Factors of Production and Productivity

Factors of production (Nature, Labor, Kapital)

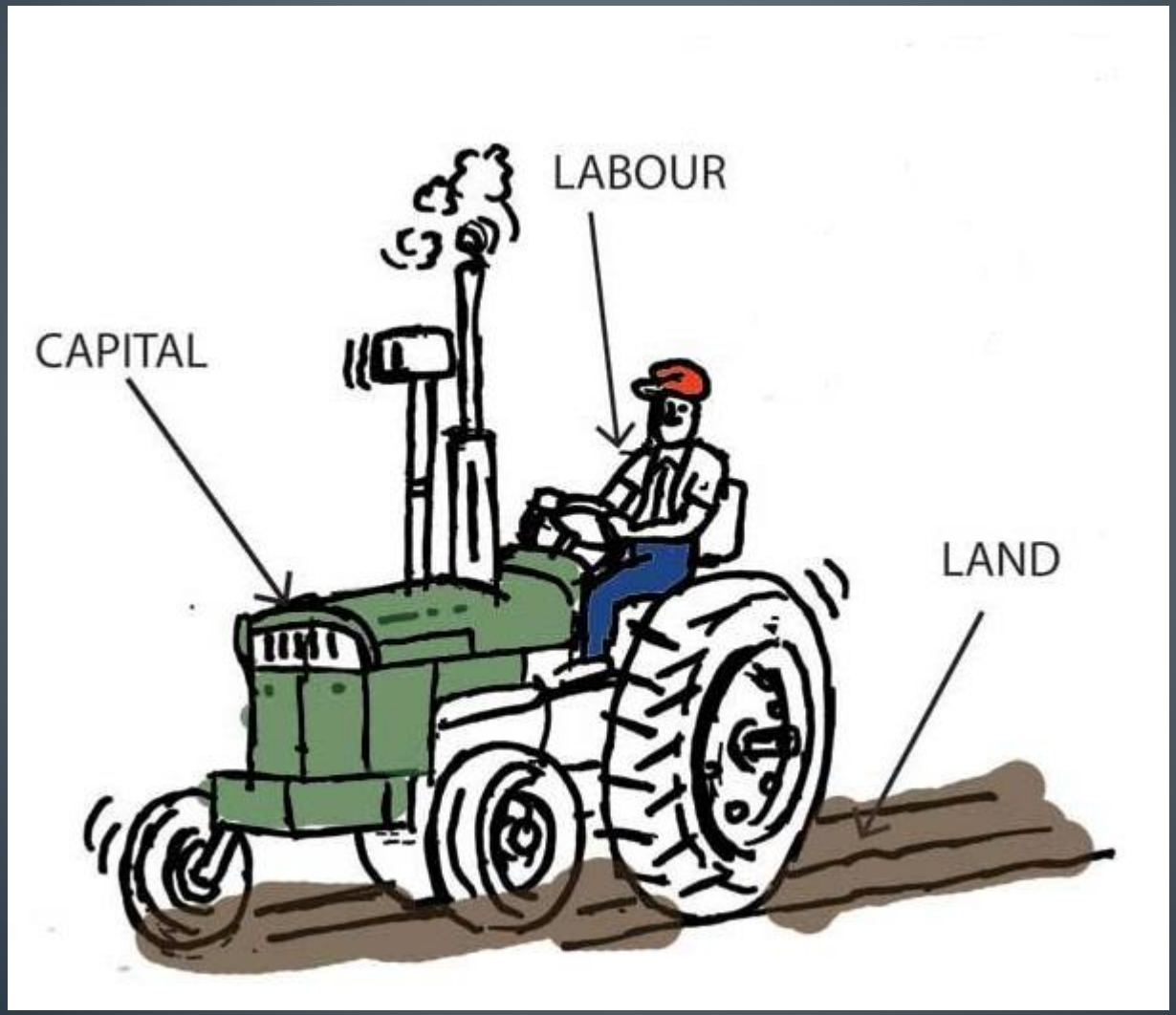
Productivity of factors of production

What Are Factors of Production?

- Factors of production are the inputs needed for the creation of a good or service. The factors of production include land, labor, and capital.

- Economic growth only comes from increasing the quality and quantity of the factors of production, which consist of: land, labor and capital. The factors of production are the resources used in creating or manufacturing a good or service in an economy.

What Are Factors of Production?



Soil - Land

- The land is any natural resource that's needed or used in the production of a good or service. Land can also include any resource that comes from the land such as oil, gas, and other commodities such as copper and silver. Typically, land includes any natural resource that's used as raw materials in the production process.

Soil - Land

Land has a broad definition as a factor of production and can take on various forms, from agricultural land to commercial real estate to the resources available from a particular piece of land. Natural resources, such as oil and gold, can be extracted and refined for human consumption from the land. Cultivation of crops on land by farmers increases its value and utility. For a group of early French economists called the physiocrats who pre-dated the classical political economists, the land was responsible for generating economic value.

While the land is an essential component of most ventures, its importance can diminish or increase based on industry. For example, a technology company can easily begin operations with zero investment in land. On the other hand, the land is the most significant investment for a real estate venture.

Labor

Labor consists of the people that are responsible for the production of a good, including factory workers, managers, salespeople, and the engineers that designed the machinery used in production.

Labor refers to the effort expended by an individual to bring a product or service to the market. Again, it can take on various forms. For example, the construction worker at a hotel site is part of labor as is the waiter who serves guests or the receptionist who enrolls them into the hotel.

Within the software industry, labor refers to the work done by project managers and developers in building the final product. Even an artist involved in making art, whether it is a painting or a symphony, is considered labor.

Labor

For the early political economists, labor was the primary driver of economic value. Production workers are paid for their time and effort in wages that depend on their skill and training. Labor by an uneducated and untrained worker is typically paid at low prices. Skilled and trained workers are referred to as human capital and are paid higher wages because they bring more than their physical capacity to the task. For example, an accountant's job requires synthesis and analysis of financial data for a company. Countries that are rich in human capital experience increased productivity and efficiency.

The difference in skill levels and terminology also helps companies and entrepreneurs arbitrage corresponding disparities in pay scales. This can result in a transformation of factors of production for entire industries. An example of this is the change in production processes in the Information Technology (IT) industry after jobs were outsourced to countries with a trained workforce and significantly lower salaries.

Capital

Capital refers to capital goods such as manufacturing plants, machinery, tools, or any equipment used in the production process. Capital might refer to a fleet of trucks or forklifts as well as heavy machinery.

In economics, capital typically refers to money. But money is not a factor of production because it is not directly involved in producing a good or service. Instead, it facilitates the processes used in production by enabling entrepreneurs and company owners to purchase capital goods or land or pay wages. For modern mainstream (neoclassical) economists, capital is the primary driver of value.

Capital

As a factor of production, capital refers to the purchase of goods made with money in production. For example, a tractor purchased for farming is capital. Along the same lines, desks and chairs used in an office are also capital.

It is important to distinguish personal and private capital in factors of production. A personal vehicle used to transport family is not considered a capital good. But a commercial vehicle that is expressly used for official purposes is considered a capital good. During an economic contraction or when they suffer losses, companies cut back on capital expenditure to ensure profits. During periods of economic expansion, however, they invest in new machinery and equipment to bring new products to market.

Capital - a factor derived from production

Capital is the set of material and financial elements used by a company in the process of carrying out its activities

The capital of any company is represented in an accounting financial document called balance sheet, a document that any company has the obligation to publish annually.

In the balance sheet the capital of a company is presented in two stages:

In concrete form in which it exists at a given moment - assets

As source of funds that were used to raise capital - liabilities

Capital - a factor derived from production

Balance Sheet

As of December 31, 2016 (000s)

Assets		Liabilities	
Cash	481	Accounts Payable	625
Marketable Securities	1,346	Current Portion L-T Debt	1,021
Accounts Receivable	1,677	Taxes Payable	36
Inventory	2,936	Accrued Expenses	157
Prepaid Expenses	172	Total Current Liabilities	1,839
Other Current Assets	58		
Total Current Assets	6,670	Long-term Debt	2,332
		Total Liabilities	**4,171**
Gross Value of Property, Plant & Equipment	2,019	**Owner's Equity**	
Accumulated Depreciation	(664)	Common Stock and Paid-in Cap	194
Net Property, Plant, Equipment	1,355	Retained Earnings	4,009
		Total Shareholders' Equity	4,203
Note Receivable	349		
Total Assets	**8,374**	**Total Liabilities and Equity**	**8,374**

What the Company Owns

What the Company Owes

Shareholders' Equity

Total Assets

Current Assets
+
Non-Current Assets

Total Liabilities

Current Liabilities
+
Non-Current Liabilities

Total Shareholders' Equity

Share Capital
+
Retained Earnings

Capital

K - the total capital of the company

K_f - fixed capital

Fixed Assets:
(tangible things that have a shelf life longer than a year)
- Equipment - Tools, Vehicles, Office Furniture
- (-) Accumulated depreciation-equipment
- Real Estate / Buildings / Land
- (-) Accumulated depreciation-buildings
- Other (specify)

Intangible Assets
- Copyright - the rights to copy and produce
- Goodwill - Anything you paid in excess for the current value
- Leasehold improvements - Improvements on a leased property
- Patent Rights - exclusive rights granted to inventor
- Trademark - word, phrase, logo, symbol or design, used to identify

K_c – current capital

Current Assets:
(things that can be converted to cash within a year)
- Cash - on hand or in the bank
- Short-Term Investments - e.g. money market, stocks, CDs
- Other Current Assets
- Accounts Receivable - money customers owe you
- (-) Allowance for Bad Debts - write off
- Federal Income Tax Refund
- Interest Receivable - interest that has been earned, & not received
- Advances to Employees - money borrowed on future work hours
- Advances to Salespersons - money borrowed on future sales
- Prepaid Expenses - insurance & rent (paid but not used)
- Deferred Income Tax Asset (short-term)
- Inventory - stocked goods
- Supplies - cost of supplies

Combining production factors

- Production can be written as a function of known factors (labor L, soil or land S, and capital K).

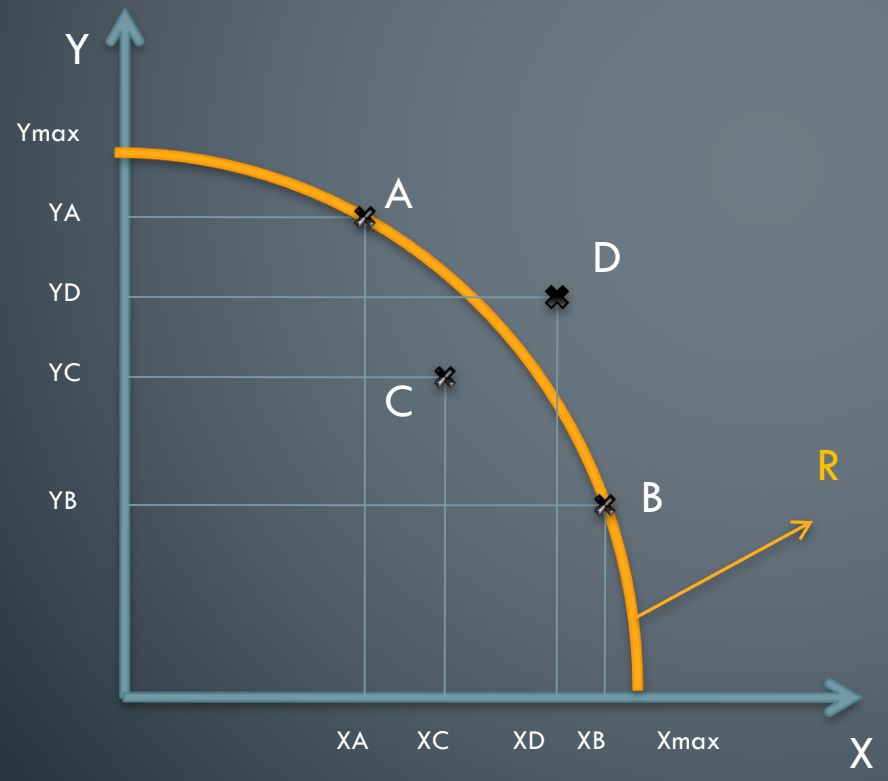
$$Q = f(S, K, L) \quad \text{or} \quad Q = f(K, L)$$

Production factors can be combined in several ways resulting in more or less efficient combinations

Given that resources are limited, companies must decide how they will allocate resources for the production of different goods..

Production possibilities frontier

- It represents the set of efficient combinations (which fully utilize the available resources) possible for a company regarding the use of resources with alternative utilities.



It can be seen that only points A and B belong to the production possibilities. Combination C is not effective because it leaves some of the resources (R) unused. Combination D is not possible because the company does not have so many resources.

Productivity

- Productivity describes various measures of the efficiency of production.
- Productivity is a crucial factor in production performance of firms and nations. Increasing national productivity can raise living standards because more real income improves people's ability to purchase goods and services, enjoy leisure, improve housing and education and contribute to social and environmental programs. Productivity growth can also help businesses to be more profitable

Productivity

Economic efficiency covers a complex system of interdependence relations between resource inputs and the results obtained in a service economy based on self-regulation, recycling, risk and uncertainty.

Productivity, as a primary form of economic efficiency, reflects the suitability of an activity to be useful, in the sense of reaching a certain goal, within a given time frame

Productivity, especially labor productivity, is inextricably linked to the law of the economy of time, to which in the contemporary era, particular attention is paid

Productivity of production factors

- The synthetic expression of the efficiency of using the factors of production in the activities from which economic goods result is productivity.
- **Productivity means fruitfulness, the yield of the production factors used.**
- The level of productivity is determined by the relationship :

$$W = \frac{Q}{Fi}$$

W= productivity level

Q= the effect, the result, that is the economic goods obtained

Fi= the effort made, ie the production factors used, which are evaluated, as the case may be, physically or in monetary expression

Factors that influence the level and evolution of productivity

1. The quality of the production factors used:

of the technical capital and especially of the equipment and technologies;

of human capital, respectively the level of general training and qualification;

of natural conditions;

of the management of the activity, respectively of the production and work organization.

Factors that influence the level and evolution of productivity

2. the economic motivation of the owners of the production factors, respectively the degree in which their efforts to increase the productivity allow them to obtain higher incomes;

3. the social and political climate, the regulations on labor protection, etc.

Factors that influence the level and evolution of productivity

natural factors: soil conditions and climate; the concentration in useful minerals of a deposit; abundance or rarity of water resources; landscape, geographical location;

technical-economic factors: the level of technical equipment; combining production factors; management of economic activity;

social factors: the level of professional training of workers; the relationship between unions and employers;

psychological and psycho-social factors: motivation (interest expressed in work); the existing climate in the workplace; family environment;

international factors: the extent and manner of manifesting the relations with the outside; the level, the efficiency of using the factors of production in the other states.

- *Partial productivity expresses the productivity of a single factor of production, considered to be at the origin of the production and its modification*

- *The overall productivity expresses the aggregate efficiency of all the factors of production involved in obtaining a result.*

- *The average productivity expresses the average productivity obtained, and is obtained by reporting the result to the quantity of production factors used.*

- *Marginal productivity expresses the efficiency obtained by modifying one or all of the factors of production with a unit.*

PRODUCTIVITY OF LAND (SOIL)

The productivity of the land (of the agricultural land) is determined as average productivity (average product) and as marginal productivity per hectare (marginal product), using the following indicators:

Average productivity per hectare WS (yield per hectare; average yield per hectare), is the ratio between total production (Q) and cultivated area (S):

$$WS = \frac{Q}{S}$$

The marginal productivity (the marginal product) of the agricultural land, is the production increase obtained by using an additional unit of land in the production process, provided that the use of the other factors of production remains unchanged:

$$WmgS = \frac{\Delta Q}{\Delta S}$$

Productivity index:

$$I_{WS} = \frac{W_{S1}}{W_{S0}} \times 100\%$$

CAPITAL PRODUCTIVITY

The return on capital highlights the link between the capital advanced, used or used and the economic effects obtained based on its use. Like any efficiency indicator, the return on capital is presented as a ratio of minimum (the coefficient of capital) and as a ratio of maximum (productivity of capital).

The average productivity of capital (K) is determined by reporting the advanced capital (used or used), over a certain period of time (as K-flows), to the economic effect obtained (Q) over the same time horizon.

$$WK = \frac{Q}{K} \text{ or}$$

or

$$WK = \frac{CA}{K}$$

Marginal capital productivity (Kmg) is the ratio of capital increase (ΔK) in a time horizon and growth of economic results (ΔQ) in the same time frame. It is determined by the relation

$$WmgK = \frac{\Delta Q}{\Delta K}$$

or

$$WmgK = \frac{\Delta CA}{\Delta K}$$

Productivity index :

$$I_{WK} = \frac{W_{K1}}{W_{K0}} \times 100\%$$

LABOR PRODUCTIVITY

- **Labor productivity, considered the productive labor force, is the most relevant indicator used in economic analyzes. It consists in the ability of the labor force to create over a period of time a certain volume of utilities (goods and services).**

- **This indicator achieves compatibility between material and human factors of production**

- **The level of labor productivity is measured either by the quality and quantity of the goods obtained and the services provided in a work unit, or by the labor expense that returns to a unit of economic good.**

LABOR PRODUCTIVITY

The average labor productivity (WL) is determined as a maximum quality indicator (WLM), by relating the obtained output (Q) to the labor factor used (L), using the relationships:

$$WL = \frac{Q}{L}$$

or

$$WL = \frac{CA}{L}$$

Marginal labor productivity, - (WmgL), is determined as a maximum quality indicator (WmgLM), through the production increase (ΔQ) obtained as a result of using an additional unit of work (ΔL), under the conditions in which the other factors are assumed constant, and qualitative indicator of minimum (WLm), through the increase of production factors (ΔL) necessary to increase the production with one unit, the other factors remaining unchanged, using the relations

$$WmgL = \frac{\Delta Q}{\Delta L}$$

sau

$$WmgL = \frac{\Delta CA}{\Delta L}$$

Productivity index

$$I_{WL} = \frac{W_{L1}}{W_{L0}} \times 100\%$$

LABOR PRODUCTIVITY

- **Increased labor productivity is of particular importance for economic agents, who pursue increased productivity of production factors. It represents the process by which the same volume of work results in a greater quantity of goods and services or vice versa, the same mass of goods and services is realized with a smaller volume of work.**

- **The ways (directions) for increasing labor productivity :**

introduction of scientific-technical and technological progress	*raising the levels of training of the workforce*	*improving the organization of production and labor*	*material interest*
• *increasing the information resources, energy sources, revolutionizing the means of work, the emergence of new factors of production and the improvement of the existing ones, the improvement of the manufacturing technologies*	• *the same amount of labor force to acquire the capacity to take on a larger volume of resources and consequently to produce a greater mass of products, thus saving both living and materialized labor*	• *ensuring more intensive use of working time and production capabilities*	• *increasing the productivity of work by combining stimulation with material responsibility for the activity submitted*

EXERCISE 1

Based on the data in the table below, determine the average and marginal labor productivity:

L (angajați)	Q (bucăți)	W_L (buc/ang.)	W_{MG} (buc/ang)
1	45		
2	60		
3	99		
4	120		
5	200		
6	240		

EXERCISE 1

Based on the data in the table below, determine the average and marginal labor productivity:

$$WL = \frac{Q}{L} \qquad WmgL = \frac{\Delta Q}{\Delta L}$$

L (labor - staff)	Q (output - buc)	W_L (buc/ang.)	W_{MG} (buc/ang)
1	45	45	-
2	60	30	15
3	99	33	39
4	120	30	21
5	200	40	80
6	240	40	40

EXERCISE 2

A company with 150 employees, produces 3000 pieces of product A in March. In April, the company wants to increase its production by 60%, given that the average labor productivity would increase by 20%. How many people the company have to hire to achieve this growth?

EXERCISE 2

$$WL = \frac{Q}{L}$$

- Luna martie
- Q = 3000 bucăți
- L = 150 employees
- WL = 3000/150 = 20
- The average productivity is 20 pieces / employee

- Luna aprilie
- Q = 4800 bucăți
- L = ?
- WL = 24

$$24 = \frac{4800}{L}$$

- L = 200

Starting from the results of March, we substitute in the productivity formula to find out L (number of employees)

- March
- Q = 3000 bucăți
- L = 150 employees

- WL = 3000/150 = 20

- The average productivity is 20 pieces / employee

- April
- Q = 4800 bucăți
- L = ?

- WL = 24

- L = 200

$$24 = \frac{4800}{L}$$

Starting from the results of March, we substitute in the productivity formula to find out L (number of employees)

- In March, the number of employees is 150, and they have an efficiency (productivity) of 20 pcs / employee

- In April, production increases and we can see after we determine L from the productivity formula (L = Q / WL) that 200 employees are needed to support this productivity increase from 20 pieces / employee to 24 pieces / employee.

- 200 employees in April - 150 employees in March = 50 employees

The answer: It takes 50 employees to grow

EXERCISE 3

- Based on the data in the table below, determine the average labor productivity and marginal labor productivity.

Munca (L)	Capital (K)	Producție totală (Q)	Productivitatea medie a muncii (WL)	Productivitatea marginalăa muncii (WmgL
1	1	100		
2	1	220		
3	1	450		
4	1	640		
5	1	780		
6	1	720		
7	1	560		

EXERCISE 3

- Based on the data in the table below, determine the average labor productivity and marginal labor productivity.

Munca (L)	Capital (K)	Producție totală (Q)	Productivitatea medie a muncii (WL)	Productivitatea marginalăa muncii (WmgL
1	1	100	100	-
2	1	220	110	120
3	1	450	150	230
4	1	640	160	190
5	1	780	156	140
6	1	720	120	-60
7	1	560	80	-160