

Foundations of Economic Analysis & Explanation

Lecture 15: Production Theory – Profit

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Overview

- Marx on Profit
- Economic Profit
- Profit Maximization
- Economic Rent



This lecture discusses the source of profit, explains the difference between accounting profit and economic profit, answers why and how it matters in business decisions, and derives the principle for profit maximization.

Questions for Discussion

Think-pair-share: discuss with your peers and write down summary answers.

- ① According to Karl Marx, what is the source of capitalist profit? Who should reap such profit? What was Marx's solution?
- ② What is the relationship between the demand curve and sales revenue?
- ③ What is the difference between accounting cost and economic cost?
- ④ What is the difference between accounting profit and economic profit?
- ⑤ Given the production function $Q = F(K, L)$ and the revenue function $TR = PQ$, what extra information is needed to calculate profit?
- ⑥ In economic theory, what is the principle for profit maximization?
- ⑦ In principle, what economic agent is entitled to business profit?
- ⑧ Is profit a cost? Who paid and what was paid for such cost?

OUTLINE

① Marx on Profit

② Economic Profit

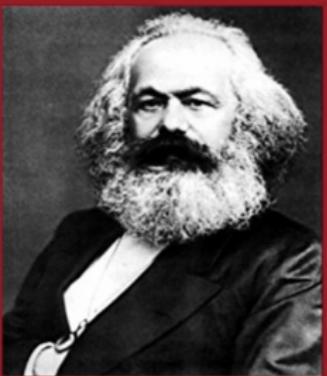
③ Profit Maximization

④ Appendix

Karl Marx, Capitalism, and Profit

- Karl Marx (1818–1883) is best known not as a philosopher but as a revolutionary, whose works inspired the foundation of many communist regimes in the twentieth century.
- Marx's economic analysis of capitalism is based on his version of the labour theory of value, and includes the analysis of capitalist profit as the extraction of surplus value from the exploited proletariat.
- Capitalism is distinctive, Marx argues, in that it involves not merely the exchange of commodities, but the advancement of capital, in the form of money, with the purpose of generating profit through the purchase of commodities and their transformation into other commodities which can command a higher price, and thus yield a profit.
- Marx claims that no previous theorist has been able adequately to explain how capitalism as a whole can make a profit. Marx's own solution relies on the idea of exploitation of the worker.

Capital (Das Kapital)



Karl Marx

THE COMMUNIST MANIFESTO



KARL MARX
FRIEDRICH ENGELS

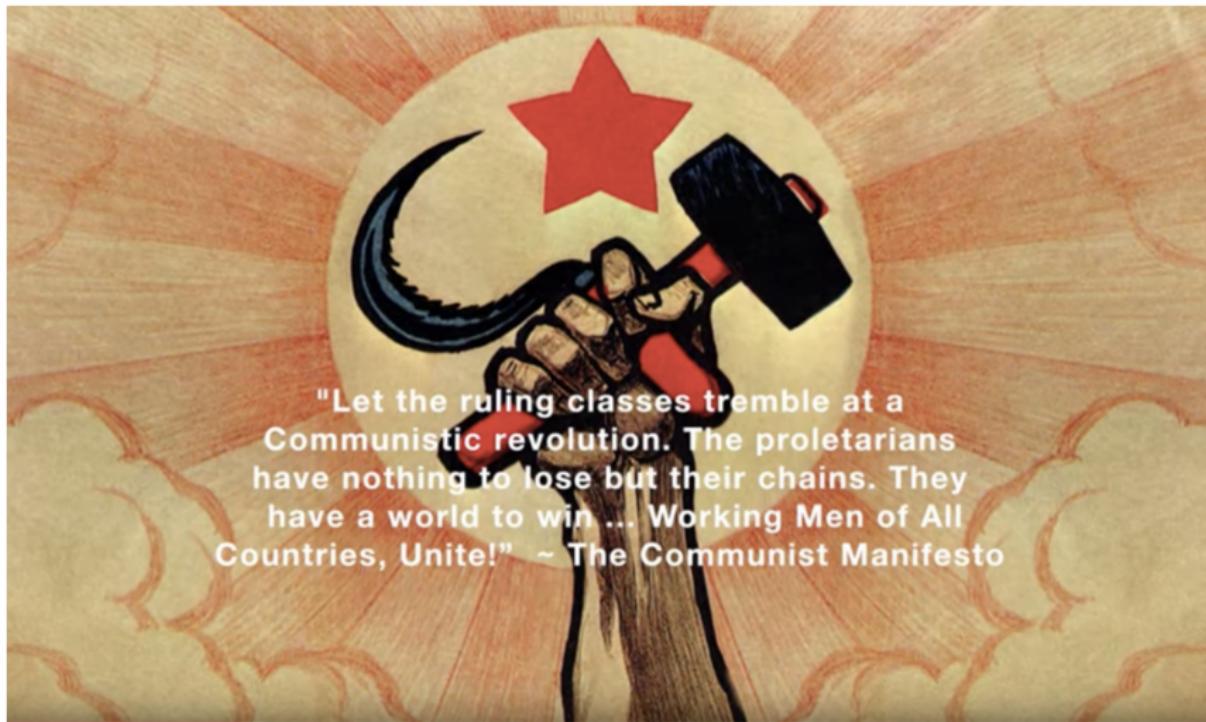
www.amazon.com

Marx: Surplus Value Theory of Profit

- In setting up conditions of production the capitalist purchases the worker's labour power—his ability to labour—for the day. The cost of this commodity is determined in the same way as the cost of every other; i.e. in terms of the amount of socially necessary labour power required to produce it.
- In this case the value of a day's labour power is the value of the commodities necessary to keep the worker alive for a day. Suppose that such commodities take four hours to produce. Thus the first four hours of the working day is spent on producing value equivalent to the value of the wages the worker will be paid. This is known as necessary labour. Any work the worker does above this is known as surplus labour, producing surplus value for the capitalist.
- Surplus value, according to Marx, is the source of all profit. In Marx's analysis labour power is the only commodity which can produce more value than it is worth, and for this reason it is known as variable capital. Other commodities simply pass their value on to the finished commodities, but do not create any extra value. They are known as constant capital. Profit, then, is the result of the labour performed by the worker beyond that necessary to create the value of his or her wages. This is the surplus value theory of profit.

<https://plato.stanford.edu/entries/marx/>

The Communist Manifesto



**"Let the ruling classes tremble at a
Communistic revolution. The proletarians
have nothing to lose but their chains. They
have a world to win ... Working Men of All
Countries, Unite!" ~ The Communist Manifesto**

<https://www.youtube.com/watch?v=vN6xPq0fGsw>

OUTLINE

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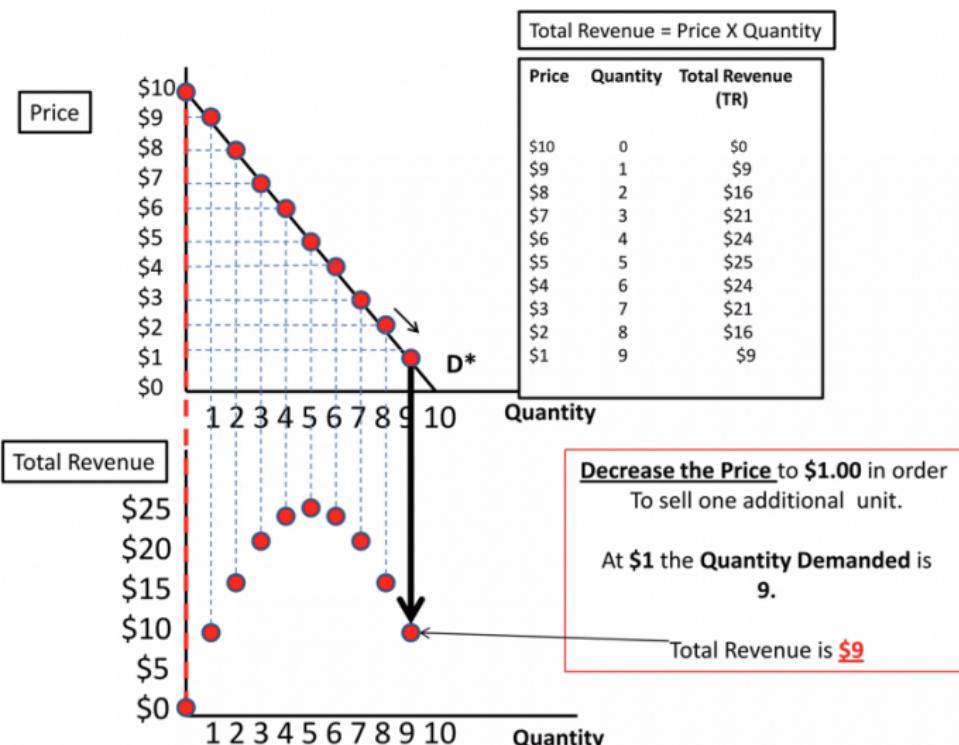
Profit Comes from Revenue

- Revenue is the income of business. How to generate income?
- Revenue Function: the relation between sales revenue and quantity sold by the firm. Total Revenue: $TR = PQ$.
- Obviously, revenue will rise as sales volume increases. It's positively related to the quantity sold in the market.
- For a given P , more sales Q , more revenue TR .
- For a given Q , higher price P , more revenue TR .
- However, P and Q move in opposite direction subject to the law of demand. Revenue must be calculated for each pair of P and Q at a time.
- Along the demand curve, TR can be maximized at some point.
- However, the business decision maker is not focusing on maximizing total revenue alone because production cost also matters.

Revenue Function: Examples

- Suppose the unit price of a product is \$2, what are the TR and MR when quantity demanded $Q = 10$?
- Suppose the demand curve is $P = 10 - Q$, what are the TR, AR, and MR when quantity demanded $Q = 1$ and $Q = 9$?
- Suppose the demand curve is $P = (100 - Q^2)^{1/2}$, draw the graphs for TR, AR, and MR as a function of Q ?

Linear Demand and Total Revenue



<https://www.slideshare.net/haywarddecon1/total-rev-test-and-mr-equal-0>

Business Costs: Explicit & Implicit

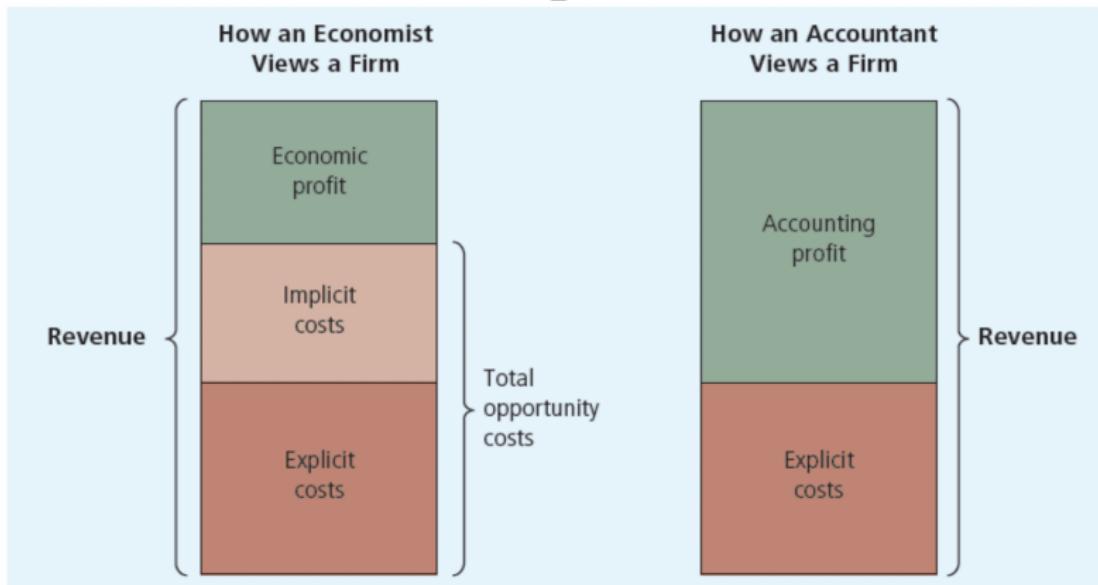
- Economists consider all opportunity costs when analyzing a business, whereas accountants record explicit costs.
- Explicit Costs (EC) require an outlay of money by the firm. Explicit costs are historical costs, including fixed cost and variable cost. Accountants record them on the income and cash flow statements.
- Implicit Costs (IC) do not require an outlay of money by the firm, which are often neglected by accountants. Implicit costs are part of, but not all, the opportunity costs for doing the business.
- Since explicit costs are backward looking book values, decision-making based on them can be misleading. In contrast, markets are forward looking: all decisions are ongoing and can incur costs and benefits real time. The right business decision shall account for opportunity costs.
- Accountants try to measure the current standing and immediate past performance of a firm, whereas economists and financial analysts is much more forward looking.

Business Profit: Example

During the harvest, the apple farm owner hires 20 workers to harvest apples for 8 hours a day. Each worker, on average, can pick 40 apples per hour. Suppose the worker's wage is \$10 per hour and each apple is sold at \$0.5 in the market. What is the profit?

- What is the profit when apple price falls to \$0.4?
- What is the profit when apple price falls to \$0.2?
- What determine the size of accounting profit?
- Which production factor shall earn the profit?
- What is the nature of profit? Is it an income? Is it a cost?
- What is the implicit cost (I.C.) of managing an apple orchard?
- What is the opportunity cost (O.C.) of owning the apple farm?

Economic Profit vs Accounting Profit



Source: N. Mankiw (2021) CH13, Principles of Microeconomics, 9e. Cengage.

- Economic profit: total revenue minus total cost ($TR - TC$).
- Accounting profit: total revenue minus total explicit cost ($TR - EC$).

Accounting Costs and Profit

Much of the information that is used in business and finance comes from financial statements. An understanding of the basic financial statements and some of the financial ratios is a first step.

Accounting profit is referred to as book-keeping profit or financial profit, is net income earned after subtracting all explicit costs from total revenue. In effect, it shows the amount of money a firm has left over after deducting the explicit costs of running the business. According to generally accepted accounting principles (GAAP), it includes the explicit costs of doing business, such as operating expenses (SG&A), depreciation, interest paid to creditors and taxes paid to the governments.

Explicit costs include:

- Raw materials purchasing
- Labor, HR, management costs
- Inventory needed for production
- Transportation and logistic costs
- Depreciation and loan deductions
- Sales, marketing, distribution costs
- Interest payments, government taxes

Implicit costs (may) include:

- Company-owned buildings, plant and equipment (no outlays)
- Self-employment resources
- The cost of capital (equity)

<https://www.investopedia.com/terms/a/accountingprofit.asp>

Profits in Accounting Practice

	<i>Item</i>	<i>Explanation</i>
Start with	Revenues	Accountant's estimate of the revenues/sales generated by any transactions made the business during the period.
Net out	Cost of Goods Sold	Estimated costs that are directly associated with producing the product/service sold by the company.
To get	Gross Profit	Unit profitability, before covering other indirect costs and financial expenses
Net out	Operating Expenses	Include all expenses associated with operations this year, with no benefits spilling over into future years.
To get	Operating Profit	Profitability of business/ operations
Net out	Financial Expenses	Expenses associated with non-equity financing (debt, for instance)
Add in	Financial Income	Income earned on cash balance and on financial investments (in companies and securities)
To get	Pretax Profit	Income to equity investors, prior to taxes
Net out	Taxes	Taxes, based upon taxable income. (May not equate to cash taxes paid)
To get	Net Profit	Income to equity investors, after taxes

<https://aswathdamodaran.blogspot.com/2022/11/meta-lesson-2-accounting.html>

Case Study: Apple's Income Statement (w)

Annual Data Millions of US \$ except per share data		2022-09-30	2021-09-30	2020-09-30	2019-09-30	2018-09-30
Revenue	[d]	\$394,328	\$365,817	\$274,515	\$260,174	\$265,595
Cost Of Goods Sold	[d]	\$223,546	\$212,981	\$169,559	\$161,782	\$163,756
Gross Profit	[d]	\$170,782	\$152,836	\$104,956	\$98,392	\$101,839
Research And Development Expenses	[d]	\$26,251	\$21,914	\$18,752	\$16,217	\$14,236
SG&A Expenses	[d]	\$25,094	\$21,973	\$19,916	\$18,245	\$16,705
Other Operating Income Or Expenses		-	-	-	-	-
Operating Expenses	[d]	\$51,345	\$43,887	\$38,668	\$34,462	\$30,941
Operating Income	[d]	\$119,437	\$108,949	\$66,288	\$63,930	\$70,898
Total Non-Operating Income/Expense	[d]	\$-334	\$258	\$803	\$1,807	\$2,005
Pre-Tax Income	[d]	\$119,103	\$109,207	\$67,091	\$65,737	\$72,903
Income Taxes	[d]	\$19,300	\$14,527	\$9,680	\$10,481	\$13,372
Income After Taxes	[d]	\$99,803	\$94,680	\$57,411	\$55,256	\$59,531
Other Income		-	-	-	-	-
Income From Continuous Operations	[d]	\$99,803	\$94,680	\$57,411	\$55,256	\$59,531
Income From Discontinued Operations		-	-	-	-	-
Net Income	[d]	\$99,803	\$94,680	\$57,411	\$55,256	\$59,531
EBITDA	[d]	\$130,541	\$120,233	\$77,344	\$76,477	\$81,801
EBIT	[d]	\$119,437	\$108,949	\$66,288	\$63,930	\$70,898
Basic Shares Outstanding	[d]	16,216	16,701	17,352	18,471	19,822
Shares Outstanding	[d]	16,326	16,865	17,528	18,596	20,000
Basic EPS	[d]	\$6.15	\$5.67	\$3.31	\$2.99	\$3.00
EPS - Earnings Per Share	[d]	\$6.11	\$5.61	\$3.28	\$2.97	\$2.98

<http://www.macrotrends.net/stocks/charts/AAPL/apple/income-statement>

Direct Cost vs Overhead Cost

- Direct Cost: the amount paid as production and operation continues. It changes directly with the quantity of output being produced. It is similar to explicit cost, which includes variable and fixed costs.
- To start up a business, some initial investment is indispensable. Once in business, the investment is not a direct cost any more.
- However, for book-keeping purposes, accountants record past investment as historical or sunk costs on the balance sheet as asset, accounting for depreciation on the income statement.
- Economists shall NOT focus on historical or accounting costs because the decision maker can change or sell the business.
- Overhead Cost: the amount earned by selling the entire business outright (liquidation). This is the alternative of staying in business, therefore an economic cost (not a historical or fixed cost). Overhead cost is not a cost in the short run as long as the business continues to operate.

Accounting vs Economic Profit

- Total revenue = price \times quantity
- Accounting profit = revenue – accounting cost
- Economic profit = revenue – economic cost
- Accounting cost \approx explicit cost (+ implicit cost)
- Economic cost = opportunity cost = cost of all inputs
- Total cost = EC+IC = DC+OC = FC+VC+OC= factor cost
- Given price P and wage W, profit is also a function of Q.
- Accounting is based on the explicit costs on the book. In practice, accounts do not count dividends paid to shareholders as profit. Instead, they distribute dividends from the profit.
- Economic profit nets out all costs, e.g., the tied-up capital costs, which includes interest to lenders and dividends to the shareholders. Therefore, there is also a cost for making profit.

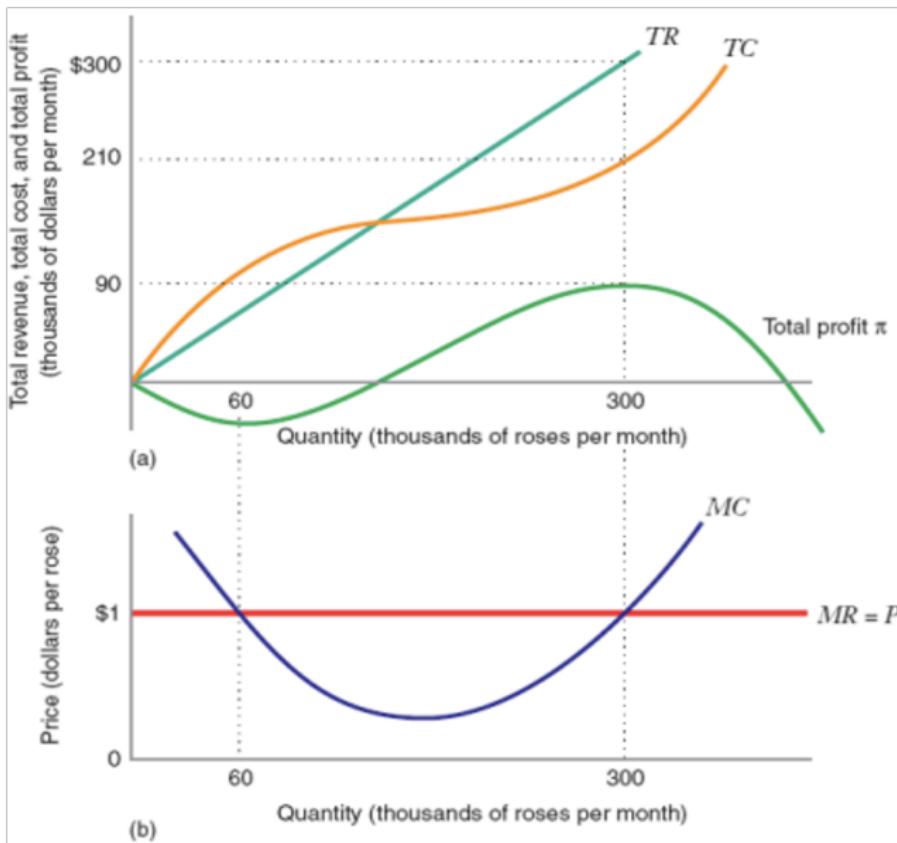
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Profit Maximization: Example

- Suppose $P = \$3$, $MC = (Q-2)^2 + 1$, what is the Q that maximizes profit?
Graph the relation for profit and Q .
- Can you derive the functions for TR and TC ?

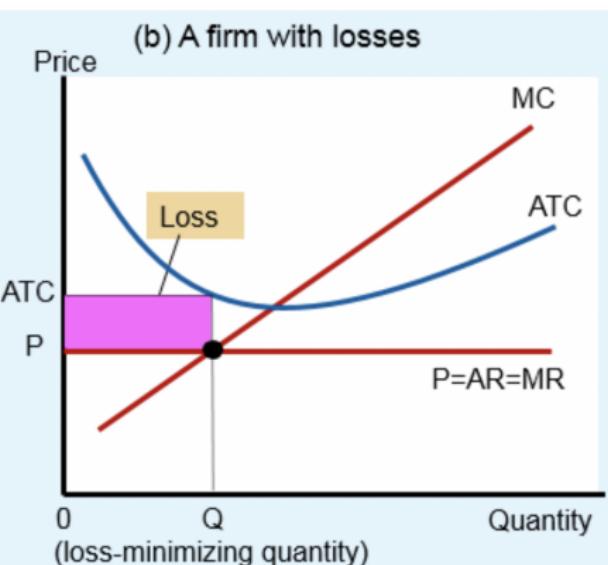
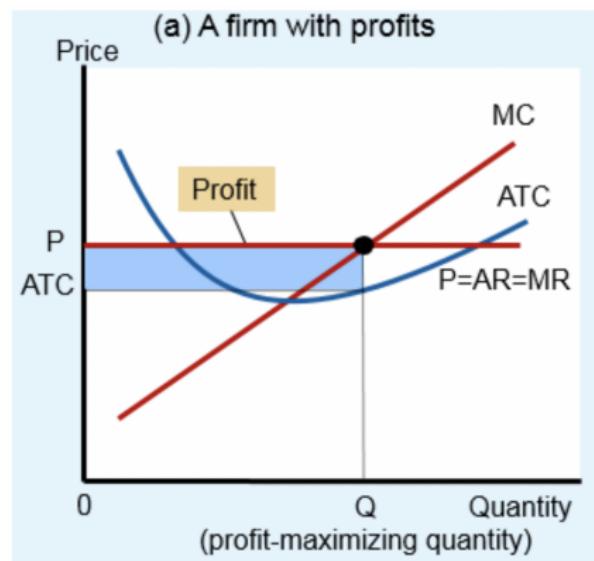
Q	P\$	TR\$	MR\$	MC\$	TC\$	TR-TC\$
1	3					
2	3					
3	3					
4	3					
5	3					



Profit Maximization: $MR = MC$

- To maximize accounting/economic profit, the firm must balance two factors at the same time—the total revenue and total costs, both are functions of the quantity of output. $\text{Profit} = \text{TR}(Q) - \text{TC}(Q)$
- Remember the relation between the marginal variable and the total variable. As long as $MR > 0$, TR will increase.
- However, as Q rises, TR and TC will eventually fall due to the law of demand and the law of diminishing marginal product, respectively.
- If $MR > MC$, total revenue increases faster than the total cost, the firm's economic profit will still increase.
- If $MC > MR$, total cost rises faster than the total revenue, the firm's profit will start to decrease. Where is the optimal solution then?
- The principle to maximize net income (profit) is called marginal equalization: $MR = MC$. (first order necessary condition)

Economic Profit and Losses



The area of the shaded box between price and average total cost represents the firm's economic profit/loss. The height of this box is price minus average total cost ($P - ATC$), and the width of the box is the quantity of output (Q). In panel (a), $price > average\ total\ cost$ ($P > ATC$), so the firm has generated positive profit. In panel (b), $price < average\ total\ cost$ ($P < ATC$), so the firm incurs a loss.

Graph: Mankiw (2021) CH14

Adam Smith on the Natural Price

In *The Wealth of Nations*, the wages and profits in any production process tend to an average rate that depends on the market. When the price of a commodity exactly matches the cost (rent, profit, wages) of producing it and bringing it to market, we might call it the natural price. If it sells at more than that, the seller makes a profit. If it sells at less, the seller makes a loss.

The language is antiquated, but by 'natural price' Smith means no more than the cost of production, including a 'normal' rate of profit under competition. This is in line with his view that value has more to do with what goes into a product, whereas today we would talk about supply and demand. This makes the term 'natural price' difficult to render in modern language, but it seems sensible to use simply 'cost of production'.

Eamonn Butler (2011) Page 18, *The Condensed Wealth of Nations and The Incredibly Condensed Theory of Moral Sentiments*. The Adam Smith Institute

Adam Smith on the Rate of Profit

OF THE PROFITS OF STOCK

I.9.1 The rise and fall in the profits of stock depend upon the same causes with the rise and fall in the wages of labour, the increasing or declining state of the wealth of the society; but those causes affect the one and the other very differently.

I.9.2 The increase of stock, which raises wages, tends to lower profit. When the stocks of many rich merchants are turned into the same trade, their mutual competition naturally tends to lower its profit; and when there is a like increase of stock in all the different trades carried on in the same society, the same competition must produce the same effect in them all.

<https://hurricanecapital.wordpress.com/2015/11/19/adam-smith-on-the-profits-of-stock/>

Adam Smith on the Rate of Profit

I.9.3 It is not easy, it has already been observed, to ascertain what are the average wages of labour even in a particular place, and at a particular time. We can, even in this case, seldom determine more than what are the most usual wages. But even this can seldom be done with regard to the profits of stock. Profit is so very fluctuating, that the person who carries on a particular trade cannot always tell you himself what is the average of his annual profit. It is affected, not only by every variation of price in the commodities which he deals in, but by the good or bad fortune both of his rivals and of his customers, and by a thousand other accidents to which goods when carried either by sea or by land, or even when stored in a warehouse, are liable. It varies, therefore, not only from year to year, but from day to day, and almost from hour to hour. To ascertain what is the average profit of all the different trades carried on in a great kingdom, must be much more difficult; and to judge of what it may have been formerly, or in remote periods of time, with any degree of precision, must be altogether impossible.

<https://hurricanecapital.wordpress.com/2015/11/19/adam-smith-on-the-profits-of-stock/>

Source of Profit: Uncertainty

- Frank H. Knight was one of the founders of the so-called Chicago school of economics, of which Milton Friedman and George Stigler were the leading members from the 1950s to the 1980s.
- In *Risk, Uncertainty, and Profit* (1921), Knight set out to explain the source of profits in a perfectly competitive market. His explanation was "uncertainty," which differs from risk.
- According to Knight, "risk" refers to a situation in which the probability of an outcome can be determined, and therefore the outcome insured against. "Uncertainty," by contrast, refers to an event whose probability cannot be known. Knight argued that even in long-run equilibrium, entrepreneurs would earn profits as a return for putting up with uncertainty—the opportunity cost of forgoing secured income.

<https://www.econlib.org/library/Enc/bios/Knight.html>

Classical Political Economy: Rent

- The classical economists used the term economic rent as that part of the total payment which is made for the use of land only as distinguished from the payment made for the capital invested therein. In modern economics, rent is increasingly being used in the sense of a surplus, i.e., what a factor earns over and above what is essential to maintain its supplies in its present occupation.
- In other words, it is the amount that a factor must earn in its present use to prevent it from moving (i.e., transferring its service) to another use. It is the opportunity cost of resources. An excess of actual return over this amount is treated as surplus income or economic rent. Thus, in modern terminology, transfer income is necessary income and economic rent is surplus income. The composition of the two in total factor income affects the mobility and allocation of factors.

<http://www.economicsdiscussion.net/theory-of-rent/rent-meaning-and-economic-rent/1789>

Economic Rent: Example

Three income choices A, B, or C

	Income	D.C.\$	Profit\$	O.C.\$	Rent\$
A	\$1000	\$1200	-\$200	\$3000	-\$2000
B	\$2000	\$1200	\$800	\$3000	-\$1000
C	\$3000	\$1200	\$1800	\$2000	\$1000

What are the economic cost and rent of A, B, C?

Which is the optimal decision? Four equivalent answers.

Highest income, highest profit, lowest cost, highest rent.

Economic rent is a surplus over the second-best profit.

Loosely speaking, rent and profit can be used interchangeably.

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Summary of Textbook Costs

The Many Types of Cost: A Summary	Term	Definition	Description
	Explicit costs	Costs that require an outlay of money by the firm	
	Implicit costs	Costs that do not require an outlay of money by the firm	
	Fixed costs	Costs that do not vary with the quantity of output produced	FC
	Variable costs	Costs that vary with the quantity of output produced	VC
	Total cost	The market value of all the inputs that a firm uses in production	$TC = FC + VC$
	Average fixed cost	Fixed cost divided by the quantity of output	$AFC = FC/Q$
	Average variable cost	Variable cost divided by the quantity of output	$AVC = VC/Q$
	Average total cost	Total cost divided by the quantity of output	$ATC = TC/Q$
	Marginal cost	The increase in total cost that arises from an extra unit of production	$MC = \Delta TC / \Delta Q$

Source: N. Mankiw (2021) CH13, Principles of Microeconomics, 9e. Cengage.

References

N. Mankiw (2021) Principles of Microeconomics, 9e. Cengage.

Pindyck & Rubinfeld (2021) Microeconomics, 9e. Pearson

Profit <https://www.econlib.org/library/Enc/Profits.html>

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MRU Principle of Microeconomics – Profit Maximization (w)

201808 Does profit still matter? | CNBC Explains 5:34
<https://www.youtube.com/watch?v=PDA6nF-fxdo>

201902 How Amazon Makes Money | CNBC Explains 5:36
<https://www.youtube.com/watch?v=3nGAQWyzY94>

William Ackman: Everything You Need to Know About Finance and Investing in Under an Hour <https://www.youtube.com/watch?v=WEDIj9JBTC8>

References

Ricardian Theory of Rent

Rent: Meaning and Economic Rent

Comparison between Rent and Profit

Difference between Rent and Quasi Rent

Difference between Differential Rent and Scarcity Rent

Ricardian Theory and the Modern Theory of Rent: Differences

<http://www.economicsdiscussion.net/rent>

<http://www.economicsdiscussion.net/theory-of-rent>