

Influence of Factors of Production on Efficiency of Production Systems

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Doi:10.5901/mjss.2015.v6n3s7p411

Abstract

In the course of functioning of firms the uncountable set of variants of use of factors in various combinations is supposed. Diversification of combinations is caused by scientific and technical progress and a condition of the market of factors of production. Scientific and technical progress and technical revolutions lead to occurrence new (interchanged) factors and a new product. Possibility by means of the factor as a result increases to produce a product so much, how many it is necessary for compensation of the factor and an additional product which is not necessary for factor compensation. This additional stock of a product, as a matter of fact, is an additional product. With its production probably further increase in production. The conclusion from here follows: the best use of incomes of production is a condition of the further increase in its scales, a condition of expansion of reproduction. Thus, as a result of connection of factors of production work products, set of material benefits are created. The quantitative relation of volume (weight) of the received product to the work spent for its production, characterises labour productivity. Important problem at studying of factors of production of their influence on efficiency of production systems is the problem of an optimum combination of factors of production

Keywords: production factors, resources, efficiency, production system, production potential.

1. Introduction

By classics of the economic theory were historically proved: "production as process of influence of the person on production resources for the purpose of satisfaction of basic needs" and "resources - as the natural and social forces involved in production". (Albrecht, F., 2014).

The importance of separate kinds of resources changed in process of transition from pre-industrial to the industrial production engineering and from it to the postindustrial. In pre-industrial a society the priority belonged natural and to a manpower, in industrial - material, and in postindustrial - intellectual and information. Along with concept "production resources" the economic theory operates with concept "production factors" to which, as a rule, carry:

- 1) work - capabilities and skills of the person which can be used at production of the blessings and services. If to speak more precisely here it is a question of labour as sets of physical and spiritual forces of the person, its capabilities to work. The labour in each concrete country (region) is limited by quantity of adult able-bodied population. Decrease ' birth rate and the ageing of the population connected with it put a problem of an effective utilisation of labour very sharply;
- 2) the capital - the production resources created by people - buildings, constructions, the equipment, tools, transport, means, the semifinished products used in production. Their quantity in economy is not boundless, besides they have property to wear out in the course of functioning, therefore replacement periodically demand;
- 3) the earth - the natural blessings which are used at creation of the goods and services (minerals, wood, water, air, territory sites);

- 4) enterprise capabilities (business) is the special kind of human activity consisting in capability most effectively to use other factors of production.

The basic function of production consisting in "to processing of substances of the nature for direct consumption and for the further production" remains at any social form of process of production. Therefore, in our opinion, it is important to find out a question on what factors participate in production of the blessings. In the economic theory the production factor is understood as especially important element or object which has solving influence on possibility and productivity of production. And for production of each product there is a kit of factors. Therefore there is a requirement them to classify, unite in the big groups.

There are various approaches in allocation of factors and their classification in separate groups. (Colledani, 2014).

The Marxist theory as factors allocates labour, an object of the labour and means of labour, subdividing them on two big groups: personal and material factors of production. As the personal factor of production the labour – set of physical and mental abilities of the person to work is always considered. As the material factor all means of production are accepted in aggregate.

Personal and material factors form the difficult co-operating system which efficiency is determined by technology and the production organisation. Thus the technology expresses interaction between production primary factors. The technology assumes use of various methods of handling, change of properties, forms, conditions of an object of the labour.

The production organisation provides the agreed functioning of all factors of production, their proportional quantitative ratio, interchangeability etc. The Marxist theory comes from the fact that the relationship between the factors of production, the nature of their connections define the social orientation of production, the class composition of society and the relations between classes.

The Marginal (neoclassical) theory traditionally allocating four named before group of factors of production: the earth, work, the capital, an entrepreneurial activity, opens their maintenance as follows.

The Earth is considered as the natural factor, as natural riches and economic activities fundamental principle. Here from the material factor an environment is allocated in special fund. Thus the term "earth" is used in the broad sense of the word. It covers all utility which are given by the nature in certain volume and over which offer the person is not imperious, whether it be the earth, water resources or minerals. Unlike other factors of production the Earth possesses one important property - limitation. The person is not in a condition to change its sizes voluntarily. With reference to this factor it is possible to speak about the law of decreasing return. Return in quantitative expression or decreasing profitableness thus means. The person can influence fertility of the earth, but this influence is not boundless. With other things being equal, the continuous appendix of work and the capital to the earth, to mining operations will not be accompanied by proportional growth of return.

Work is presented by intellectual and physical activity of the person, set of capabilities of the person caused by general and vocational training, the skills, the saved up experience. In the economic theory work as the production factor is meant as any intellectual and physical efforts applied by people in the course of economic activities on purpose to produce useful result.

"Any work - marks A.Marshall, - has the purpose to produce any result". Time during which the person works called as working hours. Its duration - the size changeable also has physical and spiritual borders. The person cannot work twenty four hours a day. It needs time for restoration of capabilities to work and satisfactions of spiritual needs. Scientific and technical progress leads to changes in duration of the working day, in the maintenance and character of work. Work becomes more qualified, time for vocational training of shots increases, productivity and intensity of work raises. Intensity of work is understood as its intensity, increase of an expenditure of physical and intellectual energy in unit of time. Labour productivity shows what quantity of goods is produced in unit of time. Labour productivity increase is influenced by the most various factors. (Kurdve, 2014).

The capital as the production factor represents set of means of labour which are used in production of the goods and services. The term "capital" has many values. In one cases the capital is identified with means of production (D. Rikardo), in others - with the saved up material benefits, with money, with the saved up public intelligence. A. Smith considered the capital as the saved up work, K. Marx - as the self-increasing cost, as the public relation. The capital can be determined and as the investment resources used in production of the goods and services and their delivery to the consumer. Sights at the capital are various, but all of them converge in one: the capital associates with capability of those or other values to bring in the income.

The entrepreneurial activity is considered as the specific factor of production reducing together all other factors and providing their interaction through knowledge, the initiative, sharpness and a businessman's risk in the production organisation. It is a special kind of the human capital. The entrepreneurial activity on the scales and results is equated to

costs of highly skilled work.

Distinction in classification of factors of production between the Marxist and Western economic theory is caused basically by the class approach to the analysis of natural production.

- First, the Marxism recognises that production factors as an economic category determine a social orientation of production. Already in an initial basis of process of production class composition of a society and necessity of struggle of classes for "justice" is formed. Marginalists consider factors as general technical and economic elements without which production process is inconceivable;
- Secondly, marginalists as the capital understand means and objects of the labour, and an environment allocate in special fund. Marxists unite an environment, means of labour and objects of the labour in the uniform material factor. If it is a question of a special environment in production their specificity is considered through a rent. In their opinion, it is already special department of an economic science;
- Thirdly if marginalists recognise an entrepreneurial activity as the production factor marxists deny it.

Classically developed approaches to classification of factors of production are not stiffened, develop in later and modern scientific researches. The increasing impact makes on level and production efficiency a modern science, information and economic factors. Increasing value acquires the ecological factor of production which acts or as an impulse of economic growth, or restriction of its possibilities in connection with harm of technology.

In concrete productions its elements are applied in a various combination and in various proportions. Interchangeability and quantitative variability are typical for modern production and are connected with limitation of resources on the one hand and efficiency of their use with another. (Kernschmidt, 2014),

The businessman aspires to find such combination of components of production at which the greatest yield of goods is provided at the least costs in real life. Plurality of combinations is caused by scientific and technical progress and a condition of the market of factors of production. Production is mobile. In it the big and small revolutions in technics, technologies, the work organisations are constantly made. The firm is in constant search of the most rational decisions. What gives bigger effect, - "investments in the human factor, or in growth of means of production" (capital)? How the increase in the factor A and reduction in the factor B will be reflected in costs and incomes of firm? Thus it is necessary to consider and constant changes of the prices for production resources.

Irrespective of classification all factors in the final analyses are used for product production. We will present that at very simplified production one factor is used for production of one product:

$$Q=A, \text{ where } Q - \text{ a product, } A - \text{ the production factor.}$$

In this case the product acts as function of one factor. In the real validity production process proceeds more difficult and its result (product) is result of use of set of factors. There can be various situations which can be reduced to four: the factor is not used; its possibilities are used half; it is applied to production of optimum quantity of a product; it is used for production of excessively considerable quantity of a product.

In the course of functioning of firms the uncountable set of variants of use of factors in various combinations is supposed. Plurality of combinations is caused by scientific and technical progress and a condition of the market of factors of production. Scientific and technical progress and technical revolutions lead to occurrence new (interchanging) factors (A_1) and a new product (Q_2). Possibility by means of factor A_1 As a result increases to produce product Q so much, how many it is necessary for compensation of the factor and an additional product which is not necessary for compensation of factor A_1 . This additional stock of product Q_1 , as a matter of fact, is an additional product. With its production probably further increase in production. The conclusion from here follows: the best use of incomes of production is a condition of the further increase in its scales, a condition of expansion of reproduction.

Thus, as a result of connection of factors of production work products, set of material benefits are created. The quantitative relation of volume (weight) of the received product to the work spent for its production, characterises labour productivity. It is possible to present a productivity indicator in a following kind:

$$\text{Labour productivity} = \frac{Q}{T}$$

Where Q - quantity of the created product in natural or term of money;

T - costs, work (for example, a man-hour or quantity occupied in the given production).

Each of the listed factors can be considered as the separate production resource connected to other resources on the basis of certain technology. The technological method of connection of factors of production is characterised by a certain kit of production resources on the one hand and output on the other hand.

Important problem at studying of factors of production of their influence on efficiency of production systems is the problem of an optimum combination of factors of production.

Production function shows dependence between costs of resources and output, allowing to specify the greatest

possible volume of output at each set quantity of resources, or is minimum possible quantity of resources for provision of the set volume of output. Production function sums up only technologically effective acceptances of a combination of resources for provision of the maximum output. Any improvement in the production engineering, promoting labour productivity growth, causes new production function.

Production - a method of connection of factors of production for the purpose of their transformation into the final goods and services. Predominant purpose of firm is maximization of profits. To be competitive the firm should apply such production which most effectively uses available resources. In other words for production of the set volume of goods the minimum quantity of resources is used. (Kang, 2013).

It is the main component of any functioning firm maximising profit. Production methods are considered technologically inefficient if for release of the set volume of goods they use more resources than other methods providing the same volumes of release.

That is, primary factors of production are the factors used at production of the goods and services. To such factors carry the earth (natural riches), work, the capital. Last years to number of major factors of production began to carry also business, enterprise activity. And the production potential is:

- 1) real volume of goods which probably can be produced at complete use of available resources;
- 2) available and potential possibilities of production, availability of factors of production, security its determining kinds of resources.

Each factor of production participating in process of production, forms a cumulative, average and limiting product of a variable factor of production. (Ryzhuk, 2012).

The cumulative product of a variable factor of production (TP) is a quantity of goods produced at certain quantity of this factor (L) and at other changes of factors of production. The average product of a variable factor of production is a relation of a cumulative product of a variable factor to the used quantity of this factor. In economy it has received the name "productivity of resources of work"

$$Ap_1 = \frac{TP_1}{L}$$

The limiting product of variable factors of production (MP) is a change with other things being equal a cumulative product of a variable factor in conformity about change of quantity of this factor. In economy it is called as "limiting productivity of factors".

$$MP_1 = \frac{\Delta TP_1}{\Delta L}$$

2. Method

Productivity increases until the size of a limiting product to general V already issued goods exceeds the size of an average product before the occupied workers. When the size of limiting productivity is less than productivity of resources of work, last is reduced. The point of intersection of curves limiting and productivity is characterised by achievement of the maximum productivity of a resource or work.

Therefore at a choice of models of a macroeconomic policy basically it is considered classical and Keynesian model of a macroeconomic policy.

Classical model:

- 1) the passive macroeconomic policy since is economically internally stable;
- 2) the basic equation $MV = PQ$;
- 3) on the first place the monitor policy, on the second the fiscal;

Keynesian model:

- 1) the active macroeconomic policy since the economy internally is not stable;
- 2) the basic equation $Y = C+Y+G+X_n$;
- 3) on the first place the fiscal policy, on the second the monitor;

Thus:

- 1) allocate time logs of a fiscal policy and the monitor policy - internal and external logs.

The internal log is time between the moment of economic shock and accepting of response measures of economic policy. The internal log is more characteristic for the fiscal policy.

The external log is time between what accepting or measures of economic policy and the moment of occurrence of result from this measure - is characteristic for a credit policy.

- 2) imperfection of the economic information - this results from the fact that many economic events are unpredictable. These difficulties try to solve by means of enhancement of the macroeconomic model, allowing

to predict dynamics of the basic indicators of economic development.

- 3) this factor plays to economy the major role, therefore it without fail it is necessary to consider variability of economic expectations at a choice between active and passive models of a macroeconomic policy. When in the politician of the state and the Central Bank occurs change, changes and expectations of economic agents above their economic behaviour. These changes are necessary for predicting by means of economic-mathematical models.
- 4) ambiguity of historical analogies - the conclusion between active and passive economic policy depends on how history lessons are estimated. Solving a question on tool state adjustment, the analysis of results of application of the same tools in the different countries and at various times is carried out.

However distinction in estimations of historical factors quite often is contradicting each other since there are different views and interpretation of the same historical processes. Therefore the analysis of those or other economic situations not always answers on a task in view and allows to choose a correct direction of a production policy.

Unconditionally, each factor influences not only the production maintenance but also on its efficiency, and as consequence on efficiency of production system as a whole. The concept of efficiency of the production, historically interpreted "as avoidance of losses", in modern conditions is specified by different researchers from different positions:

- From a position of increase in production potential: "when efficiency is reached then larger quantity of the goods can be produced by possibility loss to produce something else if productive resources and knowledge are invariable. But eventually the production potential can extend as a result of accumulating of new resources and the invention of new methods of how these resources to use" (Scheifele, 2014);
- From a position of increase in volume of the capital stimulating, in turn, increase of the offer of productive resources that has received the reflexion in the theory of investments;
- From a position of change of the human knowledge stimulating the invention of new technologies, new forms of the organisation, new ways of satisfaction of requirements (the theory of innovations);
- From a position of search of the new markets for already existing products that are from a position of application of a different price policy, etc.

As to the first position based on the concept of production potential it is necessary to notice, as the maintenance and structure of production potential in different works of researchers differs. In some cases the term potential is applied to the enterprise as a whole.

Application of the system approach to the analysis of development of production systems assumes research of following aspects:

1. Development of the purposes of functioning at the expense of revision of priorities and reorientation in a direction of the development caused by change of requirements and the purposes of higher levels.
2. Development of functions of system both by their expansion, and by enhancement of their execution.
3. Development of technologies at the expense of introduction of qualitatively new kinds of technologies of planning

g, management, the control, designing, production, scientific researches, testing, measurements etc. We will notice that at the analysis and synthesis of concrete systems of concept "function" and "structure" are specified in development since between them there are no rigid communications. Moreover, in process of organizational systems between them inevitably there are contradictions which are permitted by system structure change as functions and the purposes are determining in relation to a system structure.

4. Development of system structure at the expense of enhancement of its organisation, and also separately taken elements (subsystems), expansions of their railroad train and enhancement of relations between them.
5. Development of system of knowledge and representation models as about environment (development conditions), and about behaviour of system in whole and its separate elements for the accumulation account of experience, knowledge and statement of purposeful experiments on forecasting of development.
6. Enhancement of means of support of development at the expense of attraction of additional resources (investments): financial, intellectual, information, power, material, technical etc.
7. Development of system at the expense of enhancement of processes of accumulating and realisation of resources, including scientific and technical potential.
8. Development of system at the expense of enhancement of professional level of intellectual and labour shots by their continuous training in the field of designing, production and management.
9. Development of system at the expense of enhancement of the means providing communications with environment, and also with other functional systems located at top levels.

Such approach allows to form set of variables of a condition which can be taken as a principle the mathematical description of development of difficult systems in the course of research. Told concerns equally both difficult object of management, and to its control system (Kreneva S.G, Halturina E.N., Nurmuhametov I.M., Bakhtina T.B., 2015).

3. Results and Discussion

For a system complete description it is necessary to know a condition of its elements, and also a condition of communications between them. Using the system approach we will present object of research in the form of the set of co-operating subsystems having "inputs" and "exits". It allows to treat concept "production system" as the system using resources of the enterprise on an input for transformation of the factor of production in goods or services on an exit. The input is presented by means and objects of the labour, live work or the finished goods received from other production system. The complete system of production activity of the enterprise carries the name of production system which in turn consists of two subsystems - managing and managed.

Management of system is reduced to provision of its purposeful behaviour in changing conditions. It is reached by the appropriate organisation and production development. Differences of production systems from each other consist that before them various tasks are put. Methods and the means used in the organisations, are directed first of all on profit maximisation. Predominant purpose achievement is implemented by means of its functions. The function which is considered as a part of the managing subsystem at one enterprise, can be a component of a managed subsystem on other.

Production management assumes drawing up and an establishment of planned schedules, calculation and the justification of performance standards, technology enhancement, goods or material processing quality assurance.

Such approach to management of production systems is caused, first of all, by the properties inherent in production systems. (Zimovets, 2012)

Understanding under system (constituted from parts) which possesses the new quality which is absent at elements of this system, it is possible to assume certain set of the elements forming whole that the production system and the enterprise are, as a matter of fact, identical. The enterprise is considered by many economists as production system as all signs, characteristic for system are inherent in it. Enterprise divisions (sections, sites, departments, etc.) represent the subsystems consisting of elements of various degree of complexity (workers, subjects and instruments of labour and etc.). In other words production systems is the special class of systems including: workers, tools, objects of the labour and other elements necessary for system functioning in which process are created goods and services.

If to assume that the enterprise is understood as enough wide range of legal entities (organisations) with structure of the management different organizational, different scales of the production, different degree of concentration and specialisation of production operations of the same technological process of production production system it is necessary to expand borders of the maintenance of concept. It is necessary in connection with performed processes of globalisation of economy, creation of large production associations, holdings, clusters and other formations including not one, and variety of the enterprises - the juridical persons which activity is united by one strategic target of development.

Such approach demands allocation of hierarchical structure of production system where the separate parts (elements) of system interconnected by unity of functioning and development of the enterprise (group of the enterprises) can be reflected in each level as a whole. We will notice that characteristic signs of functioning of the enterprise (as production system) concern:

- Purposefulness, i.e. capability to create goods, to render services (as such systems are created for satisfaction of certain requirements);
- polystructure, i.e. simultaneous existence at the enterprise (as systems) mutually interesting subsystems (shops, sites, departments and etc.) where almost each element of system simultaneously enters into some subsystems and functions according to their requirements, the purposes;
- An openness shown in close interaction of the enterprise with environment - in material, power, information, financial and other kinds of an exchange with environment;
- The complexity caused by such basic element of system, as the human capital, and also polystructure, stochastic changes of a condition of elements of system and environment influence. It consists in a large quantity of elements of system with numerous difficult and, as a rule, alternative communications, a considerable quantity of performed processes;
- The dynamic approach to development of production system allows to allocate four basic its properties: controllability, flexibility, reliability and productivity.

- Productivity as capability to create goods to render services, it is provided with the organisation of production system;
- Controllability - the characteristic of managerial process by the enterprise as system. The system is managed, if during set time achieves the object managements and keeps within thus restrictions on resources. The system is uncontrollable, if does not achieve the object; it is badly managed, if reaches the planned purpose not precisely, and approximately or leaves for the established restrictions on resources;
- Flexibility - possibility to adjust production systems to changing environmental conditions, first of all to increase of level of a competition, change of requirements of the market, etc.;
- Reliability - steady functioning, capability to localise in rather small parts of system negative consequences of the stochastic indignations occurring both in system, and in environment. Reliability of system raises at restriction of sizes and frequencies of stochastic indignations, and also at the expense of increase in intersystem reserves and is provided with a control system.

Normal (usual) condition of the enterprise as production system - functioning. In each production system production is performed. This process changes elements of production system. The part of such elements (materials) is consumed, turning to a work in progress, semifinished products and, at last, in finished goods which leave system. Other elements, for example, tools, machine tools, gradually wear out and in process of wear process are replaced new, not always with the identical. Thus, production systems are in mobile (dynamic) balance - the system remains at continuous change. This property is provided with system structure, i.e. its organisation. Therefore the system condition is determined at any moment not by an initial condition (though the last influences a system condition during the nearest moments of time), and system parameters. The named properties of production systems predetermine them response time: the established system structure, including ratios of elements and their communication, is supported until it essentially will not change as a result of accumulating small internal and external changes or owing to purposeful enhancement of the organisation of system.

The production system globally consists of production elements (means of labour, objects of the labour, work) and elements of technical and organizational orderliness. This orderliness is established proceeding from a principle of profitability of systems. All elements of production system function with one purpose - production of goods necessary for the consumer, i.e. the production system is formed as means of achievement of the purpose - production and realisation of goods for profit reception.

For a system complete description it is necessary to know a condition of its elements, and also a condition of communications between them - "inputs" and "exits".

The complete system of production activity of the enterprise is called as an operating system. The operating system in turn consists of two subsystems:

- 1) the processing subsystem - carries out the productive work directly connected with transformation of entrance sizes in target results;
- 2) the provision subsystem - carries out functions of provision of a processing subsystem.

Set of subsystems is subdivided into managed and managing objects, i.e. on managed and managing subsystems.

Management of system is reduced to provision of its purposeful behaviour in changing conditions. It is reached by the appropriate organisation and production development. Distinction of production systems consists that before them various tasks are put. Methods and the means used in the organisation, are directed on creation of the conditions as much as possible promoting achievement of objects in view.

Planning as it has already been told, represents a known complex of actions: problem statement, forecasting, determination of the purposes, development of strategy of their accomplishment, determination of conditions and means of achievement of the purpose. Functioning of production system is provided thanks to adjustment which includes accounting and the control. In the course of planning decisions are made.

4. Acknowledgements

The author expresses deep gratitude to reviewers for detailed consideration of the manuscript and valuable remarks.

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