The impact of diversification of the oil and gas complex on the national economy of Kazakhstan

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Abstract. Diversification of the oil and gas complex of Kazakhstan is aimed not only at the development and development of oil and gas fields, but also at the further development of the manufacturing industry, in particular, at the construction of new and modernization of existing oil refining capacities. The article presents the results of analytical and research work to determine the effects of diversification on the national economy of Kazakhstan in the case of the construction of a new oil refinery and the modernization of existing production. At the stage of construction of oil refineries, indirect effects for the country's economy mainly appear, as a share of Kazakhstani content. In addition, the activities of the oil refining sector have a multiplier effect on the inter-industry balance in the structure of the national economy. The results of previously conducted studies are presented with an emphasis on multiplier effects, in which economic development takes place in other industries that are most interconnected with the petroleum products production sector. The purpose of the study is to reveal the economic effects for the economy of Kazakhstan when expanding production of oil refining products with added value.

1 Introduction

In recent years, the Republic of Kazakhstan has been implementing a program to diversify the oil and gas sector towards the development of the manufacturing industry. Investment projects are being implemented to modernize existing oil refining capacities and create new production facilities to expand the volume of production of Kazakhstani oil products.

The increase in production volumes of Kazakh petroleum products has a significant impact on the country's economy, since, along with the export of crude oil, the country entered the world markets for petroleum products, which influenced the change in the inter-industry balance in the structure of the economy of Kazakhstan towards an increase in the share of the manufacturing industry.

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2 Materials and methods

Quite a lot of research has been devoted to the development of oil refining industries, their impact on the country's macroeconomics, and assessment of individual aspects: E. Kalinenko [1], M. Smith, M. Whalen, A. Hussan [2], U. Shahzad, D. Ferraz, B .Dogan, do Nascimento Rebelatto [3], I. Filimonova, I. Provornaya and others [4], O. S. Kirichenko, A. A. Komzolov and others [5], V. P. Klepikov [6], Al Janabi, Ammar N Avda [7], A.Yu.Perezhogin [8]. The development of the oil refining sector of the economy of Kazakhstan is studied by Kazakh scientists: O.I. Egorov, O.A. Chigarkina [9].

The goal of diversifying the oil and gas complex of Kazakhstan towards the development of the processing industry is the implementation of new investment projects to expand the range and volume of production of Kazakhstani oil products. Today, the relevant government bodies are coming up with proposals for the construction of a fourth oil refinery on the territory of Kazakhstan, for which all economic feasibility studies were prepared in 2015. To implement this investment project, the country has its own oil raw materials, infrastructure facilities (roads and pipelines), appropriate logistics are being created, national personnel have been formed, work has begun on the production of technological equipment, and the construction materials market is developing. There is global demand for Kazakhstani oil products on world industry markets, and export directions have been developed.

3 Results and Discussion

Diversification of the oil and gas complex of Kazakhstan, aimed at the development of the oil refining industry, is associated with the growth of investments, which have various effects on the national economy. Based on the results of research conducted by the authors, the effects of investing in the diversification of the oil and gas complex of Kazakhstan in various areas were identified.

Impact of the construction of a new oil refinery (ORP). In the case of the construction of a new refinery, the effects on the national economy of the country are manifested at the construction and operation stages (Figure 1).

At the stage of construction of a new refinery, mainly only the indirect effect (Kazakh content) is highlighted. All other types of effects appear at the operation stage of the investment project life cycle.

During the construction of a refinery, the share of Kazakhstani content varies widely depending on the types of construction costs and purchased services produced in the country, and ranges from 10–90%.

The Law of the Republic of Kazakhstan "On Kazakh Content" defines that Kazakh content is the share of inventory and raw materials and the wage fund (for Kazakh citizens) in the total amount of all working capital [10].

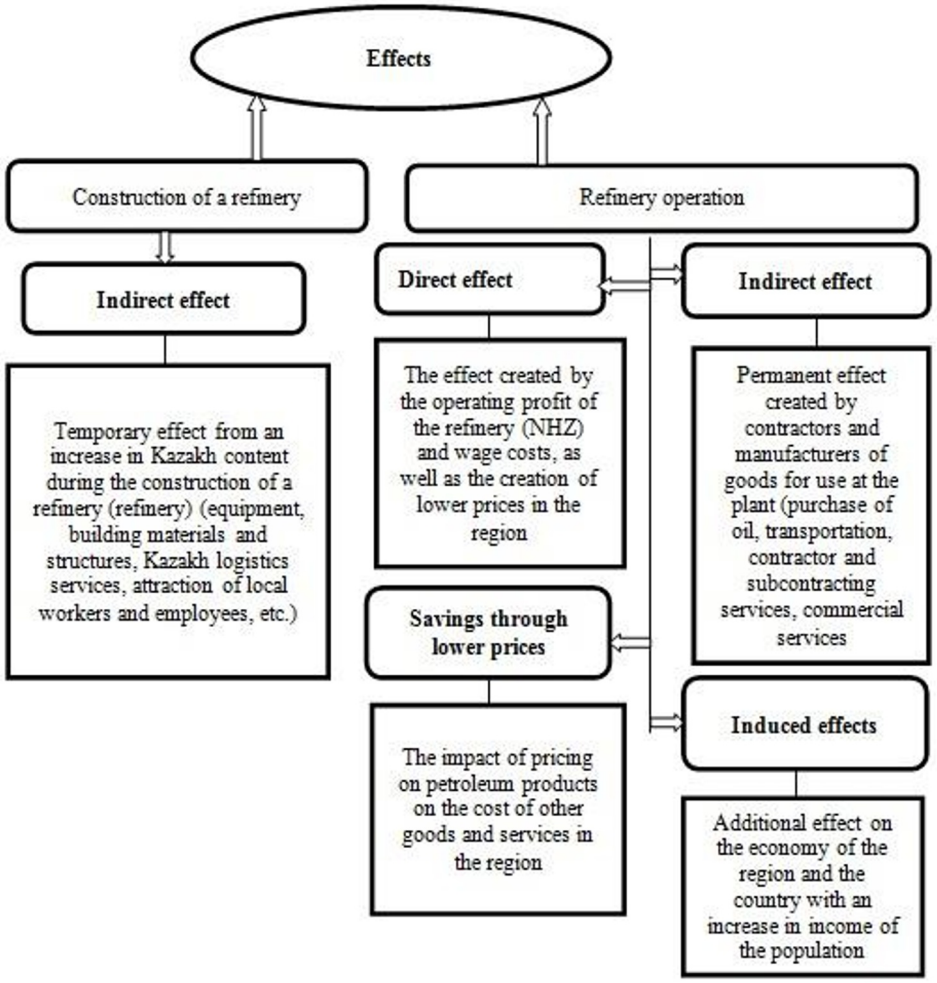

Fig. 1. Classification of effects during the construction and operation stages of a new oil refinery (compiled by the authors)..

Table 1 shows the indicators of Kazakhstani content during the construction of a new refinery.

Table 1. Share of Kazakhstani content in the construction of an oil refinery.

No.	Name	Content	Specific gravity, %
1	Equipment	Equipment for the mechanical engineering industry	10
2	Construction work and wages of builders from the Republic of Kazakhstan	In the construction industry	50
3	External infrastructure	Roads, pipelines, use of Kazakhstan's logistics infrastructure	90
4	Additional expenses	Costs of purchasing land, technical control, personnel training and others	70

According to Table 1, it can be noted that the smallest share of Kazakhstani content falls on the purchase of equipment. Taking into account the practice of modernizing existing oil refineries, the purchase of equipment produced at enterprises in the engineering industry of Kazakhstan cannot exceed 10% during the construction of a refinery.

At the construction stage of a refinery, it is necessary to carry out complex technological work, which requires the invitation of experienced, sometimes foreign, specialists. This influences the share of labor costs, where in terms of Kazakh content there should be indicators of attracting citizens from Kazakhstan to work. In addition, not all types of Kazakhstani building materials, structures and parts can be used in the construction of such specific facilities as oil refineries that produce oil refining and petrochemical products. Certain refinery facilities require the use of high-strength building materials that do not change their structure when exposed to chemicals and high temperature conditions. In connection with these points, the share of Kazakh content for construction work during the construction of special production facilities at the refinery is estimated at 50%.

External infrastructure costs consist of the construction or operation of roads and pipelines, cargo transportation, and logistics operations. Enterprises operating in Kazakhstan have accumulated experience in increasing the share of local content when using external infrastructure. In connection with the above, this indicator is 90% when implementing an investment project to create a new refinery.

Additional costs include the purchase or rental of land, various technical controls and examinations, personnel training, the purchase of office equipment and other unforeseen expenses. The share of Kazakhstani content for the implementation of an investment project for the construction of a refinery at additional costs can reach up to 70%. However, the construction of a refinery is a capital-intensive, technically complex, labor-intensive production with a long payback period, when unforeseen expenses may arise at any stage of the life cycle of an investment project. Even if all internal and possible external risks are taken into account, there are optimistic and pessimistic scenarios, during periods of managing an investment project throughout its life cycle there may always be a need to carry out some new types of operational work or services, which sometimes have to be imported. For this reason, there is a possibility of a significant reduction in the share of additional costs in Kazakhstani content during the construction of a new refinery from 70% to 45%.

When creating new production facilities for the production of petroleum products, there are certain differences between the effects of diversification of the oil and gas complex on the national economy of Kazakhstan:

- Direct effect - the direct effect of increasing the volume of output by an industry (sector of the economy) to satisfy additional demand from the state.
- Indirect effect - the effect in the supply chain from an increase in demand in sectors producing intermediate goods for the production of final marketable products for which there is demand. This effect is sometimes called the supply chain effect.
- Induced effect - direct and indirect effects leading to an increase in household income, part of which will be spent again on the purchase of other types of finished goods and services, which will lead to a further growth effect of the national economy.

There are different types of input-output multipliers to calculate different types of effects.

- Type 1 includes only direct and indirect effects.
- Type 2, in addition to the first two effects, also includes an induced effect.

These effects are determined on the basis of input-output tables using matrix inversion [11].

The calculations of industry multiplier indicators carried out by the authors revealed the effects of diversification of the oil and gas complex on the development of the oil refining

industry in coefficients of 1.7–1.9. This means that every tenge (monetary unit of the national currency) of direct effect creates 1.7 tenge of the impact of oil refining on gross domestic product (GDP) on other sectors of the economy of Kazakhstan: direct and indirect effects. Similarly, each tenge of direct effect creates 1.9 tenge of the impact of oil refining on Kazakhstan's GDP: direct and indirect and induced effects.

The detailed impact of the development of the processing industry of the oil and gas complex of Kazakhstan on other sectors of the national economy is presented in Figure 2.

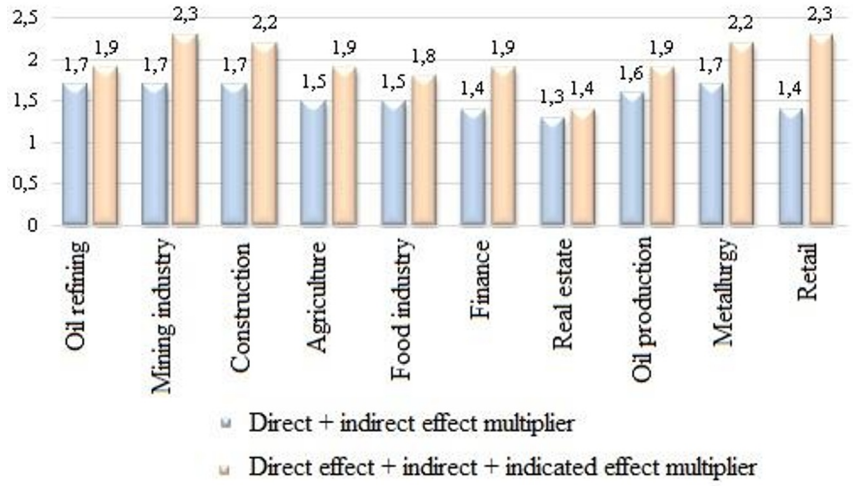

Fig. 2. Indicators of the indirect effect of diversification of the oil and gas complex in the inter-industry balance of the economy of Kazakhstan (compiled by the authors according to source data [12]).

According to the indicators in Figure 2, the main impact of diversification of the oil and gas complex is aimed at the crude oil production sector, followed by wholesale trade and transport. Of course, the impact on oil production of the oil refining sector of the economy is quite large, since the main raw material for the production of marketable products is crude oil. The impact on transport is mainly due to the fact that in Kazakhstan gasoline is the main fuel resource for road and aviation transport; diesel fuel – for agricultural and construction equipment. In wholesale trade, the main share is accounted for by the domestic market of petroleum products (gas stations, etc.).

Impact of modernizing an existing oil refinery. The structure of the oil and gas complex of Kazakhstan includes three large oil refineries that have undergone modernization: the Atyrau Oil Refinery (ANPZ JSC), the Pavlodar Petrochemical Plant (PNHZ JSC), the Shymkent Oil Refinery (Petro Kazakhstan Oil Products LLP (Petro Kazakhstan Oil Products JSC) PKOP"). As a result of modernization, the domestic market for petroleum products was completely formed from Kazakh goods. Before the completion of investment projects for the modernization of oil refineries, there was a deficit in the domestic market of Kazakhstan for the main types of petroleum products (motor gasoline, diesel fuel, aviation kerosene). The deficit was covered by imports from Russia within the framework of the annual indicative balances between the Republic of Kazakhstan and the Russian Federation.The total average annual volume of imports from the Russian Federation for gasoline, diesel and aviation fuels was about 1.5 million tons.

Based on the results of the modernization of three refineries, the total increase in the production of light petroleum products in Kazakhstan amounted to about 4.3 million tons per year. Of these, at Atyrau Oil Refinery JSC the output of marketable products increased

by 1.2 million tons, at PKOP JSC - by 2.3 million tons and at PNHZ JSC - by 0.8 million tons at full load and processing 17.5 million tons of oil. Gasoline production increased by 70%, diesel fuel by 20% and aviation fuel by 2.4 times.

The effect of diversification on the economy of Kazakhstan is presented in more detail using the example of the modernization of the Shymkent oil refinery of PKOP JSC. Figure 3 shows the forecast indicators of the economic effect for all of Kazakhstan and for buyers as a result of lower prices for petroleum products based on the results of the modernization of PKOP JSC.

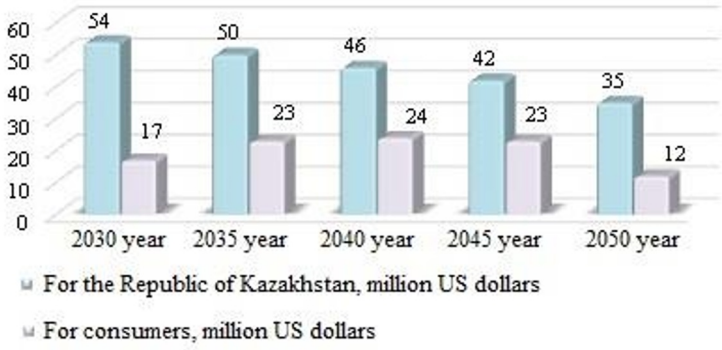

Fig. 3. Sectoral GDP multipliers for Kazakhstan based on the results of diversification of PKOP JSC (compiled by the authors).

According to forecasts, Kazakhstan's net savings from lower prices for petroleum products should reach up to $54 million per year.

Total effect (from the implementation of the investment project to modernize PKOP) = $524 million (Direct effect: operation of the modernized refinery) + $367 million (Indirect effect: effect from growth in other sectors of the economy of Kazakhstan) + $105 million (Induced effect : the effect of growth in consumer income from lower prices for petroleum products) - $760 million (Subsidies: government directions for subsidies taking into account the multiplier) = $236 million. Net savings from lower prices for petroleum products for Kazakhstan consumers will amount to $54 million per year.

4 Conclusion

- Currently, the Republic of Kazakhstan is implementing a program to diversify the oil and gas complex for the further development of the oil refining sector and the organization of new production facilities for the production of oil refining products. Work is underway to adjust the legal framework for the implementation of investment projects in the oil and gas complex.
- At the state level, industry ministries of the Republic of Kazakhstan and quasi-state enterprises have worked to enter global industry markets with Kazakhstani oil products. The necessary logistics infrastructures are available. To organize new oil refineries, a material and technical base has been created to provide its own raw materials. State programs have been adopted to increase funding for geological exploration work to confirm hydrocarbon reserves in Kazakhstan, and foreign investment has also been attracted.
- The results of scientific research by the authors of this article confirm the impact of expanding production in the oil refining sector on the economic indicators of Kazakhstan through multiplier effects. Thus, as a result of the diversification of the

country's oil and gas complex to modernize domestic oil refining capacities, the domestic market is filled with its own base oil products. An increase in the volume of produced oil refining products with added value changes the structure of the inter-industry balance of the national economy towards an increase in the share of manufacturing products and a decrease in the share of the mining industry in the country's GDP. The dependence of the replenishment of the state budget of the Republic of Kazakhstan on income received as a result of the export of hydrocarbon raw materials to world markets (where periodic price volatility is observed) should be reduced. Socio-economic effects are expressed in increased incomes of the population, growth in household budgets, and the creation of social facilities in the regions where oil refining facilities operate.

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