable costs.

Average costs

- **Average Fixed Costs** (AFC) are the average cost of the fixed costs per unit of output.
$$AFC = TFC/Y$$

- **Average Variable Costs** (AVC) are the average cost of the variable inputs per unit of output.

$$AVC = TVC/Y$$

- **Average (Total) Costs** (ATC or AC) are the average total cost per unit of output.

$$ATC = TC/Y$$

Marginal costs

- **Marginal Costs** (MC) are the increase in total costs due to the production of one more unit of output.

$$MC = \frac{\Delta TC}{\Delta Y} = \frac{dTC}{dY} = \frac{dTVC}{dY} + \frac{dTFC}{dY}$$

$$= \text{Slope of TVC or TC}$$

Table 3.2 Vermont dairy farm production costs

Y = milk (1000 lbs)	TFC ($)	TVC ($)	TC ($)	ATC ($/Y)	AVC ($/Y)	AFC ($/Y)	MC ($/Y)
0	10	0	10	–	–	–	–
1	10	10	20	20	10	10	10
2	10	18	28	14	9	5	8
3	10	23	33	11	7.67	3.33	5
4	10	30	40	10	7.5	2.5	7
5	10	40	50	10	8	2	10
6	10	56	66	11	9.33	1.67	16
7	10	74	84	12	10.6	1.43	18
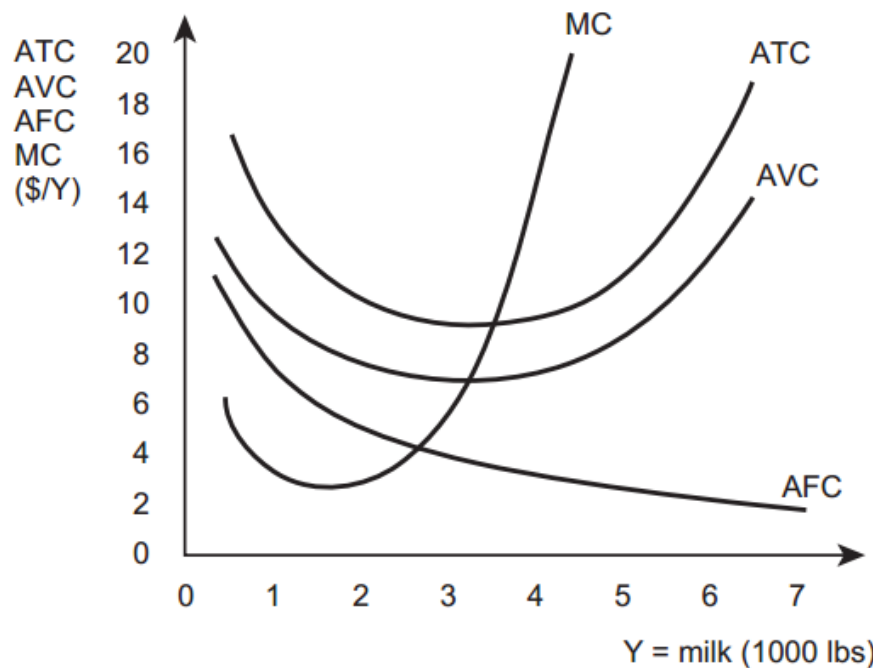
$$ATC = AFC + AVC$$

Figure 3.3 Per-unit costs for Vermont dairy farm.

Depreciation

- Depreciation is an accounting method of allocating the cost of a tangible asset over its useful life and is used to account for declines in value over time.

- Businesses depreciate long-term assets for both tax and accounting purposes.

- An example of the assets are buildings, furniture, equipment, machinery. A land is the exception which cannot be depreciated as the value of land appreciate with time.

Depreciation Example

- If a company buys a piece of equipment for $50,000, it can either write the entire cost of the asset off in year one, or it can write the value of the asset off over the life of the asset, which is 10 years.

- This is why business owners like depreciation. Most business owners prefer to expense only a portion of the cost, which artificially boosts net income.

- In addition, the equipment can be scrapped for $10,000, which means it has a salvage value of $10,000. Using these variables, the analyst calculates depreciation expense as the difference between the cost of the asset and the salvage value, divided by the useful life of the asset. The calculation in this example is: ($50,000 - $10,000) / 10, which is $4,000.

Profit maximization

- The "economic way of thinking" is based on comparing the benefits and costs of every human activity

- **Marginal Analysis** is a comparing the benefits and costs of a decision incrementally, one unit at a time

- This chapter, we assume firm is in an **Industry** characterized by **Perfect Competition**

- **Industry** is a group of firms that all produce and sell the same product

Perfect competition

- **Perfect Competition** is a market or industry with four characteristics:
  - Large number of buyers and sellers
  - Homogeneous product
  - Freedom of entry and exit: no "barriers to entry."
  - Perfect information: a situation where all buyers and sellers in a market have complete access to technological information and all input and output prices
- Competitive firms that meet the criteria listed above have no influence on prices, and will always be **price takers**

Price Taker vs Price Maker

- **Price Taker** is a firm so small relative to the industry that the price of output is fixed and given, no matter how large or how small the quantity of output it sells

- **Price Maker** is a firm characterized by market power, or the ability to influence the price of output. A firm facing a downward-sloping demand curve

Revenue

- **Total Revenue** (TR) is the amount of money received when the producer sells the product.

$$TR = P_Y * Y$$

- **Average Revenue** (AR) is the average dollar amount received per unit of output sold.

$$AR = \frac{TR}{Y} = \frac{Y \cdot P_y}{Y} = P_y$$

- **Marginal Revenue** (MR) is the addition to total revenue from selling one more unit of output.

$$MR = \frac{\Delta TR}{\Delta Y} = \frac{dTR}{dY} = \frac{d(P_y . Y)}{dY} = P_y$$

- In the perfect competition market: $MR = AR$

PROFIT-MAXIMIZING CONDITION

- MR = MC

- MC must cut MR from below

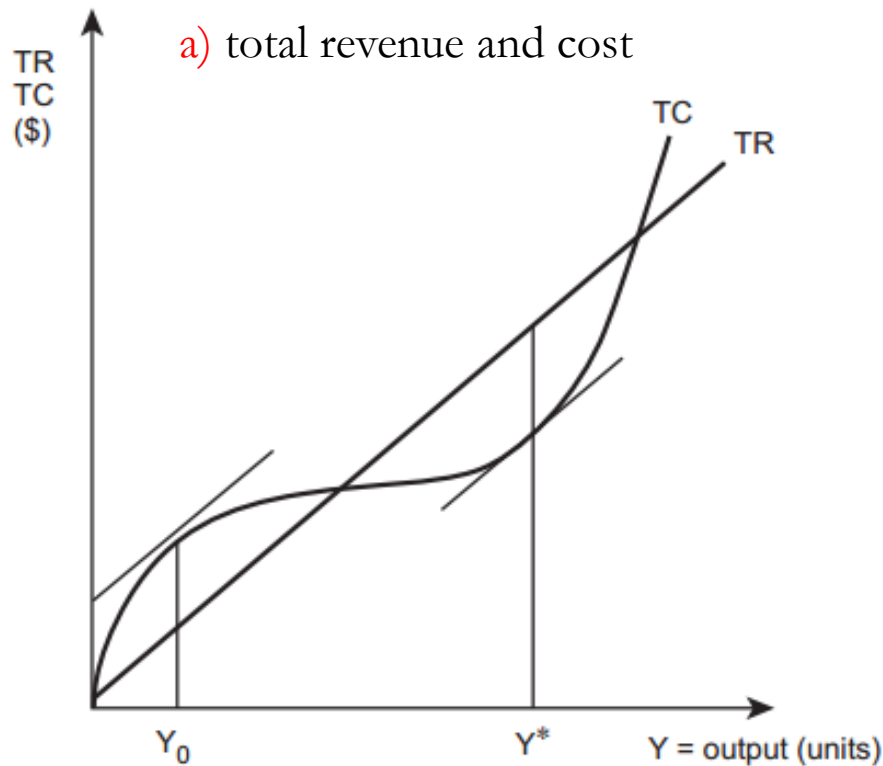a) total revenue and cost

b) marginal revenue and cost
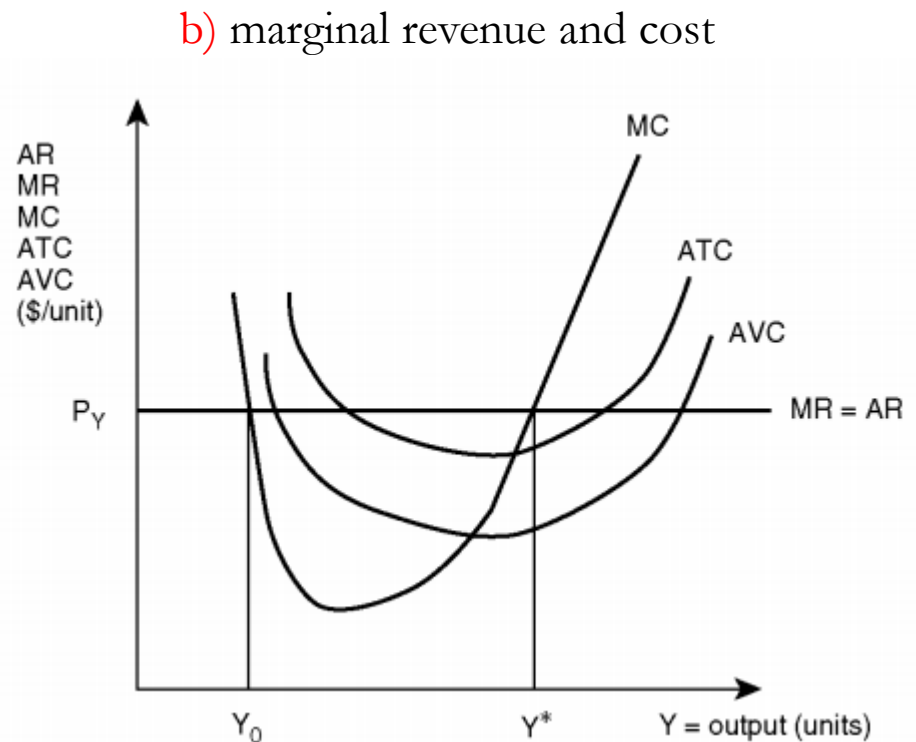
Figure 3.7 The profit-maximizing level of output

Profits and losses

- When is the firm earning profits or incurring losses?
- If PY > ATC, then profits are positive, and
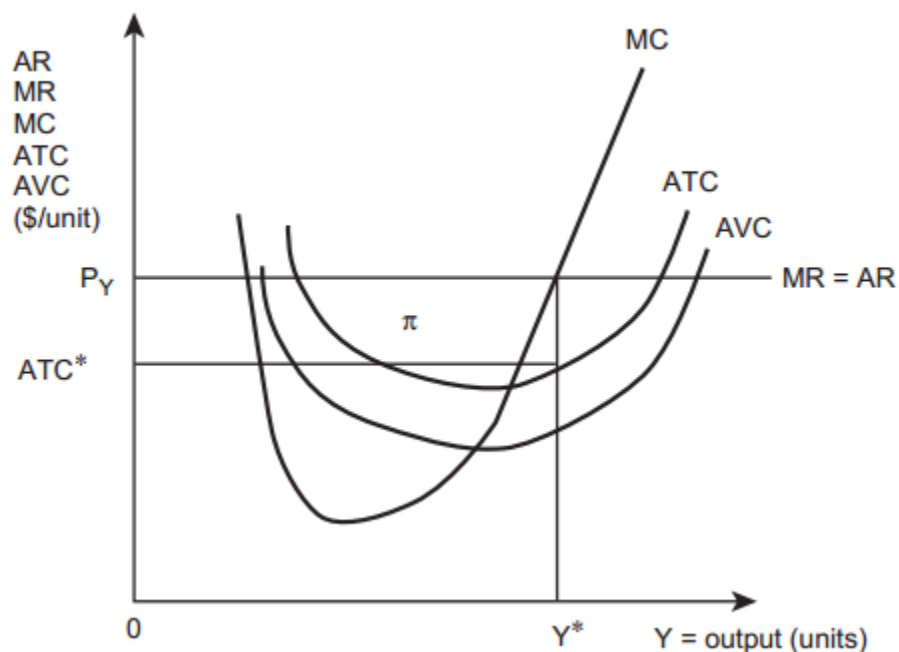 If PY < ATC, then profits are negative.

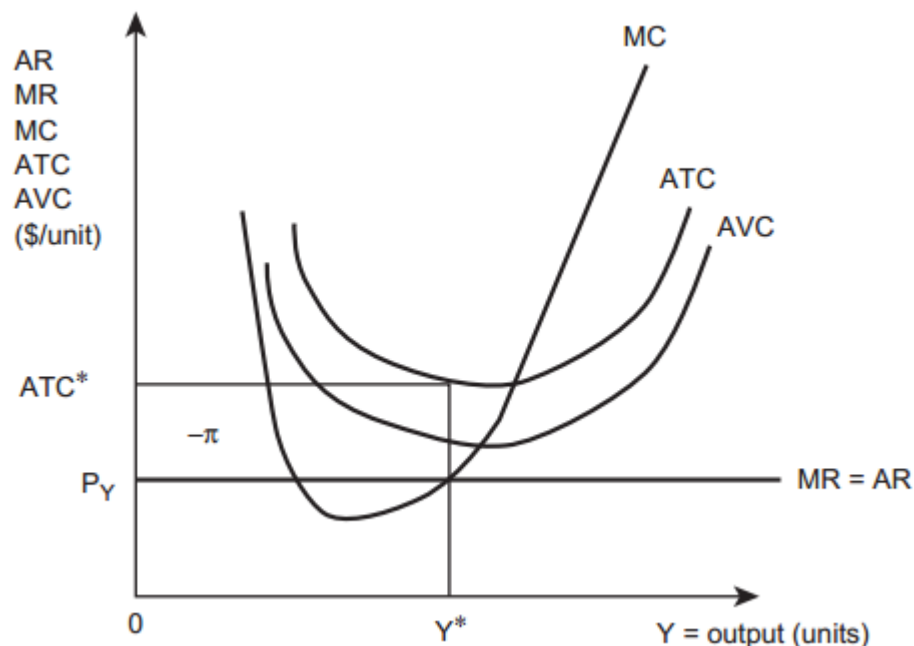Figure 3.8 Positive economic profits.   Figure 3.9 Negative economic profits.

The Break-Even Point

- If PY = ATC, then profits are equal to zero (The Break-Even Point).

- The Break-Even Point occurs when PY = MC at the minimum point on the ATC (TR=TC)
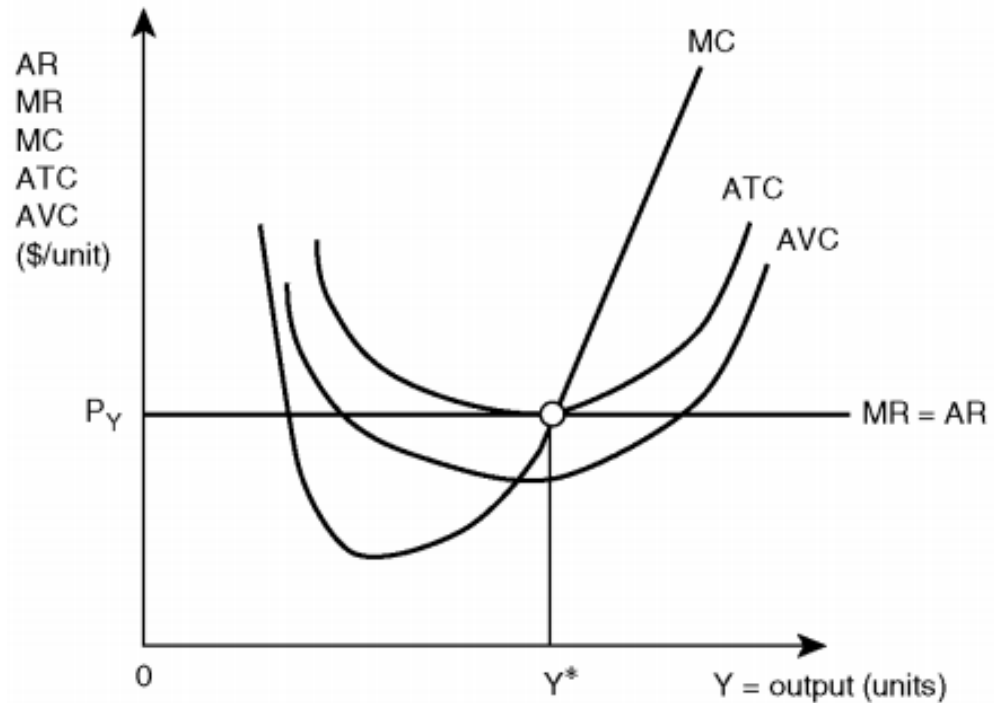

Figure 3.10 The break-even point

References

- Barkley A., and Barkley P. W. (2013). Principles of agricultural economics. Routledge. (ch3-4)

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