

Foreign Direct Investments in Central Asian Energy: A CGE Model

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Abstract

Turkmenistan, Uzbekistan, and Kazakhstan have adopted significant legislative changes since the fall of the former Soviet Union in an effort to attract foreign direct investment into their energy sectors. Of the three republics, Kazakhstan has been the most successful in attracting foreign interest, but all three republics face significant challenges in further development of oil and gas infrastructure. Even if these countries are completely successful in bringing in foreign investment, a question will remain: who wins and who loses in these countries. Using updated data, this paper will use a computable general equilibrium model to measure the effects of FDI into Central Asia. Results of the model suggest that the region would be better off overall from foreign investment in its natural gas sector, due mostly to improvements in overall production efficiency and its overall terms of trade. However, the gain in the natural gas sector would come at the expense of production and net exports of non-petroleum related industries.

Keywords: CGE, Computable General Equilibrium, Foreign Investment, Natural Gas, Transitional Economies.

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Introduction

Turkmenistan and Uzbekistan have abundant oil and natural gas reserves. According to the U.S. Department of Energy, a lack of sufficient foreign investment, geographical challenges, inadequate export pipeline infrastructure, and political instability have been deterrents of both countries becoming major energy exporters (Energy Information Agency, 2009). While both countries hope recent agreements with international companies and countries may help them find alternative export routes outside of Russia and leverage their hydrocarbon competitiveness in the region, energy production from Turkmenistan and Uzbekistan has declined since 2004. The primary factor has been a lack of new investment and technical capacity to bring new oilfields online.

Kazakhstan is more of a success story in terms of foreign investment. According to the EIA, after years of foreign investment into the country's oil and natural gas sectors, the landlocked Central Asian state has recently begun to realize its enormous production potential. With sufficient export options, Kazakhstan could become a major world energy producer and exporter over the next decade. Still however, the nation is in great need of investment. Its lack of available gas export infrastructure will limit export growth.

This paper will summarize the investment climate for oil and gas investment in Central Asia, and then use a CGE model to measure the potential effects of such investment. Part I will provide a brief summary of the energy policies of each of these three former Soviet republics. In each of them, the focus of the government's seems (though often unsuccessfully) to create a more attractive investment climate for western oil and gas investors. Part II of the paper will be a general equilibrium model that will examine the effects of these desired investment flows if they ever do materialize in the future.

1. Energy Policies of Turkmenistan, Uzbekistan, and Kazakhstan

1.1. Turkmenistan Background

Turkmenistan also has a lot of oil and gas. Its proven hydrocarbon reserves run from offshore Caspian fields to the Darya Basin reserves bordering Uzbekistan. There are companies from all over the world investing in Turkmenistan, but several issues remain a major obstacle to others. American and other major western companies seem to be most nervous about Turkmen projects to date for political and geographic reasons. Iran is a possibility for exports, but Iran is still under U.S. sanctions. Despite a new U.S. president and somewhat friendlier-sounding rhetoric, the Iran option remains complicated at best. Both ExxonMobile and Shell have either stopped or suspended their operations in Turkmenistan, citing small field

sizes, poor results, or worries about pipeline development. Presently, it is the Russians who appear to be the most promising option for Turkmenistan.

The Caspian Sea itself is a source of investor uncertainty. Kazakhstan, Azerbaijan, and Russia have basically agreed upon their Caspian Sea borders through various treaties, but the Caspian boundaries are still unsettled, much in part because Iran continues to demand a minimum one-fifth share of the seabed to itself. Turkmenistan has balked at the Iranian position, and hasn't signed on with the other three former Soviet states because of it.

With uncertainty over geographic rights and Iran's position, energy firms have been slow to sign PSA and other such agreements. Such potential investors have included Russia's Rosneft, Itera, and Zarubezhneft; and Wintershall of Germany. Foreign investment in Turkmenistan outside of the Caspian region has been more robust, including projects by Maersk, Petronas, and Dragon. There is still some dispute over the boundary between Turkmenistan and Azerbaijan, but it appears not to be as much of an obstacle to investors as the Caspian issues.

Beyond the economic and legal framework of investing in Turkmenistan (and elsewhere in the region), the political systems are another important factor for investors. Turkmenistan has an extremely strong centralized authority. This article examines the legal regime applicable to foreign investments in Turkmenistan's upstream oil and gas sector. These types of investments are significantly influenced in Turkmenistan, as in the other ex-Soviet countries, by the starting-point rule that all underground natural resources – including oil and gas – are in exclusive state ownership.

Despite its authoritarian rule, Turkmenistan has taken significant steps in attempt to clarify investment law for foreigners. In 2000, Turkmenistan adopted detailed administrative rules for conducting oil operations. Before these rules were introduced, operating companies could easily have found themselves violating obscure Soviet laws dating back to 1970 or earlier. The new rules fill out many details not covered in Turkmenistan's general Subsurface Law of 1992 (Republic of Turkmenistan, 1992), and the more specific Petroleum Law of 1996 (the "Petroleum Law" or "PL") (Republic of Turkmenistan, 1996).

1.2. Turkmenistan Legal Framework

Article 15 of Turkmenistan's Petroleum Law says that natural resources found in the subsurface may be developed only on the basis of a license, and that the licensee has the right to conduct only those operations specified in the license. There is either a tender, or direct negotiations, prior to the issuance of a petroleum license and the conclusion of a petroleum operations contract.

Licensees may be: (i) Turkmenistan legal entities (irrespective of the form of ownership) or nationals; or (ii) in accordance with Article 14 of the Petroleum Law,

foreign legal entities, provided that they register in Turkmenistan a branch or participate in a joint venture. Somewhat tighter requirements for foreign entity licensees are found in the 1998 License Issuance Decree (Republic of Turkmenistan, 1998), however, these conflict with the Petroleum Law, and it appears that the more liberal statutory provisions prevail.

Article 8 establishes the following types of petroleum licenses: license for exploration; license for production; and combination license for exploration and production. PL Article 19 allows issuance of an exploration license for up to six years plus two two-year extensions; a production license for up to 20 years plus a possible single five-year extension; and combined exploration and production license for the maximum combined exploration and production terms (plus extensions) together. The Petroleum Law now specifically states – at Articles 16 and 19 - that any extension of the terms of a license shall be made by the Competent Body only on the basis of an authorizing decree of the President.

Article 13 stipulates that an exploration license holder that makes a commercial discovery has an exclusive right to apply for and obtain a production license. (Here again, a presidential decree may now be required for this; not entirely clear in the PL as amended.)

Licenses are now to be granted by the Competent Body – and, according to PL Article 16, only on the basis of a presidential decree (per PL Article 16) as noted above – and following a tender or direct negotiations carried out between the Competent Body and the license applicant. A tender may be either open to all applicants, or closed (that is, open only to a limited number of short-listed participants). Despite the CIS-region governments' attraction to tenders (or auctions) as the economically preferred form, in Turkmenistan the large new development projects still commonly proceed by direct negotiations.

Investors have expressed concern in Turkmenistan, as in neighboring countries with similar rules, over the government's power unilaterally to annul a petroleum license – and have the associated contract simply be terminated and deemed invalid – on various grounds outside of the parties' contractual agreement. Article 51 allows a contractor to assign all or part of its rights and obligations under the license and agreement to an interested third party only with the prior written consent of the Competent Body. A more permissive assignment rule applies to assignments to affiliates and shareholders, where consent is not required. However, this more permissive treatment does require the assignor, for as long as it retains a part interest, to bear joint and several liability together with the assignee. (The Petroleum Law defines an "affiliate" relationship as involving control of "more than 50%" of voting rights.)

1.3. Turkmenistan PSA and Other Arrangements

The Turkmenistan Petroleum Law provides for certain types of contracts that may be used for conducting petroleum operations: (i) production sharing agreements (PSAs), (ii) joint activity agreements (JAAs), or (iii) as permitted by PL Article 24, a combination of these two types of agreement, as well as other kinds of agreements suited to the specific situation. The terms and conditions for conducting petroleum operations, including the program of work and expenses for such operations, are defined in these agreements.

In accordance with Article 24 (as recently amended), PSAs are to be signed on the Turkmenistan side by the Competent Body – again on the basis of a specific presidential decree. This change should add certainty in an area previously marked by some confusion. (The PL had earlier provided that the PSA could be signed by the Competent Body and/or a State Concern – and this was uncertainty over the possible role of the State Concerns, and who other than President Niyazov himself could legally sign on behalf of the Competent Body (although the PSAs to date seem to be signed by the President – acting in his capacity of Chairman of the Competent Body – in any event). The agreements concluded between the government and investors to date for fields now under exploration or development, as well as the pending E&P project negotiations, are all PSAs as far as we are aware.

JAAAs are to be signed by a state body on the basis of a presidential decree (apparently, not by the Competent Body, although it would appear that the President may also authorize the Competent Body to sign a JAA). In a JAA, the State is evidently always a party to the agreement through the state body authorized by the President. It is not clear to us whether any such JAA, as a type of petroleum development contract with the state (as distinct from a PSA), has been executed or is even in negotiations or discussion to date.

Government-generated “model” contracts on production-sharing (the “Model PSA”) and joint-venture activities (the “Model JAA”) in Turkmenistan have been in place at least since 1997, adopted by the Decree on the Competent Body and Model Contracts. (See footnote 5 above.) Note also that there have been at least three versions of the Model PSA made available from that time forward, as well as a considerable amount of de facto updating of the model from negotiation to negotiation – as each new potential PSA investor company has found.

1.4. Uzbekistan Background

Uzbekistan has a lot of oil and a lot of natural gas. The country is about the size of the state of California, and has a population of 24.8 million (U.S. Department of State, 2008). Uzbekistan is a landlocked country bordered by Kazakhstan to the north and west, Kyrgyzstan and Tajikistan to the east, and Afghanistan and

Turkmenistan to the south (U.S. Department of Energy, 2008). Uzbekistan has so far identified 187 hydrocarbon fields, including 91 gas and gas condensate fields and 96 oil and gas, oil condensate, and oil fields. The country is developing 88 of these fields; 58 fields are ready for development; nine are “held in reserve”, and 17 are in “geological exploration” (Interfax, 2004).

Uzbekistan has two older refineries at Fergana and Alty-Arik, and a newer one at Bukhara—all with a total refining capacity of 11.1 million tons per year (World Bank, 2003). Uzbekistan’s natural gas has a high sulfur content which requires significant processing. The majority of Uzbekistan’s gas is produced at the Mubarek processing plant, which has a capacity of approximately 28.3 million BCM per year (U.S. Department of Energy, 2008). A relatively new Shurtan Gas-Chemical Complex was completed at the cost of about \$1 billion, and the Kodzhaabad underground gas storage facility was completed in 1999 at the cost of \$72 million (World Bank, 2003).

Uzbekneftegaz is the state-owned company that may sign oil and gas exploration and production contracts, independently perform petroleum operations in certain areas, act as a participant in joint ventures, and supervise petroleum operations (U.S. Department of Energy, 2008). Uzbekneftegaz is a holding company which is regulated under Presidential Decree No. UP-2154 (Republic of Uzbekistan, 1998a) and COM Resolution No. 523 (Republic of Uzbekistan, 1998c). Uzbekneftegaz controls downstream and related activities in the energy sector, including: (1) Uzneddobycha (oil extraction); (2) Uznedtegaz Pererabotka (oil and gas processing); (3) Uztransgaz (gas and oil transportation and pipelines); and (4) Uzneshneftegaz (foreign economic relations) (Uzbekneftegaz National Holding, 2009).

In addition to its role as the nominated state co-venturer in exploration and production ventures with foreign investors, Uzbekneftegaz has also now been designated as the “Competent Body” to regulate the oil and gas industry (Republic of Uzbekistan, 1994b). Such a dual role as both a producer and regulator might be considered by foreign investors as a conflict of interest. Uzbekneftegaz,” was founded by the decree of the President of Uzbekistan on December 11, 1998 (Republic of Uzbekistan, 1998a; 1998b). The holding company was created out of nine companies in 1998 to unite the country's entire petroleum sector, and is now a mammoth state run concern (Anonymous, 2004).

1.5. Uzbekistan Legal Framework

Articles 3-4 and 7 of the Uzbekistan “Subsoil Law” grant authority over the subsoil (including its natural resources) to: (1) President; (2) Cabinet of Ministers (the “COM”); (3) Local authorities; and (4) Specially designated state agencies (Republic of Uzbekistan, 1994b: Articles 3-4, 7). In addition to these powers, Article 4 of the Law On Natural Monopolies also gives the power of regulatory oversight for natural

monopolies to the state. These regulated activities include: (i) the extraction of oil, gas condensate, natural gas, and coal, and (ii) oil, petroleum products, and gas transportation by pipeline (Republic of Uzbekistan, 1997).

As is common in former Soviet republics, the Uzbekistan Constitution vests ownership of the subsoil in the state (Republic of Uzbekistan, 1994a). The Law on the Subsoil of September 23, 1994 and its amendments set out Uzbekistan's framework of statutes governing the exploration and development of all subsoil resources—including hydrocarbons and other minerals. The "Subsoil Law" covers state licensing and control, rights and obligations, basic rational use rules, and other issues. It does not specify any particular form of contract favored or allowed for resource (Republic of Uzbekistan, 1994a). There is also a new "Law on Licensing of Certain Activities" of May 25, 2000 (the "Licensing Law"), (Republic of Uzbekistan, 2000a) and the older, pre-existing Cabinet of Ministers Decree No. 215 On Licensing of Business Activities of April 14, 1994, as amended (the "Licensing Decree") (Republic of Uzbekistan, 1994a)

Approved licenses are the basis for oil and gas exploration and development in Uzbekistan. The Subsoil Law requires that a license be issued to any physical or legal persons, domestic or foreign. Specifically, under the Subsoil Law Articles 10 through 14 and the Licensing Decree, a license is required only for mineral extraction (Republic of Uzbekistan, 1994b, Articles 10-14). However, it is understood that licenses may be granted for exploration, production, or combined exploration and production (Hines and Sievers, 2001).

Another important rule is Uzbekistan's right to terminate a license. In Russia, where the state has authorized exploration under both a production sharing agreement regime and a subsoil licensing regime, the Russian state reserves the right to terminate, suspend, or limit an investor's utilization of an approved license (The Russian Federation, 1992).

In Uzbekistan, the Subsoil Law (Art. 19) provides many excuses for the Uzbek authorities to terminate a license, including: (1) a finding of the user's violation of "the basic terms of the license"; (2) non-fulfillment of the Subsoil Law conditions for exploration, development, and workplace safety; (3) "necessity of confiscation of subsoil plots for other state or public needs"; (4) threat to human life or health or to the environment; (5) failure to commence work within a year of initial licensing; and (6) "systematic" non-payment of resource use payments (which are established under Art. 22) (Republic of Uzbekistan, 1994b: Article 19).

If a dispute should arise regarding a license, Uzbek law provides that "in matters of use and protection of the subsoil shall be determined in court in the manner established by law." (Republic of Uzbekistan, 1994b: Article 19) This provision likely sounds a little vague to foreign investors, though other provisions of Uzbek law attempts to give priority to international law and treaties in the choice of

jurisdiction for disputes. Several documents mention such priority, including: (1) Subsoil Law Article 5 (Republic of Uzbekistan, 1994b: Article 19); (2) provisions of the 1998 Investment Laws affording foreign investors the right to resolve disputes in international arbitration (Republic of Uzbekistan, 1998e: Article 19; 1998d); and (3) Uzbekistan's obligations under the Energy Charter Treaty (Republic of Uzbekistan, 1994b: Article 26). Additionally, the Uzbek "Law on Concessions" mentions the right to international arbitration (Republic of Uzbekistan, 1995).

1.6. Uzbekistan PSA

Beginning in 1998, the Government of Uzbekistan conducted a program to attract foreign investors to develop oil and gas deposits in the territory of Usturt plato in the Southwest of Uzbekistan, which, according to preliminary estimates, contains 4 billion tons of oil (Saparov and Frolov, 2003).

On April 28, 2000, the Uzbekistan Government adopted the "Oil And Gas Investments Decree" as part of an organized plan to attract more FDI into the Uzbek oil and gas sector. The Oil And Gas Investments Decree was introduced at a press conference on May 4, 2000, and was a main attraction at a major oil and gas convention held in Tashkent on May 17-18, 2000 (Republic of Uzbekistan, 2000b). The Oil and Gas Investments Decree contains several provisions of significant interest to foreign investors. First, companies which conduct exploratory work in the Ustyurtskiy region (and possibly others) may be granted newly discovered oil and gas deposits for a period of up to 25 years with a "right to prolong the development period." (Republic of Uzbekistan, 2000b)

Oil and gas deposits may be granted to companies engaged in prospecting and exploration work "on a concession basis." In addition, such companies are to benefit from an investment regime which includes a number of right, including: (1) the exclusive right to prospect and explore various territories with a right to further develop any deposits found in these territories, either through a joint venture or through a concession; (2) a preemptive right to acquire new territory for further prospecting and exploration if no valuable industrial resources have been found there; (3) a right of ownership and a right to freely export extracted hydrocarbons and their products processed on a tolling basis, as set out in the foundation documents of a joint venture or a concession agreement; and (4) a guarantee that actual expenses arising from prospecting and exploration will be reimbursed in the event that deposits "of industrial interest" are discovered and then transferred to Uzbekneftegaz for future development (Republic of Uzbekistan, 2000b).

Foreign companies engaged in prospecting and exploring oil and gas deposits in Uzbekistan (along with their contractors and subcontractors) are exempted from "all types of taxes, deductions, and payments" in force in Uzbekistan during the period of prospecting and exploration, as well as customs duties (except for those for payment of customs formalization) when importing equipment, material, and

technical resources and services needed to conduct prospecting, exploring, and related activities (Republic of Uzbekistan, 2000b).

On May 25, 2000 the Oliy Majlis (Parliament) of the Republic of the Uzbekistan adopted the Law "On Licensing Of Specific Kinds Of Activity" (published on June 15, 2000) ("Licensing Law"). The Licensing Law is effective from September 1, 2000 and provides the general legal framework for licensing (Republic of Uzbekistan, 2000a).

With all the positive influences on the oil and gas sector provided by Decree UP-2598, its effect on further development of contractual relationships in the sector was limited. This led to enactment of a full-fledged PSA Act at the end 2001. On December 7, 2001 Oliy Majlis (Parliament) of the Republic of Uzbekistan adopted Resolution No. 312-II On Enactment of the Act "On Product Sharing Agreements" ("PSA Act") (Republic of Uzbekistan, 2001).

A key concept of a PSA (according to the PSA Act itself) is that the Uzbek state grants to a foreign investor for a certain period of time exclusive rights to search for, explore deposits and extract minerals in a specified segment of subsoil. In return the investor is obliged to fulfill work plans determined by the agreement at its own risk and expense, as well as to transfer a share of the extracted product or its monetary equivalent to the State (Republic of Uzbekistan, 2001).

The Uzbek government has been hoping to attract \$400 million of foreign investment through production-sharing agreements (PSAs). Of the 80 fields offered under PSA arrangements, 78 fields are located in 16 exploration blocks. Eight individual fields, with total reserves of some 1.2 billion barrels of oil equivalent, have been opened up for potential foreign participation. Those fields include four in the south-western Gissar Basin and four in the Amu Darya region (Anonymous, 2004). However, success under PSA laws has been limited because foreign companies perceive the PSA terms as less attractive than those offered in other parts of Central Asia and Russia. Investors readily cite increased political risks in Uzbekistan due to Islamic opposition to President Karimov (Republic of Uzbekistan, 2001).

Such lack of success has serious implications for Uzbekistan. Uzbek government targets in their long-term resource development plans are rarely achieved. Under a program started in the 1990s, the Uzbek government predicted that Uzbekistan's oil production should reach 450,000 b/d by 2001. However, in 2001 the actual production of oil and condensate averaged only about 171,000 b/d (Republic of Uzbekistan, 2001).

1.7. Privatization in Uzbekistan

The Uzbek privatization program has run parallel to the development of the PSA regime. On March 9, 2001, the Uzbekistan Government announced a mass privatization in the Resolution of the Cabinet of Ministers of the Republic of

Uzbekistan “In Respect of Further Measures for Denationalization and Privatization of Enterprises with Participation of Foreign Investors in 2001-2002” (the “2001 Privatization Program”). The 2001 Privatization Program is intended to be carried out in part with the support of funds provided by a World Bank loan.¹

There have been two previous mass privatization programs in Uzbekistan, the first announced in late 1998 and the second in late 1999. Neither were particularly successful, largely due to continued foreign currency exchange restrictions and the Uzbekistan Government’s reluctance to allow foreign investors to obtain control over the most attractive enterprises offered for privatization (Braude, 2003). Many of the enterprises listed in the 2001 Privatization Program have been previously subject to privatization, including the seven joint stock companies of Uzbekneftgaz and the Uzbekneftgaz Holding Company. With one exception, as previously, all of the Uzbekneftgaz companies are slated to remain majority controlled by the state.

In the oil and gas sector, the Uzbek government has been offering a 49% stake in UzbekNefteGaz (UNG), but until recently, little progress seems to have been made (Anonymous, 2004). To improve its chances of a sale, the government is again restructuring UNG to make it more profitable. The government has also been offering to sell its 44% stake of Uzneftegazdobycha (UNG's oil and gas exploration arm), 44% of UzTransGaz (in charge of gas transport and the country's gas pipelines), 39% of UzNeftePereRabotka (oil refining), and 39% of UzBurNefteGaz (a drilling company) (Anonymous, 2004).

1.8. Kazakhstan Background

Kazakhstan has the Caspian Sea region's largest recoverable crude oil reserves, and its production accounts for over half of the roughly 2.8 million barrels per day (bbl/d) currently being produced in the region (including regional oil producers Azerbaijan, Uzbekistan, and Turkmenistan). Kazakhstan oil exports are the foundation of the country’s economy and have ensured that average real According to the EIA, Kazakh GDP growth has stayed above 9 percent for the last 6 years. Real GDP growth during 2007 averaged 9.5 percent (Energy Information Agency, 2009).

Kazakhstan's growing petroleum industry accounts for roughly 30 percent of the country’s GDP and over half of its export revenues. In an effort to reduce Kazakhstan's exposure to price fluctuations for energy and commodities exports, the government created the National Oil Fund of Kazakhstan. Due to high oil prices the international reserves and assets in the oil fund have doubled in the last year to \$20 billion in October 2007(Energy Information Agency, 2009).

¹ On March 9, 2001, the Uzbekistan Government announced a mass privatization in the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan “In Respect of Further Measures for Denationalization and Privatization of Enterprises with Participation of Foreign Investors in 2001-2002”.

As mentioned, Kazakhstan has a better record of attracting investments than do its other Central Asian neighbors. The U.S. Department of Energy believes this success is due to foreign investment into Kazakhstan, and offers an optimistic view of the future:

Kazakhstan is important to world energy markets because it has significant oil and natural gas reserves. After years of foreign investment into the country's oil and natural gas sectors, the landlocked Central Asian state has recently begun to realize its enormous production potential. With sufficient export options, Kazakhstan could become a major world energy producer and exporter over the next decade (Energy Information Agency, 2009).

Despite the successes, Kazakhstan still faces significant energy problems. The government maintains a virtual monopoly over energy industries. And despite its fossil fuel riches, Kazakhstan is a net importer of electricity, mainly from Russia. A major cause of the energy imbalance is an extremely high ratio of energy consumption to gross domestic product output. Reversal of energy dependency is a high priority of government economic policy (Library of Congress, 2007).

As found in a study by the U.S. Library of Congress, Kazakhstan suffers from an inefficient domestic delivery system and the failure to utilize natural gas obtained in oil extraction operations (Library of Congress, 2007). Perhaps surprisingly, Kazakhstan also imports natural gas from Uzbekistan. In 2004 infrastructure improved sufficiently for domestic output to equal consumption, at the level of 16 billion cubic meters. In the first half of 2005, Kazakhstan became a net exporter of natural gas for the first time, as production continued to increase. According to an official forecast, in 2015 gas output will reach 50 billion cubic meters, compared with 20.5 billion cubic meters in 2004 (Library of Congress, 2007). In 2005, China and Kazakhstan had talks over a prospective gas pipeline connection from Kazakhstan to Shanghai on China's east coast.

Beginning in the late 1990s, foreign investment has stimulated rapid development of the oil industry. The state-owned oil and gas company, Kazmunaigaz, provides 20 percent of output, with the remainder accounted for by three major foreign consortia: Tengizchevroil, the Karachaganak Integrated Operation, and the Agip Kazakhstan North Caspian Operating Company. In the early 2000s, the government attempted to improve the terms of foreign ownership in the oil and gas industries, although substantial restrictions remain on ownership of Caspian operations. Plans call for development of an ethanol industry to supplement conventional fuels, using grain from the agricultural region of northern Kazakhstan. Kazakhstan would be a member of the Asian Energy Club, which Russia proposed in 2006 to unify oil, gas, and electricity producers, consumers, and transit countries in the Central Asian region in a bloc that is self-sufficient in energy. Other members would be China, Kyrgyzstan, Tajikistan, and Uzbekistan.

1.9. Kazakhstan Legal Framework

According to Andrew T. Griffin of the law firm DLA Piper, there are two main pieces of legislation regulating foreign investment into Kazakhstan's energy sector. The first is the "Republic of Kazakhstan Law On Petroleum," originally passed in June 1995. The other is the "Law On the Subsurface and Use of the Subsurface," passed in January 1996 (Griffin, 2008). Both laws have been changed since their original introduction more than a decade ago.

The Subsurface Law has the wider scope of the two pieces of legislation. It outlines the rules and regulations for an investor to acquire a "subsurface-use right." In Kazakhstan the subsurface-use right is the equivalent to a license or a concession in other jurisdictions. In oil and gas projects, it is granted upon the execution of a "Hydrocarbon Contract" between the "Competent Body", i.e., the Kazakhstan Ministry of Energy and Mineral Resources and the producer, known in Kazakhstan typically as the "Contractor." (Griffin, 2008) The Petroleum Law is in some ways an addendum to the Subsurface Law in that it regulates petroleum and gas projects.

One important feature of Kazakhstan's energy law is the government's pre-emptive purchase right to produced hydrocarbons. Previously, the Petroleum Law previously required the Kazakh government to pay "world-market price" for any hydrocarbons that it received from producers. The 2007 Amendments now provide that petroleum acquired by the government under pre-emptive right from the Contractor be compensated "at prices not exceeding world-market prices." (Griffin, 2008) This is significant because it means that the Kazakh Government now has the choice of negotiating down the price, instead of automatically paying the world market price.

2. A CGE Model for Gas Investment

2.1. Background of General Equilibrium Models

Computable General Equilibrium (CGE) modeling specifies all economic relationships in mathematical terms and puts them together in a form that allows the model to predict the change in variables such as prices, output and economic welfare resulting from a change in economic policies. To do this, the model requires information about technology (the inputs required to produce a unit of output), policies and consumer preferences. The key of the model is "market clearing," the condition that says supply should equal demand in every market. The solution, or "equilibrium," is that set of prices where supply equals demand in every market— goods, factors, foreign exchange, and everything else (Hertel et al., 2007).

2.2. The Global Trade Analysis Project

GTAP is a multi-regional CGE model which captures world economic activity in 57 different industries of 113 regions (Version 7). The underlying equation system of GTAP includes two different kinds of equations. One part covers the accounting relationships which ensure that receipts and expenditures of every agent in the economy are balanced. The other part of the equation system consists of behavioral equations which based upon microeconomic theory. These equations specify the behavior of optimizing agents in the economy, such as demand functions (Hertel et.al., 2007). Input-out tables summarize the linkages between all industries and agents.

The mathematical relationships assumed in the GTAP model are simplified, though they adhere to the principle of “many markets.” The simplification is that thousands of markets are “aggregated” into groups. For example, ‘transport and communications services’ appear as a single industry. In principle all the relationships in a model could be estimated from detailed data on the economy over many years. In practice, however, their number and parameterization generally outweigh the data available. In the GTAP model, only the most important relationships have been econometrically estimated. These include the international trade elasticities and the agricultural factor supply and demand elasticities.

2.3. Structure of this Paper’s Model

In this paper, I have updated my modeling to use GTAP Version 7 data. While the core database has 57 sectors and 113 regions, I have again aggregated the matrices to simplify the world into just 10 sectors, eight regions, and five factors of production. This aggregation is described in Table 1.

Table 1. Aggregation Used in the Model

Regions	Sectors	Factors
United States	Cotton	Land
European Union	Oilseeds	Unskilled Labor
Russia	Textiles and Apparel	Skilled Labor
Central Asia	Oil	Capital
China	Gas	Natural Resources
India	Metals and Minerals	
Japan	Food	
Rest of World	Manufacturing	
	Services	
	Capital Goods	

The data is first, “calibrated,” meaning the model is solved for its original equilibrium prices and volumes in all markets. This baseline is meant to represent the economy as is, before any shock takes place. Thousands of equations are created, each representing supply and demand conditions in markets inside each

region, including markets for goods, services, factors of production, savings, government expenditure, and more.

The “shock” in this model is the introduction of foreign investment into the natural gas sector of Central Asia. For experiment purposes, a 10 percent productivity increase is introduced to the gas sector in Central Asia. Foreign investment is assumed to bring increased capital, infrastructure, management skills, and technology to the Central Asian fields. This would result in an increase in productivity and output of the natural gas sector in these regions. The magnitude of the shock is not as important as the relative changes it brings to the various economies involved. A different line of research would be needed to measure the correlation between FDI and productivity. For GTAP model purposes, this is a convenient way to bring FDI into the model. The goal of the model is to measure what effects such a productivity change would have on the region and the world.

2.4. Model Results

The foreign investment into Uzbekistan’s natural gas sector results in changes to trade balances. Overall Central Asia experiences a decrease in its trade balance, despite a now stronger gas sector. As shown in Table 2, Central Asia’s trade balance decreases by \$41.9 million dollars. Interestingly, Russia, a major partner in Uzbekistan’s oil and gas sector, experiences a \$132.8 million decrease in its trade balances. All other regions of the world see an improvement in trade balances. While these effects are not very large in relation to the size of these economies, the significance of the changes in trade is better seen by examining trade in individual sectors.

Table 2. Change in Trade Balances (Millions of dollars)

	Change
US	71.28
EU	39.87
Russia	-132.8
Central Asia	-34.9
China	16.78
India	6.42
Japan	36.65
ROW	-4.56

Source: Generated by author

Changes in trade balances by sector provide evidence of possible Dutch Disease in Central Asia. Increased Central Asian exports of natural gas and oil appear to come at the expense of decreased exports in every other sector. As presented in Table 3, Central Asia’s natural gas exports increase by a half billion dollars (\$502 million). Meanwhile, manufacturing net exports fall \$237.44 billion, metals and minerals net exports fall by \$131.55 million, and food net exports fall by \$78 million.

Outside of Central Asia, the trade effects are also significant. While Central Asia's trade balance in natural gas expands, trade balances in natural gas decline in Russia and the rest of the world. It would appear the increased Central Asian productivity in gas comes at the expense of gas sales from Russia and the Middle East.

Table 3. Change in Trade Balances by sector (Millions of dollars)

DTBALi	US	EU	Central					ROW
			Russia	Asia	China	India	Japan	
Cotton	1.44	0.54	-0.48	-4.65	0.16	0.09	-0.04	4.3
OilSeeds	0.71	-0.03	-0.02	-2.15	0.22	0.11	-0.04	1.31
TextilesApp	0.89	6.55	3.62	-35.3	7.55	2.3	0.91	15.41
Oil	-3.95	-3.33	-12.47	1.99	0.45	-0.41	-1.88	17.43
Gas	46.43	63.76	-271.19	502.32	-1.33	-0.11	45.71	-359.85
MetalsMin	3.12	25.22	47.55	-131.55	7.43	1.63	7.51	38.44
Food	2.45	5.76	16.76	-51.89	1.96	1.35	1.49	21.45
Mnfcs	26.78	-51.77	61.65	-237.44	-7.88	-0.36	-21.93	226.56
Svces	-0.25	-16.67	32.6	-77.89	6.21	1.89	6.88	47.51

Source: Generated by author

Exports and imports can be individually examined. In Central Asia, the productivity shock results in a 17.6 percent increase in gas exports, accompanied by significant decreases in exports of textiles and apparel (-1.18 percent), manufactures (-1.19 percent), metals and minerals (-1.09 percent), and cotton (-0.66 percent). Changes in aggregate exports are presented in Table 4.

Table 4. Change in Aggregate Exports by Sector (Percent)

Qxw	US	EU	Central					ROW
			Russia	Asia	China	India	Japan	
Cotton	0.07	0.13	-0.24	-0.66	0.10	0.09	0.08	0.09
OilSeeds	0.01	0.02	-0.06	-1.11	0.04	0.04	0.02	0.01
TextilesApp	0.00	0.01	0.04	-1.18	0.01	0.02	0.00	0.01
Oil	0.03	0.01	-0.08	-0.05	0.05	0.03	0.02	0.01
Gas	-1.74	-0.67	-1.01	17.60	-4.98	-23.73	-5.68	-0.70
MetalsMin	0.01	0.02	0.24	-1.09	0.01	0.03	0.03	0.02
Food	0.00	0.01	0.12	-0.81	0.01	0.02	0.01	0.01
Mnfcs	0.00	0.00	0.17	-1.19	0.00	0.00	0.00	0.02
Svces	0.00	0.00	0.19	-0.48	0.01	0.01	0.01	0.01

Source: Generated by author

Global import patterns are also affected. In Central Asia, while imports of natural gas decrease, imports increase in every other sector, including food (0.52 percent), textiles and apparel (0.6 percent), oil seeds (0.6 percent), manufactures (0.5 percent), metals and minerals (0.4 percent), and services (0.5 percent). (See Table 5). Natural gas imports increase significantly in Russia (12.7 percent), India (11.7 percent), and China (2.6 percent).

Table 5. Change in Aggregate Imports by Sector (Percent)

Qiw	Central							ROW
	US	EU	Russia	Asia	China	India	Japan	
Cotton	0.00	0.00	-0.07	0.19	-0.01	-0.01	0.00	-0.02
OilSeeds	-0.01	0.00	-0.05	0.58	0.00	-0.06	0.00	-0.01
TextilesApp	0.00	0.00	-0.08	0.59	0.00	0.00	0.00	0.00
Oil	0.00	0.00	0.10	-0.16	-0.01	0.00	0.00	0.01
Gas	0.08	0.07	10.00	-0.57	2.28	9.71	0.02	0.11
MetalsMin	0.00	0.00	-0.17	0.43	-0.02	-0.01	0.00	0.00
Food	0.00	0.00	-0.11	0.60	-0.01	0.00	0.00	0.00
Mnfcs	0.00	0.00	-0.07	0.50	0.00	0.00	0.00	0.00
Svces	0.00	0.00	-0.10	0.49	0.00	0.00	0.00	-0.01

Source: Generated by author

Changes in output reflect the same patterns. In Central Asia, total domestic production increases in natural gas, but decreases in almost every other sector of the economy. Central Asian natural gas production increases by 16.48 percent, while output falls in cotton (-0.2 percent), textiles and apparel (-0.3 percent), metals and minerals (-0.3 percent), and manufactures (-0.2 percent). Across the globe, natural gas output declines in Russia (-0.40 percent), the United States (-0.3 percent), the EU (-0.3 percent), and the rest of the world (-0.3 percent). The results are presented in Table 6.

Table 6. Change in Output Volume by Sector (Percent)

Qo	Central							ROW
	US	EU	Russia	Asia	China	India	Japan	
Cotton	0.02	0.11	-0.04	-0.21	0.01	0.01	0.00	0.03
OilSeeds	0.01	0.01	-0.01	-0.03	0.00	0.00	0.00	0.01
TextilesApp	0.00	0.01	0.03	-0.27	0.01	0.01	0.00	0.01
Oil	0.00	0.01	0.01	-0.10	0.00	0.00	0.00	0.01
Gas	-0.28	-0.31	-0.35	14.33	-0.20	0.00	-0.26	-0.31
MetalsMin	0.00	0.01	0.20	-0.33	0.00	0.01	0.00	0.02
Food	0.00	0.00	-0.01	0.03	0.00	0.00	0.00	0.00
Mnfcs	0.00	0.00	0.09	-0.15	0.00	0.00	0.00	0.01
Svces	0.00	0.00	0.02	0.07	0.00	0.00	0.00	0.00
CGDS	0.00	0.00	0.12	0.43	0.00	-0.01	0.00	0.00

Source: Generated by author

Changes in output and trade reflect changes in market prices. In Central Asia, the productivity shock in gas creates a premium on owning gas reserves. While the extra supply of Central Asian gas pushes the market price for gas down by 1.5 percent, the demand for Central Asian natural resources (including gas reserves) increases by a dramatic 13.3 percent. (See Table 7). The market prices of all other factors and output increase marginally. Globally, the expanded supply of natural gas pushes its market price down in all regions.

Table 7. Change in Market Price by Sector (Percent)

Pm	US	EU	Russia	Central				ROW
				Asia	China	India	Japan	
Land	0.00	0.01	0.02	0.38	0.00	0.00	0.00	0.00
UnSkLab	0.00	0.00	0.06	0.33	0.00	0.00	0.00	0.00
SkLab	0.00	0.00	0.06	0.36	0.00	0.00	0.00	0.00
Capital	0.00	0.00	0.00	0.36	0.00	0.00	0.00	0.00
NatRes	-0.15	-0.24	-1.09	13.30	-0.01	0.00	0.00	-0.31
Cotton	0.00	0.00	0.06	0.20	0.00	0.00	0.00	0.00
OilSeeds	0.00	0.00	0.03	0.23	0.00	0.00	0.00	0.00
TextilesApp	0.00	0.00	0.02	0.20	0.00	0.00	0.00	0.00
Oil	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01
Gas	-0.58	-0.60	-0.71	-1.48	-0.44	-0.01	-0.52	-0.61
MetalsMin	0.00	0.00	-0.03	0.18	0.00	0.00	0.00	0.00
Food	0.00	0.00	0.01	0.23	0.00	0.00	0.00	0.00
Mnfcs	0.00	0.00	-0.01	0.17	0.00	0.00	0.00	-0.01
Svces	0.00	0.00	-0.05	0.18	0.00	0.00	0.00	0.00
CGDS	0.00	0.00	-0.04	0.14	0.00	0.00	0.00	0.00

Source: Generated by author

Finally, a basic question for any shock to the economy is the overall welfare effect on the citizens of that region (Table 8). The global economy experiences a net gain in welfare of \$350.5 million dollars. The biggest winners in the global economy include Central Asia (\$445 million), the European Union (\$134.7 million), and the United States (\$61.7 million). The biggest losers include Russia (-\$135.6 million) and the Rest of the World (-\$189.7 million). Central Asia gains from the technology-driven increase in productivity and a significant improvement in its terms of trade. The terms of trade gain comes at the expense of Russia and the rest of the world, two regions which themselves pay for the right to explore gas in Central Asia.

In conclusion, the results suggest that Central Asia would be better off overall from foreign investment in its natural gas sector, due mostly to improvements in overall production efficiency and its overall terms of trade. However, the gain in the natural gas sector would come at the expense of production and net exports of non-petroleum related industries—manufacturing, agriculture, minerals and metals, textiles and apparel, and other sectors.

Table 8. Welfare Decomposition (Millions of Dollars)

WELFARE	Allocation Efficiency	Technology Gain	Terms of Trade	Savings and Investment Efficiency	Total
1 US	-0.6	0	46	16.3	61.7
2 EU	24.5	0	115.3	-5	134.7
3 Russia	-8.4	0	-137.6	10.4	-135.6
4 Central Asia	19.3	322.4	104.8	-1.5	445
5 China	0.7	0	1.7	-5.8	-3.4
6 India	-0.6	0	-1.4	-0.3	-2.3
7 Japan	-0.3	0	45.3	-5	40
8 ROW	-6.5	0	-174.1	-9	-189.7
Total	28.1	322.4	0	0	350.5

Source: Generated by author

2.5. Policy Implications

The results of this limited experiment suggest Central Asia should consider taking a balanced approach to development. While increased oil and gas output would definitely increase the welfare of its citizens, the picture is not completely rosy. A unilateral focus on laws and policies designed to boost foreign investment in natural gas would come at a significant cost of decreased production and net exports of the region's other industries.

For example, Central Asia earns a significant share of its export earnings in the cotton sector. Foreign investment in oil and gas is desirable, but given the results of this model, Uzbek lawmakers should also support growth in its existing sectors. This story is magnified in manufacturing, food, and textiles and apparel. Increased gas output appears to hit these sectors even more negatively than the cotton sector.

In conclusion, these Central Asian republics should continue its pursuit of foreign investment in oil and gas. But they should also use its laws, policies, and development strategies to support its other industries.

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