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Analysis of foreign direct investment flow in the Republic of Kazakhstan based on the accelerator model

Abstract. *Foreign direct investments play a vital role in the economy of the Republic of Kazakhstan. Nowadays, foreign direct investments are considered to be one of the key aspects in economic integration of countries through creation and facilitation of beneficial links between various countries and economies. The purpose of the paper is to analyze the flow of foreign direct investment in the economy of the Republic of Kazakhstan and its impact on the gross domestic product using the theory of the multiplier-accelerator.*

While conducting the research the following scientific methods were employed: comparative analysis, analysis and synthesis, content analysis, logical, statistical, and mathematical, graphic. As a result of the undertaken research the features of the applying the multiplier-accelerator model were studied. Based on the collection of statistical data on the inflow of foreign investment and GDP in the Republic of Kazakhstan in the period from 2005-2021, an accelerator line was built.

The main findings obtained in the course of the study made it possible to assess the impact of the inflow of foreign direct investment on the volume of gross domestic product, determine the cumulative effect and determine promising directions for the development of investment activity in the Republic of Kazakhstan.

Keywords: *foreign direct investment, gross domestic product, accelerator model, economy, Republic of Kazakhstan.*

Introduction

The inflow of foreign direct investment can cause both positive and negative effects on the economy of the host country. Uncoordinated investment inflows into the country can cause structural deformation of the economy in the recipient country, increasing the dependence of its economic development on the inflow of foreign investment. On the contrary, a well-thought-out investment policy to attract foreign capital contributes to expanding opportunities for realizing the potential of the country's economic growth [1].

At present, much attention is paid to the study of the problems regarding state regulation of macroeconomic situation, aimed at developing adequate approaches to the impact of the state on the well-being of the national economy [2].

To achieve such goals, an integrated approach is required that can combine all elements of the reproductive process. In this regard, there is a particular interest among research scientists in the theory of assessing multiplier effects in the economy.

A large number of ongoing studies in foreign literature are aimed at deepening the concept of the multiplier-accelerator in the context of the mutual influence of economic, environmental and social indicators [3, 4, 5, 6].

At the same time, at the moment there is a lack of research into the impact of various impulses on economic development using the multiplier-accelerator model in the Republic of Kazakhstan.

In addition, in the context of the encountering with crisis situations caused by both economic downturns and the pandemic, in the context of an unstable geopolitical situation in the world, there is a

redistribution of global capital, which mainly affects the economic well-being of developing countries. These facts determine the relevance of this paper.

The desire of the state to increase the level of competitiveness of the domestic economy necessitates a scientific substantiation of the goals, vector, and intensity of transformation processes in the context of modern economic conditions. This raises the question of scientific interpretation of the essence of the investment process, which acts as a factor in the innovation and technological renewal of economic entities.

Methods

The research is based on such scientific methods as: comparative analysis, analysis and synthesis, content analysis, logical, statistical and mathematical and graphic. The works of both domestic and foreign scientists, statistical data of the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan (GDP dynamics of the Republic of Kazakhstan), data of the National Bank of the Republic of Kazakhstan (gross inflow of direct investment into Kazakhstan from foreign direct investors (according to types of economic activity of residents, by country, by regions of Kazakhstan) were employed as an information base.

Literature review

One of the main theories of macroeconomic science is the theory of the multiplier-accelerator, which is used in substantiating state-important decisions in different countries of the world [7].

The content of the multiplier effect in a broad sense is that with an increase in any element of autonomous spending, an increase in national income is observed. At the same time, the increase in national income exceeds the initial increase in spending. In other words, the multiplier effect leads to a chain reaction in which there is an increase in employment in society and income.

In a narrow sense, the investment multiplier shows the relationship between a change in income and a change in investment.

The first application of the multiplier theory was to justify the anti-crisis policy, when with its help an attempt was made to stop the progression of the economic crisis and the unprecedented rise in unemployment. This theory has been proposed as a solution to the problems caused by the crisis, such as the reduction of unemployment and the restoration of a market economy. According to the multiplier theory, initial investment in one sector will stimulate demand and increase income in other sectors and in the economy as a whole [8].

The initial investment Impulse can come from both the public and private sectors. One of the fathers of this theory, J. M. Keynes, noted the key role of the state in stimulating aggregate demand. In Keynes' multiplier theory, investment projects are carried out through the organization of such public works as, for example, the construction of roads, dams, etc. A vivid illustration of the implementation of this policy of stimulating investment processes is the development of Roosevelt's New Deal measures in response to the crisis caused by the Great Depression. In other words, the main task of the state was to create effective demand and reduce unemployment [9].

Further, the theory of the multiplier was developed through the principle of acceleration. At the same time, from a theoretical point of view, when taking into account the effect of the accelerator, the following assumption is introduced: an increase in the investment flow takes place in the same year as the increase in sales. Meanwhile, from an economic point of view, when building an accelerator model, a certain time gap is taken into account in the reaction of economic agents involved in investment activities to an increase in sales or an increase in GDP. In other words, investors cannot respond immediately to positive sales or GDP growth [10].

For the practical implementation of the acceleration principle, the following is necessary:

• lack of goods in the form of stocks. Increased consumer demand can be met by inventory rather than by expanding production.

• availability of untapped human resources.

• work at the limit of production capacity. If there are idle production capacities, they will be put into operation, which will prevent the accelerated growth of the means of production.

• lack of technical progress, prospects for growth in labor productivity, when other things being equal, it is possible to increase production and satisfy the increased demand.

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The multiplier-accelerator effect reflects the mechanism of cyclic fluctuations of the economic system, while an increase in the flow of investment by a certain amount leads to an increase in national income by a much larger amount as a result of the multiplier effect. The increased income, in turn, will lead to a faster growth of investments in the future due to the accelerator. Further, these derivative investments, being part of aggregate demand, will cause another multiplier effect, which will again lead to an increase in income, stimulating another flow of investment. However, it is worth remembering the reverse effect of the accelerator multiplier, which can lead to a many times greater decrease in investment compared to changes in income or GDP [11].

The theoretical concept of the multiplier-accelerator allows the occurrence of explosive oscillations, but in practice such explosions do not occur due to certain limiting factors. Such a limitation on the growth of national income, for example, can be full employment, upon reaching which the growth of real income stops. In this case, derivative investment drops to zero, which in turn causes a reduction in total income and demand. Meanwhile, when falling, the national income reaches the lower limit, due to the amount of depreciation deductions for the restoration of fixed capital. As a result, the national income changes the trajectory of its movement to the opposite when it reaches the upper or lower limits.

The increase in the flow of investments should be commensurate with the growth of effective demand. Meanwhile, the increase in investment does not occur instantly, but in steps, in accordance with the pace of increasing production and generating income. In the event of the impact of external factors stimulating an increase in investment, there will be a reconfiguration of the ties established in the national economy, and the value of the multiplier will change. In this connection, it is necessary to accept the fact that the theory of the multiplier does not matter in terms of predicting economic changes. At the same time, the multiplier theory is effectively used as an explanatory theory [12].

Results

To confirm the operation of the multiplier-accelerator theory, the author calculated the value of the multiplier in relation to the economic situation of the Republic of Kazakhstan. For the calculations, statistical data of the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan (GDP dynamics of the Republic of Kazakhstan), data of the National Bank of the Republic of Kazakhstan (gross inflow of direct investments into Kazakhstan from foreign direct investors (by types of economic activity of residents, by countries, in in the context of the regions of Kazakhstan) were employed.

As mentioned earlier, the multiplier-accelerator theory is one of the basic theories of macroeconomics, which is rarely used in the practice of economic modeling.

In addition, in real conditions, a high stability of the accelerator value is rarely noted. The largest differences are typical for countries with economies in transition, as well as countries experiencing a change in the mode of operation (for example, from growth to recession and vice versa). In such situations, the value of the accelerator is subject to strong fluctuations, also accompanied by a shifting from positive to negative and back.

However, the application of the multiplier-accelerator theory is successfully carried out to determine estimated values that reflect the state of the national economy, as well as to justify public policy.

Generally speaking, without taking into account the time factor, the accelerator is the ratio of investment and production growth.

$$k = \frac{I}{\Delta Y}$$

Where,
k - accelerator (incremental coefficient of capital intensity);
I - investment amount;
ΔY - increase in production (income, capacity, GDP, etc.).
In the presence of the previously mentioned shortcomings and assumptions inherent in the accelerator model, the following advantages should be highlighted, namely:
- minimum amount of initial data;

- simplicity of calculations;
- ensuring the comparability of the results obtained, as well as the possibility of unification, which makes it possible to widely use this model when assessing investment processes in the context of different levels of economic development [13].

Meanwhile, there is a lack of application of the model in the works of domestic authors devoted to the study of foreign direct investment flows.

In accordance with the theory of the accelerator, the investment flow used in the calculations has the same incremental character as the result of its application, determined by the increase in the value of new capital to the existing level.

According to the accelerator theory, with an increase in investment by one unit, there is an increase in GDP by a value greater than the investment caused by this increase.

Discussion

Statistical indicators of foreign investment inflows in the Republic of Kazakhstan for the period from 2005-2021 are presented in Table 1 [14,15].

Table 1

Calculation of the foreign direct investment accelerator in the Republic of Kazakhstan, 2005-2021

Years	GDP, mln. USD	GDP growth, million USD	Inflow of direct investments, million USD	Accelerator
	Y	**ΔY**	**I**	**k=I/ΔY**
2005	57,124		7,916	
2006	81,004	23,880	12,066	0.51
2007	104,854	23,850	19,418	0.81
2008	133,441	28,587	21,301	0.75
2009	115,306	-18,135	21,437	-1.18
2010	148,052	32,746	22,246	0.68
2011	192,628	44,575	26,467	0.59
2012	208,002	15,375	28,885	1.88
2013	236,633	28,631	24,098	0.84
2014	221,418	-15,216	23,809	-1.56
2015	184,387	-37,031	15,368	-0.42
2016	137,278.3	-47,109	21,367	-0.45
2017	166,806	29,528	20,960	0.71
2018	179,338	12,532	24,271	1.94
2019	181,666	2,328	24,437	10.50
2020	171,084	-10,582	17,180	-1.62
2021	197,056	25,972	23,658	0.91

Note: compiled by the author based on Official statistics [14,15]

As the above calculations show, per 1 dollar of growth in the inflow of foreign direct investment, GDP grew by an average of 0.93 in the analyzed period. At the same time, if during the period 2006-2008 the average increase in FDI by $1 led to an average increase in GDP by $0.7, then in 2009 the accelerator value took a negative value of -1.18, which is a characteristic sign of negative GDP growth and the crisis in the economy of Kazakhstan. However, in the future, in 2010-2013, an increase in FDI by $1 was accompanied by an average GDP growth of $1 (Figure 1).

Note: compiled by the author based on [14,15]

Figure 1 – Kazakhstan Investment Accelerator, 2006-2021

Further, in 2014–2016, a negative value of the accelerator is noted, which also indicates a negative GDP growth during this period due to the financial crisis of 2014–2015, caused by a sharp drop in world oil prices, the export of which largely determines the investment attractiveness of Kazakhstan in eyes of foreign investors, and the level of the country's GDP. In the next period from 2017-2019, the average value of the accelerator was set at 4.4, which indicates an economic recovery and an increase in FDI inflows into the country's economy. The year 2020 that followed made its own adjustments in view of the COVID-2019 pandemic that broke out around the world, which led to a slowdown in all economic processes, including investment activity. The value of the accelerator in 2020 again took a negative value of -1.62. However, after the lifting of quarantine restrictions that followed in 2021, there is an increase in the flow of FDI, a positive increase in the GDP of the Republic of Kazakhstan, the accelerator value took on the value of 0.91. This accelerator value less than one indicates that the principle of acceleration (accompanied by a multiple increase) does not work. This fact is explained by high rates of inflation, the presence of unused production capacities.

Thus, it becomes difficult to interpret the results obtained from the mechanical use of the accelerator formula from an economic point of view, especially on the trajectory of negative dynamics, when the decline in incremental GDP indicators is compared with absolute FDI indicators.

To overcome this fact, we will calculate the growth of GDP and FDI (Table 2). The calculation of growth rates is based on the following formulas [13]:

$$\Delta I = \frac{I_t - I_{t-1}}{I_{t-1}} \qquad \Delta Y = \frac{Y_t - Y_{t-1}}{Y_{t-1}}$$

If we consider the GDP growth rate and the investment growth rate for the period from 2005 to 2021 (Table 2), we can see that until 2008 the investment growth rate exceeded the GDP growth rate. In the crisis year of 2008, the GDP growth rate was 0.27 with 0.10 increase in investment. From 2009 to 2013 investment growth rates followed the same pattern as GDP growth rates. In 2009, at the height of the crisis in the country, growth rates became negative, however, investment fell less than GDP. For 2014 and 2015 investment growth rates and the GDP growth rate were negative due to the financial crisis, interestingly in 2014 investment rate was not much affect as compared to 2015, when the consequences of the crisis caused uncertainty in investment processes.

Table 2.

GDP growth rate and foreign direct investment growth rate of the Republic of Kazakhstan,
2005-2021

Years	GDP, mln. USD	GDP growth rate	Inflow of direct investments, million USD	Investment growth rate
	Y	ΔY	**I**	ΔI
2005	57,124		7,916	
2006	81,004	0.42	12,066	0.52
2007	104,854	0.29	19,418	0.61
2008	133,441	0.27	21,301	0.10
2009	115,306	-0.14	21,437	0.01
2010	148,052	0.28	22,246	0.04
2011	192,628	0.30	26,467	0.19
2012	208,002	0.08	28,885	0.09
2013	236,633	0.14	24,098	-0.17
2014	221,418	-0.06	23,809	-0.01
2015	184,387	-0.17	15,368	-0.35
2016	137,278.3	-0.26	21,367	0.39
2017	166,806	0.22	20,960	-0.02
2018	179,338	0.08	24,271	0.16
2019	181,666	0.01	24,437	0.01
2020	171,084	-0.06	17,180	-0.30
2021	197,056	0.15	23,658	0.38

Note: compiled by the author based on Official statistics [14,15]

For clarity, we will display the obtained values of GDP growth and FDI growth in the period from 2006-2021 on the chart (Figure 2).
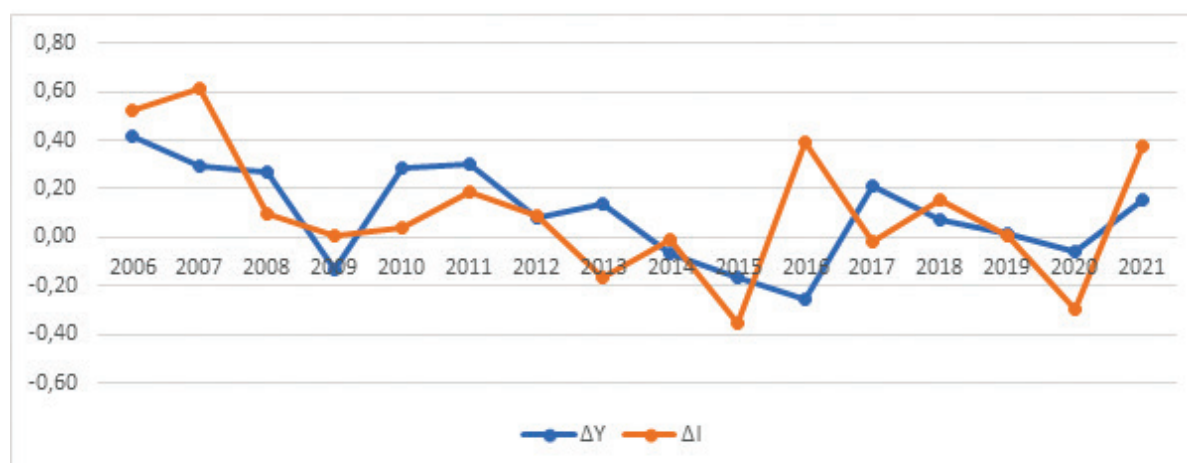

Figure 2 – The values of GDP growth and FDI growth in the Republic of Kazakhstan in the period from 2006-2021

As follows from the above data, it can be concluded that during the crisis, the growth rate is significantly reduced, including negative values. At the same time, the accelerator principle loses its theoretical meaning with negative values. Based on the analysis, it can be said that one of the signs of the end of the economic crisis, both in 2009 and in 2014-2015, 2019, was an increase in the flow of

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foreign direct investment in the economy of the Republic of Kazakhstan. At the same time, during stable economic growth, the growth rate of FDI exceeds the growth rate of gross domestic product.

Thus, based on the analysis of official statistics data using the multiplier-accelerator theory, it can be said that certain prerequisites for the emergence of a growth cycle of investment activity have developed in the Kazakhstani economy.

Conclusion

In accordance with the study of the theory of the accelerator, an increase in investment by one unit causes an increase in gross domestic product by a larger value.

The author's study of GDP growth and FDI growth showed that the increase in the flow of foreign direct investment are related with each other.

Thus, the study of the interaction of the multiplier-accelerator effects in the realities of the Kazakhstani economy becomes a prerequisite for the activation of investment processes in the Republic of Kazakhstan.

In accordance with the data obtained on the basis of official statistical information, using the accelerator principle, it is possible to continue research on the theoretical prerequisites for the emergence of cycles of growth in investment and business activity in the conditions of the economy of Kazakhstan, which is distinguished by the presence of a rich natural, innovative, and intellectual potential.

As evidenced by the study, the inflow of direct investment has a positive impact on the country's GDP, which, among other things, is explained by the multiplier-accelerator principle, which leads to positive shifts in economic development, leads to an increase in production processes, reduces unemployment, promotes the spread of innovations and technological know-how, promotes development infrastructure and as a result leads to a favorable socio-economic environment, which in turn also act as a new impetus to the inflow of foreign direct investment.

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Анализ потока прямых иностранных инвестиций в Республику Казахстан на основе модели акселератора

Аннотация. Прямые иностранные инвестиции играют жизненно важную роль в экономике Республики Казахстан. В настоящее время прямые иностранные инвестиции считаются одним из ключевых аспектов экономической интеграции стран через создание и содействие взаимовыгодным связям между различными странами и экономиками. Целью статьи является анализ потока прямых иностранных инвестиций в экономику Республики Казахстан и его влияние на валовой внутренний продукт с использованием теории мультипликатора-акселератора.

При проведении исследования использовались следующие научные методы: сравнительный анализ, анализ и синтез, контент-анализ, логический, статистический, математический, графический. В результате проведенного исследования изучены особенности применения модели мультипликатора-акселератора. На основе сбора статистических данных о притоке иностранных инвестиций и ВВП в РК в период 2005-2021 годы построена линия акселератора.

Основные выводы, полученные в ходе исследования, позволили оценить влияние притока прямых иностранных инвестиций на объем валового внутреннего продукта, определить кумулятивный эффект и определить перспективные направления развития инвестиционной деятельности в Республике Казахстан.

Ключевые слова: прямые иностранные инвестиции, валовой внутренний продукт, модель акселератора, экономика, Республика Казахстан.

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Акселератор моделі негізінде Қазақстан Республикасындағы тікелей шетелдік инвестициялар ағынын талдау

Андатпа. Тікелей шетелдік инвестициялар Қазақстан Республикасының экономикасында маңызды рөл атқарады. Қазіргі уақытта тікелей шетелдік инвестициялар әртүрлі елдер мен экономикалар арасындағы тиімді байланыстарды құру және ілгерілету арқылы елдердің экономикалық интеграциясының негізгі аспектілерінің бірі болып саналады. Мақаланың мақсаты мультипликатор-үдеткіш теориясын пайдалана отырып, Қазақстан Республикасының экономикасына тікелей шетелдік инвестициялардың ағынын және оның жалпы ішкі өнімге әсерін талдау болып табылады.

Зерттеу барысында келесі ғылыми әдістер қолданылды: салыстырмалы талдау, талдау және синтез, мазмұнды талдау, логикалық, статистикалық және математикалық, графикалық.

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Зерттеу нәтижесінде мультипликатор-акселератор моделін қолдану ерекшеліктері зерттелді. 2005-2021 жылдар аралығында Қазақстан Республикасында шетелдік инвестициялар мен ЖІӨ ағыны туралы статистикалық деректерді жинау негізінде акселератор желісі салынды.

Зерттеу барысында алынған негізгі тұжырымдар тікелей шетелдік инвестициялар ағынының жалпы ішкі өнім көлеміне әсерін бағалауға, жиынтық әсерді айқындауға және Қазақстан Республикасында инвестициялық қызметті дамытудың перспективалық бағыттарын айқындауға мүмкіндік берді.

Кілт сөздер: тікелей шетелдік инвестициялар, жалпы ішкі өнім, акселератор моделі, экономика, Қазақстан Республикасы.

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