

DUTCH DISEASE IN UZBEKISTAN?

A COMPUTABLE GENERAL EQUILIBRIUM MODEL OF EFFECTS OF FOREIGN INVESTMENT INTO UZBEKISTAN'S GAS SECTOR

Michael P. Barry*

Abstract

Uzbek lawmakers have been working hard to attract foreign investors into exploration and production in Uzbekistan. This paper will describe these laws and use a computable general equilibrium (CGE) model to analyze their macroeconomic effects on Uzbekistan and beyond. This analysis does not attempt to quantify the causal relationship between Uzbek laws and the amount of investment. Instead, the focus of the paper is closer to the following questions: successful or not, is the Uzbek campaign to attract foreign investment a good idea at all? Who wins and who loses? Results of the model suggest that Uzbekistan would be better off overall from foreign investment in its natural gas sector, due mostly to improvements in overall production efficiency and 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: *Central Asia, Uzbekistan, natural gas, CGE Model, computable general equilibrium, Dutch Disease, PSA, production sharing agreement*

Executive Summary

- The Uzbek government has been hoping to attract \$400 million of foreign investment through production-sharing agreements (PSAs). 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.
- CGE Model results suggest that Uzbekistan would be better off overall from foreign investment in its natural gas sector, due mostly to improvements in overall production efficiency and 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.

* **Dr. Michael Barry** is a professor of economics and law at Mount St. Mary's University in Emmitsburg, Maryland, USA. He has previously served as an international economist at the US International Trade Commission, at the US Department of the Treasury, and the Ministry of Finance of the Russian Federation. Dr. Barry has also served as consultant to the US Department of Commerce and the US Agency for International Development in various countries of Eastern Europe.

- 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. While Central Asia's natural gas exports increase by almost a half billion dollars (\$488 million), manufacturing exports fall \$229.6 billion, metals and minerals exports fall by \$126.2 million, and food exports fall by \$75 million.
- The results of this experiment suggest Uzbekistan (and any Central Asian state) should take a balanced approach to development. While increased oil and gas output would definitely increase the welfare of Uzbek 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 Uzbekistan's other industries.
- Uzbekistan earns a significant share of its export earnings in the cotton sector. As the "cotton producer of the former Soviet Union," Uzbekistan has considerable economic power in its cotton industries. 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.

Introduction

Uzbekistan has approximately 600 million barrels of proven oil reserves, while its probable gas reserves are approximately 5.1–6.25 trillion cubic meters with commercial reserves of about 1.62 trillion cubic meters. Uzbekistan is the world's 10th largest natural gas producer, with commercial gas reserves double those located in Britain. Further, Uzbek national holding company Uzbekneftegaz claims the country has developed less than 23% of its gas resources.

As a country with limited capital, Uzbekistan has turned to foreign investors to explore and develop its gas resources. This has required significant legislation and adjustment of Uzbek investment law. While the results have not measured up to Uzbekistan's optimistic predictions, several PSA agreements have been signed, and more seem to be on the way. A major question comes at the intersection of law and economics: what will increased foreign investment do the Uzbek economy? Is it all good news? Or are there macroeconomic costs to development of the gas sector?

In three parts, this paper will explore that question. Part I will discuss the energy infrastructure of Uzbekistan and the legal reform program designed to bring foreign investment to the country in order to develop the gas sector. Part II will briefly summarize the results of these reforms—a list of various PSA and other agreements with foreign investors in Uzbekistan. Finally, Part III will ask whether these efforts are a net gain for the Uzbek economy or a loss. Using a computable general equilibrium model, Part III will quantify the effects of foreign investment into Uzbekistan's natural gas industry. The results will show that Uzbekistan is a net winner, but there are losers within the country and in other parts of the world.

Part I: Uzbekistan Energy: Infrastructure and Legal Reform

A. *Uzbek Energy Infrastructure*

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.¹ 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.² 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”.³

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.⁴ 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.⁵ 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.⁶

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.⁷ Uzbekneftegaz is a holding company which is regulated under Presidential Decree No. UP-2154⁸ and COM Resolution No. 523.⁹ Uzbekneftegaz controls downstream and related activities in the energy sector, including: (1) Uznedobycha (oil extraction); (2) Uzneftegaz Pererabotka (oil and gas processing); (3) Uztransgaz (gas and oil transportation and pipelines); and (4) Uzneshneftegaz (foreign economic relations).¹⁰

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

¹U.S. Department of State. “Background Note: Uzbekistan,” U.S. Department of State, <http://www.state.gov/r/pa/ei/bgn/2924.htm> (accessed May 9, 2008).

²U.S. Department of Energy, Energy Information Agency, “Central Asia; Country Analysis Brief,” U.S. Department of Energy, <http://www.eia.doe.gov/> (accessed May 9, 2008).

³*Interfax*, “Uzbekistan Hopes to Be Key Gas Exporter,” October 15, 2004.

⁴World Bank, *Uzbekistan Energy Sector: Issues, Analysis, and an Agenda for Reform*, Infrastructure and Energy Services Department, Europe and Central Asia Region, (Washington: World Bank), June 2003.

⁵U.S. Department of Energy, Energy Information Agency, “Central Asia; Country Analysis Brief,” U.S. Department of Energy, <http://www.eia.doe.gov/> (accessed May 9, 2008).

⁶World Bank, *Uzbekistan Energy Sector: Issues, Analysis, and an Agenda for Reform*, Infrastructure and Energy Services Department, Europe and Central Asia Region, (Washington: World Bank), June 2003.

⁷U.S. Department of Energy, Energy Information Agency, “Central Asia; Country Analysis Brief,” U.S. Department of Energy, <http://www.eia.doe.gov/> (accessed May 9, 2008).

⁸ Republic of Uzbekistan, “Presidential Decree No. UP-2154,” (issued December 11, 1998).

⁹ Republic of Uzbekistan, Cabinet of Ministers resolution No. 523 (issued December 15, 1998).

¹⁰ See Uzbekneftegaz National Holding Company website, <http://www.uzneftegaz.uz>.

regulate the oil and gas industry.¹¹ 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, 1998.¹² 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.¹³

B. General Legal Framework for Energy Investment in Uzbekistan

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.¹⁴ 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.¹⁵

As is common in former Soviet republics, the Uzbekistan Constitution vests ownership of the subsoil in the state.¹⁶ 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.¹⁷ There is also a new “Law on Licensing of Certain Activities” of May 25, 2000 (the “Licensing Law”),¹⁸ 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”).¹⁹

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.²⁰ However, it is understood that licenses may be granted for exploration, production, or combined exploration and production.²¹

¹¹ Republic of Uzbekistan, “The Law on Subsoil, Article 7,” (issued September 23, 1994).

¹² Republic of Uzbekistan, “Presidential Decree No. UP-2154,” (issued December 11, 1998). Also see Republic of Uzbekistan, “Presidential Decree No. UP-523,” (issued December 15, 1998).

¹³ *APS Review Gas Market Trends*, “Uzbekistan Privatization,” vol. 63:15, October 11, 2004.

¹⁴ Republic of Uzbekistan, “The Law on Subsoil: Articles 3-4, 7” (September 23, 1994).

¹⁵ Republic of Uzbekistan, “Law No. 398-I: On Natural Monopolies,” (adopted April 24, 1997).

¹⁶ Republic of Uzbekistan, “The Law on Subsoil,” (September 23, 1994).

¹⁷ *Id.*

¹⁸ Republic of Uzbekistan, “Law No 71-II: On Licensing Of Specific Kinds Of Activity,” (issued June 15, 2000).

¹⁹ Republic of Uzbekistan, “Cabinet of Ministers Resolution No. 215: On Licensing Of Business Activities approving the Regulation On The Procedure For Issuing To Enterprises (Organizations) Special Permissions (Licenses) For The Right To Engage In Certain Types Of Activity,” (issued April 19, 1994).

²⁰ Republic of Uzbekistan, “The Law on Subsoil,” Articles 10-14, (issued September 23, 1994).

²¹ Jonathan Hines and Eric Sievers, “Legal Regime For Hydrocarbon Development in Uzbekistan,” *The Journal of The Centre for Energy, Petroleum and Mineral Law and Policy*, (August 11, 2001): 14-21.

Another important rule is Uzbekistan's right to terminate a license. Comparably 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.²²

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).²³

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."²⁴ This provision may sound a little vague to foreign investors, though other provisions of Uzbek law attempt 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;²⁵ (2) provisions of the 1998 Investment Laws affording foreign investors the right to resolve disputes in international arbitration;²⁶ and (3) Uzbekistan's obligations under the Energy Charter Treaty.²⁷ Additionally, the Uzbek "Law on Concessions" mentions the right to international arbitration.²⁸

C. Background to a Production Sharing Agreement Law in Uzbekistan

Beginning in 1998 the Government of Uzbekistan conducted a program to attract foreign investors to develop oil and gas deposits in the territory of Ustyurt Plateau in the Southwest of Uzbekistan, which, according to preliminary estimates, contains 4 billion tons of oil.²⁹

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, 2000.³⁰ The Oil and Gas Investments Decree contains several provisions of significant interest to foreign investors. First, companies which conduct exploratory work in the Ustyurt region (and possibly others) may

²² The Russian Federation, "Law No. 2395-1 on Underground Resources," (issued December 1992).

²³ Republic of Uzbekistan, "The Law on Subsoil," Article 19, (issued September 23, 1994).

²⁴ *Id.*

²⁵ *Id.*

²⁶ See Republic of Uzbekistan, "Foreign Investment Law No. 609-I: On Foreign Investments," (issued April 30, 1998). Also see Republic of Uzbekistan, "Investment Guarantees Law: On Guarantees And Measures For Protection Of Foreign Investors' Rights," (issued April 30, 1998).

²⁷ Republic of Uzbekistan, "The Law on Subsoil," Article 26, (issued September 23, 1994).

²⁸ Republic of Uzbekistan, "Law on Concessions," Article 24 (issued August 30, 1995).

²⁹ V. Saparov and A. Frolov, "Evolution and Developments of Oil and Gas Legislation in Uzbekistan," *Russian/CIS Energy and Mining Law Journal*, (January 2003): 33-34.

³⁰ Republic of Uzbekistan, "Presidential Decree (unnumbered): On Measures To Attract Direct Foreign Investments Into Oil And Gas Extraction," (issued April 28, 2000).

be granted newly discovered oil and gas deposits for a period of up to 25 years with a “right to prolong the development period.”³¹

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 rights, 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.³²

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.³³

On May 25, 2000 the Oliy Majlis (Parliament) of the Republic of the Uzbekistan adopted the Law “On Licensing Of Specific Kinds Of Activity” (“Licensing Law” published on June 15, 2000). The Licensing Law is effective from September 1, 2000 and provides the general legal framework for licensing.³⁴

D. The Uzbek PSA Law

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”).³⁵

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

³¹ Republic of Uzbekistan, “Presidential Decree (unnumbered): On Measures,” op. cit.

³² Id.

³³ Id.

³⁴ Republic of Uzbekistan, “Law No 71-II: On Licensing Of Specific Kinds Of Activity,” (issued May 25, 2000).

³⁵ Republic of Uzbekistan, “Law No. 312-II: On Agreements on the Division of Products,” (issued December 7, 2001).

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.³⁶

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.³⁷ 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.³⁸

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.³⁹

E. Provisions of the Uzbek PSA Law

The following are selected provisions of the December 7, 2001 Uzbekistan PSA law:

- Rights to the promising subsoil segments without proven mineral resources shall be granted subject to the conditions of the PSA.⁴⁰ Rights to the subsoil segments with proven mineral resources shall be granted on the PSA basis only in the following instances: (i) the State lacks necessary financial and technical means for exploration; (ii) attraction of special modern technology is necessary; or (iii) it is necessary to decrease the level of technological losses of minerals and prevention of possible negative socio-ecological consequences.⁴¹
- Subsoil segments shall be granted on the basis of the PSA through open tenders. However, in certain instances the PSA can be negotiated directly with the authorized agency.⁴²
- A license for use of subsoil under the PSA shall be issued to the investor according to the procedure established by the Cabinet of Ministers or its authorized body within five working days after conclusion of the agreement.⁴³
- Uzbek citizens should comprise 80% of all workers under the PSA (calculated on an average annual basis).⁴⁴

³⁶ Republic of Uzbekistan, "Law No. 312-II," op. cit.

³⁷ *APS Review Gas Market Trends*, "Uzbekistan: Privatization," vol. 63:15, (October 11, 2004).

³⁸ Id.

³⁹ Id.

⁴⁰ Republic of Uzbekistan, "Law No. 312-II: On Agreements on the Division of Products," (issued December 7, 2001).

⁴¹ Id., Article 5.

⁴² Id., Article 6.

⁴³ Id., Article 9.

⁴⁴ Id., Article 12.

F. Possible Problems with the Provisions of the Uzbek PSA Law

As Russia found with its PSA Law (and probably most other countries using a PSA regime), the chosen PSA legislation is not immediately perfect. Several provisions of the 2001 Uzbekistan PSA Law have been cited as either problematic or at least candidates for improvement from the prospective of foreign investors. One major problem with the PSA law (at least in investors' eyes) is Article 5, which limits PSA-eligible fields only to those which do not have proven mineral resources. Essentially, this clause keeps the most promising fields under the control of Uzbek officials, while the riskiest fields are left open to foreigners. Because a major portion of Uzbek land has been already surveyed, locations of proven reserves are largely determined already. The attractiveness of the Uzbek PSA scheme is thus severely reduced.

While Article 5 provides one problem, there are others. First, at least one clause of the act appears to reserve *carte blanche* control for the Uzbek authorities in the event of unforeseen developments or disputes. Article 26 of the PSA LAW stipulates that, “the Cabinet of Ministers of the Republic of Uzbekistan or authorized agencies execute state control over implementation of the agreement, including over terms of execution of work by the investor in keeping with the legislation.”⁴⁵

Second, while it is clear that licensing remains crucial in Uzbek oil and gas exploration, the licensing regime remains less than transparent for foreign investors. The PSA Law is incomplete in terms of subsoil licensing. Although the PSA Law provides for issuance of a subsoil use license within five days,⁴⁶ Uzbek legislation that regulates the procedure of issuance of such a license does not exist. Another act, “On Subsoil,” agrees that a license is necessary but fails to completely spell out how to obtain one.⁴⁷

Decree No. UP-2598 is the only legal act that clarifies the State agency that is responsible for issuance of a license. The decree authorizes the National Holding Company Uzbekneftegaz to issue licenses for prospecting, exploration and extraction of minerals in Uzbekistan, although the decree also fails to define the procedure for obtaining a license.⁴⁸

Third, while the PSA regime provides for expense reimbursement for foreign exploration and production, a peculiarity of the 2001 Act seemed to mean a large portion of expenses would not be reimbursed. Under the original 2001 PSA law, expense compensation was limited to one year—a rule that significantly reduced the attractiveness of PSA agreements to foreign investors. In particular, Article 14 of the Act says that that “recoverable expenses should be compensated from the recovery product in the same calendar year that the expenses were accrued.”⁴⁹ The problem with such a rule is that it prevents investing developers from carrying exploration and production

⁴⁵ Republic of Uzbekistan, “Law No. 312-II,” Article 26, *op. cit.*

⁴⁶ *Id.*, Article 9.

⁴⁷ Republic of Uzbekistan, “The Law on Subsoil,” (September 23, 1994).

⁴⁸ V. Saparov and A. Frolov, “Evolution and Developments of Oil and Gas Legislation in Uzbekistan,” *Russian/CIS Energy and Mining Law Journal*, (January 2003), p. 34.

⁴⁹ Republic of Uzbekistan, “Law No. 312-II: On Agreements on the Division of Products,” Article 14, (issued December 7, 2001).

expenses over from one calendar year to the next—which often would lead to no compensation at all for this portion of expenses.⁵⁰ In addition, Article 14 explicitly lists out many inventory expenses for which the PSA Law does not provide compensation to investors.⁵¹

Finally, Saparov and Frolov of Baker and McKenzie point out several other problems with the Uzbek PSA Law, including: (1) the law contains little or no provisions as to the tax treatment of the operator—meaning the operator and the investor might not be applied to the operator; and (2) the PSA law does not spell out regulation of foreign companies' branch offices located inside Uzbekistan—causing further uncertainty in investors' tax liability.⁵²

G. So Many Laws to Follow

Possibly the most significant problem with Uzbek investment law is the uncertainty created by having so many investment laws controlling oil and gas FDI into Uzbekistan. Several of these laws are described below.

First, The Law on Concessions of August 30, 1995 (the "Concession Law") provides the legislative basis for this common contractual form of mineral resource development. This Law has not yet been applied widely in practice. A PSA is normally considered a form of a concession, while the Concession Law (like the Subsoil Law) does not expressly provide for PSAs.⁵³ Second, Presidential Edict No. UP-1652 of November 30, 1996, as amended, "On Additional Incentives and Privileges for Enterprises with Foreign Investments" (the "Foreign Investment Edict") offers reduced tax rates to enterprises that attract substantial amounts of foreign investment.⁵⁴

The Law on Foreign Investments of April 30, 1998, as amended, (the "FIL") and the Law on Guarantees and Measures to Protect the Rights of Foreign Investors, also of April 30, 1998 (the "IGL"—together, the "Investment Laws"), provide some basic guarantees to foreign investors meeting certain threshold requirements.⁵⁵ Finally, the Presidential Edict No. UP-2598 of April 28, 2000 "On Measures to Attract Direct Foreign Investments into Oil and Gas Exploration and Production" (the "Petroleum Investment Edict") hoped to increase foreign investment in Uzbekistan for the exploration of hydrocarbon fields in the Ustyurt and other areas. This law provided a number of valuable concrete rights, preferences, and tax benefits for foreign companies and their joint venture and concession form investments.⁵⁶

⁵⁰ V. Saparov and A. Frolov, "Evolution and Developments of Oil and Gas Legislation in Uzbekistan," *Russian/CIS Energy and Mining Law Journal*, (January 2003), p. 34.

⁵¹ Republic of Uzbekistan, "Law No. 312-II: On Agreements on the Division of Products," Article 14, (issued December 7, 2001).

⁵² V. Saparov and A. Frolov, "Evolution and Developments of Oil and Gas Legislation in Uzbekistan," *Russian/CIS Energy and Mining Law Journal*, (January 2003), p. 34.

⁵³ Republic of Uzbekistan, "Law On Concessions," (issued August 30, 1995).

⁵⁴ Republic of Uzbekistan, "Presidential Decree No. 1652: On Additional Incentives and Privileges Granted To Enterprises With Foreign Investments," (issued November 30, 1996).

⁵⁵ Republic of Uzbekistan, "Law No. 609-I: On Foreign Investments," (issued April 30, 1998).

⁵⁶ Republic of Uzbekistan, "Presidential Decree (unnumbered): On Measures To Attract Direct Foreign Investments Into Oil And Gas Extraction," (issued April 28, 2000).

H. Efforts to Improve the Uzbek PSA Regime

In July of 2003 the government of Uzbekistan decided to create a special state commission to examine feasibility studies of projects to be conducted under PSA, determine the conditions for using subsurface resources by investors, and make decisions on specific agreements. The plan of the Commission was to determine the payments for the use of subsurface resources, terms of taxation, procedures for sharing product, and will handle other matters pertaining to PSA projects. The goal was to improve PSA law.⁵⁷

Later in 2003, formal amendments were made to the PSA Law in the hopes of addressing investor concerns. The October 31, 2003 amendments were hoped to make it possible to attract even the most demanding investors into PSAs in Uzbekistan. Specifically addressing the concern on expense reimbursement, one of the amendments gave investors in-kind compensation for funds spent on field development under a PSA, beginning in the calendar year when commercial production begins. The new version of the PSA law states that spending by an investor not reimbursed in the current calendar year will be reimbursed in subsequent calendar years during the implementation of the project.⁵⁸

I. Uzbek Oil and Gas Privatization

The Uzbek privatization program has run parallel to the development of the PSA regime. On March 9, 2001 Uzbekistan's 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.⁵⁹

There have been two previous mass privatization programs in Uzbekistan, the first announced in late 1998 and the second in late 1999. Neither was 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.⁶⁰ 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.

⁵⁷ *Interfax Petroleum Report*, "Uzbekistan Working to Speed Up PSA Projects," (July 30, 2003): 11-14.

⁵⁸ Republic of Uzbekistan, "Amendments to the PSA Act," (issued October 31, 2003).

⁵⁹ 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".

⁶⁰ Lina Braude, "Information Uzbekistan Natural Resource Law" (working paper, Coudert Brothers LLP, Washington D.C., July 23, 2003).

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.⁶¹ 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).⁶²

Part II: Results of Uzbekistan's FDI Campaign

Though Uzbekistan has not yet seen a massive inflow of dollars from the United States or other countries of the West, a number of recent deals suggest that foreign investors do consider Uzbekistan a possible choice for hydrocarbons investment. A few PSA deals have taken place under the new regime, and hopes remain high in Tashkent that this is only the start. This section will briefly outline some of Uzbekistan's limited success in attracting investors through the PSA.

A. 2001 UzPEC Deal

In March of 2001, the National Holding Company "Uzbekneftegaz" signed Uzbekistan's first agreement on product sharing ("PSA") with the British company "UzPEC Limited" to conduct prospecting and exploration of deposits in the territories of Central Ustyurt and Southwest Gissar.⁶³

The Decree of the President No. UP-2598 "On Measures on Attraction of Direct Foreign Investment in Prospecting and Development of Oil and Gas" of April 28, 2000 ("Decree No. UP-2598") served partially as a legal basis for signing the PSA.⁶⁴ Although Decree No. UP-2598 did not actually mention the PSA deal with UzPEC, the wording of the decree made it clear that the legislation was at least partially intended to facilitate the specific deal—especially provisions on granting most favorable regime status to foreign companies indirectly allowed the use of the decree for purposes of drafting the PSA.⁶⁵

There was then a Cabinet of Ministers Decree No. 97 of February 27, 2001, "On Cooperation with UzPEC Ltd. (Great Britain) in Exploration and Production of Hydrocarbons in the Ustyurt and Hissar Areas of the Republic of Uzbekistan (the "UzPEC Decree").⁶⁶ This special legislation gave a particular foreign investor (a subsidiary of Trinity Energy) the special right to continue with exploration and development of certain oil and gas fields under a PSA arrangement. The deal was

⁶¹ APS Review Gas Market Trends, *Uzbekistan: Privatization*, vol. 63:15, (October 11, 2004).

⁶² *Id.*

⁶³ V. Saparov and A. Frolov, "Evolution and Developments of Oil and Gas Legislation in Uzbekistan," *Russian/CIS Energy and Mining Law Journal*, (January 2003), p. 33.

⁶⁴ *Id.*

⁶⁵ *Id.*

⁶⁶ Republic of Uzbekistan, "Cabinet of Ministers Decree No. 97: Approving an Investment by UzPEC Ltd. (a subsidiary of the UK company Trinity Energy), (issued February 27, 2001).

given priority treatment under terms of the Petroleum Investment Edict of April 2000.⁶⁷ While this legislation did not appear to apply to all PSA deal in general, it did seem to give an indication of the Uzbek government's hopes for the future of PSAs.⁶⁸

B. Restructuring and Development of UzPEC

UzPEC itself has been undergoing a restructuring. Yury Shafranik, member of UzPEC's board of directors and the head of Russia's union of oil and gas industrialists announced that "Company capital structure is being rejuvenated and its management in full." He would not reveal the identity of the new shareholders, but reported that "American-English-Russian capital" is now represented in UzPEC."⁶⁹

UzPEC now holds two licenses: a five-year one for prospecting work at Central Ustyurt with three-year extension rights, and a 25-year license with 15-year extension rights to work the gas condensate Adamtash and South Kyzylbairak oil and gas deposits in Southwest Gissar.⁷⁰ In 2003 UzPEC invested approximately \$13 million in Uzbekistan's oil and gas complex, including around \$1 million invested in exploration work in Central Ustyurt. Other funds were used in locating and developing oil and gas deposits in Southwest Gissar. Deposits there produced around 40,000 tons of liquid hydrocarbons in 2003.⁷¹ In December of 2003 there was a well accident at South Kyzylbairak causing from \$10 million to \$20 million in losses. Including expenses in cleaning up after the accident, UzPEC has so far invested around \$40 million in the country's oil and gas complex since 2002.⁷²

C. UzPEC Takeover by Soyuzneftegaz

SoyuzNefteGaz, a Russian company, in July 2004 took control of UzPEC for an undisclosed amount. The takeover creates some uncertainty as to the future of UzPEC development of the fields in Gissar and Ustyurt. Under the PSA signed in May 2001, the company committed to \$420m in investments - with \$200m to be spent during the first five years.⁷³ Other fields being developed by UzPEC include Yuzhny-Kyzylbairak which is rich in oil, and Adamtash which contains over 30 BCM of natural gas and 5m tons of condensate.⁷⁴ Under the PSA with UNG, UzPEC as operator obtained a 70% share of production. It was said in 2001 that the percentage may be increased if new significant hydrocarbon reserves are discovered.⁷⁵

⁶⁷ Republic of Uzbekistan, "Presidential Decree (unnumbered) On Measures To Attract Direct Foreign Investments Into Oil And Gas Extraction," (issued April 28, 2000).

⁶⁸ See also: Republic of Uzbekistan, "Cabinet of Ministers Directive No. 217-F: Approving signature of the UzPEC PSA," (issued April 18, 2001).

⁶⁹ U.S. Department of Commerce, Business Information for the Newly Independent States (BISNIS), "Commercial News Update for Uzbekistan," (June 2007).

⁷⁰ Id.

⁷¹ Id.

⁷² Id.

⁷³ *APS Review Gas Market Trends*, "Uzbekistan: Privatization," vol. 63:15, (October 11, 2004): 14-22.

⁷⁴ Id.

⁷⁵ Id.

After resolving a dispute, Soyuzneftegaz signed a new 36-year PSA with Uzbekneftegaz in February 2007 and intends to invest \$462 million for development of gas fields in the Ustyurt plateau region and the Southwest Gissar blocks. In February 2008 LUKoil, another Russian energy company, acquired a controlling interest in this PSA and targets 106 Bcf/y (3 Bcm/y) of production.⁷⁶

D. Restructuring of UzbekNefteGaz

According to Interfax, Uzbekistan has completed restructuring Uzbekneftegaz.⁷⁷ Shareholders in Uzbekneftegaz and the joint stock company Uzneftegazstroi, which was previously part of the holding company, decided on a new structure for a unified company with a charter capital of Sum 172.14 billion (approximately \$172 million), in shares with a par value of Sum1,000.⁷⁸ The state plans to hold on to a controlling stake of 51%.⁷⁹ Four of the company's eight former subsidiaries have retained their status: Uznefteprodukt, Uztransgaz, Uzneftegazmash and the newly formed Uzgeoburneftegazdobycha. The latter is being set up based on the drilling company Uzburneftegaz and the exploration and production company Uzgeoneftegazdobycha.⁸⁰

In October of 2003, the Uzbek Cabinet of Ministers decided to restructure Uzbekneftegaz to improve its investment attractiveness so as to attract foreign investors to its privatization. The restructuring scheme was developed with support from a French consultant, an international consortium headed by BNP Paribas. The company is being privatized with support from the International Bank for Reconstruction and Development.⁸¹

E. LUKoil Deal

LUKoil, Russia's second largest oil company, on June 16, 2004, signed with UNG a PSA for the Kandym-Khauzak-Shady complex of fields, under which the two partners will produce natural gas in the Bukhara-Khiva region of south-western Uzbekistan. LUKoil will own 90% and UNG will hold the remaining 10% of an operating company that will develop the area. In return for UNG's agreement to raise LUKoil's stake from 70 to 90%, LUKoil will take on responsibility for all investment, which will amount to about \$1 bn. The share of production will depend on the profitability of the project and will fluctuate "from 50% to 80%, and the PSA will last 35 years."⁸² The deposits are estimated to hold roughly 8 Tcf (250 Bcm) of natural gas. The company hopes to begin producing around 210 Bcf/y (6 bcm/y) beginning in 2011.⁸³

⁷⁶ U.S. Department of Energy, Energy Information Agency, "Central Asia; Country Analysis Brief," U.S. Department of Energy, <http://www.eia.doe.gov/> (accessed May 9, 2008).

⁷⁷ U.S. Department of Commerce, Business Information for the Newly Independent States (BISNIS), "Commercial News Update for Uzbekistan," (June 2007).

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ *Id.*

⁸¹ *Id.*

⁸² *APS Review Gas Market Trends*, "Uzbekistan: The Lukoil Project," (October 11, 2007).

⁸³ Energy Information Administration, Central Asia: Natural Gas, (April 19, 2008).

F. Gazprom Deal

In another deal, LUKoil has agreed to sell to Gazprom the natural gas that it plans to produce in Uzbekistan during the implementation of the Kandym-Khauzak-Shady project under its PSA. During the first stage of the project, Gazprom would buy gas to be resold either on the Russian market or abroad. LUKoil will own 90% and Uzbekneftegaz 10% of an operating company that will deliver the project.⁸⁴

The Uzbek side agreed to increase the LUKoil share from the previously agreed 70% to 90%, as LUKoil will take on responsibility for all investment, which will amount to about \$1 billion. The property contains a proven 283 billion cubic meters (bcm) of gas. Kandym, the biggest of the fields, holds more than 150 bcm. Production will peak at around 9 bcm annually, and the project should yield 207 bcm in all.⁸⁵ Uzbekneftegaz subsidiary UzLITIneftegaz drafted the feasibility study and U.S. law firm Baker & McKenzie the PSA.⁸⁶

Uzbekneftegaz signed a 15-year PSA with Gazprom to develop the Shakhpakhty gas condensate field in the Ust Yurt district of Uzbekistan. Gazprom pledged \$15 million of direct investment between 2004 and 2007. It is anticipated that Uzbekneftegaz will sign a second PSA with Gazprom to develop condensate fields in the Ust Yurt region by the end of 2004. It is thought that the second project will cost around \$1 billion.⁸⁷

In December 2006 Gazprom received exploration licenses from Uzbekneftegaz to develop 7 gas blocks with combined reserves of 35 Tcf (1 Tcm). Gazprom expects to invest \$400 million by 2011 and \$1.5 billion over the contract life. The companies will pump between 480 and 580 Bcf/y (13.6 and 16.4 bcm/y) of gas from the fields.⁸⁸

G. Asian Companies

Asian companies such as Petronas are also part of a consortium including LUKoil, CNPC, and South Korea's KNOC to explore Uzbekistan's sector of the Aral Sea and central Ustyurt plateau. The parties signed a 35-year PSA in late 2006 and estimate reserves at roughly 14 Tcf (0.4 Tcm). In addition, Daewoo International (Korea) signed a contract in 2008 to operate fields in northwestern Uzbekistan for 5 years. China signed an accord with Uzbekneftegaz in May 2007 to participate in a joint gas exploration project in the eastern Namangan province.

⁸⁴ U.S. Department of Energy, Energy Information Agency, "Central Asia; Country Analysis Brief," U.S. Department of Energy, <http://www.eia.doe.gov/> (accessed May 9, 2008).

⁸⁵ *Id.*

⁸⁶ *Id.*

⁸⁷ *Id.*

⁸⁸ *Id.*

Part III: A CGE Model for Gas Investment

A. 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.⁸⁹

B. The Global Trade Analysis Project (GTAP)

GTAP is a multi-regional CGE model which captures world economic activity in 57 different industries of 66 regions. 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 based on microeconomic theory. These equations specify the behavior of optimizing agents in the economy, such as demand functions.⁹⁰ 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.” In short, 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.

C. Structure of this Paper’s Model

The model employed in this paper is that of the GTAP project. While the core database has 57 sectors and 66 regions, I have 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.

⁸⁹ T. Hertel, R. Keeney, M. Ivanic, and Alan Winters, “Distributional effects of WTO agricultural reforms in rich and poor countries,” *Economic Policy*, (April 2007): 289-337.

⁹⁰ Id.

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	

Source: Generated by author

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. That investment is assumed to increase the productivity and output of the natural gas sector in that country. The goal of the model is to measure what effects such a productivity change would have on the region and the world.

While the focus of the paper is investment in Uzbekistan, the GTAP database has not yet disaggregated all of the Central Asian states into separate economics. For this reason, the model is actually measuring the effects of foreign investment into Central Asian natural gas as a whole and not that of Uzbekistan’s individually.

D. 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 \$34.9 million dollars. Interestingly, Russia, a major partner in Uzbekistan’s oil and gas sector, experiences a \$127.8 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
 (In millions of US\$)

	Change
US	73.18
EU	38.45
Russia	-127.8
Central Asia	-34.9
China	13.34
India	5.59
Japan	35.29
ROW	-3.14

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 almost a half billion dollars (\$488 million). Meanwhile, manufacturing exports fall \$229.6 billion, metals and minerals exports fall by \$126.2 million, and food exports fall by \$75 million.

Table 3
Change in Trade Balances by sector
 (In millions of US\$)

DTBALi	US	EU	Russia	Centr. Asia	China	India	Japan	ROW
Cotton	1.35	0.43	-0.5	-4.65	0.1	0.06	-0.01	3.3
OilSeeds	0.68	-0.01	-0.01	-2.15	0.17	0.09	-0.02	1.24
TextilesApp	0.85	7.04	2.87	-35.3	7.62	1.9	0.71	13.97
Oil	-3.83	-2.28	-11.11	1.99	0.64	-0.31	-1.55	16.32
Gas	44.51	65.94	-271.19	488.13	-1.04	-0.07	43.63	362.94
MetalsMin	3.53	26.79	46.21	-126.22	6.82	1.83	7.32	35.55
Food	2.48	7.48	13.45	-51.89	2.24	1.16	1.41	22.55
Manufactures	23.74	-49.39	59.87	-229.58	-8.43	-0.29	-22.44	221.98
Services	-0.12	-17.55	32.6	-75.22	5.22	1.22	6.23	44.88

Source: Generated by author

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 (-\$271.2 million) and the rest of the world (-\$362.9 million). It would appear the increased Central Asian productivity in gas comes at the expense of gas sales from Russia and the Middle East.

Exports and imports can be individually examined. In Central Asia the productivity shock results in a 15.4 percent increase in gas exports, accompanied by significant decreases in exports of textiles and apparel (-1.3 percent), manufactures (-1.0 percent), metals and minerals (-1.0 percent), and cotton (-0.6 percent). Changes in aggregate exports are presented in Table 4.

Table 4
Change in Aggregate Exports by sector
 (Percent)

Qxw	US	EU	Russia	Centr. Asia	China	India	Japan	ROW
Cotton	0.06	0.12	-0.22	-0.60	0.09	0.08	0.07	0.08
OilSeeds	0.01	0.02	-0.05	-1.00	0.04	0.04	0.02	0.01
TextilesApp	0.00	0.01	0.04	-1.34	0.01	0.02	0.00	0.01
Oil	0.03	0.01	-0.07	-0.04	0.04	0.03	0.02	0.01
Gas	-1.53	-0.59	-0.89	15.44	-4.37	-20.82	-4.98	-0.61
MetalsMin	0.01	0.02	0.21	-1.03	0.01	0.03	0.03	0.02
Food	0.00	0.01	0.14	-0.94	0.01	0.02	0.01	0.01
Mnfcs	0.00	0.00	0.15	-1.04	0.00	0.00	0.00	0.02
Svces	0.00	0.00	0.17	-0.43	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 (0.6 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 (10 percent), India (9.7 percent), and China (2.3 percent).

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 14.3 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 (-0.35 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 5
Change in Aggregate Imports by sector
 (Percent)

Qiw	US	EU	Russia	Centr. Asia	China	India	Japan	ROW
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

Table 6
Change in output volume by Sector
 (Percent)

Qo	US	EU	Russia	Centr. Asia	China	India	Japan	ROW
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	Centr. Asia	China	India	Japan	ROW
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 issue 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 come 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 Uzbekistan 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
 (In millions of US\$)

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

E. Policy Implications

The results of this limited experiment suggest Uzbekistan (and any Central Asian state) should take a balanced approach to development. While increased oil and gas output would definitely increase the welfare of Uzbek 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 Uzbekistan’s other industries.

In particular, Uzbekistan earns a significant share of its export earning in the cotton sector. As the “cotton producer of the former Soviet Union,” Uzbekistan has considerable economic power in its cotton industries. 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, Uzbekistan should continue its pursuit of foreign investment in oil and gas. But it should also use its laws, policies, and development strategies to support its other industries.