



Oslo Centre of Research on Environmentally friendly Energy

Russian natural gas exports to Europe

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the EU-Russia gas trade**

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Russian gas exports to Europe

- Disputes between Russia and Ukraine triggered Russia to build Nord Stream (non-transit to Germany) and launched South Stream (to Bulgaria)
- More conflicts may come – Ukraine, Belarus, Poland...
- Conflicts may trigger large effects:
 - 1/3 of natural gas imports to Europe delivered from Russia (direct and indirect)
 - 60 % of total Russian natural gas exports delivered to Europe
 - Mutual dependence: security of supply vs. security of demand
- Effects of Russia building pipes that avoid transit of natural gas to the EU
- EU import restrictions on natural gas imports for Russia
- Effects of Russia exporting more natural gas to Asia



Outline of talk

- Russian gas industry
 - characteristics and conflicts with foreign countries
- Scenarios: long-run effects
- Numerical energy market model
- Outcome from the scenarios



Fundamentals of Russian gas industry

- Soviet Union started to export to Western Europe in early 1970s
 - Extension of pipelines supplying Eastern Europe
 - Gas industry reflected the general centralized organizational structure
 - Distribution of gas reflect priorities of the centrally planed economy
 - Natural gas was heavily used in the power and heat sector
 - Low domestic consumer price of natural gas
- Gazprom was established in 1989
 - Inherited the Soviet unified gas supply system
 - Privatized in the early 1990s; extended its business activities to include distribution and export (in addition to extraction and transport)
 - The social contract: serve domestic consumption (social stability) versus sole export supplier



Natural gas prices in Russia

- 1990s: Gas prices are increased from a very low level
- A substantial share of consumers did not pay for their gas
 - 1995: 70 %, 2000: 40 %, 2002: 2%
- 2000: Gazprom argues for higher domestic prices based on conventional economic reasoning; needs money for investment
- 2007: Russian government supports an European net-back price
- 2016: Russian government announces slow increases in gas prices. Large clients are supposed to pay 70 % of European net back price by 2030

Year	Average consumer price USD/1000 m3	Net-back price USD/1000 m3
2003	24	
2007	44	145
2013	105	

Disputes - Ukraine

- When the Soviet Union dissolved, Ukraine became a transit country for Russian natural gas, and paid a lower price for natural gas than Western European countries
- The price was increased gradually
- 2006: Ukraine did not accept new terms. Russia accused Ukraine for stealing natural gas. Ukraine accepted new price formula. Western Europe was affected
- 2009: New conflict with Ukraine, and Western Europe was again affected
- 2014: Russia annexed Crimea. Ukraine was now in a position to import gas from European countries (Slovakia)
- Disputes between Russia and Ukraine triggered Russia to build Nord Stream (non-transit to Germany) and launched to build South Stream (to Bulgaria)



Disputes - Poland

- Relationship between Russia and Poland has historically been tense
- Poland opposed Nord Stream 1: Direct export to Europe using offshore pipes
- Polish nightmare: No imports to Poland from Russia without Western Europe being affected
- Low probability scenario (?)
 - May happen only if Russia has a conflict with Ukraine (?)
- What are the options for Poland?



Disputes - EU

- EU member states have been affected by the Russia-Ukraine disputes
- No direct dispute with the EU on natural gas
- Russia has also had a dispute with Belarus on the Yamal-Europe pipeline
- EU has reconsidered its dependency on Russian gas
 - West-Germany had a self-imposed rule-of-thumb of Russian gas import share of 30 % in the early 1980s (after some US pressure under Reagan)
- EU restriction on Russian gas imports gives an incentive to Russia to consider gas exports to Asia (Piped gas to China or LNG)



2020 main scenarios

Reference	
Turkish Stream (South Stream)	Same as Reference, but Turkish Stream is built
No transit	Same as Reference, but no export to or via Ukraine
Poland	Same as No transit, but no export from Russia via Belarus to Poland/EU-30
Import restrictions	Same as Reference, but EU import restrictions on Russian gas
China	Same as Reference, but Russian gas exports to China
Competitive export supply	Gazprom is not the sole export supplier of piped gas



Numerical model - LIBEMOD

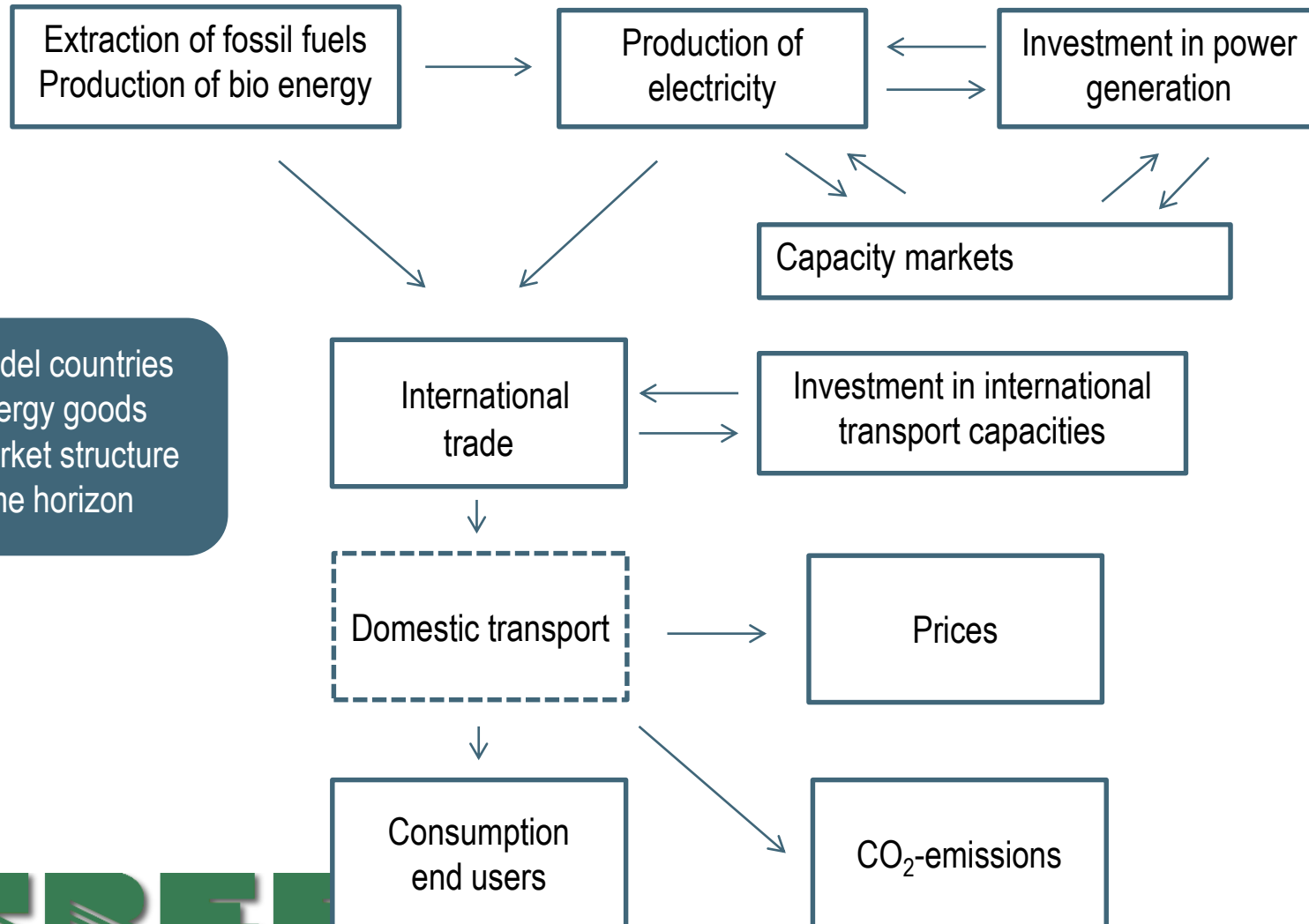


LIBEMOD

- Equilibrium model for energy markets in Europe 30, Russia and globally
- Determination of energy quantities and prices in European, Russian and global markets
 - Natural gas, oil, coal (3), bio energy (2), electricity (several technologies)
- Investment, extraction, production, trade, consumption of all goods
- Supply of natural gas
 - Extraction in several countries in Europe
 - Price sensitive exports of piped natural gas to Europe, partly from Russia
 - Price sensitive LNG exports to Europe
 - International gas trade requires pipes/LNG facilities (profitable investments are undertaken)
- Demand for natural gas: end-users and gas-power plants
- Static model – equilibrium for a future year



LIBEMOD



- Model countries
- Energy goods
- Market structure
- Time horizon

LIBEMOD

Modeling of Russia

- Russia is divided into three regions
- Regulated end-user prices of natural gas
 - Golombek et al. (2015) calibrated natural gas subsidies
 - Difference between (i) real cost of supply and (ii) price actually paid
 - Subsidies: 120 to 160 €/toe in 2009
- Russia has market power in the European gas market
 - Producer price in Europe corrected for Russian gas export tax = marginal cost + mark up + tax + costs of transport
 - Golombek et al. (2015): mark-up calibrated to 17 €/toe



Modeling of Russia, cont.

- Russian exports of natural gas to Europe
 - Direct: Germany (North Stream), Finland, Estonia, Lithuania
 - Indirect: through Ukraine and Belarus
- Exogenous investment in gas pipes between Russia and Europe/China
 - Scenarios



2020 scenarios



2020 Reference Scenarios

- Exogenous GDP growth rates between 2009 (calibration year) and 2020
- Pre-determined 2009 capacities (Pipes/lines, power plants). These are expanded in the EU if they are profitable
- 2009 Russian gas subsidies to large users reduced by 50 %
 - 2007: Reach European net-back gas price parity (Gazprom lobbying)
 - Current policy: Reach 70 % of European net-back gas price by 2030 for large users of natural gas
- EU 2020 climate and renewable energy targets are reached
 - Three instruments



2020 Reference Scenarios

	2009 calibration	2020 reference equilibrium
Natural gas consumption, Europe	409 Mtoe	346 Mtoe
Russian natural gas exports to Europe	102 Mtoe	77 Mtoe
End-user price of natural gas, Europe	504 €/toe	447 €/toe
End-user price of natural gas, Russia	43 €/toe	66 €/toe



End-user prices in 2020 reference scenario 2009 euro/toe

	EU-30	Russia
Marginal cost of extraction	144	74
Energy losses	2	1
Distribution costs	103	86
Energy taxes	36	0
Energy subsidies	0	-96
CO2-taxes	114	0
Value added tax (VAT)	49	1
End-user price (sum)	447	66



Turkish Stream

Gas pipeline from Russia through Turkey to Greece

- Russia launched South Stream (to Bulgaria) after first dispute with Ukraine
- EU feared Russia would gain market power in South-East Europe – demanded third-party access
- Putin canceled South Stream in 2014, but launched Turkish Stream
 - 57 Mtoe capacity from Russia to Turkey, 43 Mtoe capacity from Turkey to Greece
- Political tensions between Russia and Turkey – will Turkish Stream be built?



Turkish Stream - impacts

- Assume 14 Mtoe is exported to Turkey
 - Russian natural gas exports to Europe drops by 8 Mtoe relative to reference scenario (10 %)
 - NPV is negative!
- Russian rationalization of Turkish Stream
 - Prevent competing projects (from the Caspian region) for gas imports to Turkey
 - Russia may need more capacity if transit through Ukraine is not used



Effects of no Russian exports to Ukraine

- Crises in 2006, 2009 and 2014
- Russia built Nord Stream after 2006 crisis
- Scenario: No exports to and via Ukraine, but Russia can invest in gas pipes going directly to Europe (if profitable)
- Effects relative to the 2020 reference scenario
 - Total Russian gas exports drop by 1/3
 - About half of the reduction relates to gas consumed in Ukraine
 - No idle capacity to Europe in new equilibrium (No Russian pipe investment)
 - Natural gas consumption in Europe drops by 5 %
 - Natural gas consumption in Russia increases by 18 %
- No exports to and via Ukraine, **and** Turkish Stream is built
 - Natural gas consumption in Europe drops by 2 % relative to reference scenario



Polish nightmare

Restrictions on gas exports to Poland

Effects relative to no exports to and via Ukraine

- No gas exports from Belarus to Poland
 - Lithuania cannot increase its exports to Poland
- Trade between Poland and EU is possible
- Total Russian exports are reduced by 10 %
- Increase in LNG imports to Europe
- Not profitable to invest in more Nord Stream capacity
- Natural gas consumption in Europe is reduced by 1 %
- Natural gas consumption in Poland is reduced by 1 %
 - Poland imports more gas from Germany
 - Natural gas consumption in Poland is reduced by 3 % relative to reference scenario



EU import restrictions

- EU was affected by the Russia-Ukraine conflicts
- Increased concerns in the EU to become less vulnerable to Russian gas imports
- Scenario: Russian gas imports reduced by 50 percent relative to reference scenario
- Stronger effects than in the scenario with no transit through Ukraine (30 % import reduction)
- Lower imports increase EU gas prices, and trigger some more EU gas production and much more LNG-imports; moderate effect on EU gas consumption (5 % reduction)

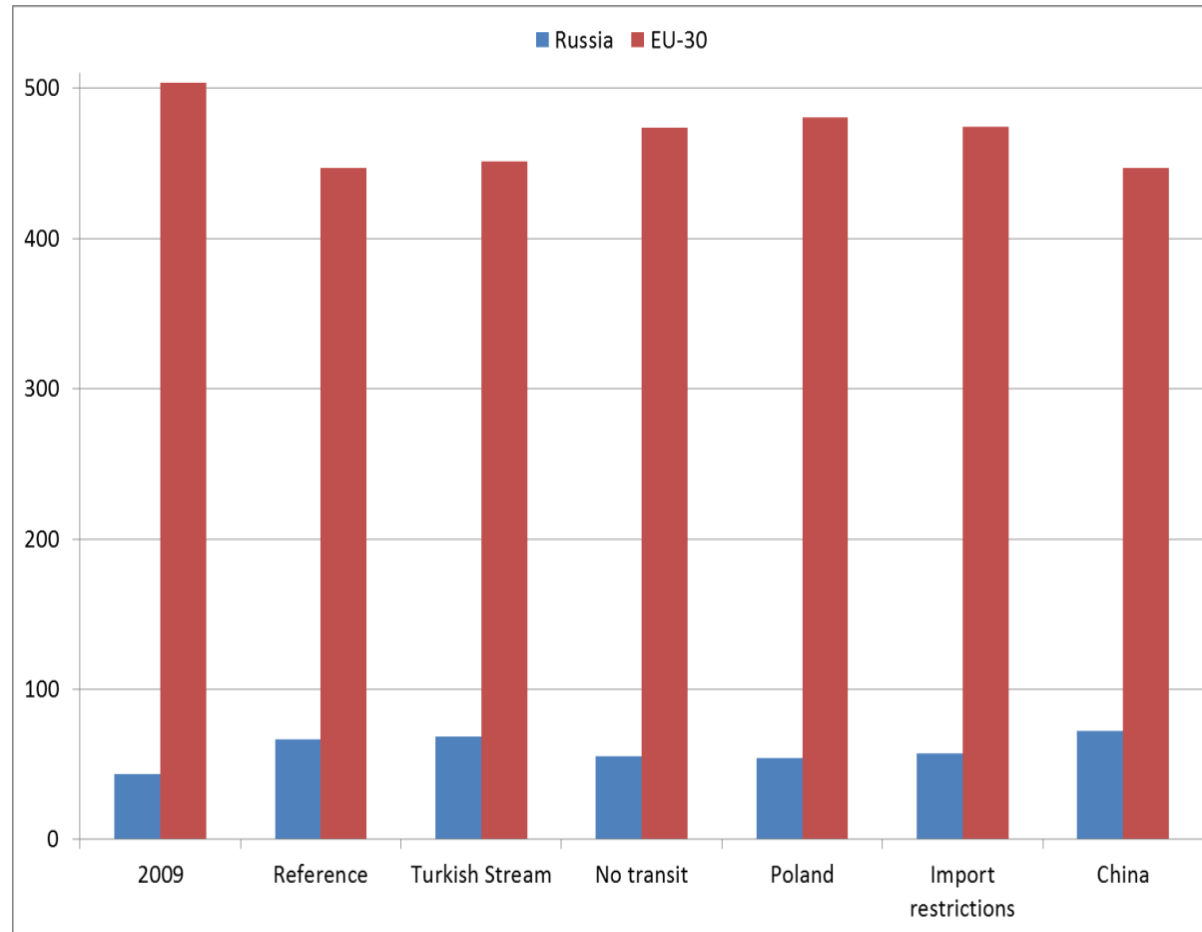


Russian gas exports to China

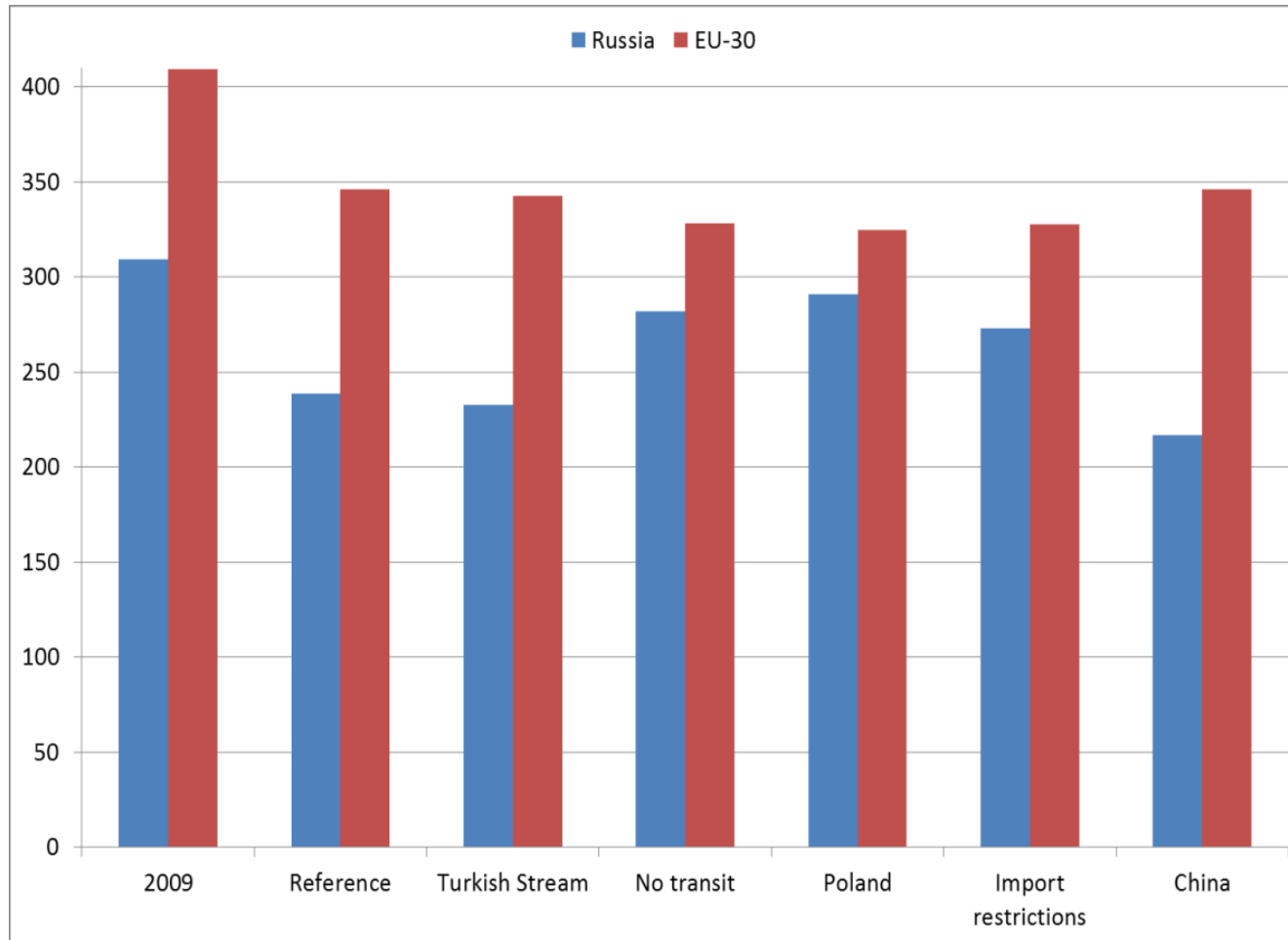
- Russia and China signed export agreement in 2014
 - Russia will deliver 30 Mtoe by 2030
- Disagreement over which Russian gas fields to extract from
 - Eastern vs. Western Siberia
- Effects of Russian gas exports of 30 Mtoe by 2020
 - Negligible effects in Europe
 - Robust finding wrt. which Russian fields to extract from



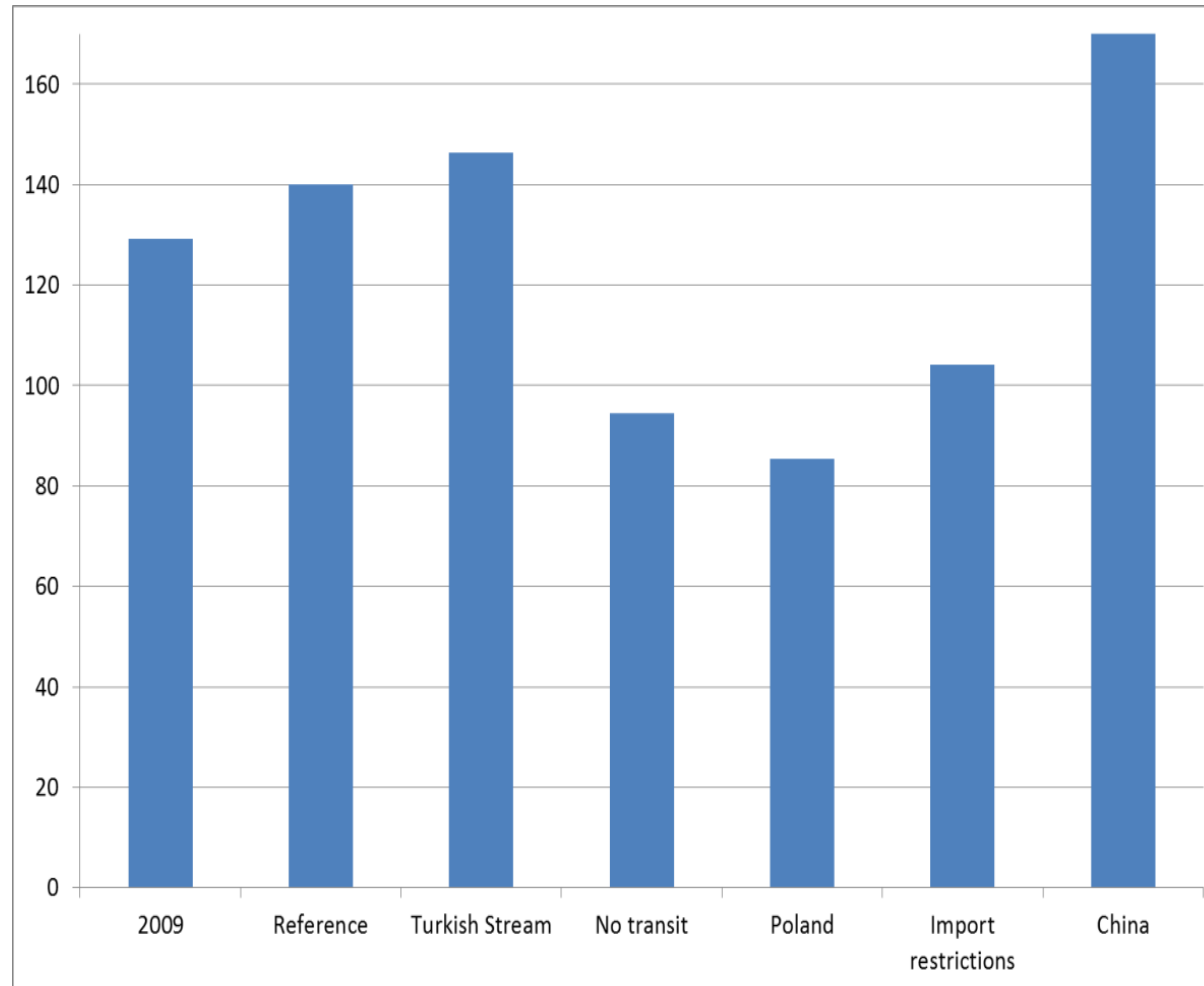
Gas consumer prices in Russia and EU-30 Euro/toe



Gas consumption in Russia and EU-30 Mtoe per year



Net export of gas from Russia. Mtoe per year



Competitive Russian export supply

- Gazprom is the sole export supplier of piped natural gas, but not the only domestic supplier
- 1990s: Market access for non-Gazprom producers
- 2012: Market share of non-Gazprom producers was 1/3
 - Main actors: Novatek (natural gas company) and Rosneft (oil giant)
- 2013: Partial liberalization of LNG exports
 - Novatek and Rosneft signed two LNG contracts



Competitive Russian export supply, cont.

- Scenario: Remove monopoly in piped gas export, and remove export tax
- Allow for profitable investment in pipes between Russia and Europe
- Total Russian export increases by roughly 25 percent
 - Cost-efficient export supply initially
 - Rather low mark-up
 - Main effect: No tax on export revenues



Main findings

- Overall modest effects in Europa of
 - Turkish Stream
 - No Russian exports to and via Ukraine
 - No exports from Balarus to Poland/EU
 - Russian export agreement with China
- Stronger effects in Russia
- Have identified long-run effects. Short-run effects may be stronger

