Natural Gas Transits and Market Power - The Case of Turkey
Florian Weiser | 40th IAEE International Conference | Singapore | 06/21/2017
Motivation: Southern Gas Corridor Project

- Southern Gas Corridor (SGC): Planned pipeline projects through Turkey connecting natural gas producers in the Caspian region and the Middle East with gas markets in the European Union (EU)

- Political actors in the EU and Turkey state that Turkey could potentially become a natural gas hub

  “Turkey’s development as an energy hub will be to the benefit of both Turkey and the EU.”

  Joint Declaration, Turkey-EU High Level Energy Dialogue, Ankara, 16 March 2015
Motivation: Turkish understanding of becoming a hub

- According to Heather (2015), natural gas hub requires: a high level of (1) liquidity, (2) volatility, (3) anonymity, (4) market transparency and (5) traded volumes
- Turkish national oil and gas company BOTAS still not unbundled and in a strong position
- What is the perception of BOTAS of becoming a hub?

“Turkey, however, bargained hard against a straightforward transit role, intending instead to take over the role of a hub, which means that it would buy gas arriving at its borders, consume what it needs, and sell on the balance at profit.” Skalamera (2016)

Research Objective

- What are the implications of the Turkish understanding of becoming an “energy hub” for the EU gas markets?
- What are the welfare effects of Turkish transit market power?
Relevant Literature

Yegerov & Wirl (2010) – Gas Transit, Geopolitics and Emergence of Games with Application to CIS Countries.

Chyong & Hobbs (2014) – Strategic Eurasian natural gas market model for energy security and policy analysis: Formulation and application to South Stream.


Hubert & Ikonnikova (2011) – Investments Options and Bargaining Power: The Eurasian Supply Chain for Natural Gas.


Berk & Schulte (2016) – Turkey’s Future in Natural Gas – Becoming a Transit Country?

Literature about Resource Transit Countries

Literature about Turkey’s Energy Relations

Literature about Strategic Gas Market Models


Holz, von Hirschhausen, Kemfert (2008) – A strategic model of European gas supply (GASMOD)


Yegerov & Wirl (2010) – Gas Transit, Geopolitics and Emergence of Games with Application to CIS Countries.

Chyong & Hobbs (2014) – Strategic Eurasian natural gas market model for energy security and policy analysis: Formulation and application to South Stream.


Hubert & Ikonnikova (2011) – Investments Options and Bargaining Power: The Eurasian Supply Chain for Natural Gas.


Berk & Schulte (2016) – Turkey’s Future in Natural Gas – Becoming a Transit Country?

Literature about Resource Transit Countries

Literature about Turkey’s Energy Relations

Literature about Strategic Gas Market Models
**Theoretical Model**

Producer 1 with marginal cost $C_1$

Producer 2 with marginal cost $C_2$

Producer 3 with marginal cost $C_3$

Transit Country buys gas at price $P_E$

$$P_E = \alpha - \beta q_1 - \beta q_T \cdot (2 + r_T)$$

Final Market with price $P_T$

$$P_T = \alpha - \beta (q_1 + q_T)$$
Ewi’s global gas market model COLUMBUS

- Model simulates >95% of global gas demand and supply
- Searches for economic equilibrium of gas exporters, infrastructure investors, customers
- Accounts for gas market specifics such as long term contracts or entry exit tariffs
- Allows simulating oligopolistic and competitive pricing strategies
- Simulates endogenous investment decision in gas infrastructure

Overview of Assumptions

- Focus on Year 2030
- Assumption of further integration of European gas markets (same entry tariff for all suppliers within market areas)
  - Northern & Western Europe (NWE)
  - South Eastern Europe (SEE)
- Oligopolistic European market structure in 2030 (similar to 2014)
- Demand based on IEA (2015)
- Current infrastructure based on ENTSO-G maps
- Production capacities based on ongoing literature research and press notifications
Model Calibration for 2014

- Modelled import flows as well as prices match historical situation
- Slightly higher demand in modelled results due to assumption of integrated markets
Domestic European production declines between 2014 and 2030
LNG (117 additional bcm) and imports by SGC (46 additional bcm) fill the resulting gap
Azerbaijan largest SGC supplier
When Turkey exerts market power, the transited volumes are reduced to 13 bcm.

Largest price increase in SEE due to Turkish market power.
Results: Competitive vs. Oligopolistic Turkish Transits

- Turkey and Russia win if Turkey exerts market power, whereas SGC producers and EU loose.
- Azerbaijan is most significantly affected by Turkish market power, since it has no alternative markets to supply.
Europe faces an import gap with natural gas due to declining indigenous production that is partly filled by LNG and potentially by SGC volumes.

In an oligopolistic gas market environment, transits through the SGC can be an important supply source for Europe.

Turkish transits to Europe are reduced if Turkey exerts market power leading to increased prices especially in South Eastern Europe.

Turkey could earn profits of 1.3 billion EUR, whereas the loss in European consumer surplus would be 8.2 billion EUR.

The potential benefits of the SGC could be eliminated by Turkish transit market power.
• I. Berk, H. Hecking, S. Schulte, 2016, Turkey’s Future in Natural Gas - Becoming a Transit Country?
• P. Heather, 2015, The evolution of European traded gas hubs
• M. Skalamera, 2016, The Russian Reality Check on Turkey’s Gas Hub Hopes.
Assumptions

- Reference demand NWE in 2030: 322 bcm/a
- Reference demand SEE in 2030: 94 bcm/a
- Reference price in 2030 for EU: 21.6 EUR/MWh
- Price elasticity of demand function of EU: -0.25
- Entry tariff to the EU market: same for all exporters
- Production costs: based on Aguilera 2009
- Turkish transit tariff 103$/kcm (full costs) = no market power of Turkey
EU focuses on Southern Gas Corridor and gas transits via Turkey

- for security of supply reasons (political will to become more independent from Russian gas)
- to fill the further increasing import gap with gas from the Caspian producers

“Turkey’s development as an energy hub will be to the benefit of both Turkey and the EU.”
Joint Declaration, Turkey-EU High Level Energy Dialogue, Ankara, 16 March 2015
Alternative Scenarios

Caspian gas via Turkey: 9.5 bcm/a, 1773
Caspian gas via Russia: 6.7 bcm/a, 545
Caspian/Russian Cartel: 5.7 bcm/a, 445

Profits [Million EUR]
Previous Model Version (exporters connected to production):

\[-\beta_{d,t} + (cv_{e} + 1) \cdot \text{slope}_{d,t} \cdot tr_{e,d,t} - \chi_{e,d,t} + \lambda_{e,d,t} \geq 0 \quad tr_{e,d,t} \geq 0 \quad \forall e, d, t\]

Model Extension (upstream producers sell their volumes to Turkey):

\[-\beta_{d,t} + (cv_{e} + 1) \cdot (2 + cv_{tr}) \cdot \text{slope}_{e,u,t} \cdot tr_{e,d,t} - \chi_{e,d,t} + \lambda_{e,d,t} \geq 0 \quad tr_{e,d,t} \geq 0 \quad \forall e, d, t\]