On the economic impact of the gas pipeline project between Russia and Germany

Paper to be presented to the SCORUS conference
14-16 October 2008 in Shanghai/China
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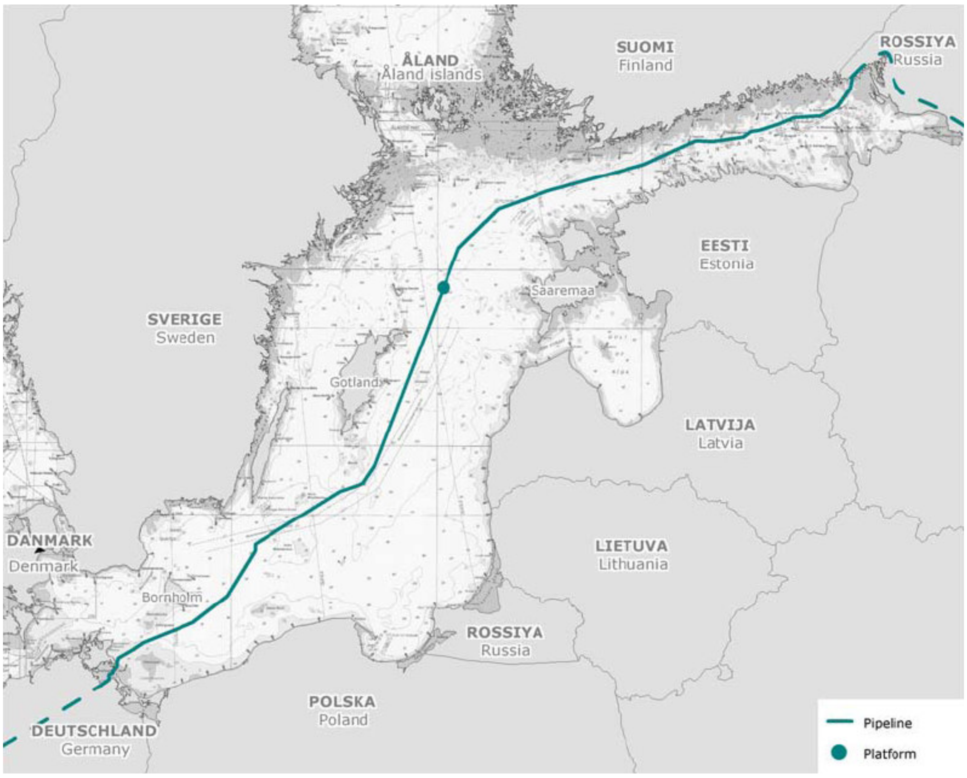
Remarks on the North European gas pipeline

The North European Pipeline mostly known as Nord Stream is one of the most discussed natural gas pipeline projects today. The realization of this project will make it possible to meet the increasing demand for gas in Europe, to raise the security of export supplies of Russian gas, and to reduce transmission costs.



A distinguishing feature of the North European gas pipeline is the absence of transit countries on its route. The 1200 km long off-shore pipeline will be stretched through the Baltic Sea bottom from Russian town Vyborg to Mecklenburg-Western Pomerania near Greifswald in Germany.

The Nord Stream project provides for the construction of 2 parallel lines, and a sea platform with total transport capacity of 55 billion cubic meters of natural gas per year, what ensures up to 25% of additional European gas-import needs by 2012. Two on-shore connections will complete the project and link the Nord Stream with the Unified Gas Supply System of Russia and European Gas Transmission System.

The project’s key importance was also confirmed by European Commission which in December 2000 declared it to be a part of the Trans-European Energy Network Guidelines (TEN-E).

For administration of the project Nord Stream AG was established with shares divided between OAO Gazprom (51%), Wintershall AG / BASF AG (24,5%), and E.ON Ruhrgas AG / E.ON AG (24,5%). The Netherlands company N.V. Nederlandse Gasunie will in the nearest future be also included into the joint venture, possessing 4,5% of shares.

Remarks on the approach

This paper focuses the impact of the investment to construct this gas pipeline, only. In order to analyze the impact of the North European pipeline project on the economies of Germany and Russia, the Leontief's Input-Output theory how it is reflected in empiric input-output tables of official statistics is used together with the Scenario technique of Future's Research.

Two scenarios were developed to give theoretically substantiated answers to the questions:

Scenario 1: What impact will the investment into the North European pipeline have on German economy in terms of production output and employment?

Scenario 2: What impact will the investment into the North European pipeline have on Russian economy in terms of production output and employment?

The theoretical framework makes use of the open ended and static Leontief-model. The term "static" means that we refer to statistical data of a certain year, only, and consider the impact of all investments in this period. The term "open ended" means that we look at the final demand as an exogenous given parameter. We consider the so-called equation of transactions of this Leontief-model which describes the flow of produced goods and services for intermediate use and final use, $X = AX + x$, where big X represents the vector of total production output of a domestic economy, where small x represents the vector of final demand/use for products and services of this domestic economy, where A represents the matrix of input coefficients, and where Ax represents the vector of intermediate use. In order to get a model for the economic changes caused by the Nord Stream gas pipeline project, the difference operator Δ is introduced symbolizing the change of the variables denoted on the right hand side, and is applied on both sides of the equation of transactions. Using the ceteris paribus condition of Alfred Marshall meaning that ΔA is not influenced by the change of final demand $\Delta \mathbf{x}$ caused by the investments for the Nord Stream project which are small compared with the entirety of investments of a full year hence $\Delta A = O$, and considering direct and indirect components of the intermediate use of total production output, separately, the estimation model is as follows:

Model equations

Δx	= given exogenous parameter
ΔX^{total}	$= (I-A)^{-1}\ \Delta x$
ΔX^{direct}	$= A\ \Delta x$
$\Delta X^{indirect}$	$= \Delta X^{total} - \Delta X^{direct} - \Delta x$
ΔE	$= D\ \Delta X$

Notations

Δx	change of final demand, vector
ΔX^{total}	change of total production output, vector
ΔX^{direct}	change of direct fraction of intermediate production output, vector
$\Delta X^{indirect}$	change of indirect fraction of intermediate production output, vector
ΔE	change of people employed, vector
D	reciprocal labour productivity coefficients, diagonal matrix
A	input coefficients, matrix
$(I-A)^{-1}$	Leontief Inverse, matrix

Statistical data

For Scenario 1 the calculations refer to the German Input-Output table for domestic production at work's prices of the year 1997 with 59 harmonized commodities, edited by Federal Statistical Office of Germany.

For Scenario 2 the calculations refer to the Russian Input-Output table of the year 2003 for domestic production with 22 commodities which is the latest one available, edited by the Information and Publishing Center Rosstat. This table is not harmonized and the data is not complete, what caused additional complexity in calculations.

Remarks on the execution

The big initial problem was the estimation of the cost data for the exogenous parameter Δx. Building of the off-shore part was at first estimated at least at 5 billion Euros. 30% of this amount is to be covered by equity contributions from the Nord Stream AG shareholders, and the remaining 70% is envisaged to be financed by banks and export credit agencies. The on-shore connections are to be financed by countries separately.

A high degree of financial data discrepancy caused several estimation problems and called for a number of assumptions. On the basis of information available in mass media (cursive written) cost parameters were estimated as follows:

Estimated costs of the North European pipeline construction

Part of the project	Construction costs		
	Billion €	%	Billion €
On-shore connection on the Russian territory	*4.5*	28	3.36
Nord Stream (off-shore pipeline Vyborg-Greifswald)	*5*	31	3.72
On-shore connection on the German territory	*6.6*	41	4.92
Total	16.1	100	*12.0*

Cursive figures: based on sources; right column: included estimations in absolute values

In order to distribute the Nord Stream investments between the two countries and corresponding input-output tables, several additional publications as well as official information issued by the involved companies was used.

The estimated investment amounts for each country were allocated to the different commodities, in order to define changes in the final demand explicitly.

Remarks on the results

The answer to the initial question of **Scenario 1** is:

If Nord Stream pipeline construction together with its on-shore connections causes the estimated increase in final demand for the commodity groups "Building construction" by about 3 Bio. Euro, "Machines and equipment" by 1.95 Bio. Euro, and "Metals and products of metal-working industry" by 0.5 Bio. Euro, on base of year 1997 this would have the following impact on the whole domestic economy in Germany:

The total production output will increase in Germany by 10 Bio. Euro. The economic multiplier of this investment is equal to 1.8. Taking into consideration the timeframe of five years for the construction, and not one year like in this model, and the fact, that labour productivity has apparently grown since 1997, the employment effect for Germany's domestic economy is below and may make up to 20,000 people employed per year. The following table shows a more detailed distribution on compressed commodity groups:

Scenario 1: Impact of Nord Stream investments on German economy

Compressed commodity groups[1]	Final demand, increase Δx Million €	Total production output, increase ΔX^{total} Million €	Employment, increase ΔE People
Agriculture / forestry / fishery	0	10	199
Mining / energy / water-supply	0	152	915
Products of chemical / oil and gas industries	0	634	4,633
Metals and products of metal-working industry	496	1,110	10,410
Machines and equipment	1,950	2,597	21,404
Products of light / timber and pulp / paper industries	0	215	1,885
Products of food and beverages / tobacco industries	0	8	59
Building construction	3,060	3,181	41,225
Trade and intermediation services / services of transport and communication	0	645	8,656
Financial intermediation services / insurance / housing and communal services	0	1,343	9,542
Health and social services / education	0	28	182
Public services / defense / social insurance / private households	0	87	1,538
Total	5,506	10,009	100,649

[1] The used input-output table of Germany of 1997 for domestic production at works prices includes 59 commodity groups

The answer to the initial question of **Scenario 2** is:

If Nord Stream pipeline construction together with its on-shore connections causes increase in final demand for the commodity groups "Building construction" by 4.9 Bio. Euro, and "Machines and equipment" by 1 Bio. Euro, on base of year 2003 this would have the following impact on the whole Russian domestic economy:

The total production output will increase by 9.6 Bio. Euro. The economic multiplier is equal to 1.63 and is predictably lower compared to the German one. The effect on Russian employment market shows a very positive tendency, but the received figures seemed to be too high, biased, and hence are not referred. In our opinion, the reason is not only the lower level of Russian labour productivity in comparison to Western Europe, but mainly the inconsistency of statistical data, which cannot be overcome at the moment.

The following table shows a more detailed distribution on compressed commodity groups.

Scenario 2: Impact of Nord Stream investments on Russian economy

Compressed commodity groups[2]	Final demand, increase Δx Million €	Total production output, increase ΔX^{total} Million €
Agriculture / forestry / fishery	0	15
Mining / energy / water-supply	0	291
Products of chemical / oil and gas industries	0	1,026
Metals and products of metal-working industry	0	647
Machines and equipment	996	1,495
Products of light / timber and pulp / paper industries	0	185
Products of food and beverages / tobacco industries	0	52
Building construction	4,910	4,415
Trade and intermediation services / services of transport and communication	0	1,263
Financial intermediation services / insurance / housing and communal services	0	110
Health and social services / education	0	57
Public services / defense / social insurance / private households	0	51
Total	5,906	9,607

[2] The used input-output table of Russian Statistical Office Goskomstat for 2003 (domestic production) includes 22 commodity groups.

Reference

Hanna Shcherbich. *On the economic impact of the pipeline project between Russia and Germany*. Master's thesis for the Degree of a Master of Arts International Economics at Berlin School of Economics. Tutor and main examiner: Helmut Maier; assistant examiner: Siegbert Preuß, Berlin 2007.