

# ***FISCAL POLICY IN THE NATURAL GAS SECTOR: AN OPTIMIZATION APPROACH***

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## **Overview**

The second biggest and the most complex domestic natural gas market in the world is experiencing numerous structural reforms. The opening of the market to competition, price liberalization and attempts to create gas spot exchange and open to third parties the gas transport system, owned by historical producer and operator, have reshaped the organization of the Russian gas industry, facing now economic and political challenges, and questioned the strategy of the main natural gas producer. The reforms ongoing in a country, which represents 17% of the world gas production<sup>1</sup> and maintains the position of the biggest gas exporter, might have significant impact on the global natural gas market.

Following the program of reforms, in order to optimize the tax revenue, the government introduced in 2014 differentiated rates for the mineral resource extraction tax, instead of unique tax rate applied previously to all gas production fields. This policy decision impacted the strategy of the biggest natural gas producer and yielded unexpected results (Yermakov, Kirova, 2017).

The goal of the paper is to analyze the results of this reform, reveal optimal strategies of the market players and compare the outcome with the real situation. The paper helps to understand the market organization in the country, explains behavior and provides insights into the strategy of the biggest gas producer.

We build an economic equilibrium model involving strategic interaction between major natural gas producers and government subject to operational, political and market constraints, specific for the Russian gas industry. We compare the solutions obtained for the current situation and for the case of a deregulated market in terms of liberalized prices and unbundled gas production and transport activities. We show that the new tax system is neither an optimal policy for the government from the point of view of tax revenue maximization nor a socially optimal solution. We calculate optimal tax rates and provide a set of optimal solutions to achieve multiple objectives set by policy makers, willing to maximize the social welfare and to fill the budget.

To the best of our knowledge we are the first trying to describe the real situation in the Russian gas market with the help of a mathematical model involving strategic integration between the market agents. The paper is the first attempt to explain the results of the natural resource tax reform in Russia and to propose optimal tax rates. The model also offers a possibility to compare the current situation with a liberalized market. This setup provides insights into organization of the domestic market in Russia, points out the reasons why the tax reform didn't achieve the initial goal and proposes a solution to make the tax policy more efficient.

## **Methods**

We address the issue of tax optimization by building a multilevel economic equilibrium model involving strategic interaction between major natural gas producers and the government, represented by a multiobjective program with equilibrium constraints.

Following the methodology described in Gabriel et al (2013), we apply the game theoretic approach to the Russian internal natural gas market in the form of a two-level model of Stackelberg type. We follow Siddiqui and Christensen (2016) representing the upper-level problem by a multiobjective optimization reflecting in our case the tradeoff

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<sup>1</sup> BP Statistical review 2018.

between maximization of the social welfare and of the tax revenue, that the government faces while setting the tax rates. The lower level problem includes the strategic interaction between gas producers maximizing their profits. In order to deal with the issue of regulated gas prices we follow Murphy et al. (2016) and Rioux et al. (2018) and put additional constraints.

## Results

We show that the new tax system is neither an optimal policy for the government from the point of view of tax revenue maximization nor a socially optimal solution. We calculate the optimal tax rates and provide a set of optimal solutions to achieve multiple objectives set by policy makers, willing to maximize the social welfare and fill the budget. We also compare the solutions calculated for the current market situation and for the case of a liberalized market.

## Conclusions

The work explains unexpected results of the natural resource extraction tax reform in the country the second biggest natural gas producer and the biggest natural gas exporter. The study allows better understanding of the market organization in this country and provides insights into strategy of the market players. The model calculates optimal tax rates and provides a set of optimal solutions to achieve multiple objectives set by policy makers, willing to maximize the social welfare and to fill the budget. The paper enables comparison between the real situation and the case of a liberalized market, that helps to realize the necessity of further reforms. These reforms may impact the strategy of the biggest gas exporter. Thus, providing insights into its strategy helps to reduce uncertainty in the global natural gas market.

## References

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