Analysis of the Impact of Tariff Levels on Energy and Other Services on Macroeconomic Indicators

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Abstract — **Energy resources are one of the main components of the production cost. The volume of this kind of cost depends on the consumption and tariffs set by suppliers. The branches of the economy are mutually related at the stage of production and sales. A number of macroeconomic indicators, which are quite complex systems, characterizes their activities. Identify the impact on them of tariffs on energy expended and various services is quite a challenge. Nevertheless, this issue is very important, since the establishment of tariffs for energy, material resources and services is sometimes carried out without taking into account their influence on the final macroeconomic indicators and the welfare of the population. In this article, an attempt is made to highlight the impact of tariffs on the main macroeconomic indicators of the economy. It turned out that the higher the tariffs, the greater the intermediate consumption and the lower the gross added value and the volume of the gross domestic product, as well as the volume of final consumption. To ensure sustainable development of the economy, it is necessary to coordinate the establishment of energy tariff levels, taking into account the welfare of the population.**

Keywords — Macroeconomic indicators; tariff adjustment; econometric models; competitiveness.

INTRODUCTION

The impact of tariffs for energy resources on the basic macroeconomic indicators of the Republic of Moldova is not studied widely in the literature. The views that can be found in the scientific publications on this topic vary considerably, starting the thesis that the impact is almost nil, until the opposite statement, that the increase in the tariffs on energy resources leads to real GDP growth. The influence of this factor is large. Scientists who share the last thesis believe that by increasing energy prices, the state can improve the situation in the national economy.

To challenge or accept this statement, we will estimate the impact using the author's model, which describes the dynamics of the core macroeconomic aggregates: GDP, consumption, employment, real wages, the actual state budget revenues, etc.

In developed countries, companies in the energy sector are treated as natural monopolies and regulated by the state. The optimal price, in terms of the society's needs, for the goods and services delivered by these monopolies must be set at the level of the minimum possible average costs in the long run. In the Republic of Moldova tariffs for electricity, heating, natural gas and water supply are set by the National Agency for Energy Regulation of the Republic of Moldova (NAER), and their level is higher than long-term average costs. As a result, the price level has risen, the competitiveness of domestic goods has diminished both on the foreign markets and on the domestic market, and the welfare of the population has worsened.

I. THE BEHAVIOR OF NATURAL MONOPOLIES IN THE ENERGY SECTOR AND THE IMPACT OF THE STATE TARIFF POLICY

The authors are taking into account that the energy tariffs will continue to increase in the near future. In this case, it is important to quantify the reaction of domestic producers and consumers and the national economy as a whole to raising

tariffs. The rational regulation of natural monopolies by the state allows the reduction of production costs, and as a result, tariffs will decrease, based on economies of scale. However, in the Republic of Moldova, second-degree price discrimination is applied in the case of gas pricing, and third-degree price discrimination is setting for electric and thermal energy.

Third-degree discrimination involves price differentiation exclusively, depending on the category of buyers, and not on the quantity of goods or services purchased. For example, in present, individuals, compared to legal entities, pay a higher price for electricity consumption. The monopolistic company maximizes its total profit by gaining the maximum profit on each segment of the market [1, pp. 238-239].

Analyzing the electricity supply market in the Republic of Moldova, the authors found the following features:

- Several companies are active on the market, making it easier to price discriminate. Consequently, electricity suppliers capture a share of the market's consumer surplus, which in turn leads to lower buyer solvency. For example, in 2001, nine electricity suppliers were operating. The electricity tariff, excluding Value Added Tax (VAT), provided by RED Centru Joint-Stock Company (JSC), RED Sud JSC, RE Chisinau was 8% higher than the electricity tariff provided by RED Nord JSC, RED Nord-Vest JSC. At present, there are six suppliers and tariffs for electricity differ not only from one supplier to another but also by groups of consumers, depending on the outdoor switchgear (0.4 kV, 6 and 10 kV, 35 and 110 kV).

- The largest supplier is not a domestic economic agent. This creates obstacles to the rational regulation of the natural monopoly by the state.

In the countries that extract natural gas, oil and electricity produce, when developing the model of the impact of the state tariff on the national economy, considers the tariffs for energy resources as endogenous variables. However, much of the scholars have an opposite view, and treats rates as exogenous.

Undoubtedly, when determining the tariffs for goods and services delivered by natural monopolies, account is taken of the information on the cost of production presented by monopolistic firms. There are two issues here. Firstly, data presented may differ from the real cost of unit costs, long-term marginal costs. Secondly, there is a lack of transparency and society does not have information on the data submitted by the suppliers, which creates conditions for establishment of the larger salaries for provider's administrative body and for employees' the National Agency for Energy Regulation of the Republic of Moldova, and therefore the level of tariffs becomes even higher.

The analysis of the situation in the energy sector shows that the growth rate of energy tariffs considerably exceeds the growth rate of nominal salaries and pensions. At the same time, the inflationist process takes place. The main cause of inflation, ceteris paribus, is the uncoordinated increase between the energy tariffs and real wages [2, pp. 37].

II. QUANTIFYING THE IMPACT OF THE ELECTRICITY'S PRICE

Taking into account the fact that the electricity tariff differs from one supplier to another, as well as by groups of consumers, the authors have developed the algorithm for estimating the electricity price as a weighted average, based on the consumption volume of each category of consumers. The result of the calculations is shown in Fig. 1.
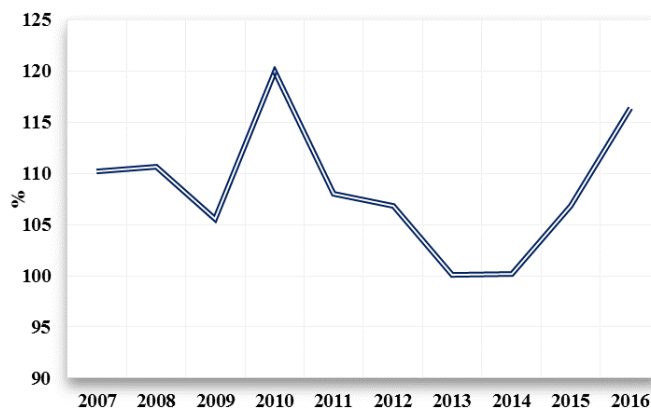

Fig.1. Dynamics of the weighted average price for electricity supplied to the final consumer, in percentage as compared to the previous year

In order to assess the impact of the electricity's price increase on the dynamics of the Industrial Producer Price Index (IPPI), the authors analyzed the first-order difference of logarithms of the studied indicators using the Eviews 9. Finally, they obtained the following results:

$$d(Log(IPPI)) = 0.95d(Log(CPI)) + 0.156d(Log(Pe)) \quad (1)$$
$$(5.269) \qquad\qquad (1.214)$$

$$R^2 = 0.86215$$

Where:

Pe – the weighted average price for electricity supplied to the final consumer, in percentage as compared to the previous year;

CPI – Consumer Price Index;

$d(Log)$ – the first-order difference of logarithms;

R^2 – the determination coefficient.

All the coefficients obtained are statistically significant and their signs correspond to the expectations regarding the impact of the state tariff policy on the general price index. According to the results, the increase by 10 percentage points of the electricity price leads to an increase of about 1.6 percentage points of the Industrial Producer Price Index.

High inflation is a very topical macroeconomic problem in Republic of Moldova [3]. Authors Using EViews developed the following econometric models for analyzing inflation in the consumer market and in industry:

$$rcpi = 0.035 + 0.008 rcpi(-1) + 0.107 rpe + 0.16 rexch + 0.1 D08 + 0.04 D11 - 0.05 D09 \quad (2)$$
$$(0.152) \quad (4.950) \quad (9.997) \quad (15.475) \quad (7.894) \quad (-9.156)$$

$$R^2 = 0.99698$$

$$rippi = 0.028 + 0.27 rippi(-1) + 0.292 rpe + 0.002 rexch - 0.1 D09 - 0.05 D16 \quad (3)$$
$$(1.674) \quad (2.949) \quad (0.045) \quad (-5.943) \quad (-2.649)$$

$$R^2 = 0.94154$$

Where:

$rcpi$ – rate of inflation in the consumer market;

$rcpi(-1)$ – inflation expectations of consumers;

rpe – the growth rate of price for electricity;

$rexch$ – the growth rate of exchange in the dollar;

$rippi$ – rate of inflation in industry;

$rippi(-1)$ – inflation expectations of producers;

D – dummy variable.

In the regression dependence (2), we have obtained the coefficients. These are indicators of the elasticity of the rate of inflation for the corresponding factors. It should be noted, there are the high positive elasticity of the rate of inflation in the consumer market by the factor of the nominal exchange rate of the dollar (0.16) and the tariffs for electricity for final consumers (0.107).

The equation (3) shows the coefficients of the elasticity of the rate of inflation for the corresponding factors. There is the high positive elasticity of the rate of inflation in the industry by the tariffs for electricity (0.292)

Thus, the coefficients of elasticity of the rate of inflation in the consumer market and in industry by the electricity tariffs for final consumers are 0.107 and 0.292, respectively.

Gross Value Added (GVA) in current prices changes not only under the influence of changes in the physical volume of goods and services, but also due to price changes. The first factor has a positive effect on the national economy, while the second factor does not increase the welfare of the population. The authors developed the following model for the estimation of the impact of electricity price dynamics on the gross value added of the production and supply of electricity, thermal energy, gas, hot water and air conditioning:

$$d(Log(GVAe)) = 0.5d(Log(Pe)) + 0.2d(Log(qe)) - 0.15 D09 - 0.1 D08 \quad (4)$$
$$(21.986) \quad (0.705) \quad (-3.268) \quad (-2.354)$$

$$R^2 = 0.86023$$

Where:

$GVAe$ – the gross value added of the production and supply of electricity, thermal energy, gas, hot water and air conditioning, in percentage as compared to the previous year;

qe – an index of the physical volume of production and supply of electricity, thermal energy, gas, hot water and air conditioning.

The obtained results show that the elasticity of the gross value added of the production and supply of electricity, thermal energy, gas, hot water and air conditioning in relation to changes in the electricity price is 0.5. Hence, the increase of the electricity price by 10 percentage points leads to increase the gross value added of the production and supply of electricity, thermal energy, gas, hot water and air conditioning roughly 5 percentage points in current prices. The rest percentage points are caused by the rise in prices for thermal energy, natural gas, hot water and the physical volume of these goods. Consequently, the impact of physical volume is very small.

The analysis of the correlation between the GDP per capita dynamics in current prices with the electricity price dynamics and the dynamics of index of GDP physical volume gave the following results:

$$d(Log(GDPcap)) = 0.3865 d(Log(Pe)) + 1.0342 d(Log(GDPph)) \quad (5)$$
$$(1.758) \quad (5.370)$$

$$R^2 = 0.86379$$

Where:

$GDPcap$ – an index of GDP per capita in current prices;

$GDPph$ – an index of GDP physical volume, in percentage as compared to the previous year.

The econometric model obtained shows that GDP per capita in current prices is elastic in relation to changes in the GDP physical volume and inelastic in relation to changes in the electricity price. Therefore, the welfare of the population is sensitive to the change in the GDP physical volume, so the way to improve the situation of the population is the sustainable development of the real sector.

III. ANALYZING THE REACTION OF DOMESTIC PRODUCERS, CONSUMERS AND THE NATIONAL ECONOMY AS A RESULT OF RAISING TARIFFS

The level and dynamics of state-regulated prices (tariffs) for goods and services in the energy sector have a significant impact on the national economy, on the following indicators:

- The Gross Value Added;

- An economic efficiency of domestic production;

- An inflation rate;

- The competitiveness of domestic products on the domestic and foreign markets.

Consequently, the state tariff policy in the field of energy price regulation is very important. It could affect the rate of

economic growth, GDP dynamics and the structure of the national economy. The unjustified increase in energy prices (tariffs) leads to a significant increase in aggregate spending for consumers, which reduces the savings and solvency of the population. Shrinking savings leads to lower investment in the national economy. As a result, aggregate income and wealth of the population are decreasing.

Applying price discrimination to any degree, two or three, does not lead to an optimal price for society, to a reasonable price that would be acceptable to producers and suppliers. The state needs to change its tariff policy. In this respect, the main task of government price (tariffs) control policies for energy resources is the implementation of an optimal tariff policy that would ensure the achievement of inflation targets and would not have a negative impact on economic growth.

The efficiency of the functioning of both the energy sector and the national economy depend on the pricing policy promoted by the state. The set tariffs have a substantial impact on the volume of revenues, savings and accumulations of producers, suppliers of electricity, heat and natural gas. In recent years, these companies face a significant investment gap. The state has to set the tariffs to the level that would satisfy as much as possible households and manufacturers.

CONCLUSIONS

At present, as mentioned, transparency of production and supply costs is not ensured, and cost-minimization reserves are not identified. The lack of transparency of the financial and economic activity of natural monopolies prevents price setting at an economically reasonable level. There is mechanism to establish the high tariffs in the energy sector, but there is not created incentive economic instruments to reduce the costs of production and supply, which in turn is not conducive to the efficient management of energy companies.

In order to encourage companies to reduce costs and increase the efficiency of natural monopolies, it is necessary to improve the price regulation mechanism. For example, in the case of heating, the share paid by consumers installing autonomous heating in centrally heated buildings has to be increased. The following policies are practiced in the countries of the European Union:

- the quota is 50% and not 10% like in the Republic of Moldova;

- the quota is 100%. Consumers can install autonomously heating, but they do not have the right to disconnect from the centralized heating.

What effect will this policy have? Undoubtedly, the basic effect will be the increase in production volume, the reduction of average fixed costs, meaning that economies of scale will occur. Finally, the competitiveness of domestic goods, the competitiveness of companies and the national economy will increase.

In addition, the authors propose to apply the method of setting a capped price in the regulation of basic tariffs. Using this price control method will encourage natural monopolies to reduce costs and ensure predictability of medium-term tariffs.

Energy resources and material expenditures are the main components of the cost of commodity production in the national economy. The final consumers feel the burden of energy tariffs. The level of the cost of energy resources depends on the volume of supplies and the tariffs set.

The sectors of the national economy are interdependent both at the production stage and at the realization of goods and services. The analysis by the authors showed that the tariffs initially influence the intermediate consumption of the branches of the national economy. It has been found that the higher the tariffs, the higher the intermediate consumption and smaller the added value and hence the gross domestic product. As a result, it was concluded that the growth rate of tariffs should not prevail the growth rates of macroeconomic indicators in long-term.

In order to ensure sustainable development of the national economy, increased competitiveness and technical and scientific progress, it is necessary to establish a rational level of coordination of tariffs for energy, natural gas, material resources and services both in the production phase and in the Consumption, taking into account the interests and producers, and consumers, i.e. the whole society.

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