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THE MACROECONOMIC IMPACT OF GAS PRICE INCREASE IN BELARUS: QUANTITATIVE ASSESSEMENT

Summary

The shift of 'Gazprom' towards the market-based approaches to price setting for the CIS countries have brought about the substantial increase in gas prices. As a result, gas price for Belarus in 2007 will be USD100 and in 2011 would reach the level that European consumers have, excluding transportation costs. This announcement has caused numerous discussions on the possible macroeconomic consequences of such price increment. The paper, to some extent, sheds a light on this issue evaluating the impact of gas price increase based on computable general equilibrium model. We start our simulations with four basic scenarios investigating of the increased prices on natural gas from Russia, and then against this background we estimate necessary reduction in gas consumption that could offset increased prices (combined scenarios). The analysis of macroeconomic impact of gas price growth showed that Belarus is extremely vulnerably to a gas price shock. According to the model estimations, the gas price increase from current USD 46.68 to USD 200 could cause 14% reduction of real GDP within medium term period. In order to compensate for increased prices the reduction of primary energy consumption should amount to 48.9%.

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1. Introduction

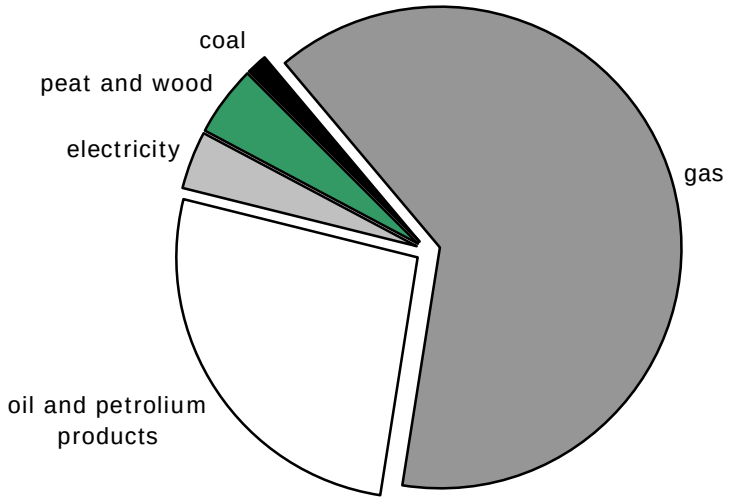
In accordance with the concept of gas prices liberalization approved by Gazprom there is proposed to raise significantly rates of prices for CIS countries. As a result, according to contract on supply of Russia's gas to Belarus was signed on December 31, 2006, the natural gas price for Belarus in 2007 will be USD 100 per 1,000 m^3 and then increase steadily up to 2011 when it should reach the level of average European price minus transportation costs. Taking into consideration that such sharp increment can cause a significant shock for economy there are a lot of debates on the issue of macroeconomic consequences of gas price increase. In this paper the impact of gas price increase is evaluated based on computable general equilibrium model. We start our simulations with four scenarios investigating of the increased prices on natural gas from Russia, and then against this background we estimate necessary reduction in gas consumption that could offset increased prices. It allows to determine an extent of essential curtailment of primary energy consumption that could be achieved either by improving the energy efficiency of Belarusian economy or by decreasing the share of gas in total consumption of key energy products.

The paper is organized as follows. Section 2 describes some peculiarities of the energy balance of Belarus. Section 3 presents the model and interprets the policy scenarios. Section 4 provides the description of the economy-wide and industry-specific effects. Section 5 concludes.

2. Energy balance of Belarus

Figure 1 shows an important role of gas in Belarusian economy. It constitutes 63.5% of total primary energy consumption in Belarus, followed by oil (26.5%) and peat & wood (4.8%). For comparison in Ukraine gas amounts 43.6% of total energy consumption, in Poland its share is 11.9%, in Lithuania and Russia 24.9%, 53.4% respectively.

Figure 1. Total Consumption of Key Energy Products in Belarus, 2005



Source: Ministry of Statistics and Analysis.

As can be seen from Table 1, an import is the main source of energy resources supply in Belarus. Since domestic production covers only 1.4 of primary gas supply, the rest should be imported from Russia who due to geographical reasons is the only one source of natural gas purveyance.

Electricity and heating consumes 74% of gas supply, while 25% is directed to final consumption of which 15.7 % to industry. It should be noted that energy intensity in Belarus is among the highest in Europe. It is almost three times higher on purchasing power parity basis than in Germany and two times higher than in neighboring coun-

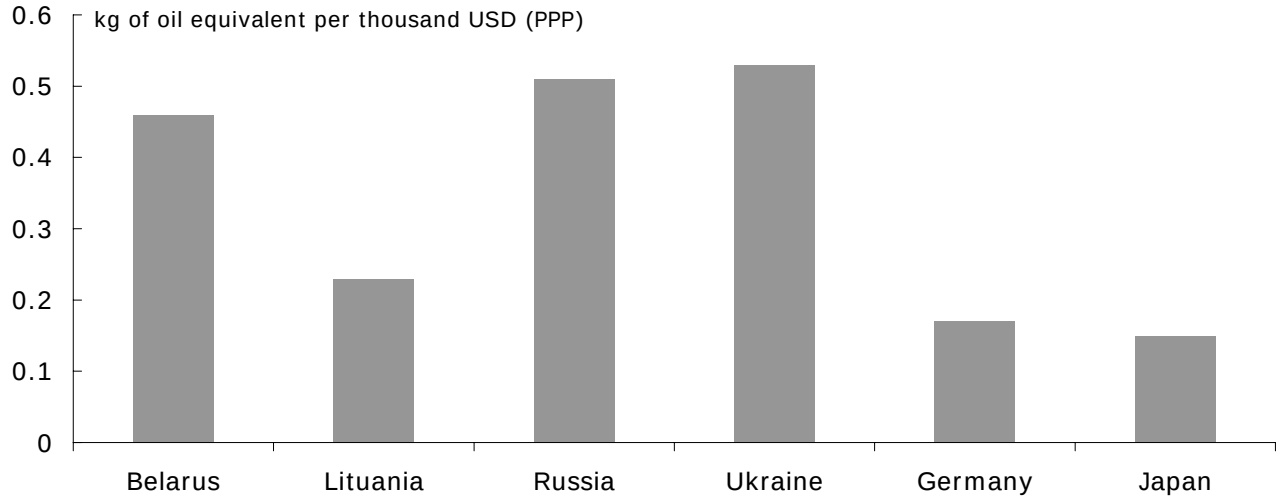
tries with similar climatic conditions such as Poland and Lithuania (Figure 2). In part this is the consequences of negative impact of preferential prices on gas supplied to Belarus by Gazprom, which do not create incentives for efficient gas use. On the other hand in accordance with IMF estimations Belarus' implicit gain from obtaining gas from Russia at prices significantly below international market prices was 11.6% of GDP in 2000 and 6.1% of GDP in 2005.[1]

Table 1. Energy Balance of Belarus in 2005

Supply	Crude oil	Gas
production	8.0	1.1
imports	86.0	98.8
exports	6.0	-
change of stocks	-	0.1
Total primary energy supply	100.0	100.0

Note. Data in % of total primary energy supply of key products measured in thousand tones of oil equivalent
Source: Ministry of Statistics and Analysis.

Figure 2. Energy Intensity of GDP for selected countries



Source: IEA, Energy Statistics.

3. Model and Scenarios

The analysis of the macroeconomic impact of gas price increase is based on a Computable General Equilibrium (CGE) model. Models of this type are broadly used at economic studies, and in particular for analysis of the energy shocks effects associated with the change in prices on key energy products. In this study we use a comparative static modeling approach to quantify and compare the effects of changes in the price for Russian gas imports. Our results describe the difference between the initial (current) equilibrium prior to price changes – the benchmark – and a new equilibrium, in which the economy has fully adjusted towards the new policies and price levels. Typically, this adjustment takes around 5 to 7 years. It is assumed that the economic impacts of gas price increase do not be influenced by other facts such as changes in world prices, relative exchange rates, and all other possible shocks that in reality can affect of the economy under study during the same period. In addition such models typically do not imply any changes in the structure of economy during the adjustment path from benchmark to new equilibrium that, in its turn, may aggravate the negative consequences of the shock.

[1] IMF (2005), Republic of Belarus: Selected Issues, Country Report No. 05/217, Washington, D.C.

To estimate the macroeconomic implications of gas price increase on Belarusian economy it was adjusted the computable general equilibrium (CGE) model that was developed for assessment of the economic impact of Belarus' accession to the WTO.[2]

The basis for our modeling exercise is a Social Accounting Matrix (that we put together on the basis on Belarus' National Accounts and the Input-Output tables for 2004 at basic prices. Input-Output tables include 34 activities/commodities. They have been aggregated into 23 sectors.

Since the schedule of price increase have been already adopted, we started our simulations by looking at the implications of increased prices for Russian natural gas imports from current USD 46.68 to USD 100 and then investigated the effects of further increment in prices. According to contract, in 2008, price would go up to 67% of the average European price, in 2009 – to 80%, in 2010 – to 90%, and in 2011 – to 100%. Hence, our scenarios are defined as follows:

Scenario 1: Increased prices for gas imports to USD 100

Scenario 2: Increased prices for gas imports to USD 120

Scenario 3: Increased prices for gas imports to USD 160

Scenario 4: Increased prices for gas imports to USD 200[3]

Then combined scenarios were simulated (Increased prices for gas + reduction of gas consumption). Against the background of increased gas prices the extent was determined to which gas consumption per output unit in all industries should be declined in order to keep GDP unchanged.

4. Results

Table 2 reports the economy-wide results of our evaluations. As expected, the higher prices for gas imports from Russia have negative consequences for the Belarusian economy. We find static welfare losses of around 7.2% of Belarus' consumption and a GDP decrease of 5.7% according Scenario 1, while simulations of gas price increase to 200 USD (Scenario 4) reveals the significant deterioration of economic development. In particular, a reduction in real GDP is estimated at 14.0%, while welfare will drop by 17.8%. Accordingly, real factor returns (Scenario 4) drop by 14.2% in the case of wages and by 17.3% for capital and labor. The worsening of welfare is explained by reduction of aggregate output, first of all in gas-intensive industries.

Table 2. Impact of Gas Price Increase on Economy Wide Variables(basic scenarios)

	Benchmark	Scenarios for higher gas prices			
	- 0 -	-1-	- 2 -	- 3 -	- 4 -
Welfare (Equivalent Variation, change in %)	-	-7.2	-9.6	-14.0	-17.8
GDP Index (change in %)	-	-5.7	-7.6	-11.0	-14.0
Consumer Price Index (change in %)		1.1	1.4	1.8	2.2
Producer Price Index (change in %)		5.9	7.8	10.6	13.3
Real factor return (change in %):					
- Return to capital (average across activities)	-	-7.2	-9.5	-13.7	-16.3
- Wage rate	-	-6.7	-7.6	-11.2	-14.2

Source: Author's calculation.

[2] Pavel, F. and Tochitskaya, I. (2005) *The Economic Impact of Belarus' Accession to the WTO: A Quantitative Assessment*. In International Conference Proceedings "Belarus WTO Accession: Problems and Perspectives", Minsk.

[3] As we do know the price for European consumers in 2011, in Scenario 4 the current average European price (excluding transit costs) is used.

The sector-specific results depend on the sectors' production structures. Obviously, increased prices for gas imports are harmful to industries that have a high share of gas in their intermediate consumption. This is especially true for electricity and heating, chemicals and petrochemicals, glass, porcelain and faience, industries in which we estimate the highest output level reductions to occur (Table 2). The results of simulation show that according even to the most optimistic scenario under consideration (scenario 1) the drop of the output in chemical and petrochemical industry and in glass, porcelain and faience industries may reach 6-8%. In the case of gas prices equal to 200 USD the cumulative reduction of real aggregate output may reach 50% in electricity and heating, 21% in chemical and petrochemical industry and 23% in glass, porcelain and faience, industries.

The economy adjusts to the shock relocating the resources to the sectors that consume less gas or gas-intensive products, e.g. metallurgy and machine building, light industry and sphere of services (excluding housing and utilities and other domestic services). Considerable reduction of output leads to substantial drop in exports at the industries that have high share of gas at the intermediate consumption. Not surprisingly, at chemical and petrochemical industry exports would shrink by 23%, at glass, porcelain and faience industry it will decrease by 41% (Scenario 4).

Table 3 reports the simulation results of combined scenarios, where simultaneously were modeled increased gas prices and reduction of gas consumption unless GDP was remained unchanged. The economy-wide results demonstrates that in order to offset the rise of gas prices to USD 100 (Scenario 1) the gas consumption should be cut down by 57%. Consequently, consumer and producer price indices would remain unchanged while exports will drop slightly (by 0.7%). In the case if gas price reaches 200 USD gas consumption has to be reduced by 77% in order not to allow significant deterioration of key macroeconomic variables.

Table 3. Impact of Gas Price Increase on Economy Wide Variables (combined scenarios)

	Increase of gas prices + reduction of gas consumption			
	- 1 -	- 2 -	- 3 -	- 4 -
GDP Index (change in %)	0.0	0.0	0.0	0.0
Changes of gas consumption	-57.0	-64.0	-73.0	-77.0
Consumer Price Index (change in %)	0.5	0.7	0.9	1.0
Producer Price Index (change in %)	1.5	1.8	2.1	2.2
Real factor return (change in %):				
- Return to capital (average across activities)	0.2	0.2	0.2	0.2
- Wage rate	-0.2	-0.3	-0.5	-0.6

Source: Author's calculation.

Taking into consideration that the share of gas in primary energy supply constitutes 63.5% the shrinking of its consumption will be equal to the following reduction of energy consumption:

Scenario 1: 57.0%*0.635 = 36.1%

Scenario 2: 40.6%

Scenario 3: 46.3%

Scenario 4: 48.9%

Evidently, that could be achieved either by improving the energy efficiency of Belarusian economy and creating incentives for efficient gas use[4], or by decreasing the share

[4] Pavel F., Tochitskaya I. (2005) *Improving Energy Efficiency of the Belarusian Economy: An Economic Agenda*. PP 11/05. GET in Belarus.

of gas in total consumption of key energy products and offsetting gas by other fuels (e.g. renewable energy sources, nuclear power).[5]

5. Conclusions

The analysis of macroeconomic impact of gas price growth showed that Belarus is extremely vulnerably to gas price shock. According to the model estimations, the gas price increase to 200 USD could cause 14% reduction of real GDP and 17.8% decrease in welfare within medium term period.

Output and exports would decrease primarily for the industries that have high share of gas at the intermediate consumption. In the first place it would be chemical and petrochemical industry and glass, porcelain and faience industries. In turn, the outflow of resources from the above mentioned industries would benefit metallurgy and machine building, light industry. These industries could also expand exports as a result of the decline of the real exchange rate followed by increase of imports and deterioration of trade balance.

Since the share of gas in primary energy supply constitutes 63.5% the shrinking of its consumption in the case of increased gas prices to 200 USD will be equal to the reduction of energy consumption by 48.9%, which could be achieved either by improving the energy efficiency of Belarusian economy and creating incentives for efficient gas use or by decreasing the share of gas in total consumption of key energy products and offsetting gas by other fuels (e.g. renewable energy sources, nuclear power).

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Minsk, November 2006

[5] see *Energy in Belarus: The Road Ahead*. International Conference Proceedings. Minsk, 2006.

6. Annex

Table A1. Impact of Gas Price Increase on Aggregate Output by Activity

	Benchmark	Higher gas prices			
	- 0 -	- 1 -	- 2 -	- 3 -	- 4 -
Electricity and heating	1.00	0.86	0.79	0.65	0.50
Gas industry	1.00	1.04	1.05	1.06	1.07
OIL, COAL AND OTHER FUEL INDUSTRY	1.00	1.00	1.00	1.00	1.00
Chemical and petrochemical industry	1.00	0.94	0.91	0.85	0.79
Metallurgy and machine building	1.00	1.05	1.07	1.10	1.13
Timber, woodworking, pulp and paper industry	1.00	1.06	1.08	1.12	1.15
Glass, porcelain and faience industry	1.00	0.92	0.89	0.83	0.77
Light industry	1.00	1.15	1.21	1.33	1.44
Food processing	1.00	1.01	1.01	1.02	1.02
Other brunches of industry	1.00	1.00	0.99	0.99	0.98
Constructions	1.00	0.98	0.97	0.95	0.94
Agriculture	1.00	1.00	1.00	1.00	1.00
Forest industry	1.00	1.01	1.01	1.02	1.03
Transport	1.00	1.02	1.02	1.03	1.04
Communication	1.00	1.01	1.02	1.03	1.04
Trade, catering and interagency	1.00	1.00	1.00	1.00	1.01
Geology and hydrometeorology	1.00	0.98	0.97	0.96	0.95
Calculative and computing services	1.00	1.02	1.03	1.05	1.07
Housing and utilities and other domestic services	1.00	0.94	0.92	0.87	0.83
Health service, culture and welfare services	1.00	0.99	0.99	0.98	0.97
EDUCATION, SCIENCE AND CULTURE	1.00	1.00	1.00	1.01	1.01
OPERATIONS WITH REAL ESTATE AND FINANCIAL SERVICES	1.00	1.01	1.01	1.01	1.01
Governance and defence	1.00	1.02	1.03	1.04	1.05
Public organizations	1.00	0.91	0.88	0.82	0.78

Source: Author's calculation.

Table A2. Impact of Gas Price Increase on Exports by Activity

	Benchmark	Gas price increase			
	- 0 -	- 1 -	- 2 -	- 3 -	- 4 -
Electricity and heating	1.00	0.23	0.14	0.05	0.02
Gas industry	1.00	0.07	0.03	0.01	0.00
Oil, coal and other fuels industry	1.00	1.00	1.00	1.00	1.00
Chemicals and petrochemicals industry	1.00	0.93	0.90	0.84	0.77
Metallurgy and machine building	1.00	1.06	1.08	1.12	1.15
Timber, woodworking, pulp and paper industry	1.00	1.07	1.10	1.14	1.18
Glass, porcelain and faience industry	1.00	0.86	0.80	0.70	0.59
Light industry	1.00	1.17	1.24	1.37	1.49
Food processing	1.00	1.07	1.09	1.13	1.16
Other branches of industry	1.00	1.01	1.01	1.00	0.99
Construction	1.00	1.15	1.20	1.31	1.40
Agriculture	1.00	1.13	1.19	1.29	1.39
Transport	1.00	1.08	1.10	1.16	1.21
Communications	1.00	1.17	1.24	1.38	1.51
Trade, catering and interagency	1.00	1.19	1.26	1.41	1.54
Calculative and computing services	1.00	1.24	1.33	1.53	1.74
Housing and utilities, and other domestic services	1.00	0.90	0.86	0.78	0.69
Health services, culture and welfare services	1.00	1.10	1.13	1.20	1.25
Education, science and culture	1.00	1.19	1.27	1.42	1.57
Operations with real estate and financial services	1.00	1.15	1.21	1.33	1.44
Governance and defense	1.00	1.24	1.33	1.53	1.73

Source: Author's calculation.