International Institutions and Russian Gas Exports to Western Europe

Franz Hubert
Humboldt–Universität zu Berlin
hubert@wiwi.hu-berlin.de

Svetlana Ikonnikova
Higher School of Economics, Moscow
sveticon@web.de

Abstract

When the Soviet Union collapsed, Russian gas exports through transit countries where left in an institutional vacuum. No accepted legal system for the negotiation and enforcement of contracts was put into place. This paper analyzes how the lack of international institutions distorted investment into the pipeline system supplying Russian natural gas to Western Europe. We use a two stage multilateral bargaining game among heterogenous players, some lacking the ability to make long–term commitments. At the first stage the players negotiate access rights and invest in transport capacity. At the second stage investment cost are sunk, capacities are given and the players bargain about the sharing of rents from previous investment. Our qualitative and quantitative analysis predicts excess capacities in equilibrium and explains overinvestment on some tracks and underinvestment on others as an attempt to create countervailing power in the absence of alternative means to protect property rights.

Keywords: Hold-up, Multilateral Bargaining, Strategic Investment, Vertical Supply Chain, Recontracting
JEL class.: L95, L14, C71

1 Introduction

For the delivery to the lucrative markets in Western Europe, Russia depends on transit through newly independent states, such as Ukraine, Poland, Belorussia and others. All countries feature a strong state involvement in the gas industry. But up till now, no generally accepted legal framework exists for carrying out negotiations or settling disputes. Hence, the negotiations take place among sovereign states, without the possibility to resort to higher institutions in case of conflict.

Production and transportation of natural gas are characterized by large initial investment in specialized facilities with a long lifetime and low operating cost. Most of the expenditures on project identification, investment planning and construction are sunk. Once installed, capacities generate large quasi–rents, hence, it is essential whether the players can credibly commit to share these rents ex-ante in long term contracts or whether they will recontract after completion of the investment. In case of recontracting, a player's bargaining power is increased if he is in de facto control of transport capacity. In principle, he may pay up–front for the increased bargaining power at the investment stage. However, large up–front payments may not be feasible. For example Ukraine's access to international capital markets is restricted for quite the same reasons which raise doubts about its commitment in the gas market. The cash–strapped country cannot afford to compensate others up–front for future gains in bargaining power. Hence, lack of international contract enforcement, financial constraints and limited commitment may result in the classic hold–up problem.

Recent investments in the Eurasian transmission network as well as plans for further pipeline connections reflect to a large extent Russia's desire to strengthen its bargaining position vis-á-vis transit countries — in particular Ukraine, which inherited all export pipelines for Russian gas from Soviet times. In the nineties the renovation and upgrading of the southern system through Ukraine would have been the cheapest way to satisfy a sluggish demand. But for strategic reasons Russia chose a much more expensive option, the new Yamal pipeline through Belorussia and Poland with a capacity which up till now is not fully used. In view of the recent disputes with Belorussia, it is getting more likely, that plans for a further development of Yamal will be dropped in favou of an even more expensive offshore pipeline through the Baltic Sea. This distortion of investment imposes cost on the countries which can be attributed the the deficiencies of the institutional environment at the international level.

In this paper we summarize results from previous research (Hubert & Ikonnikova (2004)), which uses a two stage multilateral bargaining game among the members of the gas supply chain to analyze strategic investment. At the first stage the players form strategic coalitions, by negotiating contracts over access rights and jointly investing in transport capacities. At the second stage investment cost are sunk, capacities are given and the players bargain about the sharing of the rents from previous investment in the framework of the previously established access regime. We assume that contracts at the second stage are complete with respect to prices and quantities, as is required for the efficient use of the existing network. As the number of players is small and the basic technologies of gas transport are well–known, the members of the Eurasian supply chain are assumed to bargain efficiently and to make the best use of the existing transmission network. Since

Russia is an essential player we can represent the game in characteristic form and use the Shapley value to calculate the sharing of profits in the supply chain. The relative size of payoffs indicates the strength of the players' positions. Hence, we derive the bargaining power of the parties in a very natural way from the features of the transmission grid.

As to investment at the first stage, however, it is not always possible to write credible long–term contracts to prevent recontracting. Otherwise, bargaining over rents would nev er occur because everything would be stipulated in advance. We assume that players are heterogeneous in the sense, that some can credibly commit to comply with obligations — even if there are no institutions to enforce contracts. While others will recontract if it is in their interest to do so. Russia, for example, has worked hard to establish a reputation for reliability in this market for almost three decades. It would loose this reputation if it defaulted on its obligations to achieve short run gains. Others are heading towards EU integration, making it essential to be accepted as a reliable partner in business matters. Ukraine, in contrast, has no record of honoring long–term agreements. As a newly founded state it would have to forgo short–term benefits now in order to build up a reputation for reliability in long–term business relationships what pays off only in the distant future. Given the fragility of its political system, it appears highly unlikely that other players would trust any long–term commitment at face value.

Our analysis shows that investment into links for which access rights cannot be assured is decreased, while investment into alternative but more costly options is increased in order to create countervailing power. We are also able to estimate the magnitudes of these effects and the resulting aggregate welfare loss.

In section 2 we briefly describe the most important features of the Eurasian Supply Chain for natural gas. In section 3 we sketch the theoretical approach and report some results. In section 4 we derive numerical results using estimations for demand for natural gas and cost of supply. Section 5 concludes.

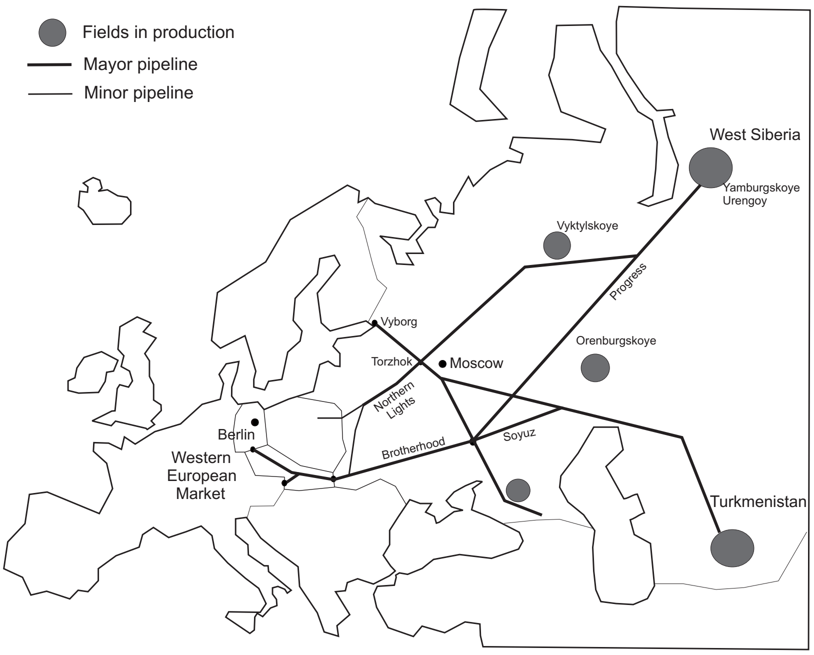
2 The Supply Chain for Eurasian Gas

When the Soviet Union collapsed, Russia found itself in the uncomfortable position that its only supply route to Western Europe passed through three newly independent states Ukraine, Slovakia and the Czech Republic.[1] Looking westward towards integration with the EU, Slovakia and the Czech Republic wanted to be seen as reliable partners who honor existing obligations. Emerging from former Czechoslovakia, these countries also benefited from old contracts with the Soviet Union, which entitled them to large deliveries of gas at low cost, thus smoothing the transition to market pricing. Both countries have been quick to privatize their transmission pipelines. After yielding control over pipelines to international energy companies, these countries did not use their strategic location as a bargaining chip in negotiations with Russia over gas prices.

Relations between Russia and Ukraine, in contrast, turned sour. In principle, Russia pays for transmission by supplying gas to Ukraine, approximately 26-30 bcm/a (plus an additional 6-7

[1] For a detailed account of the ensuing conflicts and Russia's strategy see Stern (1999).

Figure 1: Eurasian Transport Network in Soviet Times



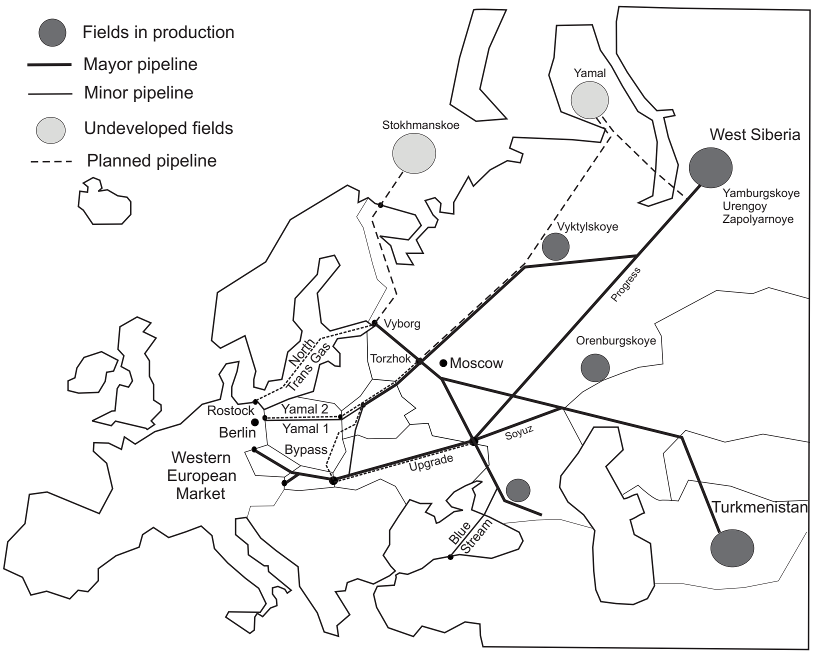
bcm/a compressor gas). This payment in kind is sometimes translated into a 'transit fee' by assigning a price to the gas, but as these fees are not actually paid, they have little relevance. The conflicts are essentially over the compensation for additional 20 bcm/a, which Ukraine dearly needs but can hardly pay for. While Russia claims average European prices Ukraine concedes only half of that. But even the lower figures have not fully been paid. Ukraine is also blamed for syphoning off gas in excess to what it acknowledges officially, a claim which has some credibility, although it is strongly denied by Ukraine.

As a result of non–payments and alleged 'steeling' debts accumulated. As the dispute about non–payments for gas deliveries and accumulated debt dragged on, threats of disconnections and counter-threats of diversion have been issued. While Ukraine's excessive withdrawals interrupted gas supplies to Western Europe only occasionally and for brief periods, these episodes highlightened Russia's vulnerability and threatened to taint its reputation as a secure supplier of gas. In marked contrast to Turkmenistan, which was quick to stop deliveries when Ukraine failed to pay, Russia has little choice but to supply whatever Ukraine takes or to default on its obligations to western importers.[2]

Meanwhile, due to aging compressors, lack of maintenance and underinvestment, the capacity of the transmission network, in Ukraine of which more than 70 bcm/a are used for export to Western Europe, is in decline. By replacing old compressors the transmission capacity could easily be

[2]For further details see Stern (1999), Opitz, Hirschhausen (2000), Kalinichenko (2002).

Figure 2: Current Eurasian Transport Network



increased by 15 bcm/a. Existing pipelines in Ukraine have the potential for another 35 bcm/a, which would require complementary investment in Slovakia and Czech Republic. In addition, there are even plans to invest up to $ 15 bn in order to expand the system (Russian Economic Society (2002)). However, so far progress on this issue is slow, mainly because of investors distrust Ukraine to protect their property rights.

Eager to diversify its export channels, Russia turned to Belorussia and Poland. With Poland a joint stock company, EuroPolGaz, was established in which Polish PGNiG and Russian Gazprom hold equal shares. Initially, Belorussia' ties with Russia remained very close and in 1993 the two countries agreed on a long–term solution for gas transit. Gazprom leased the assets needed to build an export pipeline for 99 years and Belorussian BelTransGaz was to operate the system under a service contract. This enabled Gazprom to revive ambitious plans to develop the huge Yamal field and connect it to western markets with a new massive northern route.[3] As demand was weak during the nineties and the cost of developing Yamal turned out to be very high, the project was gradually scaled down. Eventually, attention focussed entirely on the export line, now

[3] As a direct threat to Ukraine's strategic position, plans have been drawn up for a twin–pipeline with a capacity of 60 bcm/a running north–south through Belorussia, Poland and Slovakia. Since this link can also be seen as part of the larger Yamal project it is sometimes referred to as Yamal 2. Since current planning makes no provisions for additional investment towards customers in the West and fields in the east it would mainly serve to bypass Ukraine. As is shown in Hubert & Ikonnikova (2003), however, the strategic value of the *Bypass* is almost negligible, hence it will be ignored in the following analysis.

commonly referred to as *Yamal 1*, which is built 'from the market to the field'.[4] The first pipeline completed in the late nineties has a potential capacity of 28 bcm/a. Though, given the lack of demand, compressors have been installed only to support 18 bcm/a. In this sense, the project with an estimated cost of $ 3.4 bn is still running far below full capacity. At major river–crossings a second pipeline has been laid, which would double the capacity up to 56 bcm/a if completed at an estimated cost of $ 2.5 bn. In view of recent conflicts, however, it is doubtful whether the second pipeline will ever be completed.

Shortly after the first gas was pumped disputes with Belorussia emerged. Like Ukraine, Belorussia seeks large price concessions for its gas imports using the leverage it gains from its strategic position in the export chain. In April 2002 a deal was reached under which Gazprom had to deliver 10 bcm/a at a discount price. In return it was promised a controlling stake in BelTransGaz which manages Gazprom's pipelines in Belorussia in exchange for accumulated debts. However, the second part of the deal, which would have given Gazprom a much more effective control over its export routes, never materialized and Gazprom stopped delivering gas end of 2003. For a couple of weeks independent suppliers filled in the gap, then Belorussia started to divert gas from the export pipeline. Gazprom responded by shutting down gas supplies altogether, cutting off not only Belorussia but also Kaliningrad, Poland and Germany. The immediate crisis was resolved within days avoiding any serious impact on costumers in the West. Formally, Belorussia bowed to Russian demands for higher prices, but given its record of non–payments one may doubt whether a long term solution has been achieved.

Increasing frustration with the demands of transit countries led Russia to push again for direct, though much more costly, offshore options. Early plans for a Baltic Ring, connecting Russia through Finland and Sweden to Germany have been abandoned in favor of a direct offshore connection between Vybourg (Russia) and Germany, the *North Trans Gas*. The project is currently shared by Gazprom and Finnish Fortum, but German Ruhrgas and Wintershall are invited to join. Planned capacities range from 18 to 30 bcm/a with cost in the range of $ 1.7 - 3.8 bn. Commercially, the link would look more attractive if connected to Stockman, a large field which has yet to be developed. As with Yamal, the prospects for the development of Stockman are vague at best. And even if the field is developed, it might be cheaper to liquify the gas, since the cost of an onshore pipeline appear to be very high due to difficult terrain on the Kola peninsula. Nevertheless, Russia keeps pushing North Trans Gas in international negotiations, while western partners are dragging their feet due to high cost.[5]

We draw three major conclusions from this short review of the post–Soviet developments in the Eurasian gas network. First, despite of sharp conflicts among some countries over the distribution of rents from past investment, the transport of natural gas has not been interrupted for any

[4]Recently, the high cost of developing new fields such as Yamal or Stockman and the availability of low cost alternatives in old Siberian fields and Turkmenistan casted doubt on the economic viability of grand scale projects in the near future (Stern (1995)). Meanwhile, gas for *Yamal 1* is supplied from fields in the Siberian Basin including newly opened Zapolyarnoye.

[5]In the south, a similar project, the *Blue Stream* pipeline through the Black Sea to Turkey, started operations in 2002 under a long–term agreement with Turkish Botag. It substitutes for pipelines running through Ukraine, Moldavia, Romania and Bulgaria, were conflicts have been similar to those on the East–West routes.

relevant period of time. In this sense bargaining over rents is efficient. Second, recent investment into transport capacity has not been efficient. For strategic reasons, a new expansive and oversized pipeline has been built, while the players failed to renovate and upgrade existing connections. Apparently, this inefficiency is related to our third conclusion, that some players, notably Ukraine and perhaps recently Belorussia, are not able to make long term commitments. In contrast, Czech Republic, Slovakia, Russia, and Poland can be considered as players who are perceived by others as being trustworthy in long term contracts.

3 The Analytical Approach

To economize on space we give only a very short non-technical outline of the approach. The interested reader is referred to Hubert & Ikonnikova (2004) for an extensive analysis.

We analyze strategic investment as a two stage game. First, the players (countries) negotiate access rights and invest in transport capacities. At this stage the players are heterogenous as to their ability to enter long term contracts. Then at the production stage investment cost are sunk, capacities are given and the players bargain about the sharing of the rents from previous investment. Negotiations take place in the framework of the access regime agreed upon at the first stage. We solve this second stage using the Shapley value — a well known solution concept for multilateral bargaining.

At the first stage, the players form strategic coalitions. Since, by assumption, some of them are unable to make long term commitments, we cannot expect the Grand Coalition of all players to form. Instead, we have to account for the possibility that cooperation will remain incomplete. Only players which can make credible long term commitments are able to form coalitions with the aim to maximize their joint payoff. A strategic coalition does not imply that countries merge. They will remain independent actors at the second stage. They merely have the opportunity to cooperate and we explicitly analyze which form of cooperation is best for them.

We consider four independent players Russia, Poland, Belorussia, and Ukraine denoted R,P,B, and U, respectively. The situation we have in mind is the state of the system in the early nineties, that is before Yamal had been built. As to the ability of the players to commit, we look at two different cases. In the first we assume that only Ukraine lacks this ability. This captures reasonable expectations in the early nineties, when Russia and Belorussia apparently found a long–term solution for the transit problem. However, their agreements unravelled later on and in the second variant we assume that Belorussia, as the Ukraine, can neither make long–term commitments nor pay up–front. Investment possibilities exist along three tracks: Nort-Trans-Gas, Yamal, and Southern System through Ukraine, denoted (n, y, s).

Using insights from Segal (2003) into the impact of contracts on Shapley bargaining we can show that:

1. If Belorussia can commit, then a coalition of R, P, B will form which grants Russia access to the sections in Poland and Belorussia.

2. If Belorussia cannot commit, then the natural access regime in which every player has unrestricted rights over his sections will not be changed.

These results do not depend on the capacities. In our special context we can first determine the optimal access regime and then analyze the incentives for investment into enlargement of capacities. Here we find two effects. All pipelines for which complete access cannot be ensured ex ante suffer from the 'hold-up' problem in recontracting. This decreases the incentives to invest. The countries anticipate that they have to share the returns of their investment with others at the recontracting stage. The incentives to invest in links which can be controlled, however, are much increased. Not only that marginal returns on investment receive full weight, the alternative capacities which are not controlled by a coalition are strongly discounted in the evaluation. This increases the incentives to invest well above what would prevail in the first best situation. Depending on capacity cost we may obtain (i) underinvestment, (ii) distorted investment in the sense that more costly options are chosen, (iii) overinvestment, in the sense that total capacity is larger than under full commitment, and even (iv) excess capacity which will be left idle at the production stage. In order to establish the magnitudes of these effects we have calibrate the model with real data.

4 Quantitative Analysis

For the quantitative analysis we have to make assumptions on demand for Russian natural gas, on production cost and on the cost of transport along the different routes.

The demand for Russian natural gas depends on preferences for natural gas, the prices of substitutes such as oil and gas from competitors, preferences for diversifying energy supply, the cost of transporting gas within Western Europe etc. Unfortunately, data on gas prices and consumption in Western Europe are too poor to allow an econometric estimation of this function. The bulk of the deliveries is under a small number of long–term contracts, the details of which are not made public. Available data on gas prices largely reflect oil–price movements. They are of little relevance for the buyers tied up in these agreements. Moreover, many of the important structural determinants of demand for Russian gas, such as environmental concerns, preferences for diversity of supplies, turbine technology etc., are changing fast. For simplicity, we take a linear specification of the demand function and make 'plausible assumptions' for the parameters based on figures on marginal cost of alternative suppliers provided in Observatoire Mediterraneen de L'Energie (2002). An intercept of 145 \$/tcm and slope of -0.3 for the inverse demand yield a price slightly below current levels.

The production costs of Russian gas tend to increase as production from old low cost fields declines and new, more expensive fields have to be developed. Since this happens faster as production levels increase, annualized marginal production costs increase. Production depends to a substantial extent on sunk investment (exploration, wells, pipelines) in old fields, hence, there is room for argument what exactly should be counted as cost. For simplicity, we assume a linear marginal cost schedule $mc_o(x) = 11+0.4x$ for a quantity x at the Russian export node. The intercept $mc_o(0) = 11$ \$/tcm reflects marginal production cost from old fields such as Urengoy or Zapolyarnoye. For

Table 1: Transport Links for Russian Gas

	capacity[a]	investment[b]	length[c]	capacity cost[d]	marginal cost[e] at 0/90 bcm/a
	[bcm/a]	[bn$]	[km]	[$/tcm/100km]	[$/tcm]
Southern track, existing	70^f	sunk	2000	sunk	14 / 54
(Russia, Ukraine)	A system of parallel pipelines, gas storages, compressors, mostly depreciated and in poor state of repair.				
Southern track, upgrade	15	0.75	2000	0.39	22 / 59
(Russia, Ukraine)	Mostly repairs and replacement of compressor power.				
Yamal*	28	3.4	1600	1.35	35 / 73
(Russia, Poland, Belorussia)	Frankfurt/O — Torzhok. As the pipeline is already finished, this is an ex–ante perspective of the project.				
North Trans Gas*	30	4.2	1600	1.80	50 / 89
(Russia)	Greifswald (Germany) — Vyborg (Russia) 1200 km offshore, 400 km onshore to Torzhok. Originally planned for 18 bcm/a.				

*As these are new projects which take considerable time to complete, investment cost are increased by 15% to account for interest during construction.

[a] As existing or typically planned.

[b] Estimated investment cost obtained from various sources.

[c] From point of delivery in Western Europe to the main Russian export node of the grid.

[d] Annualized investment cost with an expected lifetime of 25 years and interest rate for real investment of 15% (excluding interest during construction).

[e] Total marginal cost of gas supply at the border of Western Europe: $mc(0, y)$ / $mc(90, y)$, with y and c as given in the previous two columns and $m = 0.1$ $/tcm/100km for onshore pipelines ($m = 0.2$ for offshore pipes), and $g = 0.0025$ /100km ($g = 0.005$ /100km for the old system in Ukraine and for offshore pipelines).

[f] Only capacity used for export to Western Europe.

the current export level we obtain $mc_o(90) = 47$ $/tcm which corresponds well to estimated development cost for the Yamal field and the current price for imports from Turkmenistan.[6]

The total cost of transporting gas can be decomposed into capacity cost and operating cost, which consists of management and maintenance cost and energy cost. For simplicity we ignore scale effects and assume proportional cost in the following calculation. As we express all figures on an annual basis, we obtain pipeline specific, annualized cost of capacity from the initial investment cost I as $c = r \cdot I/(1 - (1 + r)^{-T})$, where T denotes the expected lifetime of the facilities and r the interest rate for real investment. The costs of management and maintenance m depend on the pipeline (old, offshore) and are assumed to be proportional in distance and quantity. Energy cost, are calculated from the fraction of gas used for pressurizing. As it is shown in the last column of table 1 marginal supply costs are the lowest for the existing capacities along the Southern track and the highest for the planned offshore pipeline through the Baltic Sea.

Based on these assumptions on functional forms and parameters we can solve numerically for the equilibria of the various coalition structures. It turns out that in equilibrium there would be no investment in links without assured access. In other words, investment in Yamal requires a coalition of all three participants Russia, Poland, and Belorussia (R,P,B for short). If this coalition

[6] For long-term perspectives of Russian gas production and its cost see Stern (1995) and Observatoire Mediterraneen de L'Energie (2002).

Table 2: Equilibrium Capacities, Quantities, Aggregate Profits

	investment (n, y, s) bcm/a	capacity [used] bcm/a	Price $/tcm	operating profit (rent) $ mln/a	investment cost $ mln/a	net profit $ mln/a
First best	$\{0, 0, 15\}$	85 [85]	119	5789	116	5673
Coalition: R, P, B	$\{0, 60, 0\}$	130 [90]	118	5826	1296	4530
No Cooperation	$\{54, 0, 0\}$	124 [88]	118	5755	1345	4410

fails to form, there will be only investment in North-Trans-Gas. Investment into unsecured links occurs only out of equilibrium. For example, if R did not invest in NTG, P and B would invest small amounts into Yamal even if they were not in a coalition with Russia and access were not be assured. Similarly, Ukraine would invest into upgrading the old system on its own, if there were no investment on Yamal or NTG. However, these constellations do not constitute equilibria given the strong strategic incentive to invest in Yamal, respectively NTG. Table 2 gives the results in terms of aggregate figures and table 3 in terms of the shares of the various players.

We start with the reference case, in which all players could commit and optimize investment to maximize industry profits. In this case investment would have been concentrated on the upgrading of the old system in the south, increasing the capacity from 70 bcm/a to 85 bcm/a. This capacity would have been fully used, yielding an annual operating profit (rent) of $ 5.789 bn and a net profit of $ 5.673 bn. However, this outcome is not feasible given the lack of international enforcement mechansims and our assumption about Ukraine.

For the coalition of Russia, Poland and Belorussia we obtain a different picture. Rather than using the cheapest option in the south, new investment is strategically directed into a large Yamal project with 60 bcm/a capacity. Together with the already existing 70 bcm/a in the South, total capacity reaches 130 bcm/a of which staggering 40 bcm/a are subsequently left idle. Sales of 90 bcm/a generate an operating profit of $ 5.826 bn, which is reduced by high investment cost to a net profit of only $ 4.530 bn. In order to calculate how Russia, Belorussia and Poland share the joint profit we have to look at the game in which every player acts on its own. In equilibrium there is no investment in Yamal but a very large investment of 54 bcm/a in North–Trans–Gas resulting in a total capacity of 124 bcm/a at the production stage.

The figures for profit sharing explain why countervailing power is so important in this transmission system. If Russia had naively followed the first best investment strategy, paying for the upgrade in Ukraine up–front and then had been forced to bargain over rents, its bargaining power would have been poor. Rents would have been shared equally between Russia and Ukraine because both players are necessary for the operating of the system. The resulting net–profit of $ 2.779 bn for Russia compares to $ 4.073 bn which Russia can achieve by forming a coalition with Poland and Belorussia and spending $ 1.296 bn annualized investment cost on Yamal. Russia increases its net–profit, mainly by decreasing Ukraine's share. While total profit declines by app. $ 1.143 bn due to inefficient investment, Russia increases its profits by roughly the same amount. With a $

Table 3: Shares of Net–Profits and Rents

variant	Russia		Poland	Belorussia	Ukraine
	(rent)	profit	profit	profit	rent
	$ mln/a	$ mln/a	$ mln/a	$ mln/a	$ mln/a
Grand Coalition		4847	27	27	773
First best investment but recontracting	(2895)	2779	0	0	2895
Coalition: R, P, B		4073	106	106	245
No Cooperation	(5312)	3967	0	0	443

0.106 bn each, the shares of Poland and Belorussia are modest, because Russia's outside option, North–Trans–Gas, ensures already a net–profit of $ 3.967 bn. However, all countries together lost more than $ 1 bn annually (out of which Russia bears about $ 0.8 bn) through the inability to make long term commitments. This figure indicates that Russia suffers more than anyone else from the lack of a mutually accepted international arbitration system.

While Russia's policy in the early nineties was clearly based on the assumption that its strong leverage over Belorussia will prevent recontracting, recent developments have shattered this hope. Instead Belorussia proved to be as independent and prone to recontracting as Ukraine. With hindsight, Yamal turned out to be a mistake. As our calculations show the optimal strategy would have been to establish a secured market access with a large capacity of 56 bcm/a.

As to the magnitude, these figures appear to overestimate the distortion if compared to real world investment. While investment in the south was in fact close to zero, the Yamal pipelines has only half of the capacity we predict. This discrepancy between the predictions of the model and reality is not to be resolved by reasonable changes in the numerical values of our parameters. Our model tends to exaggerate the strategic aspect by assuming that investment can take place only once. In reality bargaining over rents is not only influenced by capacities established in the past but also by options to extend the system in the future (Hubert & Ikonnikova (2003)). This will reduce the need to actually spend money on capacities. It is worthwhile to recall that plans, feasibility studies and even some preparatory investment have been made for a capacity of 56 bcm/a along the Yamal track. Then pipelines with a capacity of 28 have been installed, but investment in compressors stopped short at 18 bcm/a. Given that pipelines are already in place, an increase of capacity by adding compressors is cheap and fast and everyone understands this possibility, hence there is no need to actually waste the money.

5 Conclusions

In this paper we derive the bargaining power of the different players of the supply chain for Russian gas endogenously from the architecture of the transmission system and its possible extensions by applying cooperative game theory for multilateral negotiations. As the number of players is small and the cost parameters of gas transport are well–known, we assume that the countries bargain efficiently and make the best use of the existing transmission network. This allows us to use the Shapley value to calculate the sharing of profits along the vertical supply chain.

However, in the case of pipelines much of the investment in transport infrastructure is sunk, and therefore prone to ex–post exploitation of quasi–rents. Since there is no international court system to enforce contracts between independent nations, long–term commitments can only be achieved between players who are sufficiently concerned about their reputation. If opportunistic renegotiation cannot be prevented, the well–known hold-up problem may lead to inefficient investment, even if the bargaining process itself is efficient. This means that at least some players may recontract in order to appropriate quasi rents from sunk investment. Since other players will anticipate recontracting, they may refuse to invest, or overinvest in alternative routes in order to create countervailing power.

Our qualitative and quantitative analysis show that in spite of large capacity cost, overinvestment and excess capacity are not a mere theoretical possibility in the Eurasian transport system for natural gas. Given the particular geography of this network, and the inability to make credible long term commitments or large up–front payments on part of Ukraine or Belorussia, there is in fact much to gain from creating countervailing power through excess capacity. Hence, in the absence of international institutions to enforce contracts between transit countries, overinvestment into new pipelines and underinvestment into existing ones result from rational strategic calculations.

6 References

Golombek, Rolf & Gjelsvik, Eystein & Rosendahl, Knut Einar (1995), Effect of liberalizing the natural gas markets in Western Europe, The Energy Journal Vol. 16(1).

Grais, Wafik & Zheng, Kangbin (1996), Strategic interdependence in European east-west gas trade: a hierarchical Stackelberg game approach, The Energy Journal Vol. 17(3).

Hubert, Franz & Ikonnikova, Svetlana (2003), Investment Options and Bargaining Power in the Eurasian Supply Chain for Natural Gas. Humboldt University, Discussion paper

Hubert, Franz & Ikonnikova, Svetlana (2004), Hold–Up, Multilateral Bargaining, and Strategic Investment: The Eurasian Supply Chain for Natural Gas, paper presented at the annual meeting of the European Economic Association

International Energy Agency (1994), Natural gas transportation. Organization and regulation

Kalinichenko, Natalia (2002), With blue gas, Itogi, Vol. 18(204).

Segal, Ilya (2003), Collusion, Exclusion, and Inculsion in Random-Order Bargaining, Review of Economic Studies, vol 70, 439-460

Opitz, Petra & von Hirschhausen, Christian(2000), Ukraine as the gas bridge to Europe? Economic and geopolitical considerations, Institute for Economic Research and Policy Consulting - IER, Working Paper.

Observatoire Mediterraneen de L'Energie (2002), Assessment of internal and external gas supply options for the EU, Executive Summary.

Oil, gas and coal supply outlook (1995), edition of the World Energy Outlook.

Russian Economic Society (2002), International gas consortium, Vestnik 43.

Stern, Jonathan P (2001), Traditionalists versus the new economy: competing agendas for European gas markets to 2020, The Royal Institute of International Affairs

Stern, Jonathan P (1995), The Russian gas bubble, The Royal Institute of International Affairs.

Stern, Jonathan P (1999), Soviet and Russian gas: The origins and evolution of Gazprom's export strategy, in: Mabro, Robert & Wybrew-Bond, Ian (ed.), Gas to Europe. The strategies of four major suppliers, Oxford University Press