Energy Policy ▮ (▮▮▮▮) ▮▮▮–▮▮▮

Contents lists available at SciVerse ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Natural gas supply stability and foreign policy

Brenda Shaffer *

School of Political Science, University of Haifa, Mount Carmel, Haifa 31905, Israel

HIGHLIGHTS

- Disruption of supplies can be initiated by supplier, transit and consumer states.
- Gas supply: neither side is dependent, one is dependent, or the sides are interdependent.
- Significant asymmetry of the degree of dependence is most likely to be exploited.
- States that share political alliances have experienced supply disruptions.
- States of opposing alliance systems have maintained stable gas supply.

ARTICLE INFO

Article history:
Received 27 August 2012
Accepted 15 November 2012

Keywords:
Natural gas
Foreign policy
Stability of supply

ABSTRACT

This article studies factors that affect stability of supply of natural gas. It examines the relative influence of political relations between the involved states on the stability of supply. The article identifies the factors that affect the propensity of a state to use disruption of natural gas supply in order to promote foreign policy goals. The article is based on the study of thirty five supply relations and two case studies. The article claims that disruption of supplies can be initiated not only by supplier states, but transit and consumer states. It claims that natural gas supply relations generally take three forms: neither side is dependent on the gas trade, one side is dependent on the gas trade, or the sides are interdependent in the gas trade. Cases of significant asymmetry of the degree of dependence in the gas trade are most likely to be exploited by the less dependent party for foreign policy gain. The article claims that the prevailing political relations between gas trading states are only one of the factors affecting the stability of supply.

1. Introduction

Energy supply is frequently referred to in both academic publications and policy circles as a "weapon" and supply disruptions as "threats" or "attacks" on a state. U.S. Secretary of State Hillary Clinton stated in a 2010 meeting of leaders of NATO member states that energy security and supply disruptions should be viewed as threats to the alliance.[1] Former US Senator Richard Lugar declared that "Energy is a potent weapon and a cutoff of gas or oil supplies in mid-winter could have as devastating an impact on a country's economy as a military attack."[2] Cut-off of natural gas supplies can cripple an economy, lead to deaths of citizens, and create domestic instability. In most states, energy policy is integrated into foreign policy making and institutions.[3]

In the last three decades, security concerns about supply disruptions have increased significantly due to the rising global consumption of natural gas. The nature of natural gas markets renders such supplies much more susceptible to supply disruption than those of oil and coal. Petroleum and coal are traded primarily on international markets as part of short-term deals and through flexible means of transport. Foreign policy makers and publics engaging in discussions on energy security policies generally focus on access to oil. However, due to prevailing conditions in the international oil market, oil supply can rarely be wielded as a foreign policy tool, especially by producers.[4] In contrast, natural gas is supplied chiefly in pipelines and in

* Tel.: +972 4 8240388.
E-mail address: bshaffer@univ.haifa.ac.il

[1] Secretary of State Hillary Clinton (2010) in a Washington speech before NATO leaders, Washington DC. February 24, 2010, quoted by UPI 24 February 2010.

[2] Senator Lugar Renews Energy Warning in Reaction to Russian Oil Cutoff, Congressional Press Release, January 10 Cutoff, 2007.

[3] In 2011, the U.S. State Department elevated the importance of energy as part of US foreign policy by establishment of the Bureau of Energy Resources. This bureau is tasked with promoting US energy diplomacy, and in bilateral and multilateral fora "energy transformation, energy transparency and access."

[4] See Eugene Gholz and Daryl G. Press. 2010. Protecting 'the prize': oil and the U.S. national interest. Security Studies (19) (2010), 453–485 for an excellent discussion on the lack of vulnerability of oil supplies to sustained disruption. The "oil weapon" is more successfully wielded by oil consuming states can who can

0301-4215/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.enpol.2012.11.035

the framework of long-term contracts, creating direct, long-term linkages and permanent infrastructure between suppliers and consumers. Even natural gas supplied in liquefied natural gas (LNG) tankers is traded predominately in the framework of long-term contracts and unlike the oil tanker business the LNG transport vessel market is not very flexible. In addition, LNG supply infrastructure is not standardized like that of oil, further barring market flexibility. The long-term supply relationships and permanent infrastructure involved in natural gas supply provide much greater opportunity for politics to come into play than in oil trade.

Natural gas consumption is expected to continue to grow significantly in coming decades due to its relatively low environmental impact, substantial new discoveries that have led to lower prices and new access to supplies in many markets, and the reduced appeal of nuclear energy after the Fukushima disaster. While oil was the primary fuel source of the twentieth century, natural gas most likely will be the major fuel source for much of the twenty-first century.[5] Consequently, with the rise in consumption and trade of natural gas there will be increased opportunity for the use of supply stability as a foreign policy tool.

Despite the centrality of energy to a state's national security and its importance to the functioning of a state's economy and military the international relations discipline has given negligible attention to the connection between energy and foreign policy. While a small number of studies in the discipline have looked at foreign policy questions related to oil and nuclear energy, few have examined issues related to natural gas supply. For example, *International Security*, the flagship journal in the sphere of international relations and security studies, has in more than thirty years published only nine articles devoted to energy, none of which relate to natural gas supply.[6] Policy-oriented journals, such as *Foreign Affairs* and *Foreign Policy*, publish extensively on topics relating to energy policies, but have not published articles that look conceptually at the role of energy supply in foreign policy.[7] In addition, most of the works related to energy security lump analysis of oil and natural gas together, despite the fundamental differences in supply dynamics that produce completely different situations for politics to come into play. International relations theory has not only paid meager attention to oil and natural gas in its professional journals, but in its training as well: Few survey courses in international relations include lessons directly related to energy. Thus, most students can complete a degree in international relations or political science, without studying the dynamics of oil and natural gas trade, how prices are set or learning which states possess or import significant volumes of oil and gas.

Gas supply arrangements around the world display varying degrees of stability. Some of the relationships never experience supply disruptions, while others experience frequent disruptions. In many cases and perhaps most cases, gas supply disruptions result from technical failures and extreme weather (Skea et al., 2012). However, even in these cases political relations can affect the responses of the various involved actors and policy mechanisms of the involved states can indicate how vulnerable the gas supply is to these technical and weather related challenges.

This article studies supply relations between gas trading states. It attempts to understand the political and policy factors that affect stability of supply of natural gas. In addressing this question, the article examines the relative influence of political relations between the gas trading states on the stability of supply. In addition, the article identifies the factors that affect the propensity of a state to use disruption of natural gas supply in order to promote foreign policy goals. The article is based on the study of thirty five supply relations and two extensive case studies. In attempting to understand the role of foreign relations on stability of supply and the foreign policy implications, the study focuses on the behavior and decisions of state institutions and representatives.

The article makes a number of main points. One, disruption of natural gas supplies can be initiated not only by supplier states, but transit and consumer states.[8] Second, natural gas supply relations generally take three forms: neither side is dependent on the gas trade, one side is dependent on the gas trade, or the sides are interdependent in the gas trade. The three types of relationship vary in their stability and also their potential vulnerability to utilization for political goals. Cases of significant asymmetry of the degree of dependence in the gas trade are most likely to be exploited by the less dependent party for political gain. Third, the prevailing political relations between gas trading states is only one among the factors affecting the stability of supply: States that share political alliances have experienced supply disruptions and states that are members of opposing alliances systems have maintained stable gas supply over a number of decades. Stability of supply is affected by: The degree and relative dependence on the gas trade between supplier and consumer states; the overall political and economic relationship between the involved states; the domestic supply situation of the producer and transit states; the decision making process on energy in the involved states; the continued commercial benefits of the agreement; and the involvement of transit states in the supply arrangement.

This article opens with a discussion of the dynamics of natural gas trade and supply. The article then analyzes the policy and political factors that affect natural gas supply stability. This section is based on study of the natural gas supply relations along thirty five pipeline routes as well as two case studies. The article continues and presents conclusions.

(*footnote continued*)
use the denial of access to their markets and investments as a foreign policy tool aimed at oil exporters. For a discussion of the capability of oil consumers to use denial of markets as a tool of foreign policy, see Brenda Shaffer. 2009. Energy Politics (Philadelphia: University of Pennsylvania Press, 2009), 33–36.

[5] See data in Are we entering a golden age of natural gas? (Paris: International Energy Agency, 2011).

[6] Carl Walske. 1977. Nuclear electric power and the proliferation of nuclear weapon states. International Security 1 (3) (Winter, 1977), 94–106; Robert L. Paarlberg. 1978. Food, oil, and coercive resource power. International Security 3 (2) (Autumn, 1978), 3–19 ; Richard R. Fagen. 1979. Mexican petroleum and U.S. national security. International Security 4 (1) (Summer, 1979 39–53; Ray Dafter. 1979. World oil production and security of supplies. International Security 4 (3) (Winter, 1979–1980) 154–176; David A. Deese. 1979–1980. Energy: economics, politics, and security. International Security 4 (3) (Winter, 1979–1980), 140–153; Thane Gustafson. 1981–1982. Energy and the Soviet Bloc. International Security 6 (3) (Winter, 1981–1982), 65–89; Robert J. Lieber. 1980. Energy, economic and security in alliance perspective. International Security (4 (4), Spring 1980), 139–163; Robert J. Lieber. 1992. Oil and power after the Gulf War. International Security 17 (1) (Summer 1992), 155–176.

[7] On the other hand, a number of noteworthy academic books have been published on topics relating to energy and international politics: For instance, David G. Victor, Amy M. Jaffe, and Mark H. Hayes (Eds.). 2006. Natural Gas and Geopolitics: From 1970 to 2040 (Cambridge: Cambridge University Press, 2006); M.A. Adelman. 1996. The Genie out of the Bottle: world oil since 1970 (Cambridge, MA: MIT Press, 1996); David Deese and Joseph Nye (Eds.). 1981. Energy and Security (Cambridge, MA: Ballinger Publishing Co., 1981); Brenda Shaffer. 2009. Energy Politics (Philadelphia: University of Pennsylvania Press, 2009).

[8] Along the natural gas supply chain, there are three distinct types of states: producers, consumers and transit states. While all states, including producers are also energy consumers, in this study consumer states will refer to those that natural gas imports are significant to maintaining their current energy consumption patterns.

Please cite this article as: Shaffer, B., Natural gas supply stability and foreign policy. Energy Policy (2013), http://dx.doi.org/10.1016/j.enpol.2012.11.035

2. Natural gas supply dynamics

Natural gas production and consumption are both rapidly rising globally. Natural gas is currently the third most important primary energy source and if current consumption trends continue, natural gas may overtake coal as the second most important energy source in many markets, and perhaps globally. Natural gas differs from almost any commodity: the majority of the international gas trade in natural gas is supplied through permanent pipelines and in the framework of long-term contracts. This is due to the need for long-term investment in order to produce the gas and establish export infrastructure.[9] The price of natural gas – both pipeline and LNG – is not set by the global market; instead, each contract is a fresh deal between producer and consumer. This leads to different prices for pipeline gas and LNG in various geographic locations in the world. Even LNG trade under current market conditions should be viewed as "floating pipelines": due to the large expense of building LNG facilities, they are generally not built without first locking in supply or a market. Thus, most LNG is supplied in the form of long-term contracts, rather than spot trade.[10] Of the internationally traded natural gas, approximately seventy per cent is supplied by pipeline and the remainder through LNG (liquefied natural gas) by way of LNG tankers.[11]

It should be noted that the majority of natural gas supplies (approximately seventy per cent) is consumed domestically in gas producing states. The majority of the internationally traded natural gas is supplied within regions, and gas trade between regions on the globe is still limited. Within the natural gas industry, debates are raging as to whether natural gas markets will continue to remain quite separated, or they will converge toward a global market in near decades.[12]

The political dynamics associated with natural gas trade are different from those of almost any other traded good: few traded goods are supplied by the way of permanent infrastructure and long-term supply arrangements. In addition, governments play a larger role in natural gas trade than almost any other traded good, and certainly more than in oil trade. It usually takes investments in natural gas production and export about 10 to 15 years to pay off. As a result, investors are keen to ensure that involved companies and states will uphold contracts for the life of a project. As a result they usually require host and transit state governments to back up international supply projects with government-to-government agreements. Moreover, since natural gas supply involves building permanent infrastructure in fixed locations, states must approve the installations and route, and often provide security of the infrastructure and facilities. In most cases, states are formal sides to the agreements. Natural gas trade is also a highly regulated sphere. Most natural gas trade does not take place in competitive gas-on-gas markets. Even in the few operating competitive markets (United States, United Kingdom, and the Netherlands for instance), the state plays an important regulatory role. In addition, on the supply side, most of the world's exported gas volumes are controlled by state companies and thus states are involved in natural gas trade through these entities as well.

International natural gas pipelines operate around the globe, but the overwhelming majority operates in Europe (two-thirds). In Africa and Asia the small amount of natural gas pipelines is noteworthy: two intra-Africa pipelines[13] and four intra-Asian[14] international natural gas pipelines, all located in South Asia. In volumes, in 2011 trade involving Europe and Eurasia[15] for natural gas supplied in pipelines amounted to 469.7 BCM (billion cubic meter) of the total 694.6 BCM of the internationally traded gas. Trade within North America accounted for 128.8 BCM of the international pipeline gas trade.[16]

In 2011, the top five natural gas producers were: Russia (677 BCM, twenty per cent of world total), United States (651 BCM, 19.2 per cent of the world total), Canada (160 BCM, 4.7 per cent of the world total), Qatar (151 BCM, 4.5 per cent of the world total) and Iran (149 BCM, 4.4 per cent of the world total). The top five natural gas exporters were: Russia (196 BCM, 23.5 per cent of the world total), Qatar (119 BCM, 14.2 per cent of the world total), Norway (99 BCM, 11.9 per cent of the world total), Canada (63 BCM, 7.5 per cent of the world total), and Algeria (49 BCM, 5.9 per cent of world total).[17] The top natural gas importers are: Japan (116 BCM, 13.9 per cent of the world total), Italy (70 BCM, 8.4 per cent of the world total), Germany (68 BCM, 8.2 per cent of the world total), United States (55 BCM, 6.6 per cent of the world total) and Korea (47 BCM, 5.6 per cent of the world total).[18]

3. Stability of supply in natural gas trade

This section presents some of the factors that affect stability of natural gas supply and the subsequent proclivity to suspend supplies in order to promote foreign policy goals. The findings are based on two case studies and a survey of thirty five international gas supply pipelines in operation between 1991–2011.[19] The selected pipelines are located in a number of geographic locations. Cases of varying suppliers were chosen as well as various markets of a certain supplier. In this study, only cases of pipeline gas trade were analyzed. This is since there have been very few cases of LNG supply disruption, and not enough cases to draw theoretically meaningful conclusions. In addition, LNG does not include transit states, thus this factor could not be tested in the cases of LNG supply.

The main sources for the data on natural gas consumption and supplies to a various market and information supply disruptions were natural gas related industry data bases and journals as well as government reports published in some of the countries.

Examination of the nature of the supply in these various cases shows that there are very different forms of natural gas supply relations: in some cases, neither the supply state nor the consumer state is dependent on the gas supply. In others, one side is dependent

[9] It should be noted that that the EU has set a goal in 2014 to move gas and electricity sales to spot markets and to modify the practice of long-term contracts. This legislation is part of the European Commission Third Energy package. It is not clear de facto if the legislation will be implemented in most states in the EU, especially since Europe's main supplier, Russia's Gazprom, had not agreed to supply the bulk of its gas to Europe without contracts. However, if implemented, it would radically change the way that gas is traded with EU member consumers.

[10] In 2011, approximately a third of the trade in LNG was spot sales. BP Statistical Review of Energy, June 2012.

[11] BP Statistical Review of Energy, June 2012.

[12] A rise in global shale gas production can affect the market trend in two conflicting ways: it can create more producers and more volumes and thus conditions for more LNG trade; or through production in new areas and new producers it can lead to more pipeline supply options and thus bring a reduction in the demand for LNG. Accordingly, it is not clear if natural gas trade will converge toward a global market in coming decades.

[13] Nigeria to Ghana, first phrase of the West African pipeline and Mozambique to South Africa.

[14] This excludes Central Asian pipelines.

[15] Eurasia here refers to former Soviet Union states.

[16] BP Statistical Review of Energy, June 2012.

[17] Note that while Iran is a major natural gas producer, it is actually is a net natural gas importer. Iran exports natural gas to Armenia and Turkey, but exports larger amounts from Azerbaijan and Turkmenistan.

[18] International Energy Agency, 2011 data, published in IEA Key World Statistics 2012.

[19] This period was chosen since the number of international natural gas pipelines greatly increased in this period and the period also reflects the international trade between Russia and the former Soviet and Eastern bloc states.

Please cite this article as: Shaffer, B., Natural gas supply stability and foreign policy. Energy Policy (2013), http://dx.doi.org/10.1016/j.enpol.2012.11.035

on the supply, while the other side is not. In other cases, the involved states are interdependent in the continuity of the gas supply. Accordingly, the three different models of supply relations produced very different conditions for politics to come into play.

At first blush, it would seem that consuming states are vulnerable to suppliers using the threat of a cutoff to advance political and security goals. However, the supplier can also become dependent on the consumer as a market for its gas. Generally, the supply states are dependent on the profits from the natural gas export, which are the major source of government revenues in most major natural gas exporters. Moreover, states that want to serve as long term gas sellers will not quickly sacrifice their standing as reliable suppliers for fear that in the long run customers will seek other sources of supply or different fuels. Transit states seem to have the greatest incentive to disturb or threaten to upset the security of supply, since this is their only means to achieve major political and economic benefit from the transit activity.

This analysis revealed that explicit disruptions intended to promote foreign goals are rare events. A party seldom declares an explicit disruption. Disruptions are usually attributed to technical problems, or to terrorists or sabotage, rendering the disrupter unaccountable for the action. In fact, most supply contracts have a *force majeure* clause that exempts the supplier even from financial penalties if the supply disruption can be attributed to terrorism or natural disaster. In addition, after achievement of the intended goal, sides generally stop the threat of disruption or actual disruption, leaving it unclear whether a threat or actual disruption took place. The stability of supplies can differ between the short-term and the long-term. For instance, supplier states can disrupt energy shipments for a short period as a form of pressure on a consumer state, while claiming that technical problems rather than an explicit political decision inhibited supplies. At the same time, suppliers can claim to be steadfast in their long-term commitment to supplies Table 1.

There is significant variation in the stability of the supply relations: some supply relations were frequently disrupted while others functioned without a glitch. Contrary to popular and many policy-maker perceptions, shared political alliance was not the dominant precursor of stability of supply. In some cases, supply was disrupted between members of alliances due to the involvement of transit states or due to difficulty in meeting supply commitments because of domestic consumption and production trends. In contrast, some supply relations between states that are members of opposing alliance systems endured uninterrupted for decades.

One class of supply disruptions is related to technical or weather related challenges, such as supplier problems in meeting their export commitments, due to lower production, higher domestic consumption, high demand due to weather conditions, or physical obstructions to supply on pipelines that transited areas involved in wars (Libya in 2011, Azerbaijan-Georgia-Turkey in 2008) or terrorist attacks. Even in this category, the case analysis showed that politics came into play. Even when domestic supplies were thin, suppliers were cautious in cutting supplies to close dependent allies and to important markets, and politics influenced decisions on which markets to cut supplies to and whether to cut supplies to domestic consumers.

Most of the cases categorized as intentional supply disruptions that had foreign policy goals are associated with Russia. However, even in the case of Russia, the factors outlined in this article affected Russia's policies and a pattern of disruption can be identified: Moscow's willingness to use supply disruptions for foreign policy goals generally depended on the relative vulnerability of both Russia and that the consuming state. Russia has not risked supply disruptions for commercial or political reasons with markets it depends on such as Germany; Russia has only opted to cut supplies to states such as Georgia that were vulnerable to the loss of Russian supply, but whose market was not essential to Moscow. In the case of Georgia, Russia had explicit foreign policy aims—compelling Georgia to modify its US and NATO oriented security policy and contributing to the ousting President Mikhail Saakashvilli from power. Russia tends to be identified as an "unreliable supplier." However, this analysis reveals that Moscow's policies on the disruption of supply varied based on defined circumstances and a pattern can be identified.

Based on the study of the above thirty-five natural gas supply relationships, it seems that a number of factors affect the stability of supply relations and the subsequent propensity to disrupt them to achieve foreign policy goals: The degree and relative dependence between the involved states on the continued supply; the overall political and economic relations between the states; the domestic supply situation of the producer and transit states; the decision-making process affecting natural gas policy in each state; involvement of transit states in the gas supply; and the commercial benefits of the continued supply to the involved actors. These six factors will be discussed at length in the following section.

3.1. Degree and relative dependence on the supply

A critical factor affecting the stability of supply and the proclivity to utilize the supply in order to promote foreign policy goals is the degree of dependence of the various sides on the continuity of the supply. In many cases, neither the supplier nor the consumer is dependent on the continuity of supply, and in few supply relationships both sides are dependent, thus interdependent. Merely engaging in gas trade, however, does not *prima facie* mean that either side is dependent or that both are interdependent. In addition, exposure to costs from disruption of supply or markets does not necessarily imply dependence. [20] A market may pay a price for a disruption or loss of supply (or a supplier to a disruption of loss of market) and/or disruption of the market and daily life can occur, but the degree of the price and the disruption does not inherently imply dependence on the supply/market. To assess the degree of dependence of the supplier state on a particular export target, one must assess that consumer's share of the supplier's exports and the proportion of gas export in the state's revenue and GNP. The extent of dependence of a consumer on a particular gas source depends on a number of factors: the proportion of the supply/market from the state's overall gas supply, the portion of natural gas in the state's overall fuel mix, the extent to which the consumer state possesses multiple suppliers and related infrastructure, and the ability for its electricity generation and industry to switch to other fuels (such as dual-fuel power plants) in the case supplies are disrupted. When one side is dependent on the trade, and the other is not, there is higher likeliness of supply disruptions for either economic or political goals.

Naturally, a supplier will be more cautious in upsetting supplies to a state that imports a major portion of its exports than one whose share is not significant. Likewise, the price that the supplier receives in each market will affect the likelihood to risk each of these markets: clearly, markets offering higher prices are less expendable than those with lower prices.

Few natural gas supply relationships are interdependent. According to Kenneth Waltz, two states are "interdependent if

[20] For a look at the importance of taking a nuanced view of the concept of dependence in natural gas trade, see Pierre Noël, Beyond Dependence: How to deal with Russian gas (European Council on Foreign Relations, 2008).

Please cite this article as: Shaffer, B., Natural gas supply stability and foreign policy. Energy Policy (2013), http://dx.doi.org/10.1016/j.enpol.2012.11.035

Table 1
Natural gas supply in thirty five international pipelines in operation 1991–2011*.

consumer supplier	**Type of supply relationship	Experienced multiple disruptions	Explicit foreign policy goals	Supply cuts affected by political relations	Involvement of transit states	Share political alliance and strong institutional connections	Initiator of disruption
Austria–Norway	*A*	No	–	–	Yes	No	–
Austria–Russia	*A*	No	–	–	Yes	No	–
Chile–Argentina	*B*	Yes	No	No	No	Yes	Supplier
Finland–Russia	*B*	No	–	–	No	No	–
Germany–Norway	*C*	No	–	–	No	Yes	–
Germany–Russia	*C*	No	–	–	Yes	No	–
Greece–Russia	*B*	Yes	No	No	Yes	No	Transit state and supplier
Greece–Azerbaijan	*A*	Yes	No	No	Yes	No	Transit state
Italy–Libya	*B*	Yes	No	Yes	No	No	Consumer
Italy–Russia	*B*	Yes	No	No	Yes	No	–
United States–Canada	*A*	No	–	–	No	Yes	–
Canada–United States	*A*	No	–	–	No	Yes	–
Mexico–United States	*B*	No	–	–	No	Yes	–
Turkey–Iran	*A*	Yes	No	No	No	No	Supplier
Turkey–Russia	*B*	No	–	–	No	No	–
Turkey–Azerbaijan	*B*	Yes	No	No	Yes	Yes	Transit state
Georgia–Azerbaijan	*B*	No	Yes	Yes	No	Yes	–
Russia–Azerbaijan	*A*	Yes	No	Yes	No	No	Consumer
Argentina–Bolivia	*B*	Yes	No	Yes	No	No	Supplier
Chile–Bolivia	*B*	Yes	Yes	Yes	Yes	No	Supplier and transit
Brazil–Bolivia	*A*	No	No	Yes	No	No	Supplier
Armenia–Iran	*B*	Yes	No	No	No	Yes	Supplier
Armenia–Russia	*B*	Yes	No	No	Yes	Yes	Supplier and transit states
Iran–Turkmenistan	*B*	No	No	No	No	Yes	–
Georgia–Russia	*B*	Yes	Yes	Yes	No	No	Supplier
Ukraine–Russia	*B*	Yes	Yes	Yes	No	No	Supplier
Russia–Turkmenistan	*B*	Yes	Yes	Yes	Yes	No	Consumer state
Bulgaria–Russia	*B*	Yes	No	Yes	Yes	No	Transit state
Italy–Algeria	*C*	No	–	–	Yes	No	–
Israel-Egypt	*B*	Yes	No	Yes	No	No	Supplier
Jordan–Egypt	*B*	Yes	No	No	Yes	Yes	Supplier and transit state
Syria–Egypt	*B*	Yes	No	No	Yes	Yes	Supplier and transit state
Lebanon–Egypt	*B*	Yes	No	No	Yes	Yes	Supplier and transit state
U.A.E.–Qatar	*B*	No	–	–	No	Yes	–

*Some of the pipelines were operational only part of the period. **Supply relationships.
(A) Neither the consumer nor the supplier are dependent on the natural gas supply. (B) One side is dependent on the natural gas supply. (C) Both supplier and consumer are dependent on the natural gas supply.
In this research, consumers were classified as dependent on supply in cases where 30 per cent or more of their natural gas came from that source and if cessation of the supply would lead to significant disruption in electricity or heating provision and/or unsustainable financial expenditures.
In terms of supply states, an exception to the classification system is the case of Azerbaijan's gas supplies to Iran. The exports to Iran are not thirty per cent or more of Azerbaijan's natural gas exports, but Baku also transits through Iran's gas transmission system supplies to the Nakhchevan region of Azerbaijan (a region of Azerbaijan that is not territorially adjacent to the main part of the republic). Thus, Azerbaijan is dependent on stable supply to Iran in order to ensure that transit to Nakhchevan is not disrupted by Tehran.

the costs of breaking their relations or of reducing their exchanges are about equal for them. Interdependence implies that the parties are mutually dependent."[21] Russia and Germany are a case of an interdependent gas supply relationship: loss of the gas supply from Moscow would be costly and destabilizing to Germany and loss of German payments would be a crucial blow to Russia. However, most of the supply relationships surveyed in no way displayed that "the parties are mutually dependent" due to the trade.

Understanding that most natural gas trade relationships do not entail interdependence is critical to grasping the failure of "peace pipeline" policies. Policy-makers, especially in the US and Europe, have frequently promoted establishment of natural gas trade between states in order to promote peace between states in conflict.[22] Part of the flawed logic of these policy promotions is that many assume two unfounded claims: the existence of gas supplies between states implies interdependence and interdependence implies preservation of peace. As shown in this study, gas can be traded between states, with neither or only one of the sides possessing dependency on the supply. In addition, international relations literature has shown that interdependence can be a factor in both peace and conflict, thus even if states are interdependent in gas trade, it most likely would not preserve peace.[23]

3.2. Political and economic relations setting

Whether or not countries use natural gas supply disruptions to specifically further foreign policy goals is affected by the overall political and economic relations between the linked states. Close to a third of the pipeline natural gas supply relationships exist between states that share high levels of political and strategic cooperation (US–Canada, UK–Norway, for instance). These supply relations have not experienced foreign policy related supply disruptions. However, close political relations do not render supply immune to supply disruptions: states that share a close political alliance have also experienced disruptions. For instance, frequent disruption of Egypt's supplies to Jordan in 2011. On the other hand, stable gas trade can take place between members of opposing alliances, such as between Russia and Germany and Russia and Finland. Germany and Russia were able to maintain stable supply relations without disruption since the early 1970s, enduring the Cold War, the Soviet breakup and various governments in independent Russia. Natural gas supply arrangements involving transit states experienced a relatively high frequency of supply disruptions, also in cases when the suppliers and consumers are members of a common political alliance, or shared strong political cooperation, such as Russia and Greece.

3.3. The domestic supply situation of the producer and transit states

In order to assess the proclivity to stable supply, it is necessary to examine the production and domestic consumption trends of the supplier and consumption trends of the transit states. In addition, the level of management of the domestic gas sector (such as maintenance of storage facilities and redundancies in the production and supply infrastructure) can indicate the supplier's capability to successfully manage stable exports, even when technical and weather challenges arise.

States will rarely continue to meet full export commitments when their domestic demand for natural gas is not met. This has been evident in the case of Argentina's reduction and cuts of gas supplies to Chile since 2005[24] and Russia's reduction of exports to Ukraine in February 2012. Egypt's lack of effective action in preventing attacks on the gas export supply line in 2011 and 2012 to Israel-Jordan-Syria and Lebanon is motivated by the lack of sufficient supplies to meet concurrently their export commitments and supply domestic demand.[25] In addition, transit states tend to first take the needed quantity for their domestic market, even if this brings to shortages to consumers down the line. This was also evident during the February 2012 gas crisis involving the Caucasus: Georgia did not transit to Armenia the Russian gas that it needed to meet its domestic demand.

Natural gas producers tend to subsidize domestic gas consumption, and in most cases domestic demand grows significantly in the decades after initiation of production. Thus, many natural gas producers that made export commitments in their opening production period overtime have difficulty in providing for both the export and the rising domestic demand. Maintaining both domestic and export commitments is more difficult for states with large populations and thus close consumption to production ratios. The case studies in this article showed that in these circumstances, politics also comes in to play. In cases where states had multiple export commitments and needed to reduce exports, but not stop them entirely, it seems that in most cases the decision on which markets to cut supplies to was affected by political relations and goals. Azerbaijan, for instance, continued to export to its ally Georgia in February 2012 during a period of very high demand in both domestic and export markets, despite the difficulties in maintaining supplies. Baku wanted to prevent instability in Georgia, Azerbaijan's main transit state.

Stable supply is also influenced by the manner in which the supplier manages the energy sector: sufficient storage and well maintained infrastructure. Thus, when technical and weather challenges arise, the supplier has the means to maintain supply.

3.4. Decision-making process on energy supply

Intentional natural gas disruptions are rare events as continuity in energy trade generally serves the long-term interests of both the supplier and the consumer. However, actors in a state or involved company do not always operate in a state's long term interest and may be motivated by domestic political agendas or personal financial benefit to upset the supply. Moreover, involved companies and traders, including those that are national

[21] Kenneth N. Waltz. Theory of International Politics (1979) (Reading, MA.: Addison-Wesley Publishing Company, 1979), pp. 143.

[22] A large part of the motivation of Israel to import natural gas from Egypt was to increase the prospects for preserving peace. Energy supply from Egypt to Israel was a plank in the Camp David Accord. In addition, in the 1990s, a number of US Congressmen and State Department officials promoted the idea of compelling Azerbaijan to build its major oil export pipeline through Armenia, as a means to bring peace to the South Caucasus. See, John J. Maresca, State Department's previous chief negotiator on the Nagorno—Karabagh conflict, John J. Maresca. A 'Peace Pipeline' to end the Nagorno—Karabakh Conflict, Caspian Crossroads, No.1, Winter 1995.

[23] Dale C. Copeland. Economic interdependence and War: a theory of trade expectations. International Security Vol. 20, no.4 (Spring 1996); Kenneth N. Waltz. The Myth of National Interdependence, in Charles P. Kindleberger (Ed.). The International Corporation (Cambridge, MA.: MIT Press, 1970), pp. 205–223; Kenneth N. Waltz. Theory of International Politics (1979) (Reading, MA.: Addison-Wesley Publishing Company, 1979), pp. 144.

[24] Sidney Weintraub. Introduction, in Sidney Weintraub with Annette Hester and Veronica R. Prado (Eds.). 2007. Energy Cooperation in the Western Hemisphere: Benefits and Impediments (Washington, D.C.: Center for Strategic and International Studies, 2007), pp. 10.

[25] Egypt's LNG Trains Still Short of Gas, May 30, 2012 Publication of EnergyIntel at World Gas Conference, 2012, pp. 4; Peace pipeline' deal in ruins as energy officials await their fate, The National June 28, 2012; Egypt negotiating with Qatar to fill natural gas gap, Ahram Online, September 22, 2012; and Egypt's growth means importing gas, Qatar and Iraq probable sellers, Ahram Online, October 2, 2012.

Please cite this article as: Shaffer, B., Natural gas supply stability and foreign policy. Energy Policy (2013), http://dx.doi.org/10.1016/j.enpol.2012.11.035

companies, do not always define their interests as the same of the state, and may promote policies related to stability of supply that are different than those advocated by the state institutions and leaders. Thus, in order to assess the prospects of stability of supply, it is important to analyze the decision-making process in each of the involved states. At the same time it should be pointed out, a decision as significant as an intentional supply disruption will most likely be taken by the high political echelon in the involved state, in the case of suppliers or consumers. There are cases in transit states, such as Ukraine, where it seems that commercial entities undertook the decision to upset the transit, not considering long-term state interest.

Since large sums of money are at stake, and both commercial and state entities are often involved, potentially conflicting interests can impair the state's decision making process and lead to outcomes that may be irrational in terms of promotion of national or long-term commercial interests, but rational in terms of the interests of an involved company or individual. The involvement of actors that do not share the long-term interest of the state is found in both democratic and non-democratic government systems.

In addition, states may disrupt natural gas supplies, even if the tool is not effective vis-à-vis the state linked in the supply, in order to achieve goals related to other actors, such as domestic audiences, or to signal to third parties and deter/induce future behavior. Thus, while a disruption may not achieve foreign policy goals or make long-term commercial sense, it can take place if it serves a domestic or personal agenda.

3.5. Transit states

Supply arrangements involving transit states are much more prone to disruption than arrangements in which exporters and importers have a direct relationship. Among the three types of states along the energy supply line, transit states have the most significant incentive and the least risk from disrupting supply in order to promote other goals. They can use their middleman position to obtain economic, political, and other benefits while not risking their own supplies too much. Therefore, supply arrangements in which transit states lie between the supplier and the consumer are less stable than direct ones and require frequent policy attention by the producer and consumer states. In recent decades, energy supply arrangements involving transit states have become more prevalent for three reasons: (1) the expansion of demand for natural gas that has rendered long-distance and multiple state pipeline projects commercially attractive; (2) the initiation of oil and natural gas exports from a number of landlocked states (Azerbaijan and Turkmenistan, for instance); and (3) expansion of oil and natural gas exports from Russia to markets in Europe through existing supply networks that were established in the Soviet period involving transit states.

With the trend of rising natural gas consumption, it is anticipated that the establishment of long, multiple state supply pipelines involving transit states will increase. Many of the new natural gas supply projects under consideration in the first quarter of the twenty-first century involve transit states: Southern Corridor options of gas supply from Caspian states to markets in Europe, natural gas export from the Eastern Mediterranean to Europe, and expanded natural gas export from Central Asia to China.

3.6. Commercial benefits

The degree of continued commercial benefit of the natural gas trade affects the propensity to disruption. Natural gas contracts are generally long-term and trade terms that were once mutually advantageous to the sides when the contract was concluded, can cease to be beneficial to one of the sides over time, especially due to changes in other markets. In addition, establishment of LNG export facilities may render existing pipeline export less attractive to a producer. New commercial opportunities can arise for either the supplier or the consumer and a side can seek to end or reduce the supply relationship. Thus, the existence of a supply contract does not necessarily preserve the supply, if the commercial conditions do not continue to be sufficiently beneficial to the involved actors.

In fact, the lack of commercial soundness of the natural gas trade terms can have negative consequences for the bilateral political relations between the trading states. It is not uncommon that when the terms of supply relations are not commercially advantageous to one of the involved parties and it would like to end the deal, it will attempt to do so using political rhetoric instead of citing commercial factors, as a means of avoiding commercial penalties. This behavior also reaps benefits vis-à-vis domestic audiences. Thus, natural gas can be wrongly perceived as being used as a political tool when it is actually the economic basis of a supply agreement that is the motivation for one of the sides to disrupt trade.

Accordingly, in evaluating whether a market or supply disruption is for foreign policy purposes, it is important to evaluate first if the continuity of the supply relationship makes commercial sense to the side initiating the disruption or not. If the continuity of the supply relationship is not commercially sound to one of the sides, the political rhetoric associated with the disruption may be promoting a commercial agenda, and not the opposite.

4. Case studies

The following section analyzes in detail the cases of disruption of Egypt's gas exports to Israel and Jordan (2008–2011) and disruptions and challenges of supplies (February 2012) from Russia and Azerbaijan to markets in the region and in Southern Europe. These case studies were chosen for a number of reasons. One, these cases have not been analyzed in previous studies on gas supply and foreign relations. In fact, most academic works that study the topic of natural gas as a foreign policy instrument focus on the case of Russia. While the Russian case is clearly the most prominent to illustrate the use of supply disruptions as a foreign policy tool, Russia's supply relations with the former Soviet states and with Eastern Europe are exceptional and thus not elucidating for most cases: the pipelines between Russia and these states were built as domestic pipelines and most reflect a degree of asymmetry of dependence between the supplier and the market that is rarely found. In addition, the analyzed cases were chosen since they also reflect a growing phenomenon in supply disruptions: emanating from difficulty in meeting supply demand due to extreme weather or high domestic demand. These cases show how politics can come into play in these decisions which seem technical.

4.1. Case I: Egyptian natural gas supply to Israel and Jordan (2008–2011): A lamb in a wolf's clothing

The case of Egypt's natural gas supply to Israel and Jordan illustrates a number of points discussed in this analysis of natural gas stability of supply: supply relations in which one side is dependent on the trade and the other is not are more prone to instability; poor commercial terms can lead to supply disruption and thus hurt political relations; natural gas trade does not preserve or contribute to political relations and in fact when the commercial aspects of the trade are not sound for one of the parties can hurt the political relations; trade involving transit

Please cite this article as: Shaffer, B., Natural gas supply stability and foreign policy. Energy Policy (2013), http://dx.doi.org/10.1016/j.enpol.2012.11.035

states is more prone to disruption than direct supplies; the decision-making mechanism in the involved states affects the stability of the supply; and in the case of Egypt's supplies to Jordan, supplies can be interrupted despite sharing a political alliance.

On July 1, 2005, then Egyptian Petroleum Minister Sameh Fahmy and Israeli Minister of National Infrastructures Benjamin Ben-Eliezer signed an agreement for Egypt to supply annually 1.7 billion cubic meters of natural gas to the Israel Electric Corporation (IEC) beginning in October 2006.[26] The actual binding commercial agreement was concluded between commercial entities in Israel and Egypt: the Israel Electric Corporation and the joint Israeli-Egyptian company Eastern Mediterranean Gas and Oil (EMG).[27] The contract provided for supply from Egypt of 25 BCM of natural gas over fifteen years. The commercial terms of the contract were not transparent to the publics in Egypt or Israel and the governments were not formal parties to the contracts. EMG constructed an undersea pipeline from El Arish in Egypt's Sinai to the Israeli port of Ashkelon. The pipeline capacity allowed for supplies of up to 7 BCM annually. Gas supplies from Egypt to Israel were inaugurated in 2008. From its initiation, the gas supply was erratic, there were multiple disruptions, and the quality level of the gas supplies was very low.[28] Despite these factors, Israel was very keen to continue to the supply, which Israeli policy makers viewed as a positive factor in preserving the peace with Egypt. Israel's former Minister of National Infrastructures, Benjamin Ben-Eliezer, who presided in the office when the agreement was signed, stated that "the gas contract reinforced the peace treaty, and was therefore historic primarily on account of its strategic implications, and only afterward on account of its economic implications."[29] He added: "I saw in that agreement the most important added value for the State of Israel, because what is the significance of the peace treaty by itself? Nothing. It has no meaning, it is merely a non-belligerence agreement… In my eyes the gas pipeline is as important as the peace agreement."[30] The 1979 Egypt–Israel Peace Treaty included commitment of Egypt to supply Israel with regular oil supplies. When Egypt's oil production ended, Israel sought to replace the oil supply with natural gas.[31] By 2010, Israel became dependent on the Egyptian supplies for 40 per cent of its natural gas consumption and thus for stable electricity production. At the same time, due to rising domestic consumption and stagnant production rates, the gas available for export from Egypt began to dwindle.

The Israeli government did not regularly monitor the state of production and consumption in the supplier state nor analyze the meaning of those trends for the stability of supply. In 2010, for instance, decision-makers in Israel were presented with data on the rising consumption trend in Egypt that narrowed the amount of gas available for export. They did not express concern about this data, assuming that the existence of a supply contract and the mutual desire of the governments to preserve the gas supply would outweigh other considerations.

Egypt's natural gas exports consisted of LNG liquefaction and pipeline export to Israel, Jordan, Syria and Lebanon. Egypt's pipeline natural gas exports transit the Sinai Peninsula in one pipeline. At the Egyptian city of El Arish the pipeline separates into two spurs: one to Israel and one to Jordan (see Map 1). The pipeline to Jordan is called the "Arab Gas Pipeline" and was inaugurated in 2003. In 2006 a second phase of the pipeline within Jordan was completed. An extension of the pipeline from Jordan to Syria was completed in 2007. Gas supply to Syria was inaugurated in 2008. In 2009, transit agreements were signed between Egypt, Lebanon and Syria allowing for supply of gas to Lebanon through exchanges involving Syria. The natural gas from Egypt is Jordan's only source of supply and Amman is dependent on this gas as the source of eighty per cent of its electricity production.

While both Israel and Jordan are highly dependent on the Egyptian gas supplies, these exports are a small part of the Egyptian gas production and exports. Egypt annually produces approximately 65 BCM of natural gas, of which 45 BCM is consumed domestically. Of the 20 BCM that is exported annually, over seventy per cent is exported as LNG, leaving for the pipeline approximately 6 BCM annual exports. The LNG exports are preferable, receiving a higher netback than Egyptian pipeline exports. Egypt's capacity for export is further compromised by rising domestic natural gas consumption, aided by highly subsidized domestic natural gas prices. Cairo has difficulty meeting simultaneously its domestic demand and export commitments, and electricity black outs have been frequent in Egypt as well as disruptions to the export supplies since their inauguration over the past decade.[32] In the summer of 2010, not long before the massive demonstrations that led to the fall of the Mubarak regime in Egypt, blackouts were frequent in Egypt. Some Egyptian officials and opposition figures blamed the export of gas to Israel for the necessity of blackouts in Egypt.[33]

Following the fall of the Mubarak regime in February 2011, the shadowy dealings of the Egyptian component of the EMG Company came to light and under public scrutiny in Egypt. EMG was headed (until his departure from Egypt in February 2011) by Hussein Salem, a close associate of Egyptian former president Hosni Mubarak. Salem, Mubarak and members of Mubarak's family were indicted in 2011 in Egypt for corruption and fraud in connection to EMG's natural gas exports and specifically the destination of the profits from the gas export.[34]

Following the fall of the Mubarak regime, the pipeline in Sinai was attacked and consequently disabled ten times during 2011. The attacks on the pipeline led to disruptions of supplies to both Israel and Jordan, since the same pipeline that transits the Sinai desert serves both countries (see Map 1). The attacks were attributed to Bedouin tribes that reside in the Sinai Peninsula. It seems that the attacks, which severely disrupted the pipeline gas exports served, a number of Egyptian interests: it left more gas available for domestic consumption and thus prevention of very politically costly electricity blackouts; it released Egypt from financial penalty for not fulfilling its commercial obligations and played well with the domestic Egyptian audience, since the ruling regime was in actuality ceasing gas supplies to Israel. While there is no explicit evidence that Cairo encouraged or sponsored the attacks on the pipeline, the ruling government could have done a

[26] A Frightening Discovery: How Israel approved the Egyptian Gas Deal, Globes, November 13, 2011.

[27] Ministry of Energy and Water, State of Israel, http://energy.gov.il/English/Subjects/Natural%20Gas/Pages/GxmsMniNGEconomy.aspx.

[28] Author's interview with senior official in Ministry of Energy and Water, State of Israel, April 2011.

[29] Benjamin Ben-Eliezer, quoted in Haaretz, April 30, 2012.

[30] Ibid.

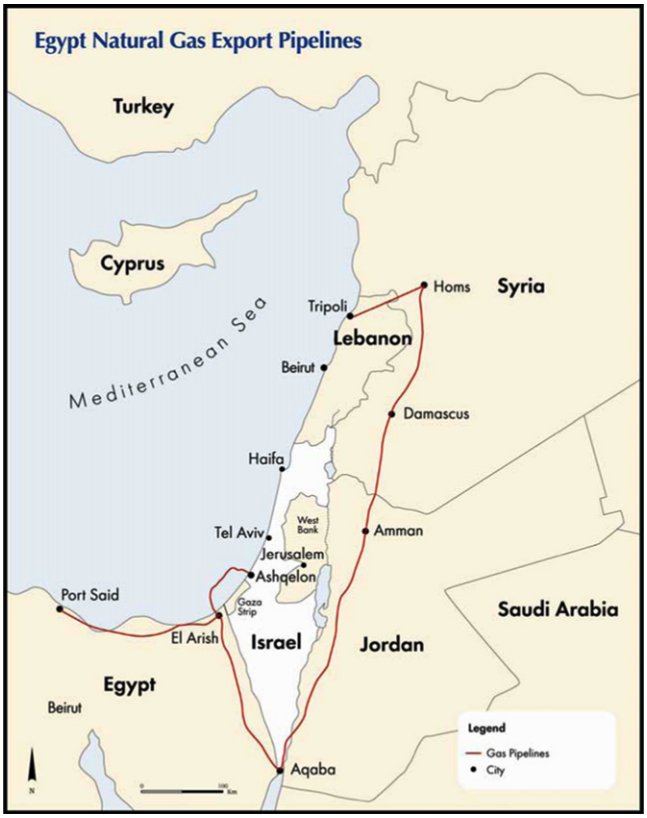
[31] Benjamin Ben-Eliezer, Israel's Minister of National Infrastructure during the time of the signing and implementation of the agreement stated that the "agreement is historic" and will "show everyone that the peace between Israel and Egypt is solid." (New York Times, July 1 2005). Also, Nimrod Novick Merhav Group Vice-President and chief Israeli negotiator of the EMG gas supply agreement, speech at Netanya College, March 19, 2012 (author's notes).

[32] Egypt's LNG Trains Still Short of Gas, May 30, 2012 publication of EnergyIntel at World Gas Conference, 2012, pp. 4; "'Peace pipeline' deal in ruins as energy officials await their fate," The National, June 28, 2012.

[33] See, for instance, Egypt blames Israel for power blackouts, Haaretz, August 8, 2010.

[34] Salam was subsequently convicted and Mubarek and his family members were acquitted of these charges.

Please cite this article as: Shaffer, B., Natural gas supply stability and foreign policy. Energy Policy (2013), http://dx.doi.org/10.1016/j.enpol.2012.11.035



Map 1. Egypt natural gas export pipelines.

lot more to prevent the attacks and dragged its feet each time in the repairs after each incident. The repair times and subsequent length of each disruption was much longer than common in the industry.[35] In addition, the Bedouin groups which control the smuggling routes in the Sinai desert could have been coopted to stop the attacks, if the government wanted to maintain the supply. Having the pretext of the "terrorist attacks" in the Sinai desert allows the Egyptian regime to evoke *force majeure* and thus not to be subject to commercial penalties for cancelling the supplies. During the period of the attacks, the new regime in Egypt reopened the terms of the contracts with Israel and Jordan and eventually in April 2012 cancelled the supply contract to Israel, further illustrating that it benefitted from the attacks on the pipeline and intended to end the supply. Through the attacks on the pipeline, the regime has been able to eject itself from an agreement that it views as not commercially favorable to Egypt, while at the same time to make political gains vis-à-vis domestic Egyptian audiences and the larger Middle East.

While the new ruling leadership in Egypt has not taken any concrete steps to revoke the peace agreement with Israel, the gas supply disruptions have raised fears in Israel that the relations are in danger.[36] Following the announcement of the Egyptian national gas company of its intent to cancel the agreement all together, Israel's Minister of Finance Yuval Steinitz stated regarding the cancellation: "This is a dangerous precedent that diminishes the peace treaty."[37] Accordingly, rather than helping to preserve the peace between Egypt and Israel, the disputes over commercial conditions of the agreements damaged the political relations between the sides. While the suspension of supplies, at first glance, seems politically motivated and to serve as a foreign policy tool and the rhetoric associated with the cessation is political, the motivation is primarily economic.

The Egyptian-Israeli and Egyptian Jordan gas supply possessed a number of the characteristics that lead to unstable supply: the consumers were highly dependent on the supplies, while the supplier was not dependent at all and in fact had difficulty in producing the gas for export without cutting domestic supplies. In fact, continuation of blackouts could endanger the stability of the regime. The new regime, with its fragile stability, could not also reduce or cut public subsidies of natural gas electricity. The decision-making process in concluding the original supply agreements also contributed to the unstable supplies: the Egyptian side was led by a shadowy private company that most likely promoted personal financial interest of the investors and the Mubarak clique, and not the long-term interest of the producing state. At the same time, the government of Israel was not a formal side to the supply agreement, leaving lack of transparency and stability of management of a crucial national security issue in the hands of a commercial entity. The cessation of the supplies to Jordan illustrates the complicating element of the involvement of a transit state in gas supplies: while Cairo most likely wanted to suspend supplies to Israel, since the pipeline served both markets, supplies to Jordan have been disrupted consequently each time that the supplies to Israel were suspended. This case is illustrative that some cases of disruptions may employ political rhetoric to mask economic interests. Thus, a disruption at first glance may seem to be a case of use as a foreign policy tool, when in actuality the crux of the disruption is determined by economic factors.

4.2. Case II: Winter 2012 supply cutoffs: Russia and the Caucasus

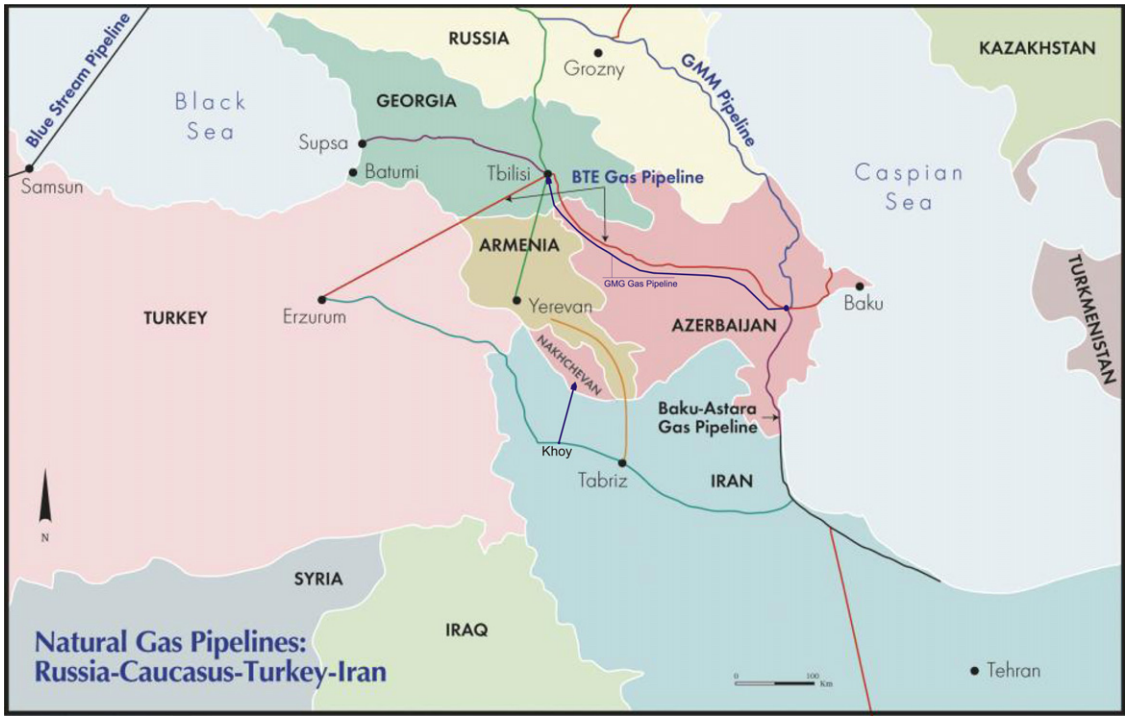
Many disruptions of natural gas supply emanate from technical problems or extreme weather. The frequency of supply disruptions associated with extreme weather will most likely increase in coming years as a result of climate change. However, in the cases of supply disruptions that are not intentional and emanate from technical and weather challenges, politics and policies often come into play. This is illustrated in the February 2012 gas crisis that stemmed from extreme weather in Southern Europe and in its main gas supply states, Russia and Azerbaijan. Southern Russia, Turkey, Iran and the states of the South Caucasus (Azerbaijan, Armenia and Georgia) are connected in multiple gas supply pipelines (see Map 2). In the region, Russia supplies to Turkey, Georgia and Armenia. Azerbaijan supplies to Russia's north Caucasus, Georgia, Turkey, Iran and to the region of Nakhchevan via Iran. Iran supplies gas to Armenia and Turkey.

Due to extreme cold weather in February 2012 in southern Europe natural gas demand was abnormally high in both a number of the producer states and in their consumer markets. The concurrent high domestic and export demand created difficulties for Russia and Azerbaijan to supply both markets and obligated some supply cuts and significant reductions. The behavior of the various suppliers and transit states reflects a number of factors that affect natural gas supply stability: states will supply their own populations first before they export or transit gas; involvement of transit states raises the propensity to disruptions; political relations between the involved states can affect the security of supply, even when the disruption is not intentional and emanates from technical or weather related factors; supply disruptions can be initiated by various states (producer, transit and consumer) along the supply chain; and producer states that manage their gas sector well (storage, redundancy in infrastructure) tend to be relatively more reliable suppliers. The case also

[35] Author's interview, September 2011.

[36] See, for instance, Israel's Minister of Energy and Water, Uzi Landau quoted in Militants Blow Up Egypt-Israel Gas Pipeline Terminal in a Predawn Attack, Bloomberg, July 12, 2011.

[37] Quoted in Haaretz, April 23, 2012.



Map 2. Natural gas pipelines: Russia-Caucasus-Turkey–Iran.

illustrates that the spot market in southern Europe at the time of the crisis was not able to provide sufficient supplies of non-contracted gas in times of spike demand, such as during periods of extreme weather.

In its attempt to meet its concurrent rise in demand domestically and in export markets during the first week of February 2012, Russia cut back supplies to its export markets. As the spokeswoman for the EU Energy Commissioner stated, "There has been a decrease in gas deliveries, Russia needs more gas itself; they are having an extremely cold winter."[38] According to Gazprom representatives, its reductions in exports to Europe were exasperated by the fact that Ukraine, the main transit state of Moscow's natural gas exports to markets in Europe was taking out "significantly more than contract volumes."[39] The cut-backs of Russian gas were most significant to markets that involved a number of transit states, such as Italy. Even though Italy is a significant market to Russia, and Gazprom and Italy's ENI have excellent cooperation on a variety of issues, the transit states along the way took the gas they needed to meet the domestic demand, despite obligations to transit the volumes to Italy. Moreover, consumers in Italy requested additional supplies beyond their contracted volumes, and Gazprom clarified that it could not supply non-contracted volumes.[40] In addition, Russian gas supplies to Armenia were significantly reduced and at times during the crisis completely ceased, despite the fact that Yerevan is a close ally of Moscow.[41] This is due to the fact that the supplies transit Georgia and Tbilisi took from the supplies what it needed to meet its domestic demand.[42] Lack of adequate Russian storage capacity damaged its capacity to serve as a stable supplier to all its export markets during the crisis, despite a seeming lack of political goals connected to the disruptions. Moscow was able to meet most of its contracted supply obligations, but was not able to meet the rising demand beyond what was obligated in the contracts. This case does illustrate some of the beneficial aspects for consumers of long-term supply contracts.

Azerbaijan on a regular basis supplies natural gas to a number of consumers: Georgia, Turkey, Iran and Russia. The behavior of Azerbaijan in the supply crisis was influenced by the political relations with the states it shares the trade with. In addition, Baku's capability to carry out these policies was affected by the policies that guide the management of its natural gas sector. The February 2012 cold wave was particularly harsh in the North and South Caucasus region and created extraordinary demand, including in Azerbaijan itself. The leadership of Azerbaijan's national oil company, SOCAR, made a policy decision to attempt to meet demand in its export markets despite the concurrent increased domestic demand.[43] This policy decision reflects political goals: Baku was concerned that supplies would not be interrupted to its neighbor Georgia, which serves as landlocked Azerbaijan's major transit state in order that Georgia would not be vulnerable to political destabilization. [44] In fact, Baku made extraordinary efforts to ensure the supplies to Georgia, despite the fact that these supplies enabled Georgia to transit more Russian gas to Armenia (with whom Azerbaijan is in a state of war). Baku's behavior toward Georgia during the February 2012 natural gas crisis is consistent with its policies toward Tbilisi throughout most of the post-Soviet period. For instance, Azerbaijan insisted

[38] Marlene Holzner, spokeswoman for EU Energy Commissioner quoted in Fox Business, February 3, 2012.

[39] Alexander I. Medvedev quoted in New York Times, February 3, 2012.

[40] Alexander Medvedev, Director General of Gazprom Export, stated at the World Gas Conference, Kuala Lumpur, June 4th that "during the cold spell in February, we could not meet that excess demand that was not covered by contracts… Those that had long-term contracts got what they had contracted. Those that suddenly wanted more than they had contracted, could not find it." (Author's notes of Medvedev's presentation).

[41] Author's interview with energy company executive involved in gas supply in the region, February 2012.

[42] Author's interview with oil company executive involved in the supply to Georgia, February 2012.

[43] Author's interview with SOCAR official, February 2012 Baku.

[44] For discussion on Azerbaijan's dependence on Georgia as a landlocked energy exporter, see Avinoam Idan and Brenda Shaffer (2011), The Foreign Policies of Landlocked States, Post-Soviet Affairs Vol. 27, No. 3 (July 2011), pp. 1–37.

Please cite this article as: Shaffer, B., Natural gas supply stability and foreign policy. Energy Policy (2013), http://dx.doi.org/10.1016/j.enpol.2012.11.035

on offering Georgia a relatively attractive price for supply of natural gas, contrary to recommendations of the World Bank.[45] During the 2006 shutdown of both natural gas and electricity supplies from Moscow to Georgia, Azerbaijan provided Georgia with electricity (despite its own shortages). During the 2008 war between Russia and Georgia, Azerbaijan provided Georgia with abundant fuel supplies.

Baku also worked to meet the rising demand to Russia's north Caucasus to show Moscow that Azerbaijan's activity as a natural gas exporter can be complimentary to Russia's national interest.[46] This contributes to Azerbaijan's political goal in cooperating with Russia on gas issues so that Moscow does not undermine Baku's natural gas export activity. At the same time, Baku's supplies to Turkey were significantly reduced (and for a number of days during the crisis even completely stopped), formally due to technical problems. The gas supply to Turkey transits Georgia, where there was extraordinary increased demand. Despite Tbilisi's close and even strategic relations with Baku, it took during the crisis the gas that it needed to meet domestic demand, upsetting the transit to Turkey.

Energy policy also came into play in Azerbaijan's capacity to deal with the extreme weather challenge. Baku was able to meet most of the increased demand (with the exception of supply to Turkey) in both the domestic market and Georgia and Russia, due to its well-managed natural gas sector: Azerbaijan maintains extensive natural gas storage capacity and thus is relatively able to maintain stable supply during periods of extraordinary demand. However, when transit states are involved, supply can be disrupted to markets despite the intentions of the supplier.

5. Conclusions

This article examined the factors that affect stability of supply of natural gas between states, focusing on the relative role of political relations, policies and the factors that affect the subsequent propensity to use the supply as a foreign policy tool. The findings have a number of practical implications when assessing future natural gas pipeline projects. One, from the data it was very clear that projects involving transit states are inherently less stable than those that are direct between supplier and consumer. In addition, the analysis also shows clearly that states usually curtail export of gas when it entails shortage of supply at home. This point should be obvious, yet it seems that many consumers do not monitor and analyze the meaning for security of supply of the production and consumption trends of their supplier. As pointed out in the case study, this was very evident in the case of Israel and the eventual cessation of supplies from Egypt. Decision-makers in Israel were aware of the data on the rising consumption trend in Egypt that narrowed the amount of gas available for export, but assumed that the existence of a supply contract and the mutual desire of the sides to preserve the gas supply would outweigh other considerations.

In entering into supply contracts, consumers should consider the domestic supply policies and obligations of their suppliers. A number of natural gas exporters have turned within the period of their export contracts to importers, due to their domestic consumption patterns. It seems that countries with large populations (such as Egypt and Algeria) and with domestic subsidy policies are most likely candidates to have difficulty in upholding export and maintaining the domestic supply and thus are more likely than others to fumble as stable suppliers. The topic of domestic supply policies and influence on export stability warrants future research. The study also shows that a contract is not enough to guarantee stable supply. Conditions must continue to be commercially beneficial, as well as the supplies must be amply produced.

The importance of natural gas in foreign relations will most likely grow during the early twenty first century. Consumption of natural gas is not only growing rapidly in volumes but also in the extent of international gas trade.[47] Furthermore, due to technological advances, during the early twenty first century vast natural gas reserves have been discovered in new locations around the globe, widening the number of locations where natural gas is consumed and traded.

Increase in consumption and international trade in natural gas will create even more political opportunities and challenges. The rapid expansion of international trade in natural gas is taking place in a period of global economic recession. In this period, many states do not have the economic means to establish backup supply infrastructure, such as storage and multiple pipelines that will enhance the security of supply of the consumers and security of markets of the producers. Thus, under these conditions even greater opportunity for use of natural gas as a foreign policy tool will emerge.

The map of the natural gas suppliers, transit states and consumers is changing as well. Due to technological developments in use in the early twenty first century, such as advances in deep-water drilling techniques and hydraulic fracking for discovery of unconventional natural gas, vast new natural gas and oil supplies have been uncovered. This is leading to changes in the list of states that possess volumes of natural gas, and many consumer states are becoming producer states. The United States, for instance, transformed in the first decade of the twenty-first century from a state that was poised to increase significantly its natural gas imports, to a state that now holds over a hundred and twenty five years of reserves (according to 2010 consumption rates) and the U.S. is expected to reemerge as one of the globe's top oil producers.[48] The U.S. is also poised to become a natural gas exporter. States that have free trade agreements with the US will be the first in line to receive approval of export projects. Thus, being a US ally will receive an additional benefit of access to natural gas supplies at lower prices than most of these states' current options. China, as well, has detected massive natural gas reserves. According to a survey of representatives of the natural gas industry, in 2030, China is anticipated to be the largest producer on the globe of natural gas.[49] Accordingly, China will most likely be able to supply most of its future consumption and perhaps export to neighbors in Asia. These shifts are significant also for the future trends in natural gas and foreign relations.

With demand for natural gas in new markets, the number of multiple state supply projects, which involve transit states, is increasing. As shown in this article, supply involving transit states is significantly more vulnerable to disruption. It also requires much more policy investment to attempt to maintain the stability.

In addition, due to the rise in exploration and production of gas in offshore locations, the number of maritime border conflicts is growing and is anticipated to rise. Conflicts have emerged in recent years related to natural gas exploration between Cyprus and Turkey (from 2011), between Israel and Lebanon (2010) and

[45] Author's interview with a political advisor to President Heydar Aliyev, March 2003, Baku, quoted in Brenda Shaffer, Energy Politics (Philadelphia: University of Pennsylvania Press, 2009).

[46] Author's interview, February 2012 Baku.

[47] Joe Barnes, Mark H. Hayes, Amy M. Jaffe, and David G. Victor. Introduction to the study David G. Victor, Amy M. Jaffe, and Mark H. Hayes (Eds.) (2006) Natural Gas and Geopolitics: From 1970 to 2040 (Cambridge: Cambridge University Press, 2006), pp. 11.

[48] Energy 2010: North America—the new Middle East? (Citigroup: Citi GPS: Global Perspectives and Solutions, 20 March 2012).

[49] Oil and Gas Journal, June 7, 2012.

Please cite this article as: Shaffer, B., Natural gas supply stability and foreign policy. Energy Policy (2013), http://dx.doi.org/10.1016/j.enpol.2012.11.035

China Vietnam, and the Philippines and China and Japan (reignited in 2012). The addition of conflict over maritime borders has added complication to existing conflicts as well, such as Cyprus and Israel/Lebanon. Prior to the intensification of offshore oil and gas exploration in the world, many maritime borders where not formally delimitated or of interest to involved parties beyond fishing rights. With the initiation of exploration in many of these non-delimitated zones, conflicts are rapidly emerging and will create a new issue of concern for policy makers on regional and international agendas and future research.

References

Adelman, M.A., 1996. The Genie out of the Bottle: World Oil since 1970. Cambridge, MA: MIT Press 1996.

Are we entering a golden age of natural gas? (Paris: International Energy Agency, 2011).

Author's interview with senior official in Ministry of Energy and Water, State of Israel, April 2011.

Author's interviews with energy officials and executives related to the natural gas supplies in the Caucasus, February 2012.

Barnes, Joe, Hayes, Mark H., Jaffe, Amy M., Victor, David G., 2006. Introduction to the study. In: David G., Victor, Amy M., Jaffe, Mark H., Hayes (Eds.), Natural Gas and Geopolitics: From 1970 to 2040. Cambridge University Press, Cambridge.

BP Statistical Review of Energy, June 2012.

Clinton, Hillary, in a Washington speech before NATO leaders, Washington DC. February 24, 2010, Quoted by UPI 24 February 2010.

Copeland, Dale C., 1996. Economic interdependence and war: a theory of trade expectations. International Security 20 (4), Spring.

Deese, David, Nye, Joseph (Eds.), 1981. Energy and security MA: Ballinger Publishing Co., Cambridge 1981.

Energy 2010: North America—The New Middle East? (Citigroup: Citi GPS: Global Perspectives and Solutions, 20 March 2012).

Gholz, Eugene, Press, Daryl G., 2010. Protecting 'the prize': oil and the U.S. National Interest. Security Studies 19, 453–485.

Holzner, Marlene, Spokeswoman for EU Energy Commissioner Quoted in Fox Business, February 3, 2012.

IEA Key World Statistics 2012.

Idan, Avinoam, Shaffer, Brenda, 2011. The foreign policies of landlocked states. Post-Soviet Affairs 27 (3), 1–37, July.

Landau Uzi, Israel's Minister of Energy and Water, Quoted in "Militants Blow up Egypt–Israel Gas Pipeline Terminal in a Predawn Attack," Bloomberg, July 12, 2011.

Maresca, John J., State Department's Previous Chief Negotiator on the Nagorno–Karabagh Conflict, John J. Maresca, "A 'Peace Pipeline' to End the Nagorno–Karabakh Conflict," Caspian Crossroads, No.1, Winter 1995.

Medvedev, Alexander I., Quoted in New York Times. February 3, 2012.

Novick, Nimrod, Merhav Group Vice-President and Chief Israeli Negotiator of the EMG Gas Supply Agreement, Speech at Netanya College, March 19, 2012.

Noël, Pierre, Beyond Dependence: How to Deal with Russian Gas (European Council on Foreign Relations, 2008,).

Senator Lugar Renews Energy Warning in Reaction to Russian Oil Cutoff, Congressional Press Release, January 10, 2007.

Shaffer, Brenda, 2009. Energy Politics. Philadelphia: University of Pennsylvania Press 2009.

Skea, Jim, Chaudry, Modassar, Wang, Xinxin, 2012. The role of gas infrastructure in promoting UK energy security. Energy Policy 43, 202–213.

Victor, David G., Jaffe, Amy M., Hayes, Mark H. (Eds.), 2006. National Gas and Geopolitics: from 1970 to 2010. Cambridge: Cambridge University Press 2006.

Waltz, Kenneth N., 1970. The Myth of national interdependence. In: Kindleberger, P. (Ed.), The International Corporation. Cambridge, MA.: MIT Press, pp. 205–223.

Waltz, Kenneth N., 1979. Theory of International Politics. Reading, MA.: Addison-Wesley Publishing CompanyReading, MA.: Addison-Wesley Publishing Company.

Weintraub, Sidney, 2007. Introduction. In: Sidney Weintraub with Annette Hester and Veronica R. Prado (Eds.) Energy Cooperation in the Western Hemisphere: Benefits and Impediments (Washington, D.C.: Center for Strategic and International Studies, 2007).

Please cite this article as: Shaffer, B., Natural gas supply stability and foreign policy. Energy Policy (2013), http://dx.doi.org/10.1016/j.enpol.2012.11.035