


RECONNOITERING ELEMENTS OF UZBEKISTAN'S TRADE PERFORMANCE IN RECENT YEARS: A GRAVITY MODEL APPROACH ADAPTING PANEL DATA ESTIMATION

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ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 03 March 2023</p> <p>Accepted 29 May 2023</p>	<p>Purpose: The study examines the impact of growing investments and increasing manufacturing activities on the trade performance in case of Uzbekistan. It also tries to explore the influence of being in CIS region and being a former part of Soviet Union on the trade patters with its major partner countries.</p>
<p>Keywords:</p> <p>CIS; Uzbekistan; Gravity Model; Trade Flows; Regional Trade Agreements; Panel Estimation; Random-Effects GLS Regression; RE GLS Regression with AR (1) Disturbances.</p> <div data-bbox="172 1193 480 1440" style="text-align: center;">  </div>	<p>The theoretical framework: The study takes Gravity Model as a base to formulate estimation equation where Uzbekistan trade is taken as a dependent variable. Panel dataset is prepared and random effects GLS regression is used to estimate the augmented equation.</p> <p>Findings: The study concludes that lately the composition of trade has shifted. It argues that trade is more based on intra-industry than comparative advantage. Yet the economy envisions strengthening its trade flows by boosting investment in fixed capital and strengthening the manufacturing sector. The study shows that manufacturing and investment in fixed capital are potentially increasing its trade performance. However, trade is still concentrated in a few markets. It is concluded that Uzbekistan's trade differs in time (a positive indication) and within the group of countries significantly (not so good situation).</p> <p>Research Policy Implications: Based on the analysis, it is recommended that the economy find more global markets to realize its comparative advantage and continue the intra-industry trade within the region.</p> <p>Originality/Value: The study gives new insights on the most recent trends in trade patters of Uzbekistan with its major partners as well as also identifies the nature of its strength in terms of realizing comparative advantage or intra-industry trade. Based on the results the trade performance can be further increased by exploring the markets and product categories more categorically.</p>
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ELEMENTOS DE RECONHECIMENTO DO DESEMPENHO COMERCIAL DO UZBEQUISTÃO NOS ÚLTIMOS ANOS: UMA ABORDAGEM DE MODELO GRAVITACIONAL ADAPTANDO A ESTIMATIVA DE DADOS DE PAINEL

RESUMO

Objetivo: O estudo examina o impacto dos investimentos crescentes e do aumento das atividades de manufatura sobre o desempenho comercial do Uzbequistão. Também tenta explorar a influência do fato de estar na região da CEI e de ser uma ex-parte da União Soviética sobre os padrões de comércio com seus principais países parceiros.

A estrutura teórica: O estudo usa o Modelo Gravitacional como base para formular a equação de estimativa, em que o comércio do Uzbequistão é considerado uma variável dependente. O conjunto de dados do painel é preparado e a regressão GLS de efeitos aleatórios é usada para estimar a equação aumentada.

Resultados: O estudo conclui que, ultimamente, a composição do comércio mudou. Ele argumenta que o comércio está mais baseado na vantagem intraindustrial do que na vantagem comparativa. No entanto, a economia prevê o fortalecimento de seus fluxos comerciais por meio do aumento do investimento em capital fixo e do fortalecimento do setor manufatureiro. O estudo mostra que a manufatura e o investimento em capital fixo estão potencialmente aumentando seu desempenho comercial. Entretanto, o comércio ainda está concentrado em alguns mercados. Conclui-se que o comércio do Uzbequistão difere no tempo (uma indicação positiva) e dentro do grupo de países de forma significativa (situação não tão boa).

Implicações da política de pesquisa: Com base na análise, recomenda-se que a economia encontre mais mercados globais para realizar sua vantagem comparativa e continuar o comércio intraindustrial na região.

Originalidade/valor: O estudo fornece novas percepções sobre as tendências mais recentes dos padrões de comércio do Uzbequistão com seus principais parceiros, além de identificar a natureza de sua força em termos de realização da vantagem comparativa ou do comércio intraindustrial. Com base nos resultados, o desempenho comercial pode ser melhorado explorando os mercados e as categorias de produtos de forma mais categórica.

Palavras chave: CEI, Uzbequistão, Modelo Gravitacional, Fluxos de Comércio, Acordos Regionais de Comércio, Estimativa de Painel, Regressão GLS de Efeitos Aleatórios, Regressão RE GLS com Distúrbios AR (1).

ELEMENTOS DE RECONOCIMIENTO DE LOS RESULTADOS COMERCIALES DE UZBEKISTÁN EN LOS ÚLTIMOS AÑOS: UN ENFOQUE DE MODELO DE GRAVEDAD ADAPTANDO LA ESTIMACIÓN DE DATOS DE PANEL

RESUMEN

Objetivo: El estudio examina el impacto del aumento de las inversiones y de las actividades manufactureras en los resultados comerciales de Uzbekistán. También intenta explorar la influencia de pertenecer a la región de la CEI y ser una antigua parte de la Unión Soviética en los patrones comerciales con sus principales países socios.

Marco teórico: El estudio utiliza el Modelo Gravitacional como base para formular la ecuación de estimación, en la que el comercio de Uzbekistán se considera una variable dependiente. Se prepara el conjunto de datos de panel y se utiliza la regresión GLS de efectos aleatorios para estimar la ecuación aumentada.

Resultados: El estudio concluye que, últimamente, la composición del comercio ha cambiado. Sostiene que el comercio se basa más en la ventaja intraindustrial que en la ventaja comparativa. Sin embargo, la economía prevé reforzar sus flujos comerciales aumentando la inversión en capital fijo y reforzando el sector manufacturero. El estudio muestra que la industria manufacturera y la inversión en capital fijo aumentan potencialmente sus resultados comerciales. Sin embargo, el comercio sigue concentrado en unos pocos mercados. Se concluye que el comercio de Uzbekistán difiere a lo largo del tiempo (indicio positivo) y dentro del grupo de países de manera significativa (situación no tan buena).

Implicaciones para la política de investigación: Basándose en el análisis, se recomienda que la economía encuentre más mercados globales para hacer realidad su ventaja comparativa y continuar con el comercio intraindustrial en la región.

Originalidad/valor: El estudio aporta nuevas perspectivas sobre las últimas tendencias de los patrones comerciales de Uzbekistán con sus principales socios, además de identificar la naturaleza de su fortaleza en términos de realización de la ventaja comparativa o comercio intraindustrial. A partir de las conclusiones, se pueden mejorar los resultados comerciales explorando los mercados y las categorías de productos de forma más categórica.

Palabras clave: CEI, Uzbekistán, Modelo Gravitacional, Flujos Comerciales, Acuerdos Comerciales Regionales, Estimación de Panel, Regresión GLS de Efectos Aleatorios, Regresión RE GLS con Perturbaciones AR (1).

POLICY OUTLOOK AND TRADE IN RECENT TIMES

Uzbekistan is becoming a promising economy within the CIS group lately, adopting a political ideology inclined progressively towards a more market-based system. This shift in the paradigm of the economy and its policy-making is visible with a clear intention of making the economic system fundamentally strong and inclusive of the market. For instance, in the World Bank's country partnership framework 2016-2021, one of the main pillars for the development pathway for the economy is "a strong private sector response" (World Bank, 2022). The New Development Strategy (NDS) for 2022-2026 also focuses on "Developing the national economy and ensuring high-growth rates" along with other fundamental targets (World Bank, 2022). The Country Operation Business Plan (COBP) 2021-2023 of ADB puts "Promotion of exports based on comparative advantages" and "Enabling environment for private sector development and transformation of state's role in the economy" on top priority (Asian Development Bank, 2020).

From the perspective of trade, these efforts shall strengthen two essential aspects. One, in manufacturing, where the economy realizes comparative advantage and two, the exports within the CIS group and beyond. For instance, major product categories which show a relatively high degree of comparative advantage (based on the RCA index) in 2021 show an increasing trend in some categories. However, in some cases, the index value has reduced also. It is worth noting that Silk, Natural Gas, Textile yarn, flour meals, and gold shows an increasing trend in comparative advantage, which is inclined towards manufacturing. It indicates that the focus is shifting to strengthening manufactured exports. The following table highlights the degree of comparative advantage of these product categories.

Table 1

Revealed Comparative Advantage (RCA) index, major products, Uzbekistan, annual											
Product Category / Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Meal and flour of wheat and flour of meslin	0.49	0.48	0.39	0.54	0.67	0.46	20.80	38.12	28.22	30.93	33.41
Silk	64.51	67.28	73.74	109.61	112.25	75.44	69.38	103.41	113.57	156.44	175.83
Cotton	177.04	159.58	155.81	181.06	197.48	183.27	68.09	39.46	27.68	31.86	29.59
Natural gas, whether or not liquefied	5.62	4.36	6.31	6.60	6.80	10.01	12.89	19.35	16.66	24.07	12.04
Radio-actives and associated materials	34.91	43.60	56.47	64.25	66.91	51.72	26.41	21.48	15.70	16.42	17.35
Textile yarn	14.99	17.11	16.49	20.70	22.02	20.13	23.41	28.61	28.88	33.71	30.35
Zinc	20.23	23.72	22.70	26.79	24.91	23.70	22.39	23.58	22.78	24.88	23.92
Gold, non-monetary (excluding gold ores and concentrates)	3.38	3.45	4.62	6.25	7.76	8.91	14.78	12.22	17.80	10.71	14.86

Source: UNCTAD Statistics 2023

On the other hand, the current export trends suggest that relatively high export growth is achieved in industry-based goods and finished products over other traditional exports such as food and animals, non-food raw materials, etc. The trends are summarized in the table below.

Table 2

Export of the Republic of Uzbekistan by categories SITC-2008												
<i>In Millions of US dollar</i>												
Code of SITC	Name of SITC	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
	Total:	14,795.1	13,455.4	14,298.6	13,532.0	12,499.6	12,078.4	12,534.2	13,990.4	17,458.7	15,102.3	16,662.8
1	Food and live animals	1,777.4	736.9	1,399.3	1,631.2	1,239.6	644.9	817.9	1,029.9	1,436.4	1,336.2	1,371.8
2	Beverages and tobacco	41.9	43.0	32.4	23.0	23.1	17.8	23.4	22.3	29.8	27.1	36.0
3	Non-food raw materials, except fuel	1,486.1	1,403.9	1,305.3	1,174.6	885.3	788.5	626.6	427.5	591.2	456.1	509.5
4	Mineral fuels, lubricating oils and similar materials	2,722.2	4,656.0	3,435.3	3,110.2	2,685.1	1,713.9	1,607.6	2,666.8	2,528.9	659.0	914.8
5	Animal and vegetable oils, fats and wax	0.4	0.3	0.1	0.1	0.2	0.0	0.0	0.1	12.4	26.8	1.5
6	Chemicals and similar products	819.6	747.8	580.3	620.6	594.8	817.6	860.7	881.3	836.5	820.9	1,131.2
7	Industrial goods	1,805.7	1,733.3	1,864.4	1,927.0	1,739.5	1,712.6	2,200.7	2,411.8	2,752.9	2,906.4	4,333.1
8	Machines and transport equipment	983.9	878.5	821.1	544.5	137.0	208.9	350.8	204.1	421.8	434.4	693.6
9	Various finished products	196.7	233.1	269.3	230.3	213.1	245.8	311.8	337.6	435.7	617.3	785.6
10	Other goods	3,188.7	666.2	1,648.2	1,240.2	1,920.6	2,807.6	3,260.0	2,939.0	4,978.2	5,813.1	4,303.9
11	Services	1,772.4	2,356.4	2,942.8	3,030.3	3,061.3	3,120.6	2,474.5	3,070.0	3,434.8	2,005.0	2,581.7

Source: Uzbekistan Statistics Agency 2023

The top 10 trading partners in terms of exports per 2021 data are Afghanistan, China, Kazakhstan, Russia, Tajikistan, Turkey, Turkmenistan, Ukraine, Iran (Islamic Republic of), and Kyrgyzstan (Uzbekistan Statistics Agency, 2023). Uzbekistan's exports to all of these countries have been increasing since 2011, Afghanistan being an exception.

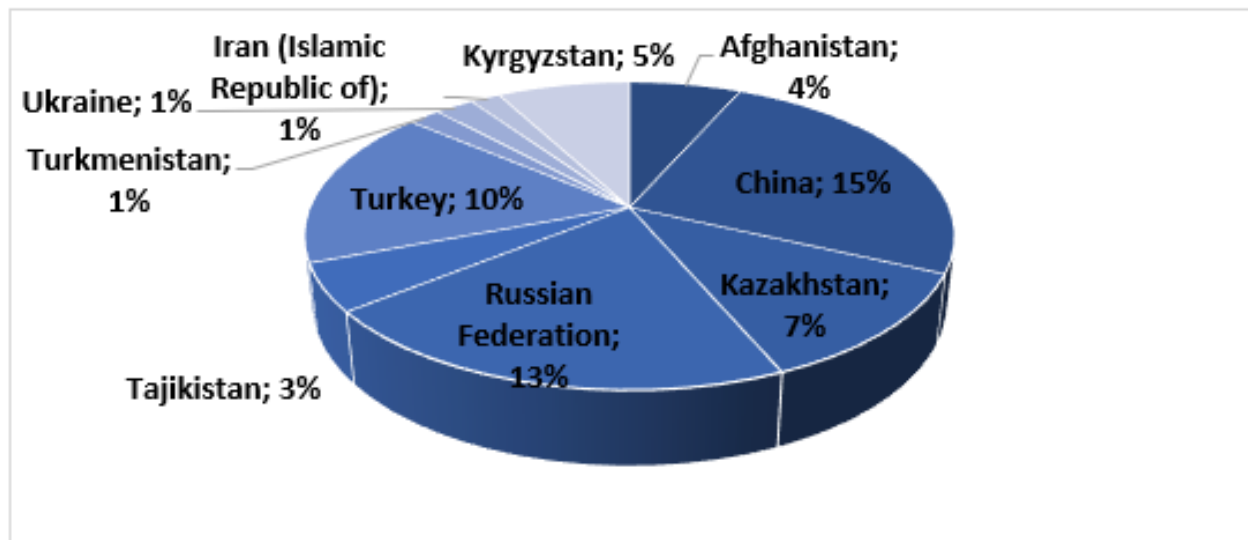
Table 3

Uzbekistan's Exports of Goods and Services by Major Countries											
<i>In Thousands of US Dollars</i>											
Territories	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total:	15,021,321	13,599,659	14,322,656	13,545,748	12,507,382	12,094,646	12,553,738	13,990,745	17,458,687	15,102,281	16,662,804
	.0	.9	.3	.2	.2	.3	.7	.4	.7	.2	.4
Afghanistan	797,732.4	747,716.6	669,327.7	601,029.1	444,466.9	517,261.3	615,606.6	602,503.1	616,959.9	776,737.5	667,484.3
China	1,302,223.2	1,463,106.3	2,055,432.6	2,123,647.1	2,472,244.6	1,999,267.3	2,025,481.8	2,875,388.7	2,528,749.7	1,937,053.3	2,529,091.0
Kazakhstan	1,673,253.4	1,676,832.3	2,083,419.0	2,487,689.5	1,849,388.2	945,023.7	1,057,579.0	1,352,167.8	1,392,964.9	908,419.8	1,178,376.7
Russian Federation	4,405,554.0	5,144,759.0	3,442,699.9	2,545,791.6	1,821,065.2	1,794,904.8	2,019,162.4	2,117,289.8	2,531,870.5	1,485,755.1	2,088,237.3
Tajikistan	118,976.5	164,276.9	145,212.1	153,372.5	160,327.0	164,846.6	186,065.2	237,491.8	327,557.3	405,124.1	501,902.4
Turkey	910,180.8	854,610.7	896,838.0	966,255.1	790,093.2	686,213.2	877,812.3	944,755.2	1,217,633.2	1,018,992.8	1,692,380.2
Turkmenistan	168,620.9	173,284.4	170,258.5	230,077.8	105,970.0	79,501.1	69,902.3	59,537.8	144,331.6	126,068.6	191,886.2
Ukraine	180,038.9	410,371.3	525,421.7	193,640.7	65,749.7	51,188.9	106,046.3	100,123.9	119,428.1	123,853.8	232,545.4
Iran (Islamic Republic of)	378,361.0	323,542.4	209,945.8	318,300.7	318,100.1	350,408.3	267,201.8	172,877.9	219,907.6	141,751.3	177,090.0
Kyrgyzstan	94,162.3	72,931.5	159,232.5	164,075.1	99,949.6	121,450.9	178,256.9	269,735.8	669,643.1	760,459.1	792,044.4

Source: Uzbekistan Statistics Agency 2023

These ten countries account for about 60% of Uzbekistan's total export volume, with China, Russia and Turkey being the most prominent export destinations (15%, 13% and 10%, respectively). The rest of the exports go to the neighbouring countries in the CIS region. The following figure demonstrates this.

Figure 1. % Share of Total Trade: Country Wise



Source: Uzbekistan Statistics Agency 2023

The striking feature is that out of 60% of this trade, about 40% goes to only three countries, and 20% is distributed among CIS countries. China and Turkey are far in the distance, and Uzbekistan is landlocked. The CIS nations face common borders or are relatively closer to national land. One thing is common among Russia and other CIS countries as trading partners, i.e., most of them have been a part of the former Soviet Union.

From the trade policy front, by 2026, Uzbekistan's development strategy intends the country's exports to reach \$30 billion, with the private sector contributing 60% of the total (Global Markets Uzbekistan, 2022). For this purpose, many bilateral and regional trade agreements have been enforced by the country with many of its trading partners and others⁶Russia and Uzbekistan agreed upon a Strategic Framework Agreement containing free trade and investment privileges in 2004. The "Treaty of Allied Relations" between the government and Russia, which included

⁶ For more details, refer to UNCTAD 2023 International Investment Agreements Navigator <https://investmentpolicy.unctad.org/international-investment-agreements/countries/226/uzbekistan>

measures for economic cooperation, was signed in November 2005 (International Trade Administration, 2022). The 2004 deal between Uzbekistan and Ukraine eliminates all trade restrictions. The CIS Free Trade Zone officially accepted Uzbekistan as a member in 2014. Currently, Uzbekistan has free trade agreements in place with eleven nations, all of which were formerly part of the Soviet Union. The European Union accepted the enlarged General System of Preferences (GSP+) trade agreement, which waives duties on 2,200 product categories. In addition, Uzbekistan signed the regional Trade Investment Framework Agreement (TIFA) in 2004 along with the U.S. Trade Representative's Office and Tajikistan, Turkmenistan, Kazakhstan, and the Kyrgyz Republic, four of its neighbours in Central Asia (International Trade Administration, 2022).

SOME IMPORTANT QUESTIONS

All these developments trigger a few interesting questions. How is manufacturing and accumulating conducive fixed capital contributing to the trade potential? What explains the large trade concentration with distant economies such as China and Turkey? Three, how have the reductions in the tariffs (via trade agreements) and the formulation of trade agreements have contributed to trade performance? The answers are also expected to explain the volume and value effects.

EMPIRICAL LITERATURE

Farhad (2022) aims to analyze the impact of trade shocks on overall international trade relations. The study concludes with a number of recommendations, the most important of which was that trade shocks frequently occur as a result of different countries' economic and trade policies rather than just the demands of the traditional economic cycle or emergency or exceptional international economic conditions. Trade shocks, with their positive and negative effects, exceed the state's trade balance to be reflected on all other economic variables such as gross domestic product, income, employment, commodity prices, interest rate, exchange rate, and cash reserves. The severity of the shock and its time duration depend on the nature of the exported or imported goods according to the study.

Almashhadani (2023) explores the possible economic effects of Iraq's accession to the World Trade Organization. As per the conclusions Iraq will pay a high price for delaying membership due to the barriers that other nations may erect, especially given that the OIC countries, which totaled 164 nations, control nearly (97%) of the volume of global trade in goods, services, intellectual property, Information technology, telecommunication, and finance services.

Ali, Abu Bakar & Bakar (2022) aim to present an analysis on the effect of governance and its indicators on bilateral exports and bilateral imports of Pakistan with its major trading partner countries separately. The results show that, on average, the impact of governance on bilateral exports is favorable, showing that improved institutional quality generally enhances bilateral trade. The impact of institutional quality on trade has "waxed rather than waned" over time. Additionally, the beneficial impact of governance on bilateral imports suggests that trading with trading partners who have better institutions is straightforward.

Using Augmented Dicky Fuller unit root tests and Kapetanios unit root tests with structural breaks for the empirical investigation, Al-kasasbeh, Alzghoul and Alhanatleh (2022) show that government expenditure and taxation have a positive impact on economic growth. Economic growth is negatively impacted by public debt, but the impact is small. Trade liberalization greatly affects economic growth in case of Jordan.

As trade gets influenced by policy measures and changes in other factors, the direction of trade needs to be tested empirically. The Soviet Union has been an exciting area for many scholars since the 1990s (for instance, see Baldwin, 1994, and Kaminski et al., 1996). Almost all agree that trade between CIS countries has been heavily skewed towards high-income countries, especially the E.U.; however, after a transition of a decade or so, the trade flows of former Soviet Union countries have shown a different pattern. An attempt to explore the recent development may be limited. And especially in reflection on the opening up of the CIS economies, where the transition now is from a command system to a more market-based economy; such analysis is a special consideration in recent times.

A study attempted by the world bank lays that the leading CIS nations, including Russia and Ukraine, mainly had finished reorienting their trade flows away from long-standing CIS partners and toward new markets by 2001. Trade reorientation was hastened by the Russia crisis in 1998. Except for the USA, the CIS countries generally traded at or near the level predicted by the gravity model, both within the region and with the rest of the globe. Except for Belarus, trade

with the E.U. is almost at its potential. Yet, the rise in energy prices and the rerouting of energy flows were the leading causes of this redirection of trade flows in the CIS. Trade redirection in manufacturing has yet to catch up. Moreover, the CIS-7's trade diversification has lagged behind advancements (Freinkman, Polyakov and Revenco, 2004). The question is, are these findings still valid?

The study further argues that the overall adjustment of trade flow direction impacts some countries' significant bilateral trade imbalances. For instance, the trade deficits of Armenia, Belarus, Moldova, Turkmenistan, Ukraine, and Uzbekistan with the E.U. are huge. Compared to the rest of the CIS, these countries can provide less mineral resource-intensive products for the E.U. markets. Restrictions on market access (typical for most developing nations) and more unique behind-the-border issues in the CIS are responsible for the under-exporting of non-resource-intensive items to the E.U. (Freinkman, Polyakov and Revenco, 2004).

A significant drawback of the study is that it considers the E.U. a major trading partner of the CIS countries. The data presented in the opening section suggests that it might not be the case now, at least in the case of Uzbekistan. Turkey has been the only major trading partner from the E.U. region in recent times.

Exploring the trade potential of CIS countries, Shepotylo (2009) develops a model that is more appropriate for analyzing trade diversifications. The study then employs this Model to CIS countries' firm level and macro trade data. It concludes that CIS nations frequently trade excessively with one another and export disproportionately more in industries focused on resource extraction. It is especially true for the energy resource sector, which notably deviates from the global trend. CIS nations also consistently export less than anticipated in the food, forestry, and agriculture sectors, which may be a sign of additional external and internal trade restrictions specific to these two sectors. Surprisingly, little trade exists between Central Asia and the Caucasus region and China and India, despite the region's potential to grow exports to the east (Shepotylo, 2009).

We see that from 1990 to 2009, there were conflicting views regarding the trade flows, trade diversification and trade potential of CIS countries. Two major studies, as cited above, postulate two different perspectives. After 2009, many developments have occurred in the region towards free trade, regional integration and a pro-market-based approach. Mainly, Uzbekistan has been aggressive on all these fronts in recent times. Therefore, there is a need to examine

Uzbekistan's trade dynamics with its trading partners. The questions posted in previous sections form the basis of the analysis conducted.

EMPIRICAL METHODOLOGY

The studies above and many more have employed Gravity Model as a base to study the trade dynamics, the reason being its strength in explaining the trade flows and diversification quite successfully. Shepotylo (2009) improvises the Model and proposes alternative equations to systematically examine the firm-level heterogeneity and zero trade flows. The first empirical prints using the Gravity Equation can be traced in Tinbergen (1962) to analyze the trade flows. After that, the theoretical justification and foundations were laid by Anderson (1979), and since then, the Model has been widely used in various augmented forms and shapes in many studies. From an estimation point of view, the literature is enormous, from standard regression models (OLS) to panel estimation models such as fixed and random effect and more recently debated Heckman selection model and PPML, which treats the issue of zero trade flows well. Kaminski et al. (1996) provide insights into Intra CIS trade using a gravity equation and show that the rapid reorientation of exports outside of the CIS in the last ten years was consistent with earlier forecasts. Only a small portion of exports from the Kyrgyz Republic, Belarus, Moldova, and Turkmenistan are still going to the CIS compared to what the Model expected.

Frankel deployed a more recent gravity model (1997) that uses data from 1992 on a sample of 63 countries (with CIS members not included). The primary difference between the earlier Model and this more modern one is that the latter explains bilateral total trade flows (exports + imports), whereas the former solely addresses exports. As a result, the updated model aids in determining whether certain trading partners overtrade or under-trade one another when compared to other nations with comparable characteristics. This study develops a model based on bilateral trade flows for the question centred here. At first, A simple gravity equation is tested on a panel data set of Uzbekistan's major trading partners (indicated in section 1) from 2001-2021. It gives us a panel of 10x21, equivalent to 210 observations. For analyzing the bilateral trade flows, the equation looks like the following:

$$[bt] \quad _ijt = G ([gdp] \quad _it^{\alpha} [gdp] \quad _jt^{\beta}) / (d_{ij})^2$$

Here, bt_{ij} is the bilateral trade flow between Uzbekistan and its 10 major trading partners⁷, gdp_i is the Gross Domestic Product (U.S. \$ at 2105 constant prices) of Uzbekistan, gdp_j is the Gross Domestic Product of partner countries⁸ (U.S. \$ at 2015 constant prices), d is the distance between home and trading country measured in K.M.⁹ G is the gravity coefficient, α and β are the coefficients that show the magnitude of the relation between economic size and trade, and t is the period from 2001-2021.

It is to be noted that the square of the distance is used here since we look into the bilateral trade flows rather than distance only. A log-linear model is formed for estimation by taking logs from both sides. The estimation equation is laid down as follows:

$$\ln(bt_{ijt}) = \alpha + \beta_1 \ln(gdp_{it}) + \beta_2 \ln(gdp_{jt}) - \beta_3 d_{ij}^2 + \beta_4 D_{exssoviet} + \varepsilon_{ijt} \quad (1)$$

The data is organized in the form of a panel, and therefore, panel estimation models are explored to estimate the above equation. We see that the trading partners are diverse. It is a mix of countries from CIS as well as the E.U. Also, China and Iran are, again, quite distinct from CIS countries. Looking at this mix of countries, using the Random-effects model rather than fixed effects is better. Traditionally, a dummy is included in the estimation equation to capture the results. A dummy for ex-soviet is introduced, which takes a value of 1 if the country was part of the former Soviet Union and 0 otherwise. It is expected to reveal how average trade among CIS partners differs from others.

At the second stage, the estimation equation is augmented as per the questions raised, i.e., how have the changing policies and this transition to a market-based approach over time influenced the trade? How do trade flows differ among this heterogeneous group? What is the role of manufacturing and investment in fixed capital formation in increasing trade flows? And how significant is the trade cost since Uzbekistan is a landlocked country? The first question can be answered by including the time-specific dummies in the equation, taking 2001 as the base, whereas the second is captured by introducing the country dummies. Third, the growth rate in the manufacturing sector and growth rate in investment in fixed assets¹⁰ is included in the Model. Along with distance which represents the cost of trade, the tariff rates (effective average applied

⁷ US\$ Thousand from UNCTAD

⁸ US\$ 2015 constant prices from world bank open data databank

⁹ Form CEPII GeoDist database

¹⁰ In % from Statistics Agency Uzbekistan

rates¹¹) are included in the equation. These are also expected to represent the policy changes. The augmented equation is presented below:

$$\ln(\text{logbt})_{ijt} = \alpha + \beta_1 \ln(\text{gdp})_{it} + \beta_2 \ln(\text{gdp})_{jt} - \beta_3 d_{ij}^2 - \beta_4 \text{tariff}_{it} + \beta_5 \text{gmanu}_{it} + \beta_6 \text{ginv}_{it} + \beta_7 D_{\text{exssoviet}} + \gamma D_{\text{(time, from 2002-2021)}} + \delta D_{\text{(C, for country 2-10)}} + \varepsilon \dots (2)$$

MODEL RESULTS

Table 4 Model Results: Simple Gravity Equation Random-Effects GLS Regression

logbtijt	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
loggdpit	.833	.275	3.03	.002	.295	1.371	***
loggdplt	.702	.123	5.72	0	.462	.943	***
logdisij	-.306	.109	-2.82	.005	-.519	-.094	***
Dexsoviet	.721	.601	1.20	.23	-.456	1.898	
Constant	-21.319	5.514	-3.87	0	-32.127	-10.511	***
Mean dependent var		13.248	SD dependent var			1.246	
Overall r-squared		0.704	Number of obs			207	
Chi-square		279.033	Prob > chi2			0.000	
R-squared within		0.605	R-squared between			0.786	

*** p<.01, ** p<.05, * p<.1
Authors Calculation

As expected, the gravity model holds well on the selected date and set of countries, indicating once again the strength of the gravity equation in empirically explaining the trade flow dynamics. All the coefficients except for the dummy are highly significant; the economic size positively impacts bilateral trade, and distance has a negative influence. Surprisingly, the effect of home GDP is more than that of the GDP of other countries. In the sample, countries like Russia and China are much more prominent in economic size than Uzbekistan. It gives further intuition to investigate the country's effects to understand the dynamics. The dummy coefficient is positive, indicating a more significant average trade with countries that were part of the former Soviet Union; however, this coefficient is insignificant. It also will be much more evident when individual country effects are included in the Model.

¹¹ From UNCTAD

Table 5: Equation 2: Augmented Equation. Model 1: Random-Effects GLS Regression with Robust Standard Errors (Controlling Heteroskedasticity)

logbtijt	Coef.	Robust St.Err.	z-value	p-value	Sig
loggdpit	5.722015	4.488325	1.27	0.202	
loggdpjt	2.00519	.4029546	4.98	0.000	***
logdisij	-4.120311	.6311653	-6.53	0.000	***
trffjt	-.0470415	.0763665	-0.62	0.538	
grmanuit	.1889246	.2965644	0.64	0.524	
ginvit	.0087576	.0111471	0.79	0.432	
Dexsoviet	8.090939	1.367955	5.91	0.000	***
Constant	-145.7929	150.592	-0.97	0.333	*
_lid_2	2.828177	1.395481	2.03	0.043	**
_lid_3	-12.71583	2.116615	-6.01	0.000	***
_lid_4	-3.744191	1.059924	-3.53	0.000	***
_lid_5	-15.28359	2.211691	-6.91	0.000	***
_lid_6	5.506155	1.340496	4.11	0.000	***
_lid_7	0	-	-	-	
_lid_8	0	-	-	-	
_lid_9	0	-	-	-	
_lid_10	0	-	-	-	
_Iyear_2002	0	-	-	-	
_Iyear_2003	0	-	-	-	
_Iyear_2004	0	-	-	-	
_Iyear_2005	0	-	-	-	
_Iyear_2006	0	-	-	-	
_Iyear_2007	0	-	-	-	
_Iyear_2008	0	-	-	-	
_Iyear_2009	0	-	-	-	
_Iyear_2010	3.178562	2.287051	1.39	0.165	
_Iyear_2011	3.125582	2.170344	1.44	0.150	
_Iyear_2012	2.763005	2.297313	1.20	0.229	
_Iyear_2013	1.090	1.418803	2.49	0.106	*
_Iyear_2014	1.527924	1.159544	1.32	0.188	
_Iyear_2015	1.320067	1.419002	0.93	0.352	
_Iyear_2016	.7535837	.9087172	0.83	0.407	
_Iyear_2017	.9082017	1.418803	0.64	0.522	
_Iyear_2018	0	-	-	-	
_Iyear_2019	0	-	-	-	
_Iyear_2020	0	-	-	-	
_Iyear_2021	0	-	-	-	
Overall r-squared	0.9679	Number of obs		207	
Chi-square	.	Prob > chi2		.	
R-squared within	0.6161	R-squared between		1.0000	

*** p<.01, ** p<.05, * p<.1

Model 2: Random-Effects GLS Regression with AR (1) Disturbance. (Controlling Contemporaneous Correlation)

logbtijt	Coef.	St.Err.	z-value	p-value	Sig
loggdpit	3.50333	4.739429	0.74	0.460	
loggdpjt	1.68331	.5303985	3.17	0.002	***
logdisij	-3.687847	.9732429	-3.79	0.000	***
trffjt	-.0023267	.0545688	-0.04	0.966	
grmanuit	.0982744	.3006768	0.33	0.744	
ginvit	.0071197	.0119806	0.59	0.552	

Dexsoviet	7.548874	1.981117	3.81	0.000	***
Constant	-77.96661	155.5725	-0.50	0.616	
_Iid_2	3.562545	1.166105	3.06	0.002	***
_Iid_3	-11.20729	3.262061	-3.44	0.001	***
_Iid_4	-2.86632	1.546882	-1.85	0.064	*
_Iid_5	-14.0139	3.38792	-4.14	0.000	***
_Iid_6	5.775767	1.383557	4.17	0.000	***
_Iid_7	0	-	-	-	
_Iid_8	0	-	-	-	
_Iid_9	0	-	-	-	
_Iid_10	0	-	-	-	
_Iyear_2002	0	-	-	-	
_Iyear_2003	0	-	-	-	
_Iyear_2004	0	-	-	-	
_Iyear_2005	0	-	-	-	
_Iyear_2006	0	-	-	-	
_Iyear_2007	0	-	-	-	
_Iyear_2008	0	-	-	-	
_Iyear_2009	0	-	-	-	
_Iyear_2010	1.947938	2.512371	0.78	0.438	
_Iyear_2011	1.996579	2.405532	0.83	0.407	
_Iyear_2012	1.688111	2.49295	0.68	0.498	
_Iyear_2013	.7114657	.585042	1.22	0.224	
_Iyear_2014	.9004244	1.331551	0.68	0.499	
_Iyear_2015	.6500208	1.614692	0.40	0.801	
_Iyear_2016	.3073748	1.139264	0.27	0.787	
_Iyear_2017	.3735385	1.485576	0.25	0.801	
_Iyear_2018	0	-	-	-	
_Iyear_2019	0	-	-	-	
_Iyear_2020	0	-	-	-	
_Iyear_2021	0	-	-	-	
Overall r-squared	0.9651	Number of obs	207		
Chi-square	436.61	Prob > chi2	0.0000		
R-squared within	0.5996	R-squared between	0.9987		

*** p<.01, ** p<.05, * p<.1

AUTHORS CALCULATIONS

A modified Wald test for groupwise heteroskedasticity was conducted, showing the presence of heteroskedasticity in the data. Since we have had a macro panel for 21 years, it is suspected that cross-sectional dependence will also be a problem. Hence, the Breusch-Pagan LM test of independence was carried out, suggesting the presence of contemporaneous correlation. Therefore, two models are tested to control these problems.¹² The two models do not have

¹² There are models available which could be deployed where both problems can be dealt with simultaneously, but that requires the panel to have complete observations. Some values must be included due to data unavailability; hence, two separate models are tested.

contrasting results; in fact, both complement each other. The results are intriguing; the comparison of the two models is presented below:

Table 6: Comparison of Both the Models

	(1)	(2)		(1)	(2)		(1)	(2)
	logbtijt	logbtijt		logbtijt	logbtijt		logbtijt	logbtijt
loggdpit	5.722 (1.27)	3.503 (0.74)	_Iid_2	2.828* (2.03)	3.563** (3.06)	_Iyear_2002	0 (.)	0 (.)
loggdpjt	2.005*** (4.98)	1.683** (3.17)	_Iid_3	-12.72*** (-6.01)	-11.21*** (-3.44)	_Iyear_2003	0 (.)	0 (.)
logdisij	4.120*** (-6.53)	-3.688*** (-3.79)	_Iid_4	-3.744*** (-3.53)	-2.866 (-1.85)	_Iyear_2004	0 (.)	0 (.)
trffjt	-0.0470 (-0.62)	-0.00233 (-0.04)	_Iid_5	-15.28*** (-6.91)	-14.01*** (-4.14)	_Iyear_2005	0 (.)	0 (.)
grmanuit	0.189 (0.64)	0.0983 (0.33)	_Iid_6	5.506*** (4.11)	5.776*** (4.17)	_Iyear_2006	0 (.)	0 (.)
ginvit	0.00876 (0.79)	0.00712 (0.59)	_Iid_7	0 (.)	0 (.)	_Iyear_2007	0 (.)	0 (.)
Dexsoviet	8.091*** (5.91)	7.549*** (3.81)	_Iid_8	0 (.)	0 (.)	_Iyear_2008	0 (.)	0 (.)
Constant	-145.8 (-0.97)	-77.97 (-0.50)	_Iid_9	0 (.)	0 (.)	_Iyear_2009	0 (.)	0 (.)
			_Iid_10	0 (.)	0 (.)	_Iyear_2010	3.179 (1.39)	1.948 (0.78)
						_Iyear_2011	3.126 (1.44)	1.997 (0.83)
						_Iyear_2012	2.763 (1.20)	0.711 (0.68)
						_Iyear_2013	1.090* (2.49)	0.711 (1.22)
						_Iyear_2014	1.528 (1.32)	0.900 (0.68)
						_Iyear_2015	1.320 (0.93)	0.650 (0.40)
						_Iyear_2016	0.754 (0.83)	0.307 (0.27)
						_Iyear_2017	0.908 (0.64)	0.374 (0.25)
						_Iyear_2018	0 (.)	0 (.)
						_Iyear_2019	0 (.)	0 (.)
						_Iyear_2020	0 (.)	0 (.)
						_Iyear_2021	0 (.)	0 (.)

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

The predictions of the gravity equation are well established in both results. The economic sizes have a positive impact, and the distance has a negative effect. However, the deviation from the base model is that the home gdp is not significant. It could be the case because, in the panel, there are countries with a much larger GDP than the home gdp. Distance in both models has a significant effect. Tariff rates of different countries have a negative impact. Though this influence is relatively minimal (about a 4.7% reduction in trade with a unit rise in tariff rates), The growth rate in manufacturing and investment in fixed capital shows a positive influence, with manufacturing being higher than investment in fixed capital. A unit change in the growth rate in manufacturing is expected to raise the bilateral trade by 18%.

More interesting are the results of the dummy variables¹³. The dummy for ex-Soviet countries has a positive coefficient (8.09 in model 1 and 7.54 in model 2). It means that Uzbekistan's average trade is relatively higher, with the countries having Soviet roots compared to the overall trade. It is interesting to see how this differs in the case of countries in the panel. We see that the dummy coefficient of country two and country 6 is positive (note that the base dummy is country 1, i.e., Afghanistan, a CIS country). These two countries are China and Turkey. It indicates that compared to Afghanistan, trade is relatively higher with China and Turkey, clearly reflecting that average trade compared to the CIS region is higher with non-CIS members. Countries 3, 4 and 5 show a negative coefficient, and these three countries are Kazakhstan, Russia and Tajikistan. It is surprising to see in the case of Russia. The results show that the average bilateral trade with Russia is lower relative to Afghanistan along with the other two nations (note that all coefficients are significant). The time-specific dummies have a positive coefficient for all the years, which shows that the economic transition has significantly helped increase bilateral trade over time. The developments that have taken place in terms of political shifts, a shift towards a more market-based approach and strengthening the manufacturing sector have helped trade to rise.

CONCLUSION

Uzbekistan is currently implementing a series of reforms, and in the recent past, efforts have been made to ensure robust economic development around all corners. Trade in goods and services has always been an integrated tool to boost economic performance. Regional integration makes using economic and natural resources more optimal via healthy trade. The analysis above

¹³ Some year dummies and country dummies are omitted because of collinearity.

suggests that Uzbekistan is moving towards trading goods where the relative degree of comparative advantage is less. It indicates that trade is more skewed towards intra-industry rather than comparative advantage. The economy needs to focus on manufacturing and diversifying the manufactured trade with countries that do not have a competitive edge in producing those goods. The concentration of trade among the CIS region and a few high-income economies may be an obstacle to realizing the comparative advantages that the economy enjoys. If exports are diversified to a more significant number of economies, maybe gradually, the RCA index in these categories will also rise. The regression analysis suggests that growth rate in manufacturing and investment in fixed capital are key factors in improving trade performance. It also shows the disparity among the concentration of trade flows with the trading partners. Time effects reflect a positive side of the economic reforms that are being implemented. Overall, the economy has a bright future in increasing its trade performance; the key to success, as recommended, is realizing comparative advantage and not being held to intra-industry trade along with more countries. So, exploring global markets is one key area that the economy shall focus on.

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