Berlin Studies Transnational Journal of Science and Humanities ISSN 2749-0866
Vol.1 Issue 1.1 Economical sciences
http://berlinstudies.de/

Gravitate analyse von investitionen in die wirtschaft von Usbekistan und Karakalpakstan

Utemuratov R. B. - Lehrer der Staatlichen Universität Karakalpak

Anmerkung: Der Artikel beschreibt die von der Regierung durchgeführten Reformen, um Investitionen in die Republik Usbekistan zu locken, die Analyse des aktuellen Stands der Investitionstätigkeit und die Umsetzung des Gravitationsmodells der wirtschaftlichen Situation in Ländern mit Außenwirtschaftsbeziehungen.

Schlüsselwörter: investitionen, bruttoinlandsprodukt, gravitationsmodell, transaktionskosten, Außenhandelsumsatz.

Gravitate analysis of investment in the economy of Uzbekistan and Karakalpakstan

Utemuratov R. B. - teacher at Karakalpak State University

Abstract: The article describes the reforms carried out by the government to attract investment to the Republic of Uzbekistan, the analysis of the current state of investment activity and the implementation of the gravitational model of economic situations in countries with foreign economic relations.

Keywords: investment, gross domestic product, gravitational model, transaction costs, foreign trade turnover.

Introduction

Today, investment is considered a key factor in economic growth, in this regard, in particular, foreign investment serves as an engine of economic development, providing modern development technologies, the latest production processes, production methods, tools and management skills. Therefore, the investment growth model is seen as a growth model of the state economy. It is obvious that attracting investments into the economy plays an important role in the development of the country's economy, the organization of new production, the creation of new jobs, employment and income growth.

10.5281/zenodo.5582508

In the current context of globalization, the issue of attracting and efficient use of foreign investment in the economy is one of the most pressing issues, which is the country's natural resources, cheap labor, favorable conditions for investors, regulations, in short, investment attractiveness. dependence on factors requires in - depth scientific research in this area.

In this sense, the use of gravity models in attracting investment to improve the ways of attracting foreign investment in the economy of the Republic of Uzbekistan was identified as the purpose of the study. Studies show that the gravitational model can be used as an empirical method to determine the optimal solution. Also, due to the characteristics of the gravitational model, it can be used in research related to foreign investment flows, the effect of distance on attracting foreign investment, and the conditions of interaction between foreign investment and trade. Just as there are several theoretical models for describing foreign investment, there are also different classifications for foreign investment models based on the gravity model.

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan "On the organization of the Agency for Foreign Investment under the Ministry of Investment and Foreign Trade of the Republic of Uzbekistan" The agency was established to form a database of information, to promote the economic, resource and investment potential of the Republic and to perform a number of other tasks [1]. Hence, today it is important to conduct more extensive scientific research in the continuation of these tasks.

The degree to which the problem has been studied

In world practice, there is a wide range of assessments of international trade potential based on the gravity model. Empirical studies based on the gravitational equation have been covered by a number of scientists in their work since Jan Tinbergen, including X. The Linnemann model hypothesized that trade also depended on political and cultural factors, the proximity of countries, the availability of resources, and so on, suggesting that this method could predict potential long-term trade flows [3]. Bergstrand also explored the theoretical foundations of bilateral trade

10.5281/zenodo.5582508

in which gravitational equations were linked to simple monopolistic competition models [4]. In the late 1990s, a number of authors systematized the existing theoretical conclusions of the gravitational model. Deardorf (1998) provides the most comprehensive review of the literature on the subject. Evenett and Keller (1998) compare and test gravity models from different authors. Later, an expanded gravity model was introduced a few years ago to more accurately model geographic variables. The connection between the new economic geography and the gravitational model is illustrated in the work of Iton Kortum (2002) and the most popular in this field is the gravity model developed by Redding and Venable (2000). More recently, the Hattari model of attracting foreign investment for developing countries in Asia, Rajan (2009) has shown that it has had a sustained positive impact on the growth of imports in the host country [5].

Research methods

Empirical studies based on the gravitational equation date back to the first half of the 1960s. The concept of the gravitational equation was first used by a group of physicists at Princeton University based on the well-known Newton's law of gravitation. Jan Tinbergen, a Nobel laureate in economics, proposed in 1962 to use the same functional formula of the universal law of gravitation to analyze international trade flows. An econometric model was created by Jan Tinbergen using the simplest form of the gravitational equation of bilateral trade to estimate mutual trade flows, and the model was tested using the least squares method. Tinbergen explained the general gross trade flows between different pairs of countries, the gross domestic product of both trading partners, the distance between them as clear, explicit variables, and using fictitious variables such as proximity, common boundary, and community affiliation [2].

In economics, the gravitational equation is an expression that provides the relationship between the amount of trade turnover between countries, the indicators of economic dimensions of exporters and importers, and the distance, and it has the following general form:

10.5281/zenodo.5582508

$$Y_{ij} = k \cdot \frac{x_i \cdot x_j}{d_{ij}^2}, \quad (1)$$

where, Y_{ij} is the amount of trade volume between countries;

x_i, x_j - indicators of economic dimensions of exporting and importing parties;

d_{ij} -distance between countries;

k - is the interaction factor coefficient.

If in this gravitational equation the economic indicators are taken as the gross domestic product of the country, then equation (1) has the following form:

$$Y_{ij} = k \cdot \frac{GDP_i \cdot GDP_j}{D_{ij}^2}, \quad (2)$$

where GDP is the corresponding gross domestic product of a country.

In addition, in the gravitational equation as economic indicators can be taken values of the country's population, land area, GDP per capita. The distance variable in the equation can also be interpreted as a measure of the cost of covering foreign trade costs. This process is interpreted as an increase in the transaction costs of trade activities between countries, increasing their geographical distance and having a negative impact on them. In this case, formula (2) looks like this [6]:

$$Y_{ij} = k \cdot GDP_i \cdot GDP_j \cdot PS_i \cdot PS_j \cdot A_{ij} \cdot PR_{ij} / D_{ij}^2 + \varepsilon, \quad (3)$$

where, PS_i and PS_j - the corresponding population of the countries; A_{ij} - any other factor supporting trade relations between the countries; PR_{ij} - trade preferences between countries; ε - random error.

Given the fictitious parameters that affect economic performance in the gravitational equation, formulas (2) and (3) can be written as follows:

$$Y_{ij} = k \cdot \frac{GDP_i^{\alpha_1} \cdot GDP_j^{\alpha_2}}{D_{ij}^{\alpha_3}}, \quad (4)$$

$$Y_{ij} = k \cdot GDP_i^{\alpha_1} \cdot GDP_j^{\alpha_2} \cdot PS_i^{\alpha_3} \cdot PS_j^{\alpha_4} \cdot A_{ij}^{\alpha_5} \cdot PR_{ij}^{\alpha_6} / D_{ij}^{\alpha_7} + \varepsilon, \quad (5)$$

where, α_i are parameters that apply to empirical evaluations, which are measured according to the magnitude of the effect of the variables.

10.5281/zenodo.5582508

In order to make the gravitational model of foreign trade turnover between countries given by formulas (4) - (5) suitable for statistical analysis, we write the equation in the form of a linear logarithm:

$$\ln Y_{ij} = \ln k + \alpha_1 \ln(GDP_i) + \alpha_2 \ln(GDP_j) - \alpha_3 \ln(D_{ij}), \quad (6)$$

$$\ln Y_{ij} = \ln k + \alpha_1 \ln(GDP_i) + \alpha_2 \ln(GDP_j) + \alpha_3 \ln(PS_i) + \alpha_4 4 \ln(PS_j) + \\ + \alpha_5 \ln(A_{ij}) + \alpha_6 \ln(PR_{ij}) - \alpha_3 \ln(D_{ij}) + \varepsilon. \quad (7)$$

To evaluate the parameters of the gravitational model, panel data containing both time and structural components can be used in the composition of the observations. This in turn allows for a more complete coverage of the problem under study in terms of information. Based on these studies, we believe that this structured gravity model can also be used to analyze export-import flows between the Republic of Uzbekistan and other countries, including investment flows.

Analysis and results

We pay attention to the definition of standard variables included in the gravitational models of direct investment flows between the Republic of Uzbekistan and foreign countries. These variables are considered to be the country's gross domestic product, economic performance, and the distances between them. Our gravitational model for foreign direct investment includes not only gravitational variables, but also other variables that can determine the factors that affect the foreign investment of the Republic of Uzbekistan. These include political risk, cultural proximity, openness to international trade, and attitudes toward natural resources.

Some features of a country's gross domestic product, such as market size or its expected growth, can be seen as an important factor in determining the inflow of foreign investment. As markets grow, so do the opportunities for efficient use of resources and the exploitation of a large-scale economy. We can observe the dynamics of change by determining the relationship between foreign investment and GDP per capita (Table 1).

According to the table, the GDP per capita of the Republic of Uzbekistan in 2020 increased by 17469.8 thousand soums compared to 2000 and amounted to

10.5281/zenodo.5582508

17601.9 thousand soums. The volume of investments in fixed assets amounted to 201255.6 billion soums. soums and amounted to 202000.1 bln. sum. In turn, per capita investments in fixed assets increased by 5870.7 soums to 5900.9 thousand soums. The growth rate of gross per capita income increased by 11632.4 soums compared to 2000 and amounted to 11728.8 thousand soums. Although positive results have been noted in the growth of these indicators, economic relations between the Republic of Uzbekistan and other foreign countries under the laws of gravity may not be sufficient. This, in turn, has an impact on attracting foreign trade partners to the Republic of Uzbekistan, including investment. According to the World Bank, the average per capita GDP of the world's countries is 10,926 US dollars. Thus, in the Republic of Uzbekistan (1686 US dollars) the difference in this indicator is 9240 US dollars.

Table 1

The volume of GDP per capita and investments in fixed assets in the Republic of Uzbekistan

№	Indicators	2000 y.		2005 y.		2010 y.		2015 y.		2020 y.		Change from 2020 to 2000 (+, -)	
		Uzbekistan	Karakalpakstan	Uzbekistan	Karakalpakstan	Uzbekistan	Karakalpakstan	Uzbekistan	Karakalpakstan	Uzbekistan	Karakalpakstan	Uzbekistan	Karakalpakstan
1.	Gross domestic product per capita (thousand soums)	132,1	72,2	608,5	333,2	2763,7	1317,0	7072,2	3772,3	17601,9	11485,2	17469,8	11413,0
2.	Fixed capital investments (billion soums)	744,5	35,9	3165,2	149,3	16463,7	496,4	44810,4	6021,2	202000,1	7089,8	201255,6	7053,9
3.	Investment in fixed assets per capita (thousand soums)	30,2	23,7	121,0	95,0	583,2	302,6	1431,7	3388,2	5900,9	3710,0	5870,7	3686,3
4.	Gross income per capita (thousand soums)	96,4	60,6	371,8	203,2	1765,8	1498,9	5070,5	3908,0	11728,8	9503,1	11632,4	9442,5

Now, if we analyze the data in the table for the Republic of Karakalpakstan, we can see that the gross regional product per capita in 2020 increased by 11413.0 thousand soums compared to 2000 and reached 111485.2 thousand soums. The volume of investments in fixed assets amounted to 7053.9 billion soums. soums and

10.5281/zenodo.5582508

increased by 7089.8 bln. The per capita investment in fixed assets increased by 3686.3 soums to 3710.0 thousand soums, and the growth rate of gross per capita income increased by 9442.5 soums compared to 2000 and reached 9503.1 thousand soums.

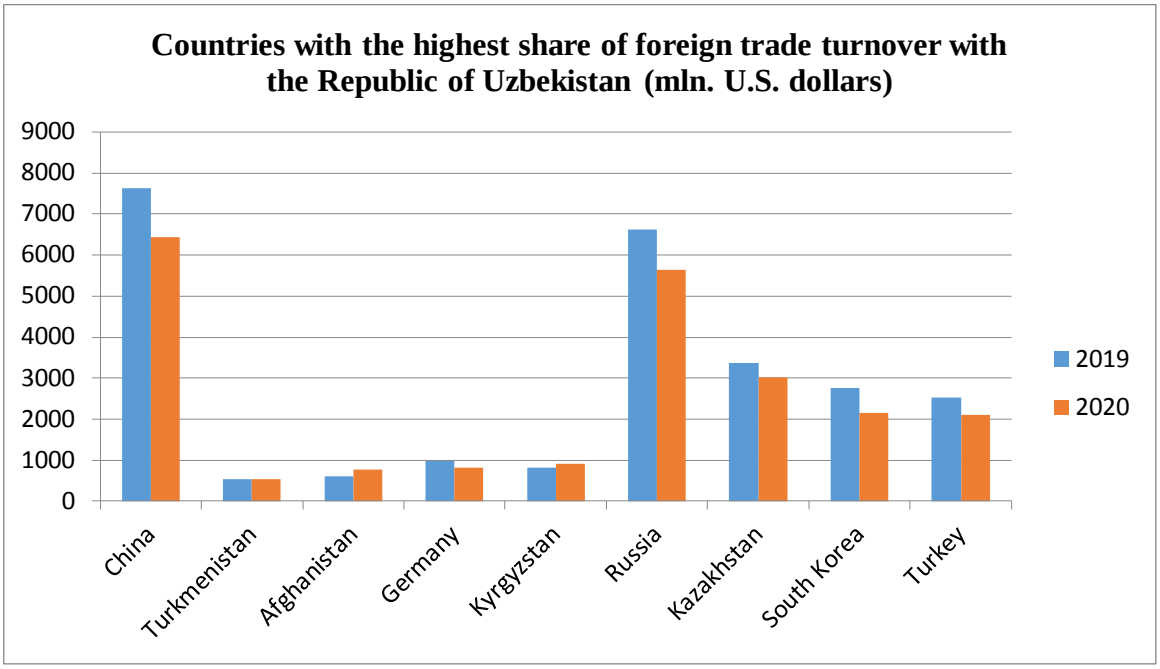

Figure 1. Countries with the highest share of foreign trade turnover with the Republic of Uzbekistan (author's work based on the data of the State Statistics Committee of the Republic of Uzbekistan)

Empirical research on the determinants of foreign investment in the Republic of Uzbekistan shows that investments are encouraged, especially with countries such as Russia, China, Turkey, South Korea and Kazakhstan (figure 1). This is mainly due to the need to meet the growing demand for primary resources and boost domestic economic growth.

Table 2

Information on the main investor countries for the Republic of Uzbekistan*

№	Countries	Population, person	Land area (sq. Km)	GDP (US $)	Per capita income (US $)	Foreign trade turnover (US $ million)	Distance (km)
1.	Uzbekistan	34232050	448924	57707189945,4	1670		
2.	Russia	144104080	17098250	1483497784867,6	10690	5640,7	3394
3.	China	1402112000	9600012,9	14722730697890,1	10610	6432,2	3933
4.	Kazakhstan	18754440	2724902	169835426427,2	8680	3018,5	1617
5.	Turkey	84339067	785350	720101212394,1	9050	2101,7	4647
6.	South Korea	51780579	100370	1630525005469,1	32860	2142,4	4887

*- author's work based on data from the World Bank

10.5281/zenodo.5582508

Using the data in the table, we calculate the indicators of foreign economic activity between the Republic of Uzbekistan and the countries with high foreign trade turnover and major investor countries using the gravitational equation. According to the calculations, we have the results in Table 3 below:

Table 3

The results of the calculation of foreign economic activity between the Republic of Uzbekistan and individual countries using the gravitational equation

№	Countries	Population, mln. person	GDP, mln. US dollars	Distance, thousand km	LnY1	lnY2	Y1	Y2
1.	Russia	144,1	1483497,8	3,4	-0,70	7,80	0,50	2446,85
2.	China	1402,1	14722730,7	3,9	1,30	12,08	3,67	175951,00
3.	Kazakhstan	18,85	169835,4	1,6	-1,39	5,08	0,25	160,61
4.	Turkey	84,3	720101,2	4,6	-2,05	5,92	0,13	370,80
5.	South Korea	51,8	1630525,0	4,9	-1,34	6,14	0,26	466,10

Thus, using the gravitational equation, the indicator of foreign economic activity between the Republic of Uzbekistan and some countries was calculated on two options. In the first option, an indicator of the volume of gross domestic product of countries and the distance between countries was obtained, and in the second option, in addition to these, the population of the country was obtained. Calculations showed that out of 5 countries, China had the highest score of 3.67, followed by Russia, South Korea and Kazakhstan, respectively, and the lowest score belonged to Turkey. The conclusion is that the opportunities for further development of foreign economic relations between China and the Republic of Uzbekistan, including to a higher level in attracting investment, are greater than in other countries under consideration. Moreover, it can be said that if a country's economic performance is very high and the distance between countries decreases, the results of the gravitational equation show that the potential for foreign economic trade between these countries increases.

Using the above data, we calculate the indicator of foreign economic activity between the countries selected for the Republic of Karakalpakstan using the gravitational equation, because we can see that these countries have the highest

10.5281/zenodo.5582508

foreign trade turnover with the Republic of Karakalpakstan. As a result of the calculations we have the data in Table 4:

Table 4

Results of calculation of foreign economic activity between the Republic of Karakalpakstan and investor countries using the gravitational equation

№	Countries	LnY1	lnY2	Y1	Y2
1.	Russia	-3,572	2,053	0,028	7,788
2.	China	-2,380	5,520	0,093	249,550
3.	Kazakhstan	-5,710	-2,125	0,003	0,119
4.	Turkey	-4,783	0,306	0,008	1,358
5.	South Korea	-5,000	-0,399	0,007	0,671

The table shows that between the Republic of Karakalpakstan and China, the highest score was 249.55, followed by Russia with 7,788, Turkey with 1,358, South Korea with 0.671 and Kazakhstan with the lowest score of 0.119. The conclusion from these results is that it is recommended to further develop economic relations with the Republic of Karakalpakstan and countries with high foreign economic activity, including taking into account the breadth of investment opportunities.

Conclusion

At present, attracting foreign direct investment is one of the important factors influencing the growth and development of the economy of any developing country. The gravitational equation can be used to explain direct foreign investment between a pair of countries. The growth of economic indicators of the Republic of Uzbekistan plays an important role in attracting foreign investment. In economics, the gravitational equation is the expression that provides the relationship between the amount of trade turnover between countries, the indicators of economic dimensions of exporting and importing parties, and distance. In addition, in the gravitational equation as economic indicators can be taken values of the country's population, land area, GDP per capita. The distance variable in the equation can also be interpreted as a measure of the cost of covering foreign trade costs. The countries with the greatest potential for further development of foreign economic relations of the Republic of Uzbekistan, including the attraction of investments, have been identified. In addition,

10.5281/zenodo.5582508

ensuring the inflow of foreign investment will allow to identify areas that will affect the country's economy and better determine the transition to a mature stage of development.

References

1. Resolution of the Cabinet of Ministers of the Republic of Uzbekistan dated July 24, 2019 No 621 "On the organization of the Agency for Foreign Investment under the Ministry of Investment and Foreign Trade of the Republic of Uzbekistan" / https://lex.uz/docs/4438435
2. Tinbergen J. An Analysis of World Trade Flows. New York.-1962.-P.1002-1010
3. Linnemann H. An econometric study of international trade flows. The American economic review.- Nashville, Tenn.- 1966.-Vol.57, №1.-P.283-285
4. Bergstrand, J.H. The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence. The Review of Economics and Statistics.- 1985.-Vol. 67, №3.-P.474-481
5. Hattari R., Rajan R. Sources of FDI Flows to Developing Asia: The Roles of Distance and Time Zones. https://www.researchgate.net/publication/46476489_Sources_of_FDI_Flows_to_Developing_Asia_The_Roles_of_Distance_and_Time_Zones.
6. Uskova T. V., Dedkov S. M., Smirnova T. G., Selimenkov R. Yu., Asanovich V. Ya. Interregional cooperation as a factor of integration processes between Russia and the Republic of Belarus Vologda: RAS, 2011.-p 176
7. https://databank.worldbank.org/reports.aspx?source=2&country
8. https://www.stat.uz/uz/
9. https://qrstat.uz/uz/

10.5281/zenodo.5582508