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THE ROLE OF NATURAL MONOPOLIES IN THE NATIONAL ECONOMY

In the modern economy, natural monopolies, being mainly infrastructure companies, often determine the sustainable functioning and development of national economic systems. Their tariffs have a great impact on the country's economy. Natural monopolies exclude the possibility of creating an economically efficient competitive environment, resulting in the need for state intervention in its activity. In the article, the nature of natural monopolies, their social (public) effects, their performance as an essential part of the infrastructure of the national economy, the subadditivity of the costs of natural monopolies, the increasing importance of alternative energy sources in the world energy supply were touched upon, and an analysis of the indicators was given in the example of electroenergetics, which is one of the main representatives of natural monopolies in Azerbaijan, and the reform prospects of the field were considered. Also, a brief overview of the contributions made by representatives of various theoretical schools to the study of certain aspects of the activity of natural monopolies is given. It was noted that it is more important not to destroy natural monopolies, but to direct their activities to the maximization of social benefits, viability and economic security of the country through efficient regulation by the state. In the present conditions, it is concluded that this policy reflects the change of the priorities of the state policy in relation to the mentioned sectors of the economy, leaving room for the issues of the reform of Azerbaijan's natural monopolies. Based on the world experience, it is justified that the strategy of the reform of natural monopolies of Azerbaijan envisages the structural division of vertically integrated systems, and this involves a strict vertical division of the reformed areas into competitive and natural monopoly activities. However, in many countries, in addition to vertically integrated monopoly companies, independent electricity producers and even separate distribution companies exist in parallel.

Keywords: *natural monopoly; infrastructure; electroenergetics; electricity; reform; market; competition; tariff.*

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РОЛЬ ПРИРОДНИХ МОНОПОЛІЙ У НАЦІОНАЛЬНІЙ ЕКОНОМІЦІ

У сучасній економіці природні монополії, будучи переважно інфраструктурними компаніями, часто визначають стійке функціонування та розвиток національних економічних систем. Їхні тарифи мають великий вплив на економіку країни. Природні монополії виключають можливість створення економічно ефективного конкурентного середовища, внаслідок чого виникає необхідність державного втручання в їх діяльність. У статті розглядається природа природних монополій, їхні соціальні (суспільні) ефекти, їх ефективність як невід'ємної частини інфраструктури національної економіки, субаддитивність витрат природних монополій, зростання значення альтернативних джерел енергії у світі. торкнулися питання енергопостачання, наведено аналіз показників на прикладі електроенергетики, яка є одним з основних представників природних монополій в Азербайджані, розглянуто перспективи реформування галузі. Також подано короткий огляд внеску представників різних теоретичних шкіл у дослідження окремих аспектів діяльності природних монополій. Зазначалося, що важливіше не знищити природні монополії, а спрямувати їхню діяльність на максимізацію соціальних переваг, життєздатності та економічної безпеки країни шляхом ефективного державного

регулювання. У сучасних умовах зроблено висновок, що ця політика відображає зміну пріоритетів державної політики щодо зазначених секторів економіки, залишаючи місце для питань реформування природних монополій Азербайджану. Виходячи зі світового досвіду, обґрунтовано, що стратегія реформування природних монополій Азербайджану передбачає структурний поділ вертикально інтегрованих систем, що передбачає жорсткий вертикальний поділ реформованих сфер на конкурентну та природну монополію. Однак у багатьох країнах, крім вертикально інтегрованих компаній-монополістів, паралельно існують незалежні виробники електроенергії та навіть окремі розподільні компанії.

Ключові слова: *природна монополія; інфраструктура; електроенергетика; електрика; реформа; ринок; конкуренція; тариф.*

Introduction. Currently, natural monopolies deserve special attention as they form the basis of the sustainable development of the domestic economic system in a situation where crises often occur in the world.

Natural monopolies are cost-intensive industries, so the level of tariffs for their products and services affects the general price level in the country, inflation and the state of the economy as a whole. A decrease in the productivity index in this area can lead the economy to a deeper crisis.

If the state does not have the ability to systematically influence natural monopolies, it and its citizens become hostages to the abuse of the powers of natural monopolies. In practice, this manifests itself in the increase in prices and tariffs for the services of natural monopoly subjects, which aggravates the already difficult economic situation of most industrial enterprises and the population.

Therefore, the influence of tariffs of natural monopoly subjects on inflationary processes and its regulation are urgent issues both for our country and for other countries that have chosen the path of market economy, because all state production is based on the raw materials of natural monopolies [2, p. 68].

Tariffs of natural monopolies have a great impact on the country's economy because the monopolist has huge market power and sets the prices of its goods and services much higher than the production costs. First, they lead to an inefficient allocation of resources among consumers, and secondly, an increase in tariffs leads to an increase in inflation, because the increase in tariffs leads to an increase in the prices of the products of producers who use the products of natural monopolies as resources.

Demand-side inflation is associated with an improvement in the economy and (or) an increase in the money supply. With this form of inflation, consumers themselves create demand for products and cause price increases. The consumer may refuse this product, but he does not intend to refuse because of the increased purchasing power. At the same time, the cost of production may remain unchanged, but increased demand may lead to increased prices for certain types of goods.

Cost inflation, on the other hand, is related to changes in the cost of production. Consumers cannot refuse these types of goods and services, no matter how much they want to. A good example of this is utility bills. Natural monopolies play their role here. Monopolists raise the price of their resources, and as a result, the population faces higher quarterly bills for electricity, heating, hot water, etc.

It goes without saying that the resources of natural monopolies are included in the consumption basket, because their raw materials are a kind of "base". Whether it is a simple bakery that uses electricity to bake bread, or the production of gasoline based on oil, enterprises build their production on this "foundation". Such enterprises are quite familiar with the changes in the prices of raw materials of natural monopoly subjects and are forced to increase the price of their products to cover production costs.

In 2020, 156 products and services were included in the consumer basket in Azerbaijan. Of course, the products of natural monopolies are directly presented in small quantities, but by causing a chain reaction, the monopolist absorbs the entire economy, all production areas in which its raw materials are involved. As a result, prices rise, the purchasing power of the nominal currency decreases, which causes inflation.

According to various estimates, it can lead to a significant acceleration of price growth in a situation where the contribution of the tariff increase to inflation is 30% or more [8, p. 29].

The problem with tariff increases is twofold. On the one hand, in the short term, increasing the tariffs of natural monopolies has a negative impact on all economic entities that create strong coalitions against tariff increases. On the other hand, underinvestment in the development of natural monopolies may lead to constraints on economic growth in the long run.

The French economist Jacques Sapir said the following about the social (public) effects of the activity of natural monopolies: "Natural monopoly is a special form of monopolies, where the production of goods and services allows to create a single more effective organizational structure of production and a more efficient system of service to the population. The indicated units are of great social importance to provide the population with vitally necessary services and are mostly used by the state for these purposes. Therefore, the activity of such monopolies is under his control compared to others." This definition places an important emphasis on not only the efficiency of natural monopolies, but also their social orientation and social importance. After all, in most cases, providing the population with vitally important services reflects the level of social welfare.

The production approach to the study of natural monopoly is that it is currently considered part of the infrastructure of the national economy. Therefore, they also associate natural monopoly with the network nature of service delivery. Natural monopolies include the supply of oil and gas, energy and heating networks, railway transport, air traffic dispatch system. These areas are the areas that form the production infrastructure. In our opinion, the operation of infrastructures causes large external effects, both positive and negative (in the case of continuous operation). Thus, the losses due to the failure of communications can be greater than the direct marginal benefits of the products obtained with their help. Infrastructure companies operating electricity, gas, and water supply systems are characterized by high capital intensity of fixed assets and have high value. This predetermines high fixed costs on the one hand and leads to very low marginal costs on the other hand. According to A. Cournot, if the marginal cost function decreases, then "nothing limits the production of goods in the future" and a monopoly arises. The famous Irish economist F.I. Edgeworth, who first graphically described the state of natural monopoly, noted in his work "Graphical representation of costs" that the demand curve intersects the supply curve to the extent that marginal costs increase, and then to the extent that they decrease.

The very important position they hold in the economy determines the necessity of regulating the activity of natural monopolies and coordinating their development policy. Mechanisms of operation of natural monopoly enterprises and methods of their state regulation were formed during the last century. Another important nuance is that the technological and economic characteristics of the behavior of natural monopolies form such a mechanism that the consumer loses not only the opportunity to choose, but also, in most cases, the ability to influence other conditions of the supply of natural monopoly products (services). These fields have networks as an integral technological element.

Since the second half of the 20th century, the possibilities of competitive relations opening up to the activities of natural monopoly enterprises have been theoretically justified. Since the 80s, the reform process of natural monopoly enterprises has been started in most industrially developed countries, which has not bypassed the principles of their operation mechanism and regulation.

The effect of economies of scale plays an important role in the production of natural monopoly products, which are considered by a number of researchers as a public good. It should be noted that the effect of scale leads to the creation of a natural monopoly if we are talking about a product with low demand elasticity and no substitutability. The definition of natural monopoly given by D.N. Hyman is based on the characteristics of the average cost function. "A natural monopoly is a firm that can satisfy the entire market demand for one unit of output at a lower average cost than would be possible for two or more firms to supply the same volume of the commodity". Thus, if the intersection of the demand curve and the average cost curve graphically lies in the lower part of the latter, then the natural monopoly market will be served by one firm.

Thus, the larger the output volume in the field, the lower the average costs, and therefore the marginal costs are lower than the average costs over all output volumes.

An important consequence of economies of scale is that this field can be monopolized through the operation of normal market mechanisms. For example, if there were more than one firm in the field, one of them could cut price and increase output dramatically, creating profit difficulties for its smaller competitors.

The regulation of most natural monopolies tariffs, which are infrastructural in nature, often acts as one of the most effective tools for stimulating business activity.

Already from the middle of the 19th century, outstanding economists N.V. Sinior, A.A. Cournot, C.St. Mill, L. Walras, F.Y. Edgeworth tried to reveal the essence of natural monopoly. All of these economists were united by the idea that a number of firms become monopolies under special conditions that arise in the industrial production method typical of the firm.

We consider it necessary to mention one fact that the phenomenon of natural monopoly differs from other monopoly phenomena in that it is not determined by the state, but arises naturally as a result of the activity of market forces.

The phrase "natural monopoly" was introduced into scientific circulation for the first time by A.A. Cournot. He reviewed the natural monopoly from the point of view of determining control over the use of nature, that is, natural resources. It follows from this that the basis of the concept of "natural monopoly" is the determination of the specific feature of having an exclusive right to a natural resource.

The definition of natural monopoly in the modern sense was completed and definitively formulated by W.J. Baumol, W.W. Sharkey, J.C. Panzar and R.D. Willig within the framework of the theory of conflict markets [1, p. 809–822; 5; 7].

Referring to the feature of natural monopoly costs called subadditivity, we would like to note that the average costs of production of goods (services) by two or more firms are higher than those of production of goods (services) by one firm. When costs are subadditive, society may prefer the market of one firm over the market of many firms producing the same amount of output.

Subadditivity can be formally expressed as the following inequality:

$$C(\sum X_i) < \sum C(X_i), \tag{1}$$

Here, X_i – the share of the release volume needed by each firm;

C – costs of each firm relative to its output volume.

Let us also add that there is a close connection between the scale effect, subadditivity and barriers to entry into the field.

Economies of scale in a single-product firm are not a sufficient but necessary condition for a natural monopoly. A production process can be subadditive when savings due to an increase in production (a decrease in average costs) also occur in the case of an increase in average costs. In a

multi-product firm, for example, economies of scale are not observed when producing goods separately, while economies of scale cannot create a natural monopoly.

Let's take a brief look at the impact of the factors we have touched on in electroenergetics. Here, on the one hand, there is a network structure under the control of a single dispatcher, and its performance in most cases is not economically justified, on the other hand, electricity is the most necessary commodity for the absolute majority of citizens, enterprises and organizations, until now, the purchase of this commodity from other sources (autonomous generation) is uncompetitive. A number of specialists investigating the field have shown in their work that electric energy has had a significant scale effect that allowed it to be viewed as a natural monopoly at least during the 20th century. In addition, it should be noted that taking into account the social importance of the field and the risks arising during the operation of energy equipment, the activity on the production and distribution of electric energy is not possible without a license in many countries.

Let's take into account that the size of production – "scale effect", technological characteristics – "network effect" and state licensing also justify another feature of the behavior of natural monopolies in the market – they form very high barriers to market entry.

In general, the technological characteristics of production and the supply of a number of goods and services (for example, the availability of network infrastructure), the absence of commodity-substitutes and, in turn, both as a result of economies of scale (for example, in electroenergetics) and as a result of limited government activities, high barriers of entry into the field are considered as the main factors of the formation of natural monopolies.

From what we mentioned, it also follows that the model of monopoly behavior in the market assumes that the monopolist tries to determine the price that corresponds to the elastic part of the demand curve and maximizes the demand, relying on its market dominance.

The basis of long-term price regulation of natural monopolies is the principle of price formation based on full average costs. $P = AC$.

A number of characteristics specific to natural monopolies – ensuring all demand in the served market, having and disposing of information about the market, regulating the activity and prices of natural monopolies, and the features of such regulation mechanisms (asymmetry of information, "capture of the regulator", etc.) consolidation – forms a seller's market. The characteristics of the seller's market are that the natural monopoly dictates the terms of supply of products (providing services) to the consumer through its direct and/or indirect effects [11, p. 217].

Among the researchers of the field, such an idea has formed that the change in the nature of production can destroy the natural monopoly. Thus, as scientific and technical progress develops, new production methods appear that allow natural monopolies to more efficiently satisfy the current demand for goods and services. In other words, a firm with new technologies has costs and structures that help it achieve efficiency (allowing for new players to enter the market and the emergence of substitutes) and eliminate cost subadditivity within a natural monopoly goods (services) market, which in turn can destroy the condition of existence of natural monopoly.

It is no secret that technical progress significantly reduces production costs, it gives rise to new products and contributes greatly to economic prosperity. If we consider what we have said again in the example of electroenergetics, we will see that such changes are also taking place here. Thus, towards the 80s of the 20th century, the development of technological production on the basis of the cycle that turns steam into mechanical power has practically exhausted the possibilities of economy of scale due to the increase of the individual power of thermal power plant units.

In these circumstances, it became possible to create a new generation of independent electricity producers, whose basis is a steam-gas unit and steam generator units. New technologies have made it possible to increase the efficiency of new turbines in order to decrease the optimal

power of power plants (the level of capital costs for their production is not less important). As a result, the cost of construction of 1 MW fixed capacity has been significantly reduced.

In addition, the sun, wind, swells, thermal sources, etc. environmentally friendly alternative methods of electricity that use energy are gradually becoming competitive. There are expectations that in the medium-term perspective, low-power devices and especially renewable energy sources will occupy a significant place in the world's energy supply. This is proven by the changes in the attitude of the small energy sector by the World Bank. So, if earlier it actively supported only large-scale energy projects, now, according to its experts, the promising way to supply energy to several billion people who are forced to live without electricity passes through the latter. It should also be noted that wind and solar energy production are more developed and universal sectors of small electric energy.

Small power industry acts as a serious alternative enterprise to the natural monopoly of the supply of services in the field of electric power. Small-scale systems of energy production, which have already taken their place, are gradually becoming attractive alternatives to large power plants. Increasing their efficiency is accompanied by a change in demand. Among the demands of consumers, there are factors such as the attempt to reduce their dependence on centralized supplies, the concern for environmental protection, and the reduction of the risks of a sharp increase in the price of electricity [3, p. 35–38].

In 2020, the volume of products (works, services) produced in the main indicators of Azerbaijan's enterprises operating in the field of energy amounted to 27,344 million manats at the current prices of the respective years. This indicator was 20,581 million manats in 2015, 25,438 million manats in 2016, 32,108 million manats in 2017, 39,418 million manats in 2018, 37,401 million manats in 2019, and 27,344 million manats in 2020. As it can be seen, there was an increase in the products manufactured until 2019, but a decrease was recorded in the last two years. This was also related to the processes going on in the world, especially the coronavirus pandemic.

Energy supply from renewable sources in Azerbaijan was equal to 16,611.4 thousand NET in 2020. If we look at the dynamics of development in the last 5 years, we will see that growth has been observed here, with the exception of 2020. If we pay attention to energy efficiency indicators, we will see that the specific weight of electricity from renewable energy sources in the total electricity production will be 5.5 percent in 2020. In that year, the value of 1 kg of energy product produced in the GDP was equal to 1.8 1 manat/kg of oil equivalent. In general, the specific weight of electricity costs in the total production costs is 0.9 percent in the said year. Energy dependence was equal to -254.5 percent, self-sufficiency was equal to 364.0 percent. It should also be noted that both coefficients have shown a decreasing trend over the last 5 years.

Allowed losses in the energy sector are reflected in the table 1.

Table 1

Losses (in kind)

	2016	2017	2018	2019	2020
Crude oil (including gas condensate), thousand tons	43,1	40,6	76,8	40,7	48,3
Natural gas, million cubic meters	804,8	769,0	580,8	720,8	667,0
Thermal energy, thousand G. cal	200,0	189,8	195,6	190,8	206,3
Electricity, million kWh	2 350,2	2 250,6	2 219,8	2 225,6	2 042,2

Source: [9, p. 60].

It should also be noted that losses of up to five percent in electric grids are considered acceptable for developed countries.

In the Strategic Roadmap for the development of communal services (electricity and heat energy, water and gas) in the Republic of Azerbaijan, the issues of reducing electricity losses were

touched upon, and in any case, despite the aging of the general infrastructure network, certain achievements were made in reducing losses during the transmission and distribution of electricity. It was shown that the share of these losses in the total amount of electricity produced during 2010–2014 decreased from 20.4 percent to 13.6 percent.

The analysis of technological changes in a number of areas allows us to say that they affect the fundamental conditions of the existence of natural monopolies in the industry, and as a result, the nature and forms of the formation of natural monopolies in modern conditions are transformed. This is especially noticeable in the case of a multi-product natural monopoly, because in these companies, first of all, subadditivity of costs is broken and a single firm in the market ceases to be economically efficient.

Conclusion. Thus, in the conditions of modern economic development, the operating conditions of natural monopolies change under the influence of various factors. First of all, as a result of scientific and technical progress, new types of goods and services appear, goods-substitutes are created, the quality and reliability of the released product (service) increases, new technologies and alternative methods of production of the corresponding product are applied. All this leads to a change in the fundamental conditions for the existence of natural monopolies. In natural monopolies, the initial conditions for the development of competition are formed.

As a natural monopoly market structure, it tries to maximize profits, but operating in those socially important sectors, production costs are considered as carriers of resources that are not insignificant for society. This requires state intervention in the operation of a natural monopoly to balance the interests of the monopoly itself and society as a whole. From this point of view, it is not necessary to destroy natural monopolies, but to direct their activities to the maximum of social benefits, viability and economic security of the country through efficient regulation by the state. Still, natural monopolies in Azerbaijan have less incentive to reduce costs and increase production efficiency than natural monopolies in many developed countries due to the lack of motivation for managers, despite allocations (transfers) from the state budget, the "X-inefficiency" factor.

Currently, the reform of Azerbaijan's natural monopolies reflects the change of state policy priorities in relation to these sectors of the economy. The strategy of the reform of natural monopolies of Azerbaijan envisages the structural fragmentation of vertically integrated systems, which means a strict vertical division of the reformed areas into competitive and natural monopoly activities [10].

If we take the electric energy sector as an example, this sector of the Azerbaijani economy is characterized by vertically integrated monopoly companies that sell the entire cycle of energy production (production, transportation, distribution and marketing) in the territory entrusted to them. Thus, such companies "vertically" cover all areas of activity, being responsible for reliable (uninterrupted) energy supply to consumers in a certain area. The reason for the dominance of vertically integrated companies in the electricity industry is the high level of transaction costs. The technological and organizational impossibility of "separating" electricity generation from its transmission made vertical integration the only possible condition of the industry for a long time, which allows to ensure the reliability and quality of its operation.

However, for some time now, in many countries, alongside such vertically integrated monopolistic companies, it has been possible to coexist with independent electricity producers, or even separate distribution companies, which, they can also buy and sell electricity from monopoly companies under special contracts and under state control. Structural changes should contribute to the development of market relations in potentially competitive segments, increasing their investment attractiveness.

From this point of view, we must closely monitor the institutional transformations in the fields of natural monopoly in the developed market economies in the 70s and 80s of the last

century. As the experience of reforming natural monopolies in those countries shows, this is a rather long process.

If we are going to reform natural monopolies under these conditions, in our opinion, it is appropriate to keep Azerenergy partially state-owned by being effectively managed by the state.

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