

# **Theoretical and Practical Aspects of Natural Gas Pricing in Domestic and Foreign Markets: The Case of Russia**

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## **ABSTRACT**

The paper analyzes the need to change the approaches to Russia's natural gas pricing in domestic and foreign markets. The authors conclude that changes are inevitable in the medium term because existing pricing practices are becoming obsolete in the rapidly transforming gas market. The development of the gas industry is severely hampered by inefficient domestic consumption due to distorted price incentives, lack of competition in the domestic market and the pegging of export gas prices to the oil product basket. The paper discusses possible development options for Russia's gas industry and their potential macroeconomic effects.

Keywords: natural gas, pricing, cross subsidization.

JEL: D24, D40, D60, E20.

# Theoretical and Practical Aspects of Natural Gas Pricing in Domestic and Foreign Markets: The Case of Russia

## 1 INTRODUCTION

Natural gas is a strategic natural resource that plays a dominant role in the Russian energy balance. Based on recent data, natural gas accounted for 53.2% of the Russian fuel mix in 2013.<sup>1</sup> In natural gas-rich countries, the gas supply is gradually taking on a social aspect; the supply of natural gas to residential and industrial consumers is considered a public function, as is the supply of electricity, heat and hot and cold running water. Natural gas sold in foreign markets at above-domestic prices, on the one hand, generates substantial budget revenues through export duties (approximately 3.2% of GDP<sup>2</sup>). On the other hand, these revenues allow Gazprom to cover part of its costs of operating and developing infrastructure in the domestic market.

The current macroeconomic situation intensifies the domestic gas market challenges: (i) domestic wholesale and final prices and transportation tariffs still do not reflect the costs of production, transportation and gas distribution, (ii) as the result of artificially low prices there aren't adequate incentives for gas saving, (iii) the Gazprom financial model still holds unclear mixing of profits from exports, losses from regulated prices that differ by regions and consumers and fail to cover costs for domestic market infrastructure development, (iv) regulation is inconsistent (of license, fiscal, regulatory forms) for Gazprom and independent gas producers, such as Rosneft, (v) there are no common institutional rules - price regulation, participation in cross-subsidization, fiscal burden, transportation pricing, supplier of last resort burden – all of these differ from one producer to another.

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<sup>1</sup> BP Statistical Review of World Energy 2014. <http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy/country-and-regional-insights/russia-insights.html>

<sup>2</sup> Authors' estimations based on data released by the Ministry of Finance and the Central Bank.

Also the natural gas industry has recently been driven by mixed regulation; on the one hand, attempts are being made to reduce rate of growth in domestic gas prices. On the other hand, rising domestic prices are viewed as a key to a competitive and transparent market. As a result, the market is driven by inconsistency and lack of coordination between executive government bodies and Gazprom. All these challenges indicate that Russian natural gas pricing and industry institutions must be revised. This paper is using theoretical and practical arguments to develop the necessary revisions.

First, following Tarr and Thomson (2004) we show the social benefit of dual pricing for international and domestic markets. In addition to Tarr and Thomson's analysis, we assume that the long-term cost function is a step function and explain that a regulated price at long-term marginal costs is not optimal for the domestic market since it would lead to losses that are not sustainable. Second, we discuss details of three cross-subsidy schemes that have only be sketched in the literature. Third, we elaborate three development options for domestic pricing: netback parity prices; welfare optimal but regulated prices; and competitive unregulated pricing. Netback parity prices are very inefficient but represent the current situation. Welfare optimal but regulated prices are theoretically allowable but are likely to lead to regulatory mistakes; we recommend competitive pricing in the long run. We show the consequences of these options in terms of key industry and macro indicators.

## **2 METHODS**

### **Domestic pricing inconsistency**

Both the theoretical literature and practice indicate the extreme inconsistency in domestic pricing. Three main phases of wholesale gas pricing can be identified in 2000–2013. In *Phase I* (until 2007), wholesale gas pricing was performed on a cost-plus basis (prices were set based on economically grounded costs plus regulated markup). In practice, however, it was difficult to determine whether prices were set using that method because there was no public transparency of those data. It may be concluded that prices were set not “equal”, but “keeping in mind” the cost-plus level; the cost-plus principle was generally not followed, and prices were set “manually” at the top political decision-making level, reflecting some type of economically committed (for industrial

consumers) and socially acceptable (for residents) point. At this time, the first and one of the most important published work about Russian natural gas pricing was the paper by Tarr and Thomson (2004). In the context of Russian WTO accession they demonstrated that dual pricing (monopolistic in international markets and long-term marginal costs in domestic) is optimal in terms of Russian social welfare. Gaddy and Ickes (2004) also stated that it is improper to treat the European price as a benchmark for domestic one but it was a little argument for the politicians negotiating WTO accession terms.

In *Phase II* (2007–2011), a market-pricing principle based on netback parity was announced to take effect 1 January 2011:<sup>3</sup> “approximation of domestic gas prices to prices in international markets less export duties and export-related transportation and organization costs.” With that phase, the netback parity price was officially calculated and published for information purposes only as a future reference point. In practice, however, prices remained posted “manually” (in line with the price dynamics defined in the Ministry of Economy short-term forecast) at an economically committed (for industrial consumers) and socially acceptable (for residents) point. Additionally, a formal distinction was made between pricing mechanisms for “old” consumers and “new” consumers. Old consumers referred to those who signed their first gas contract before July 1, 2007; gas pricing for them was declared as following the cost-plus principle. New consumers, with their first contract after July 1, 2007, were assigned a price range varying from cost-plus price to “cost-plus price plus a regulated interest” set by the government. At that time almost all academicians criticized netback parity. Henderson argued that net back parity is a convenient label to increase domestic prices but not a specific quantitative target (Henderson, 2011). Spanjer went further and asserted that EU security of supply might worsen under the unified gas price (Spanjer, 2007). Around the same time the debate on the gas sector reform began in the academic papers. Grigoryev discussed the arguments for a sector deregulation (Grigoryev, 2007) and Tsygankova showed that when Gazprom had small market share

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<sup>3</sup> In compliance with Russian Government Order No. 333 dated 28.05.2007, “On Improvement of State Regulation of Gas Prices.”

in Europe then a split-up of Gazprom's monopoly might not be beneficial for Russia (Tsygankova, 2010). Ahrend and Tompson represented their vision of the reform in which the special emphasis was to increase transparency in the sector and to transfer many of the regulatory functions performed by Gazprom to the state (Ahrend, Tompson, 2010). A separate popular paper direction was to analyze the influence of the Russian gas market developments on the foreign markets (Sagen, Tsygankova, 2008, Bilgin, 2009; Glachant, Hauteclouque 2009, Umbach, 2010, Orttung, Overland, 2011).

*Phase III* (since the beginning of 2011) is distinguished by a decision not to introduce the netback parity principle immediately in favor of a gradual moving to a netback parity price with the use of a discount.<sup>4</sup> The decision was determined by initially seeking not to raise prices sharply and instantly (by almost 70%) and because of a longer-than-expected recovery from the 2008–2009 crisis. Mathematically, the domestic gas pricing formula was set as netback parity with the European basket of fuel oil and gas oil, with a manually set discount (the linkage of gas prices to that basket is typical for Gazprom export contracts with European consumers). In other words, the discounted netback parity price with Gazprom export supplies was set domestically.<sup>5</sup>

In June 2013, a decision was made to postpone and, perhaps more likely, not to introduce netback parity pricing.<sup>6</sup> Note that netback parity was generally useful to rely on in times when domestic gas prices were severely lower than international ones; thus, it is used to advocate the necessity of their increase. However, netback-parity official support ceased when international prices went down and domestic prices increased. First, simple calculations no longer led to considerable domestic price increases; second, a calculated price growth rate based on the netback parity level did not reflect the desired growth rate for the sector as a whole.

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<sup>4</sup> The immediate introduction of netback parity pricing provided for by Russian Government Order No. 333 of December 31, 2010, was replaced with “gradual moving” the day before the scheduled date of introduction, when Clause 15.2 thereof was removed by Russian Government Order No. 1205.

<sup>5</sup> A time-zone coefficient describing the degree of interregional cross-subsidization was also used in the formula at the regional level.

<sup>6</sup> Prime Minister Dmitry Medvedev meeting on June 26, 2013 with members of the all-Russian public organization Delovaya Rossiya. <http://government.ru/news/2653>.

It is necessary to note that at the time when netback pricing was the official target, it was also an important part of the independent producer's financial models. When this target was officially declined, the other issues to develop their economics came to the table: improving competition in the domestic market and getting an access to export deliveries. However, Tsygankova showed that Russian consumers would not benefit if independent gas producers were able to supply both the domestic and international markets (Tsygankova, 2012) and Lunden noted that independent producers increased the shares in the domestic market only because of more favorable conditions rather than Gazprom (Lunden et al, 2013)

### **Theoretical optimal domestic and foreign pricing for a gas-rich country**

Piped-gas supplies<sup>7</sup> both in foreign and domestic markets are characterized by segmentation; that is, the final consumer can be identified with a certain degree of reliability,<sup>8</sup> and a discriminatory approach to pricing can thus be implemented. This segmentation is clear from the difference in natural gas prices for different customers (in both domestic and foreign markets), which cannot be fully explained by differences in the costs of production, processing, transportation, storage and distribution. At the same time, infrastructural barriers severely limit the piped-gas exchange between users (such resale restrictions may also be stated in supply contracts). In other words, having overcome such cost barriers, consumers can theoretically break the segmentation in piped-gas markets and eliminate the practice of discrimination, but they will bear heavy costs. However, it seems that international segmentation of piped-gas markets may be limited by liquefied natural gas (LNG) supplies if piped gas price is higher than minimum delivered price of LNG<sup>9</sup>.

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<sup>7</sup> Piped natural gas is a gas supplied via domestic or international pipelines.

<sup>8</sup> With the entrenched practice of interaction between economic agents supplying gas to various regions, which allows for perfect identification of a certain consumer by point of delivery (the country/region to which a cross-border gas pipeline is connected or the enterprise or community to which a gas grid is connected).

<sup>9</sup> Minimum delivered price for US exporters on the European market is expected around \$9/MMBtu ~ \$322 per 1000 m3, Oil and gas reality check 2015, Deloitte

Economic theory assumes that market segmentation and separate pricing have an ambiguous effect on aggregate welfare (consumer surplus plus producer profit). For instance, Schmalensee concluded that, with an independent demand level in various markets and constant marginal costs, market segmentation tends to increase welfare only if production grows (Schmalensee, 1981). Varian showed that for welfare to increase, marginal costs may not necessarily be constant and may increase (Varian, 1985). However, these models lead to the following general conclusion: with such separate pricing, despite the rise or fall of aggregate welfare, the market power of producers definitely becomes greater, as do their profits (Stigler, 1966; Varian, 1989).

The task of maximizing the welfare of a country, a net exporter of natural gas, can be conventionally divided into maximizing the profits of gas suppliers in each of the foreign markets in which no domestic consumers are present (their surplus is not a concern) and maximizing welfare (defined as the sum of producer profits and consumer surplus) in the national territory. With such an arrangement, national suppliers must apply to each identified/segmented group of consumers (in each importing country) a coordinated pricing discipline close to a monopoly one, i.e., setting different prices for natural gas ( $P = p_m$ ). Price differences among foreign consumers will reflect willingness-to-pay rather than transportation costs. In the domestic market, it is optimal to reach an equilibrium with regulated or competitive prices close to long-term marginal costs ( $P = c$ ), thereby maximizing national social welfare<sup>10</sup>. These simple representations are illustrated in Figure 1.

*Fig. 1*

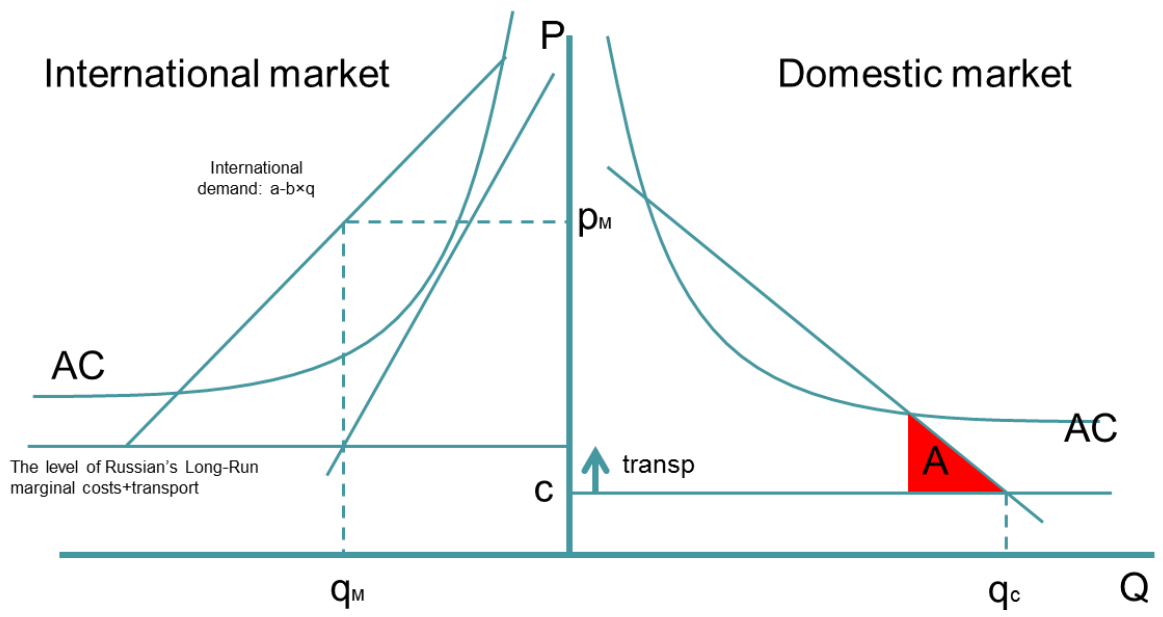
### **Socially optimal pricing in the domestic and international markets for Russian gas**

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<http://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-er-oil-and-gas-reality-check-2015.pdf>

<sup>10</sup> This controversial result in context of Russian WTO accession was firstly drawn by Tarr and Thomson (2004).





It clearly follows from a simple theoretical analysis that netback parity pricing in the domestic gas market is not desirable for Russia. Netback parity pricing leads to welfare loss (deadweight losses) due to artificially high prices of gas inside the country (which in this case would equal  $p_m - \text{transp}$ ). However, producers do benefit from this pricing because it is closer to the internal monopolistic price.

At the same time, the motivation of export duty presence with market segmentation pricing should be discussed only in terms of sharing profits between Gazprom and the government budget<sup>11</sup> rather than in terms of optimal domestic pricing. Hence, the mechanism of optimal pricing may imply both the presence of a gas export duty as a tool designed to capture for the budget some part of producer profit and the absence of a gas export duty – when using any other tool is used (e.g., dividend distribution rules, cost control or infrastructure development obligations). In both cases, however, pricing based on long-term marginal costs is desirable for the domestic market.

Notice that this theoretical result is true under some simplifying assumptions. First, the resource reserves are to be unbound at present and in the future. At present, unlimited resource reserves (with marginal costs being constant) determine the ability of producers to meet any demand both in the domestic and international markets. The importance of having unlimited resources in the future is attributed to the fact that producers may have incentives for rapid extraction or, alternatively, incentives to preserve them for the future. Producer's behavior depends on gas price expectations, as these affect the cost of raising capital. If the real gas price follows a downtrend in the long term, then producers are interested in early field development to be able to invest in alternative projects because in the future they will have less profit from gas production. Conversely, if real price is to increase, producers (and perhaps the whole society) will tend to keep the resources for the future.

Second, such a theoretical result is accessible only if infrastructure (e.g., pipeline and gas grid capacity and the power of compressor stations) places no limit on supply meeting demand. Third, constant long-term marginal cost is important. If this assumption is relaxed, then the choice of the market – internal or external – for the first delivery affects the amount of a producer's costs in each

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<sup>11</sup> Idrisov, Sinelnikov-Murylev, 2011.

market. In this case, the producer's costs in different markets become connected, which as with cross-subsidization, does not allow separating domestic and foreign markets in terms of pricing.

Each of the above three aspects indeed can be seen in practice; however, the current situation in the Russian natural gas market is close to the above stylized model. Based on experts' estimates, Gazprom and independent producers have sufficient capacity to produce and supply much more gas than they do today, with no infrastructure capacity limits and unit costs remaining unchanged<sup>12</sup>. In other words, pricing objectives in the domestic and foreign markets indeed can and should be considered separately in practice, and, theoretically, the linkage between the mechanisms of domestic and external pricing appears to be quite artificial.

Note that in actual pricing practice, the monopoly rent captured by export duty can be seriously influenced by LNG development and the substantial reduction of global production costs caused by the U.S. shale revolution. Future liquefaction and regasification technologies will lead to highly diversified supplies in Europe, particularly in coastal regions. Some piped-gas suppliers may lose bargaining power, and consumers will enter into short-term spot contracts with prices no longer pegged to the crude oil price (or oil products). Such trends will largely reduce Gazprom's influence in foreign markets and may seriously cut the government resource rent. If extra profits and revenues from export duties drop to the point that they cannot provide the subsidy required for the domestic market, then both international and domestic pricing for Russian piped gas must be revised.

### **Long-term marginal costs**

A theoretical analysis of optimal domestic and foreign gas prices can be used for designing regulation and deregulation tools. Socially optimal domestic pricing, that is, the intersection of marginal cost curve and demand curve defined as first best, can be very difficult to achieve in practice

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<sup>12</sup> In 2014 Gazprom gas extraction amounted to 444 billion cubic meters., while its production capacities were about 610 billion cubic meters per year, 19 of May, 2015 <http://www.gazprom.ru/f/posts/19/451903/2015-05-19-verbatim-press-conference-ru.pdf>

because in this case, a subsidy to a producer should be implemented. Figure 1 shows that the first-best point in the domestic market is below average costs ( $AC$  curve); hence, gas suppliers sustain losses.

Under these conditions, a second-best (intersection of demand curve and average costs curve) is searched for, and it is assumed that deadweight losses (triangle  $A$  in Figure 1) are less than net administration costs of producer subsidization. It is critical to clarify what long-term marginal costs are in theory. Generally, long-term marginal costs are defined as total cost growth induced by production growth by one unit in the long term (i.e., when all production factors are flexible and the producer uses the best available technology). In other words, this is the minimum cost change associated with a change in output by one unit.<sup>13</sup> However, the definition of “production growth by one unit in the long term” becomes ambiguous with step functions, which are frequently used for gas-sector costs (a stair-step pattern of costs). Many textbooks contain a construction of a step marginal cost curve, including an argument that the first-best point is the intersection of marginal costs and demand, that is, demand and constant marginal costs for producer marginal capacity.

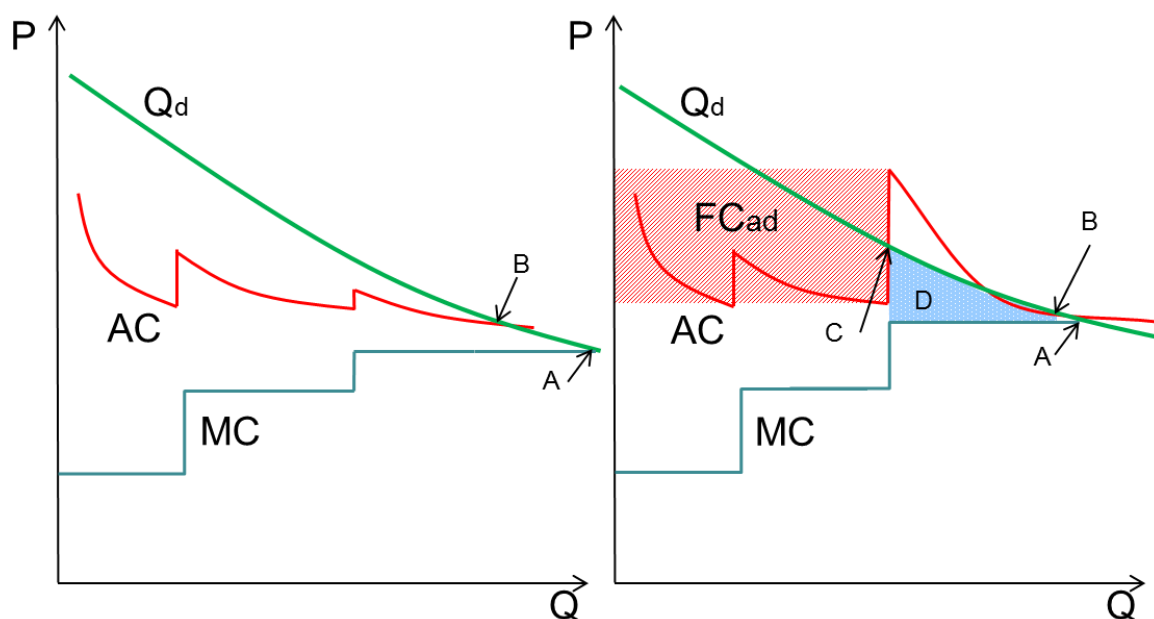
A stair-step pattern of costs usually occurs when production of an additional unit of commodity is associated with other than previous marginal costs; that is, production capacity must be discretely built up to boost production.

*Fig. 1*

### **Step marginal and corresponding average cost function**

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<sup>13</sup> Varian, 1992.



For instance, point *A* is better than point *B* (see the left-hand section in Figure 2) because it is socially optimal for the marginal producer capacity to produce some additional goods to meet demand (when marginal producer capacity was already installed). Formally speaking, the move from point *B* to point *A* is Pareto improvement, and there is no Pareto improvement for point *A*; hence, point *A* shows the Pareto-optimal output and price. Net social losses will be minimized due to moving from point *B* to point *A*.

However, in the case of a step marginal cost function, a deviation from this classical argumentation is possible. As mentioned above, long-term marginal costs are those that a producer incurs during a period long after the decisions on market entry and the first capacity installation were made; a producer does not count fixed costs, instead of being guided only by variable costs. The long-term perspective and discrete aspects of step costs play a key role because, occasionally, additional costs to install new capacity should be considered concerning a change in output by one unit. In other words, in some cases, production of an additional unit of output in the long term requires building a new power plant, launching a new greenfield gas project or expanding a gas transmission network.

In a graphic example (see the right-hand section in Figure 2), a potential social benefit from the marginal capacity operation (trapezoid *D*) thus should be compared with additional (installation) costs for the marginal capacity to operate (rectangle *FCad*). These additional variable costs may

substantially exceed a potential social benefit, in which case the installing marginal capacity would be inefficient. Strictly speaking, in this case, a socially optimal combination of output and price will be shown at point C rather than at point A (a marginal costs curve intersects a demand curve) or B (an average costs curve intersects a demand curve).

Although using the definition of long-term marginal costs, which is understood as “change in costs by one output unit in the long term”, it is implicitly assumed that fixed costs are no longer relevant; all of them were incurred by the producer in the past and have no effect on output decisions in the future. However, if construction of a factory, a new power plant or launching a new oil-and-gas greenfield project is on the agenda to increase output, then additional variable costs that don’t depend on output should be considered both in the context of social welfare and commercial incentives. Long-term marginal costs are an important theoretical framework that is worth using to provide a strong line of reasoning. In practice, however, to make the best decision in terms of social welfare it may be interpreted as marginal costs at marginal capacity (if an extra unit is supplied from/using installed facilities) or average costs at marginal capacity (if marginal capacity must be installed).<sup>14</sup>

The evolution of global pricing models for natural gas is a vivid illustration of changed definitions in the context of increasing supply by launching a greenfield project, constructing new cross-border gas pipelines and setting up new LNG capacity (see ECS, 2007). In such a case, the socially optimal price would be long-term average costs. However, as soon as all field and infrastructure development investments have been made, exactly long-term marginal costs become socially desirable (see ECS, 2007, Augustine et al, 2006, Percebois, 2008, Zajdler, 2012).

Theoretically, at least three conclusions can be made from this analysis. First, approaches to and models of domestic pricing should be publically discussed. In a situation in which no reliable information about marginal or average costs is available to industry regulators, producers or

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<sup>14</sup> Moving from point C to point A under free-market conditions should provide benefits not only for the society as a whole but also for the individual producer. In practice, this will require introduction of a mechanism designed to redistribute potential consumer surplus for the benefit of producers.

consumers, any “manual” decision (e.g., administratively enforced cuts on Gazprom’s costs, a unifying tax on mineral resource extraction between Gazprom and independent producers or export monopoly rejection) can usually break up a status quo and have unexpected results. Any mistake might cost too much for a capital-intensive and socially relevant industry.

Second, the concept of socially optimal domestic pricing (price equals long-term marginal costs), which implies social welfare maximization (consumer surplus plus producer profits), should become a basis for discussing domestic pricing mechanisms. In practice, however, some amendments could be made because long-term marginal costs cannot be precisely calculated; gas producers cannot be subsidized directly and cannot operate in developing financial markets when the price equals marginal or even average costs.

Third, with piped-gas market segmentation and no infrastructural constraints, domestic and foreign pricing should not be linked using specific formulas. In the current situation, when there is no independent gas cross-country trader, the pricing linkage will have a negative effect on social welfare, whereas the issue of distributing profits earned in foreign markets between producers and the state, in other words, the presence or absence of gas export duty, should be addressed separately from pricing mechanisms.

### **About cross-subsidization**

The variety of cross-subsidization schemes is often explained as some sort of “special care” for selected categories of consumers and as necessary to achieve desired social consequences.<sup>15</sup> Leaving aside the discussion on whether such subsidization is worthwhile, we will focus on its economic aspects. Note that no consensus has yet been reached on the term “cross-subsidization”. In some cases, cross-subsidization is defined as simply setting different prices for different consumers

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<sup>15</sup> Even assuming that both the marginal costs of existing capacity and the average costs of promising capacity can be statistically assessed with sufficient precision.

when those prices do not reflect an associated difference in costs, whereas in other cases, cross-subsidization refers to a price being set below average or even at marginal cost for some category of consumers. We hereafter will use the classical theoretical definition: the financing of an unprofitable part of an enterprise by a more profitable part (Rutherford, 1992). With this definition, neither the exact prices set nor the definition of profitability matter. What matters is that the profits of one activity are used to finance the costs of another activity.

Thus, the salient feature of cross-subsidization existence is commodity sales to a specific group of consumers at a price below the marginal costs of production, transportation and distribution.<sup>16</sup> Hence, the costs of doing business with some consumers are covered with the revenue earned from doing business with other consumers. Note that a situation with prices varying for different consumers will not necessarily be referred to as cross-subsidization, but can rather simply be a form of price discrimination. In this case, prices may not be equal for any consumer, but all are above marginal/average costs; thus, the producer obtains different margins from different consumers. In other words, statistical discrepancy between prices for different consumer groups cannot be explicitly interpreted as a cross-subsidization scheme; to reach such a conclusion, additional producer economics study is needed.

In the Russian gas industry, at least three cross-subsidy schemes are used: domestic inter-regional cross-subsidization, cross-subsidization between industrial and residential consumers and cross-subsidization between foreign and domestic markets.<sup>17</sup> Inter-regional cross-subsidization implies setting prices in Russian regions considering the transportation distance from production to consumption areas, but the closer a region is located to the production area, the higher is the rate of return to calculate the regulated regional price. The rate of return decreases as the transportation distance increases, and it becomes negative in the farthest supply regions. That is, with an inter-regional cross-subsidization scheme, gas prices are flattened (price differentiation is substantially

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<sup>16</sup> Hancher, Buendia Sierra, 1998.

<sup>17</sup> In practice, however, a weaker criterion based on average rather than marginal cost may be used.



lower than it would be if based on real marginal or average supply costs), which can be interpreted as some sort of economically committed (for industrial consumers) and socially acceptable (for residents) public contract. This situation leads to inefficient investment decisions in terms of both gas saving and location of gas-intensive production facilities.

The second scheme of cross-subsidization allows covering costs of gas supplies to residential consumers from the profits of supplies to industrial ones. Note that gas supplies to residential consumers are often costly, first, because of the gas distribution component. At the same time, the price difference for residential and industrial consumers does not reflect the marginal or average difference in distribution costs; both regulated price levels for these two groups are often comparable.

The third scheme of cross-subsidization in Russia implies that profits earned in foreign markets become a source of investment in domestic infrastructure development and compensate Gazprom for insufficient domestic profit.

Fig. 3

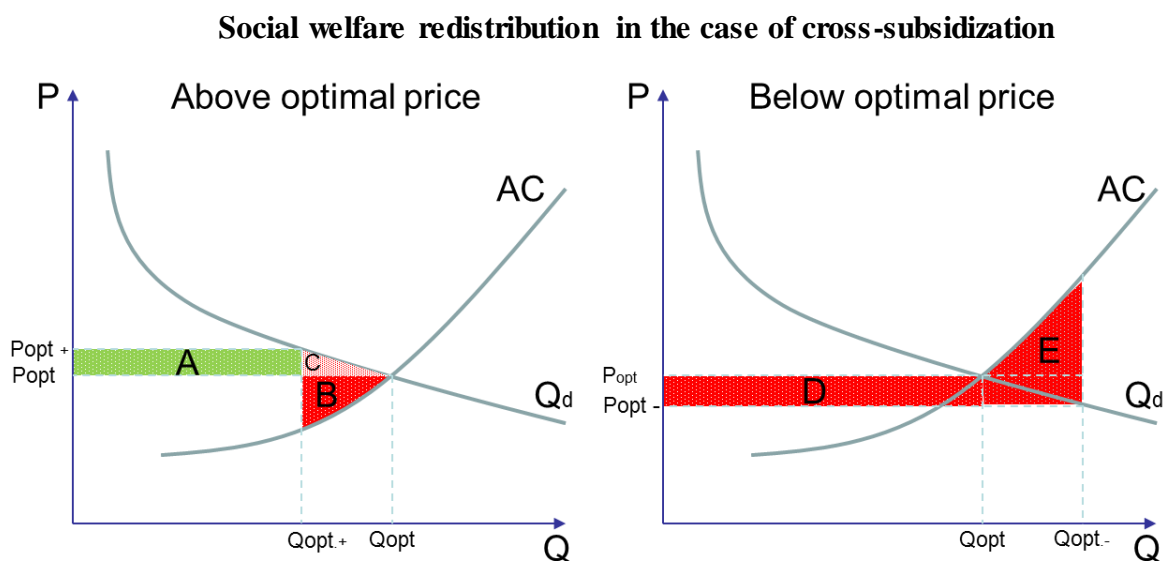


Figure 3 shows how social welfare changes when an inter-regional cross-subsidization scheme is used. With a price level set below the optimal one (see the left-hand section in Figure 3), social welfare losses appear because some consumers cannot afford goods at this price (C area) and no producer produces them (B area). In another region with prices set below the optimal ones (the right-hand section in the Figure), social welfare losses appear because producers must produce at a loss and consumers demand too much. Such a redistribution of welfare from one donor region to another recipient region results in distorted pricing signals directly affecting consumers' behavior. In regions with prices below optimal ones, consumers have no incentives to make their gas consumption efficient, and natural gas producers in such regions have no incentives to maintain and develop the infrastructure because this investment is certainly unprofitable. Thus cross-subsidization resulting in redistribution of social welfare between regions reduces rather than increases consumer and producer aggregate gains; the distortion in price incentives leads to direct losses of allocative efficiency, namely, non-optimal gas consumption – regions consume above/below the optimum compared with competitive conditions.

Subsidization of Russian gas consumers through low gas prices is highly questionable because low prices impede efficient usage and hamper economic modernization processes. The rationale of this approach to industrial consumers is often stated as the fact that cheap energy allows the production of cheap commodities, that is, these goods will be competitive in the global market. This statement is correct as long as two conditions are met: a) using cheap energy, producers maintain low prices for their goods rather than cover their own inefficiency and/or earn excessive profits and b) no products similar to domestic ones can be bought in the international market using revenues from gas sales. In other words, only in some cases will the price subsidy for input energy, which reduces producer costs compared with their long-term marginal level, result in lower prices (particularly for traded commodities), that is, will achieve the intended purpose.

For residential consumers, price subsidization is mostly a social benefit; however, although such a decision might be made, it would not be a good solution at all. The economy-wide performance

of cross-subsidization is generally poor because in practice, subsidies are used to cover inefficiency. When discussing domestic and foreign pricing for Russian gas, one should seek not to implement cross-subsidization schemes. If the price for a commodity does not reflect its supply cost, activity is stimulated in which market cost inputs exceed the value of the final products. This would be a classic instance of negative value added production. In particular, a similar situation is observed in Russia's oil refining sector (see Idrisov, Sinehnikov-Murylev, 2011).

### **Domestic market development uncertainties**

The changes being observed in natural gas markets – both domestic and international ones – indicate that Russian natural gas pricing must be revised. Domestically, the most important cause is that existing pricing practice *de facto* leads to the absence of competition between Gazprom and independent companies. Regulations designed to dampen growth in domestic prices, which are regionally set using cross-subsidization schemes, now instead keep these prices from declining. More precisely, mixed incentives occur because domestic gas prices do not reflect production and transportation costs; the regulation keeps prices from falling in regions located close to fields, in which prices are above the actual average costs, whereas the same regulation keeps prices from rising in remote regions, in which regulated prices are below the actual costs.

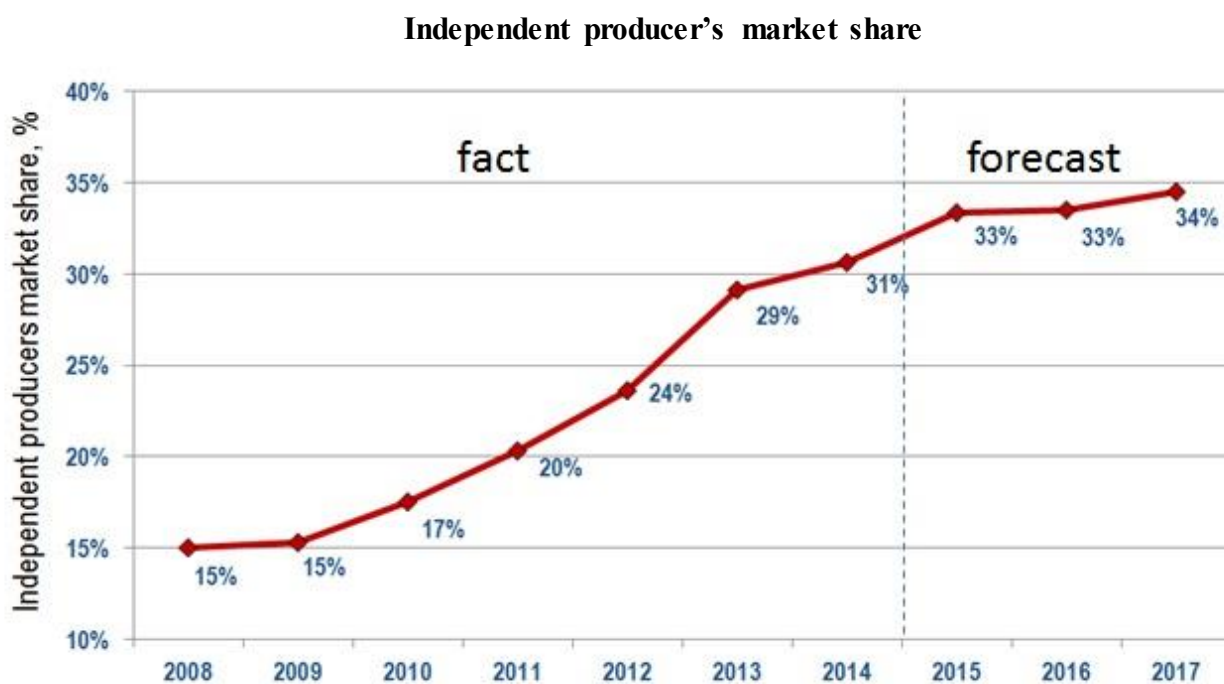
According to microeconomic considerations, new producers if possible will enter a market in which prices are above average costs. This is exactly what independent producers are doing now in Russia.<sup>18</sup> In fact, with the opportunity to offer a price below the regulated level, they are gradually conquering the donor regions for the Gazprom cross-subsidization practice. As a result, every year the share of Gazprom supply to the donor regions falls, whereas in recipient regions it grows. This situation actually erodes the existing model of domestic inter-regional cross-subsidization.

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<sup>18</sup> An interview of Head of Russia's Federal Tariff Service S. Novikov to Interfax IA. [www.fstrf.ru/press/interview/23](http://www.fstrf.ru/press/interview/23).

Exacerbating the situation is the fact that consumers in subsidized regions have explicit price incentives to consume more gas (whereas new consumers have incentives to establish their production in recipient regions) because of its relatively low price. Thus, several serious issues must be addressed to change domestic pricing drastically.

Fig. 4



Source: OAO Gazprom, [www.gaidarforum.ru/files/Den\\_2.\\_Vasili\\_Smirnov..pptx](http://www.gaidarforum.ru/files/Den_2._Vasili_Smirnov..pptx)

**Piped gas supplies in regions in 2014**

	<b>ОАО «Газпром»</b>	<b>ОАО «Novatek»</b>	<b>ОАО «Rosneft»</b>
<b>High-profit regions</b>	<b>3%</b>	<b>63%</b>	<b>79%</b>
Average-profit regions	51%	33%	7%
Low-profit regions	41%	3%	14%
Negative-profit regions	5%	-	-

Source: OAO Gazprom, [www.gaidarforum.ru/files/Den\\_2.\\_Vasilii\\_Smirnov..pptx](http://www.gaidarforum.ru/files/Den_2._Vasilii_Smirnov..pptx)

As long as domestic pricing policy is not revised, Gazprom's profit will decline due to the loss of consumers in profit-making regions. Thus, the pricing agenda to be addressed by policy makers already consists of the following. First, to control Gazprom's profit loss in donor regions, it appears that Gazprom should be given an opportunity to implement a soft pricing policy to decrease prices for major and reliable consumers. On the one hand, such a solution will impose competition on independent producers and allow some time to reconsider cross-subsidization performance. On the other hand, it will limit the rapid development and the regulated price discount practice of independent producers that has resulted from a lower tax on mineral resource extraction.

Second, all forms of domestic cross-subsidization practice should be gradually reduced. In other words, domestic prices of gas must reflect actual costs (marginal or average to be discussed), and if a public contract function in gas supplies remains in place, it should play a minor role in pricing. In our opinion, the presence or absence of any cross-subsidization scheme is a political rather than an economic decision.

On the one hand, gradual demolition of the cross-subsidization practice would be a clear price signal to consumers and would indicate the need to modernize inefficient production. On the other hand, quick demolition would be an unexpected price shock for most industries. At the same time, economic modernization of Russian industries is closely related to not only physical facility renovation but also their geographical reallocation; in the absence of inter-regional cross-subsidization, it is profitable to locate gas-intensive production facilities closer to gas fields rather than closer to final products sales or labor markets. Essentially, inter-regional cross-subsidization has resulted in not only technological but also geographical inefficiency of gas consumption for a long time.

Gazprom's reliability system functions (e.g., supplier of last resort and default supplier) in all regions (even in those in which there are no Gazprom customers) and for all consumers (even with significant payment delays) should be eliminated. In our view, these responsibilities should be shared with all suppliers in a given region, whereas Gazprom and independent companies should be entitled to suspend gas supplies to consumers (including for residential use) with large unpaid invoices. It is also important to further simplify the procedure for granting access to pipelines for independent producers and unify transportation tariffs among Gazprom's subsidiaries and those independent producers.

The export-pricing model must be reformed else Gazprom will gradually lose the European market because of the price differences in long-term piped-gas contracts and spot or LNG contracts.<sup>19</sup> The situation is further aggravated by the full implementation of the EU Third Energy Package and by a few global gas traders (suppliers of LNG to the North American, European and Asian markets) emerging simultaneously. This will reduce Gazprom's bargaining power and might force some European countries not to prolong the practice of pegging terms to the crude basket price. The fact

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<sup>19</sup> Vedomosti. 2012. December 13. [www.vedomosti.ru/opinion/news/7132131/novatek](http://www.vedomosti.ru/opinion/news/7132131/novatek). Moreover in the last trials on access to the Unified gas supply system state usually takes the side of independent producers (Henderson, 2013). This leads to the fact that Gazprom and independent producers, as a rule, agree on the access issues before the trials, so nowadays independent producers get access to the pipe much easier than 5-10 years ago

that Gazprom has experienced declining share in the European market is already being accompanied by the launching of revisions to pricing mechanisms in some export contracts.<sup>20</sup>

Foreign pricing policy should be changed to keep maximum resource rent and not to lose the European market. It is worthwhile to minimize the cross-subsidization of the domestic market by means of the international market, even as a source of financing investment for domestic infrastructure. This will make the domestic gas market more economically healthy and bring it up to the structure prevailing in developed countries.

### **3 RESULTS**

#### **Russia's gas-market development options**

To assess the possible effects on the Russian economy, assume that domestic gas pricing will be developed from among the following options: netback parity, welfare optimal but regulated pricing and competitive pricing.

##### *Option I. Netback parity prices*

Main assumptions:

– The institutional framework of Russia's domestic market remains unchanged in the short and mid-term. Independent natural gas producers keep increasing their supplies to donor regions, and Gazprom keeps following inter-regional cross-subsidization practices and transfer pricing for Gazprom subsidiaries.

– Domestic regulated prices are raised to netback parity with European ones.

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<sup>20</sup> Quarterly Report on European Gas Markets. Vol. 6, Issue 2 / European Commission, 2013.

- Core gas-consuming industries are under rapid modernization because of gas price increases.

As a result, based on our estimates, domestic gas price will increase by approximately 200%.<sup>21</sup> However, with the cross-subsidization practices remaining in place, domestic prices will not reflect actual costs, and their regional differentiation will be the same as currently, i.e., +/-30% of the average country level.

The only policy instrument needed to realize this option is the 2007 decision to restore netback parity price, which was scheduled to occur beginning in 2015. With regulated domestic prices being set twice a year, their volatility would be sufficiently low.

### *Option II. Welfare optimal but regulated prices*

Main assumptions:

- Domestic prices remain regulated, but they are set to maximize consumer surplus and producer profit (welfare optimal level) rather than reflect cost-plus or a netback parity level with inter-regional cross-subsidization amendments, which implies that prices are set at the level of long-term marginal costs (equals the average cost of marginal capacity).
- Cross-subsidization practice is declining; inter-regional cross-subsidization is cancelled; however, other schemes remain in use.
- Gas transportation tariffs for Gazprom (including its subsidiaries) and independent producers are unified; Gazprom transportation subsidiaries improve their performance efficiency and modernize infrastructure (transportation efficiency program is developed).

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<sup>21</sup>



– Gazprom performance efficiency has been markedly improved and operating costs optimized; Gazprom corporate framework is seriously redeveloped to be a competitive market entity rather than the “ministry of gas industry”.

As a result, the domestic gas price will increase by an average of 40%;<sup>22</sup> however, because of the declining practice of inter-regional cross-subsidization, wholesale prices in each region on average will reflect the actual level of long-term marginal costs, and their regional differentiation will increase to a level of +/-40% of the country average.

The main policy instruments to follow this option are changing approaches to domestic pricing and regulation practice. A qualitative switch to a new price regulation implies a smooth region-specific gas price growth, whereas incentive pricing-practices, cost control and transparency cost programs of natural gas producers are implied at the national level. Structural measures to improve efficiency of natural monopoly entities (in terms of competitive services as gas production, and natural monopoly services as transportation and distribution) are listed below.

1. Change returns on the investment component in gas prices and transportation tariffs (removing the flattened fixed costs component): pricing/tariffing should be based on actual average costs of marginal capacity and regulated rate of return. The investment component in gas prices or in transportation tariffs should only reflect the costs of raised capital to install marginal capacity for the given consumers and capital infrastructure amortization.

2. Implement operational cost optimization program: special audit procedures (public price and technological audit providing a multiple-choice approach to infrastructure development), comparative monitoring and standardization of costs and information transparency standards for companies whose prices of services are regulated, are introduced.

3. Develop unified rules for competitive procurement of all, including financial, goods and services, in natural monopoly entities and companies with state participation.

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<sup>22</sup> Domestic price becomes equal to the Gazprom export price at the German border less customs duty and transportation costs. Calculations are based on data available on the official websites of OAO Gazprom, the Federal Tariff Service of Russia and the Bank of Russia.

4. Develop a consumer-oriented transparency standard for natural monopoly entities: at minimum, develop rules for mandatory information disclosure about availability of pipeline connections, state of the piped-gas transportation system and quality of services.

5. Introduce incentive pricing for natural monopoly entities, allowing them to share with consumers the benefits from enhanced efficiency as long as the service quality requirements are met; introduce a benchmark pricing practice at the regional level.

*Option III. Competitive prices: long-term contracts and exchange-based practice*

This option assumes a substantial expansion of domestic competition, institutional and fiscal reforms not to discriminate against any producer in terms of doing business (first, access to pipelines and tax rates) and corporate reform in OAO Gazprom and its subsidiaries. These changes will expose profit and loss activities to be optimized and will force consumers' incentives toward gas saving.

The domestic pricing mechanism may be interpreted simplistically as a two-mode operation

- a) some piped gas for industrial and residential use (mandatory) is contracted on a long-term basis;
- b) some piped gas is traded on an exchange-based principle (e.g., gas exchange, e-trading platform and gas hubs). In this case, an independent gas-market regulation body may set an obligatory share of total gas production that all producers must sell in an exchange-based regime. The institutional role of exchange-based gas-trading operators is to provide a supply-demand balance (at various Unified gas supply system points) and set a market price on gas. At the same time, the tariff for transportation/distribution services may be regulated as other natural monopolies (cost plus, return on investment or other approach).

To prevent a possible domestic gas shortage due to a more profitable foreign supply, the regulatory body may define an "exploration + export" license for certain new gas fields (for example which have separate infrastructure for export) which implies an option to sell extracted gas to an export operator or directly to the foreign consumers. An operator that has secured a monopoly on

piped export (to maximize social welfare) purchases gas from export-licensed fields under long-term contracts with prices pegged to average costs.

There is no doubt that the above interaction scheme among producers, consumers, transportation/distribution operators, gas-market regulation body, exchange-based gas-trading operators and export operator is not unreasonable and definitely must be further considered by industry professionals. Importantly, implementation of this option should lead to a significant expansion of market pricing mechanisms in the domestic market.

According to our calculations, domestic gas wholesale price will increase by an average of 30%<sup>23</sup> and the practice of cross-subsidization will be reduced due to an enhanced role of market-driven pricing. Regional price differentiation will be approximately +/-40% of the country average level, whereas the nature of exchange-based pricing will imply high seasonal volatility. Nevertheless, because a significant share will take long-term direct contracts, volatility will not be excessive across the country as a whole.

From a theoretical point of view, the policy instruments needed to realize this option are, in our opinion, largely transparent but, of course, are much more complicated in practice. First, it is hardly possible to switch from the current situation to Option III because doing so would cause significant uncertainty and price changes. Pushing up prices with a fast rejection of cross-subsidization practices might produce a price shock effect on consumers and have a severe negative effect on industry dynamics in general. Therefore, it is advisable to move to Option III after the institutional redesigning provided in Option II; the most significant price disproportions will be eliminated through a regulated “grouping”. Thus, Option III implies the following structural measures in addition to Option II:

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<sup>23</sup> This growth implies that the cost of capital components is in the price structure. The model calculations are based on data released by the Federal Statistic Service (Rosstat), the Federal Tariff Service of Russia and OAO Gazprom’s financial statements.

– create legislative and institutional framework for the modernization of extraction, refining, transportation and storage and hence eliminate price disproportions that lead to excess energy consumption in the Russian economy;

– develop fiscal regulation in the gas industry to raise the tax on mineral resource extraction (first for independent producers), which will converge the tax burden between oil and gas sectors, to maximize gas rent and keep high revenues for the state budget;

– introduce a practice of open and fair competition between all natural gas producers based on the development of a contract framework of sales via long-term and exchange-based contracts, establishing independent regional trading platforms (with physical supplies in the Unified gas supply system, UGSS, nodes);

– design an efficient mechanism for transportation/distribution services regulation.

The assumptions and consequences of the three proposed options are summarized in the table below.

Table 1

**Key features of possible consequences for domestic gas pricing**

Assumptions	Option I: netback parity prices	Option II: Welfare optimal but regulated prices	Option III: long-term contracts and exchange-based practice
No cross-subsidization between near and far regions	–	+	+
No cross-subsidization between the domestic and foreign market	–	only in returns on investment component	only in returns on investment component
No cross-subsidization between industrial and residential consumers	–	–	+
Gazprom corporate and gas institutional reform	–	+	+
Fiscal regulation reform	–	–	+
Exchange-based practice development	–	–	+
Government-regulated domestic prices	+	+	contract design only
<b>Key effects</b>			
Average level of wholesale prices	+200%	+40%	+30%
Regional price differentiation	Low	Average	Average
Price volatility	Low	No volatility	Average

OAO Gazprom's profitability	Substantial improvement	Insignificant improvement	At average level in the economy
Independent natural gas producers' profitability	Substantial improvement	Insignificant improvement	At average level in the economy
Gas consumer economics	Very strong incentives for modernization	Strong incentives for modernization	Strong incentives for modernization
Macro effects: short-term impacts	CPI: +4.4 p.p. GDP: -4.0 p.p.	CPI: +0.88 p.p. GDP: -0.8% p.p.	CPI: +0.66 p.p. GDP: -0.6 p.p.

## 4 DISCUSSION

As seen from Options II and III, with the most intense institutional reforms, the smallest increase (+30–40%) in domestic prices is expected. Although both options result in substantial regional price differentiation because of cross-subsidization practice removal, they are preferred to Option I because domestic and foreign pricing is not linked with any formulas. In other words, Options II and III avoid domestic overpricing that would result in a direct transfer of price signals from external markets. It is important to note the substantial difference between options II and III. Both of them assume domestic prices at long-term marginal costs but Option II by the regulation rather than Option III by the long-term contracts and exchange-based pricing. In our opinion, taking into account the discussed nuances in the long-term marginal costs section (the difference between marginal and average costs at a marginal capacity) if a new capacity have to be installed it is Option III more preferable. Option II may lead to the conscious regulation mistakes or deliberate manipulation of the regulated price by the momentary policy reasons.

Note a potential effect on natural gas producer economics. If a netback parity level is set (Option I), independent producers benefit most from a substantial price rise, expanded operations with Gazprom donor regions (in which high prices are set for cross-subsidization purposes) and the absence of a unifying tax on mineral resource extraction between them and Gazprom. In Option II, the economics of independent producers also improve, compared with the current situation, because of increasing prices and retaining a tax advantage for Gazprom. For Gazprom, the situation is somewhat different. Option II provides for the highest increase in profitability, through higher prices

and elimination of cross-subsidization practice. Option I allows for improved economic performance because of large price growth; however, a competition with independent producers with their better tax conditions reduces the positive effect. Finally, Option III leads to profits for both Gazprom and independent producers that are compatible with the economic average due to exchange-based pricing development.

According to our estimates, with the cross-subsidization practice being retained, most consumers develop no strong incentives for gas saving because they receive distorted market signals, whereas such incentives occur as cross-subsidization is eliminated during institutional reforms. Our main interest is assessing the macroeconomic effect on GDP and CPI. Our estimates of short-run CPI and GDP elasticity with respect to gas prices<sup>24</sup> are 0.022 and -0.02, respectively. In other words, in the short term, a country-average gas price increase by 10% would lead to an additional CPI growth of 0.22 and a slowdown in GDP growth of 0.2 percent points.

The regional aspect of a potential domestic price increase is essential indeed because if subsidization is eliminated, in currently subsidy-recipient regions, even at a 30-percent country-average price growth, the regional effect will be multiplied. Based on our estimates, increasing domestic gas prices less than 10% per year will not lead to output decreases in any industry in any region due to the smooth restructuring of the economy. Thus, the transition to Option II or III will be relatively painless for aggregate output within a period of 5–7 years, given regional specifics. Notice that our estimates consider only the technological inefficiency of gas consumption; the geographic insufficiency should be studied additionally using more-sophisticated methods designed to assess gains and losses of reallocating gas-intensive facilities or creating new ones in the close-to-fields regions.

## **5 CONCLUSIONS AND POLICY IMPLICATIONS**

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<sup>24</sup> The estimates are similar in general to those performed for Option II, but additionally assumed significant competition and market pricing methods development

The presented theoretical considerations and actual practices lead to the conclusion that there is a long-felt need for change in domestic gas pricing. Gas overconsumption, cross-subsidization and Gazprom's loss of profit-making regions erode Russian gas economics, clearly justifying pricing mechanism transformation. With low domestic gas prices leading to inefficient consumption distorted by cross-subsidizing schemes causing regional prices to send wrong signals to industries, Gazprom still looks like a ministry of a gas industry (with commercial inflexibility and lack of transparency) rather than an enterprise – all of this provides a strong reason to think about changing the institutional situation. The committed earlier transition to netback parity pricing is no option for Russia's economy in terms of aggregate welfare, particularly given that it restricts even low economic growth through very high gas prices.

In our view, the most attractive option fits best the interests of Russian society (consumers, producers and the state) and provides for a smooth transition (within a period of 3–5 years) to pricing Option II, followed by a transition (within a period of 5–7 years) to Option III. The short-run negative effects of higher gas prices on GDP and CPI will be reduced in the mid-term by improved efficiency performance in gas-consuming industries.

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