“Promotion of green economic growth in post-Soviet countries: Role of foreign direct and portfolio investments”

AUTHORS	Bayali Atashov Elnura Mammadova Elshan Ibrahimov

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Bayali Atashov (Azerbaijan), **Elnura Mammadova** (Azerbaijan),
Elshan Ibrahimov (Azerbaijan)

PROMOTION OF GREEN ECONOMIC GROWTH IN POST-SOVIET COUNTRIES: ROLE OF FOREIGN DIRECT AND PORTFOLIO INVESTMENTS

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Bayali Atashov, Doctor in Economics, Professor, Vice-rector for Science and Innovation, Azerbaijan Cooperation University, Azerbaijan. (Corresponding author)

Elnura Mammadova, Doctor in Economics, Associate Professor, Department of Finance and Banking, Azerbaijan Cooperation University, Azerbaijan.

Elshan Ibrahimov, Doctor in Economics, Associate Professor, Department of Finance and Banking, Azerbaijan Cooperation University, Azerbaijan.

Abstract

Green economic growth ensures the country's wealth and population well-being with decreasing ecological damages. This strategy requires effective government policy to push economic agents to environmentally friendly behavior and significant financial resources to invest in technological modernization. The study aims to assess whether promotion of green economic growth in post-Soviet countries depends on direct and portfolio investment. The paper develops the index of green economic growth performance considering traditional economic growth, social, and environmental indicators. To determine the contribution of direct and portfolio investments in the promotion of green economic growth performance, regression equations (for the panel of countries as a whole and each country in particular) are developed. All models are supplemented with traditional economic growth control variables (GDP growth, inflation, gross fixed capital formation, trade). The information base is public data from the World Bank for the sample of 13 post-Soviet countries for 2000–2021. It was revealed that Estonia and Latvia have the highest level of green economic growth performance, while Ukraine, Uzbekistan, and Kazakhstan have the lowest. The most effective country (Latvia) uses its green economic growth potential only for 62.33%. Modeling results do not confirm the significance of foreign and portfolio investment contributions in promoting green economic growth in most post-Soviet countries (portfolio investments boost green economic growth in Estonia and Moldova, while foreign direct investments contribute to green economic growth in Ukraine). These results might be explained by a lack of institutional capacity and government efficiency to ensure effective absorption of investments.

Keywords green economy, sustainable growth, environmental damage, post-Soviet countries, foreign direct investments, portfolio equity

JEL Classification Q01, E60, O47, E22, C23

INTRODUCTION

The concept of "green economy" was first mentioned in 1989 by the Government of the United Kingdom. However, in 2008, it was already revised and officially introduced by the United Nations Environment Programme as a potential framework for achieving sustainable development goals. A green economy might ensure a sufficient level of well-being and social equity while decreasing environmental damage (Sustainable Development Knowledge Platform, 2022). Representatives of national and sub-central governments, business agents, and environmental activists have coordinated their efforts for the last 25 years to mitigate environmental damages and boost sustainable development initiatives. Nonetheless, green economic growth depends not only on an effective decision-making process but also requires comprehensive financial support. According to McKinsey & Company (2022) and Clements et al. (2022), up to 275 trillion USD are needed to achieve net zero greenhouse gas emissions by 2050.

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Thus, mitigation of environmental damages requires significant investment that domestic donors cannot fully ensure. It forces low- and lower-middle-income countries to attract foreign investments to ensure technological modernization in resource efficiency and eco-innovation. Otherwise, the expansion of foreign capital might also trigger some national security problems because of the loss of market positions and leadership. From this perspective, it is crucial to promote green economic growth using approximately equal contributions of foreign and domestic investments. It also should be noted that in promoting green economic growth, not only direct investments play a significant role, but also portfolio investments and portfolio equity. Relevance of portfolio investments was strongly supported by the growth of green assets market capitalization from 4% of global market capitalization in 2010 to 7% in 2021.

In most developed countries, green economic growth is supported by both direct and portfolio investment instruments. Despite general trends, it is fair to note that in different countries, the scale of contribution of different types of investments in promoting green economic growth varies significantly. Traditionally developed countries with resilient economies and developed financial markets demonstrate better green economic growth outcomes from investment inputs while developing countries face significant obstacles in fulfilling this task. It might be explained by bad governance, inefficient regulatory quality, high level of corruption and shadow economy, lack of institutional capacity and financial resources, etc. Therefore, it is more valuable to underline the sensitivity of economic response to investment inflows in developing countries, especially in transition economies. Thus, it is essential to explore progress in green economic growth promotion in post-Soviet countries, most of which are still transforming their economic and political systems, together with clarification of the scale of direct and portfolio investments contribution in ensuring green economic growth.

1. LITERATURE REVIEW

It is traditionally considered that green economic growth is ensured within three perspectives: ecological, economic, and social. In particular, among the environmental determinants of ensuring green economic growth, scientists single out the need to control climate change and introduce long-term programs of economic development of the country taking into account environmental effects (Bardy & Rubens, 2022; Sahioun et al., 2023), implementation of corporate environmental and social responsibility strategies (Brychko et al., 2023; Apalkova et al., 2021; Makarenko et al., 2023; Wiguna et al., 2023; Ali et al., 2023), development of renewable energy and reducing the consumption of energy resources (Sotnyk et al., 2022; Naumenkova et al., 2022; Ziky & El-Abdellaoui, 2023; Bublyk et al., 2023; Alam et al., 2023; Wang et al., 2023), and limitation of greenhouse gas emissions (Sineviciene et al., 2019; Kurbet & Korol, 2023).

In turn, personnel skills and human capital development are necessary social prerequisites for ensuring green economic growth (Arfara & Samanta, 2023). Specifically, Yu (2023) notes that the social perspective of sustainable development lies in human capital development. In turn, human capital development is ensured within an effective education system, which contributes to the formation of highly professional personnel capable of significantly contributing to economic growth. While researching the impact of public investment in education on the development of human capital on the example of different regions of China, Yu (2023) revealed significant differentiation of the level of public investments in different regions of the country. At the same time, the modeling results confirmed the positive impact of increasing investment in higher education on regional economic growth and human capital development.

Among the key economic determinants of green economic growth is the resilience of the economic system, which is characterized by progressive economic growth rates (Vasilyeva et al., 2021). According to Vasilieva et al. (2022), an economic perspective of sustainable development is measured through such indicators as the Global Competitiveness Index, Ease of Doing Business, Financial Development Index, Economic Development Index, and Economic Freedom Index. Instead, Vysochyna et al. (2022) define consumer price index, current account balance, volume of credits to the private sector, net foreign direct investment, GDP growth, GDP per capita, gross capital formation, business density, employment ratio, R&D expenditures, and trade turnover as key determinants of green economic growth.

Investigating the prerequisites for the growth of foreign direct investment on the example of Jordan, Tahat (2022) found that large corporations are more inclined to invest in markets with a stable economic and political situation, while the assimilation of financial resources in countries with a higher level of turbulence appears to investors to be less promising. Thus, it can be noted that foreign direct investments in developing countries with unstable economic and political situations are carried out by riskier investors, whose main goal is not to contribute to the sustainable development of the country recipient of investments but to earn a profit from their investments or expansion into markets where competition is lower.

There is a lack of research on exploring specific green economic growth outputs on investment inputs. However, there are some papers focused on revealing indirect impetus helping to improve sustainable development response to investment contribution. An important prerequisite for ensuring a large-scale positive return on investments is the perspective of the field in which they are invested. In particular, investing in current projects that do not contribute to the provision of significant added value will not ensure significant economic growth and sustainable development of the investment recipient country. Instead, investing financial resources in innovative projects has a much higher potential for sustainable economic growth (Zeynalli et al., 2022; Pawar & Munuswamy, 2022). A vital vector for stimulating the simultaneous development of human and innovative potential is the creation of investment laboratories based on universities specializing in fundraising for students' innovative projects. Thus, it confirms the validity of the thesis about the importance of investment support for innovative projects (Kaya et al., 2023). It is also promising from the point of view of intensification of the qualitative transformation of the national economy in the direction of ensuring sustainable development in support of investment projects aimed at the development of digital technologies and digital infrastructure (Iastremska et al., 2023; Melnyk et al., 2021).

High institutional efficiency is a critically important prerequisite for increasing the country's competitiveness and its green economic growth as a response to foreign direct investment inflows. Thus, Carril-Caccia and Pavlova (2018) empirically confirmed that for highly developed countries, there is a positive relationship between economic competitiveness, human capital development, and foreign direct investment, while weak institutional efficiency in developing countries significantly impairs the strength of causality between these parameters. Leonov et al. (2012) and Vasylyeva et al. (2014) also confirm that lack of institutional capacity significantly constrains the development of the investment segment of the financial market. Fiscal policy inefficiency and extremely high fiscal burden are also mentioned within obstacles that eliminate green economic growth outcomes as a response to investment inputs (Lyulyov et al., 2021; Zolkover et al., 2022). Filipava and Murshudli (2023) focus on the role of private financial institutions in sustainable development issues, including the major investment banks and companies, several European financial centers, London (Green Finance Initiative), Luxembourg (Green Exchange), and Paris (Finance for Tomorrow Initiative), and stock exchanges (in Dublin, Milan, Stockholm, and Frankfurt), as well as informal green associations in corporate and financial sectors (mutual obligations platforms, joint industry initiatives, lobby groups). Cooperation between these investment centers will facilitate the exchange of best practices and ensure the convergence of crucial principles and dimensions toward sustainable development.

Moskalenko et al. (2022) noted that socio-economic, infrastructural, innovation determinants, energy resources, and agricultural factors influence a country's sustainability and investment attractiveness. Considering Bulgaria, Croatia, Lithuania, Latvia, Romania, Poland, and Ukraine, it was found that Ukraine has the lowest level of investment attractiveness, while Lithuania, Latvia, and Poland have the highest.

Lomachynska et al. (2020) emphasize that ensuring sustainable economic growth depends on foreign direct investment. Sampling countries of the Visegrad Group, it was established that the growth of foreign direct investments ensures increased economic growth and trade development. In contrast, their impact on the innovative transformation of the country is insignificant. Murshudli (2023), emphasizing the need to identify new sources of financing for

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targeted environmentally sustainable development projects, points to the key role of international bank financing in these processes in developing countries. The significant contribution of the green policies of international banks to improving the environmental situation in the countries of presence is confirmed by the empirical analysis of OECD and World Bank Open Data for the period from 2010 to 2020. The results of the study give reason to expand the list of traditional mechanisms for stimulating sustainable development and to actively use the international green banking business to promote these processes.

Many scientific studies are devoted to researching sustainable development and green economic growth perspectives. However, there is a lack of research on clarifying the impact of investment flows on the country's green economic growth in developing countries. That is why the aim of this study is to assess the scale of the green economic growth outcomes as a response to the foreign direct and portfolio investment inputs in post-Soviet countries (excluding the Russian Federation and Armenia).

2. METHODOLOGY

The fulfillment of the research objective considers several stages. Stage 1 involves the formation of the composite indicator of green economic growth performance. The generalization of existing approaches to clarify the green economic growth performance showed that ecological, economic, and social components widely characterize it. Therefore, the study used the following environmental, social, and economic indicators to quantitatively assess green economic growth performance:

- Access to clean fuels and technologies for cooking (% of population)
- Annual freshwater withdrawals, total (% of internal resources)
- CO2 emissions (metric tons per capita)
- Nitrous oxide emissions (thousand metric tons of CO2 equivalent)
- Methane emissions (kt of CO2 equivalent)
- Electric power consumption (kWh per capita)
- Electric power transmission and distribution losses (% of output)
- Renewable electricity output (% of total electricity output)
- Gini index
- Employment to population ratio, 15+ (%) (modeled ILO estimate)
- GDP per capita (current USD).

All variables were collected from the World Bank Group (The World Bank, n.d.). The geographic structure of the sample is represented by 13 post-Soviet countries, including Azerbaijan, Estonia, Latvia, Lithuania, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Belarus, Moldova, Ukraine, and Georgia (the Russian Federation and Armenia were excluded from the country sample because of the political reasons). The time horizon of the study covers 2000–2021 (or the latest available period).

However, it is essential to note that the selected parameters have different units of measurement, which makes it impossible to aggregate them without carrying out appropriate transformations. To bring the variables to a comparable form, it is proposed to use the most common normalization method – mini-max. For its application, all indicators are divided into stimulators and inhibitors, considering their positive or negative impact on the performance indicator. Thus, stimulators are such indicators as access to clean fuels and technologies for cooking (% of the population), renewable electricity output (% of total electricity output), employment to population ratio, 15+ (%) (modeled ILO estimate), and GDP per capita (current USD). The remaining indicators are inhibitors. Normalization of stimulators involves dividing the normalized value by the maximum value of this indicator for all countries for all years of observation. Normalization of inhibitors involves dividing the minimum value of the indicator for all countries for all years of observation by the value of the normalized indicator. According to the results of the normalization procedure, all variables have a comparable form (their values are concentrated in the range [0;1]), where a higher indicator value reflects its more positive impact on green economic growth performance.

The next step within this stage is forming an integral indicator of green economic growth performance. However, considering the differentiation of the scale of influence of these parameters on the integral indicator, it is necessary to determine the weighting factors for each of them. For this purpose, it is proposed to use the principal components method. In particular, the normalized values of the indicator are processed using this multivariate analysis tool in the Stata 14.2/SE software product. In the first step, the paper determined the number of principal components within which eigenvalues are selected in the following stages. For this purpose, the scree plot method is used. When constructing the graph of the eigenvalues of the input parameters, the number of principal components is selected, with the graph having a steeper inclination angle. As a rule, this number of principal components should explain more than 70% of the total variation of the input parameters.

After selecting a satisfactory number of principal components, the eigenvalues of the indicators within the vectors of each of the selected principal components are analyzed. The level of relevance of the contribution of each of the input parameters to the formation of an integral indicator of green economic growth performance is determined by calculating the arithmetic average of the absolute eigenvalues of these indicators for all principal components. In the next step, the calculated averaged eigenvalues are ranked, in which rank "1" receives the parameter that has the least relevance, and rank "11" – the parameter that has the highest calculated value of this indicator. By dividing the individual rank of the corresponding indicator by the total sum of ranks (66), the weight factor of the variable in the integral indicator of green economic growth performance is determined. Based on the results of the calculations, an index of green economic growth performance is formed, the values of which are concentrated in the range [0;1], where a higher indicator value reflects a higher level of sustainability of the country's development.

Stage 2 is the identification of the green economic growth outputs as a response to the investment inputs. In order to formalize the scale of how green economic growth performance in post-Soviet countries depends on various types of investments, regression modeling is used. Moreover, both a general regression model for the entire panel data and individual models for each country are built.

The index of green economic growth performance formed at the previous stage is the dependent variable. Indicators of investment activity are chosen as independent variables, namely:

- Foreign direct investment, net (BoP, current USD)
- Portfolio investment, net (BoP, current USD)
- Portfolio equity, net inflows (BoP, current USD).

In addition, the control variables used in economic growth models are also added to the models to improve the quality of the simulation, namely:

- GDP growth (annual %)

Table 1. Principal component analysis

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.146	1.573	0.377	0.377
Comp2	2.573	1.454	0.234	0.611
Comp3	1.119	0.323	0.102	0.713
Comp4	0.796	0.093	0.072	0.785
Comp5	0.703	0.151	0.064	0.849
Comp6	0.552	0.076	0.050	0.899
Comp7	0.475	0.167	0.043	0.942
Comp8	0.309	0.157	0.028	0.970
Comp9	0.152	0.056	0.014	0.984
Comp10	0.096	0.016	0.009	0.993
Comp11	0.080	.	0.007	1.000

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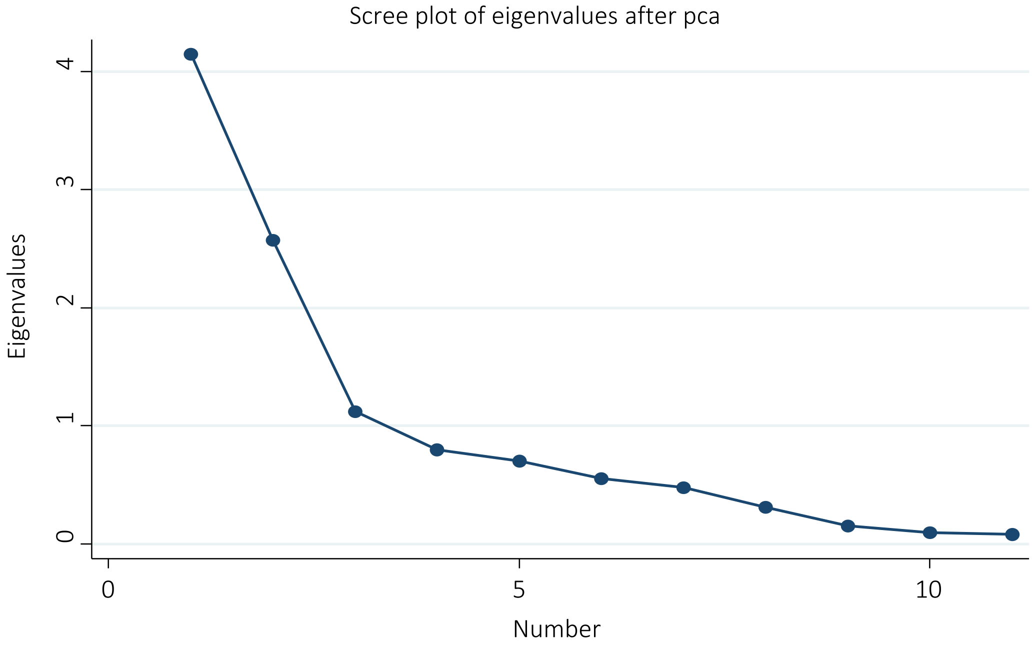

Figure 1. Scree plot of eigenvalues after principal component analysis

- Inflation, consumer prices (annual %)
- Gross fixed capital formation (% of GDP)
- Trade (% of GDP).

Thus, based on the results of the conducted empirical research, both general patterns for the whole sample of post-Soviet countries of green economic growth response to the investment inputs, as well as patterns specific to each country, are revealed.

3. RESULTS

3.1. Stage 1 results

After bringing the array of input indicators to a comparable form using the mini-max method, the principal components method was applied. A graphic representation of the scree plot graph is presented in Figure 1, and the summary results of the first stage of multivariate analysis are shown in Table 1.

Table 2. Identification of weighting coefficients

Variable	Comp1	Comp2	Comp3	Comp_av	Rank	Weight
Clean	0.418	0.009	0.118	0.182	2	0.0303
Water	0.112	0.431	–0.457	0.333	9	0.1364
CO2	–0.402	0.124	–0.015	0.180	1	0.0152
NO2	–0.260	0.287	0.533	0.360	11	0.1667
Methane	0.069	0.505	0.466	0.347	10	0.1515
EPC	–0.393	–0.143	–0.101	0.212	4	0.0606
EPTDL	0.201	0.269	–0.307	0.259	6	0.0909
RenOut	–0.357	0.271	–0.320	0.316	8	0.1212
Ginny	0.160	–0.378	0.210	0.249	5	0.0758
Empl	0.339	–0.124	–0.141	0.201	3	0.0455
GDPpc	0.341	0.370	0.071	0.261	7	0.1061

Note: Clean – Access to clean fuels and technologies for cooking (% of population); *Water* – Annual freshwater withdrawals, total (% of internal resources); *CO2* – CO2 emissions (metric tons per capita); *NO2* – Nitrous oxide emissions (thousand metric tons of CO2 equivalent); *Methane* – Methane emissions (kt of CO2 equivalent); *EPC* – Electric power consumption (kWh per capita); *EPTDL* – Electric power transmission and distribution losses (% of output); *RenOut* – Renewable electricity output (% of total electricity output); *Gini* – Gini index; *Empl* – Employment to population ratio, 15+ (%) (modeled ILO estimate); *GDPpc* – GDP per capita (current USD).

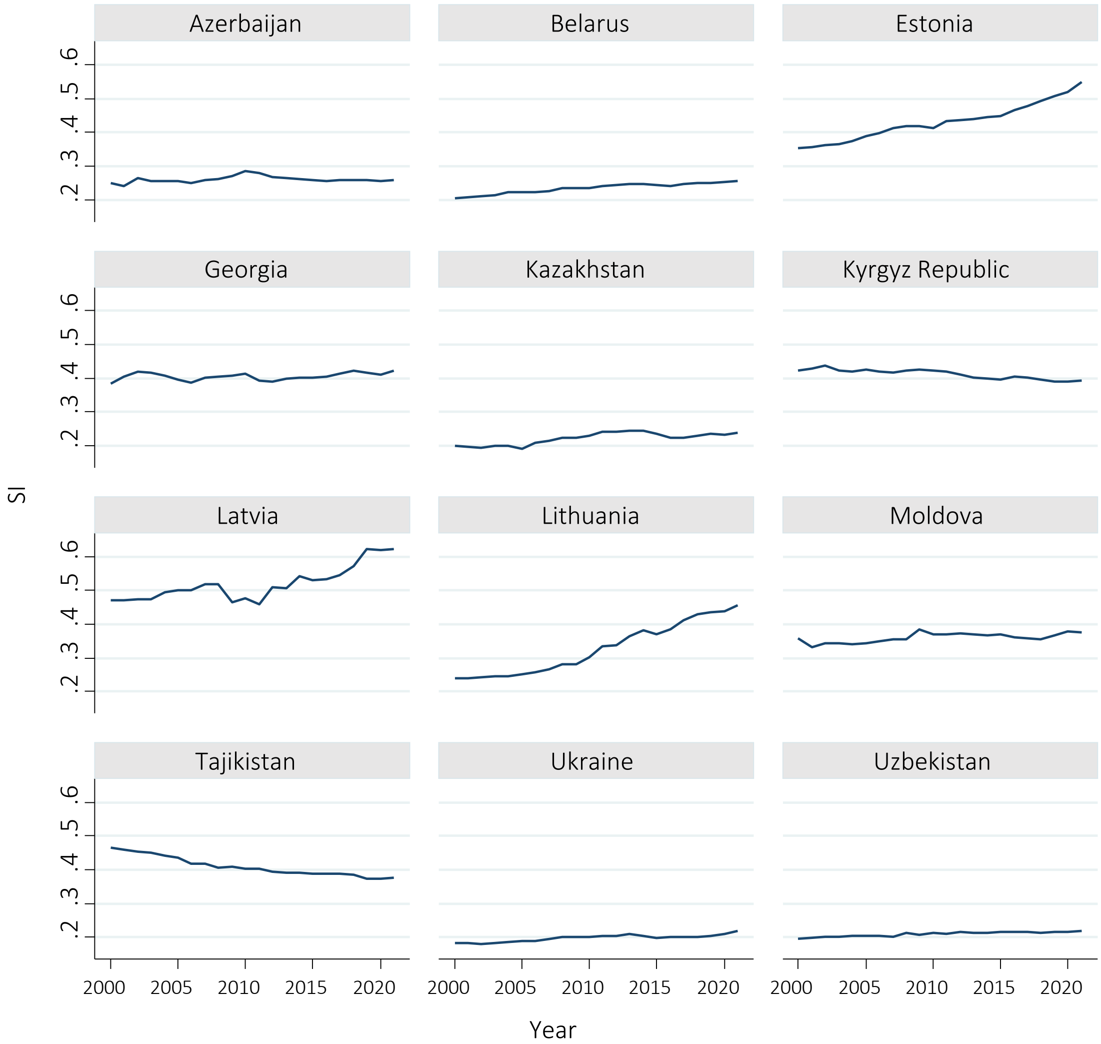

Figure 2. Index of Green Economic Growth Performance (IGEGP) for post-Soviet countries in 2000–2021, units

So, according to the data in Figure 1, it can be noted that the first three principal components are characterized by a significant step in the variation of the eigenvalues of each of them, which provides a steeper angle of inclination of the graph. In contrast, from the fourth principal component, the graph becomes gentler. Thus, the study preliminarily concludes that three principal components should be selected for further iterations. The data in Table 1 confirm the validity of this conclusion. In particular, the first three principal components explain 71.30% of the cumulative variation.

At the next stage, the averaged eigenvalues of the indicators for all three principal components, their ranking, and determination of weighting factors were determined. The results of the specified stage are presented in Table 2.

Based on the use of additive convolution and considering the determined weighting factors, the Index of Green Economic Growth Performance (IGEGP) was formed; the country-specified dynamic is presented in Figure 2.

According to the data in Figure 2, it can be clearly noted that Estonia and Latvia are characterized by the highest level of green economic growth performance, and Ukraine, Uzbekistan, and Kazakhstan are characterized by the lowest. It is also worth noting that the index values for the period are concentrated in the range [0.1817; 0.6233]. Thus, in the best case, the flagship country of the sample (Latvia) uses the potential to ensure sustainable development by only 62.33%.

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Table 3. Regression results for 13 post-Soviet countries

ISD	Coef.	Std.Err.	Z	P>z
PEnet	1.74e–12	7.15e–12	0.24	.8081
PInet	4.75e–13	9.28e–13	0.51	.6092
FDInet	2.96e–12 **	1.28e–12	2.32	.0204
T rade	.0007 ***	.0001	6.91	0
GFCF	–.0009 ***	.0003	–2.76	.0057
Infl	–.0004 ***	.0002	–2.63	.0086
GDPg	.0011 ***	.0004	2.92	.0035
Constant	.2892 ***	.0298	9.69	0

*Note: **** – significance at a 1% level; * * – significance at a 5 % level; *PEnet* – Portfolio equity, net inflows (BoP, current USD); *PInet* – Portfolio investment, net (BoP, current USD); *FDInet* – Foreign direct investment, net (BoP, current USD); *Trade* – Trade (% of GDP); *GFCF* – Gross fixed capital formation (% of GDP); *Infl* – Inflation, consumer prices (annual %); *GDPg* – GDP growth (annual %).

3.2. Stage 2 results

The following research stage is the definition for the panel as a whole and for each of the sample countries in particular, the interdependence between the level of green economic growth and different types of investments. Thus, the regression modeling results for the entire panel of countries are presented in Table 3.

Therefore, according to the modeling results for the entire sample of countries, it was established that the green economic growth of the post-Soviet countries does not depend on the growth of the net inflow of portfolio equity and net portfolio investments. Instead, it was confirmed that the green economic growth performance is positively conditioned by the growth of net foreign direct investments: the index of green economic growth performance is increased by $2.96 \cdot 10^{-12}$ units as a response to the factor variable increase by 1 USD. Among the control variables, the highest contribution to ensuring sustainable development for the whole sample of countries demonstrates trade openness and GDP growth (an increase in 1% of the control variables leads to an increase in the index of green economic growth performance by 0.0007 and 0.0011 units, respectively). In turn, the growth of the gross fixed capital formation and inflation has a negative impact on sustainable development.

The simulation results for each country are separately presented in Table A1, Appendix A. It is worth noting that the modeling results for Azerbaijan proved the absence of a statistically significant relationship between green economic growth and investment activity.

Similar to Azerbaijan, the existence of a statistically significant dependence of green economic growth on investment activity in Belarus has not been confirmed either. At the same time, for Belarus, the relevant determinants in the process of ensuring green economic growth are the containment of inflationary processes (a decrease in the green economic growth performance index by 0.0002 units is ensured by a 1% increase in inflation) and GDP growth (an increase in the dependent indicator by 0.0019 units have resulted from a 1% increase in the independent variable).

The modeling results for Estonia proved the existence of a statistically significant positive impact on the country's green economic growth of an increase in portfolio investments: the index of green economic growth performance increased by $2.19 \cdot 10^{-11}$ units as a response to the increase of the independent variable by 1 USD. In addition, the positive impact on the sustainable development of the country's trade turnover has been empirically confirmed: the growth of the green economic performance index by 0.0019 units is a result of a 1% increase in the total volume of exports and imports in GDP. The influence of the remaining factor and control variables of the model for Estonia is statistically insignificant.

The simulation results for Georgia showed the lack of relevance of the impact on green economic growth of all the investigated variables except for trade. In particular, the growth of the green economic performance index in Georgia by 0.0005 units is ensured by a 1% increase in the total volume of exports and imports in GDP.

The modeling results of determining the scale of the green economic growth response to the impact of investment determinants in Kazakhstan also demonstrate the absence of a statistically significant relationship between the variables. Nevertheless, the positive influence of one of the control variables – trade – has also been empirically confirmed. In particular, the growth of Kazakhstan's green economy performance by 0.0009 units is ensured by a 1% increase in the total volume of exports and imports in GDP.

In the Kyrgyz Republic, there is no statistically significant conditionality of green economic growth by the dynamics of investment processes. At the same time, the positive influence of two control variables – trade and gross fixed capital formation – has been empirically confirmed. The increase of the index of green economic growth performance by 0.0004 and 0.0021 units resulted in a 1% increase in trade and gross fixed capital formation, respectively.

According to the results presented in Table A1, it is also possible to note the absence of a statistically significant contribution of investment determinants for green economic growth in Latvia. At the same time, the growth of the green economic performance index in Latvia by 0.0019 units is ensured by a 1% increase in the total volume of exports and imports in GDP.

In Lithuania, green economic growth performance is not conditioned by the growth of any type of investment. Nevertheless, it was found that an increase in the index of green economic growth performance by 0.003 units ensured a 1% growth in the volume of the country's trade turnover.

The modeling results for Moldova are slightly different from the countries studied earlier. In this case, green economic growth performance is positively conditioned by the growth of portfolio investments: the growth of the Index by $3.37{\cdot}10^{-10}$ units is ensured by a 1 USD increase in net portfolio investments. In addition, the negative impact of inflation on the sustainable development of the country has been empirically confirmed: a decrease in the performance indicator by 0.0015 units is a result of an increase in the factor variable by 1%.

It can also be noted that Tajikistan is characterized by a significantly higher level of dependence of green economic growth performance on the selected determinants than in other countries. It has been confirmed that an increase of the green growth performance index by 0.0003, 0.0008, and 0.0021 units is ensured by a 1% increase in the share of trade turnover in GDP, gross fixed capital formation in GDP, and GDP growth rate, respectively. At the same time, a decrease in the index of green economic growth performance by 0.0007 units is a result of a 1% increase in inflation. However, investment factors are still not relevant in the process of ensuring green economic growth.

The modeling results for Ukraine proved the existence of a statistically significant positive contribution to the country's green economic growth performance of net foreign direct investment at a 1% confidence interval: an increase in the index of green economic growth performance by $5.50{\cdot}10^{-12}$ units is a result of 1 USD growth of factor variable. In addition, it has been empirically confirmed that the green economic growth in Ukraine is also dependent on the growth of the share of gross fixed capital in GDP: an increase in the performance indicator by 0.0022 units is ensured by an increase in the factor variable by 1%.

For Uzbekistan, there is no statistically significant dependency of green economic growth performance on foreign direct or portfolio investments. However, it has been empirically confirmed that an increase in the index of green economic growth performance by 0.0002 units is ensured by a 1% increase in the share of trade turnover in GDP.

4. DISCUSSION

Summarizing the research results, the existence of a statistically significant relationship between the level of green economic growth performance and the dynamics of investment processes was not empirically confirmed for most of the studied post-Soviet countries (developing countries). These results correlate with the results of many researchers, who also did not find a connection between the specified parameters. Ramli et al. (2022) do not confirm a statistically significant causality between economic growth and public invest-

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ment in Algeria. At the same time, establishing a close correlation between the specified indicators is possible. However, qualitative transformations must be carried out in the field of ensuring the effectiveness of the public administration system, and overcoming corruption must be carried out for this.

The study also found that the return on foreign direct investment is significantly weakened due to weak institutional efficiency in developing countries. Tahat (2022) and Shumilo et al. (2022) also note that economic and political instability, as well as a high level of shadowing of the economy (Tiutiunyk et al., 2022), are serious obstacles for rational investors. Additional obstacles for investors may also be ineffective monetary policy in the country and too high costs of lending capital (Olonila et al., 2023). Researchers also note that the level of financialization of the economy in highly developed countries contributes to the inflow of foreign direct investment, while this connection has not been confirmed for developing countries (Eastern European countries). No statistically significant impact of financialization processes on investment activity in the real sector of the economy was found either (Korneyev, 2019; Bogdan & Lomakovych, 2021). Makohon et al. (2020), investigating the role of investment instruments on economic growth, also concluded that in developing countries this causal relationship is not always statistically significant. Among the reasons for such differentiation, researchers note the insufficient level of efficiency and predictability of the introduced investment policy of the state. That is why developing countries are more attractive for pragmatic and risk-taking investors who do not aim to concentrate their investments on the long-term but are guided by short-term motives for obtaining profit from risky investment operations.

Another obstacle on the way to ensuring a return on investment in the context of ensuring the green economic growth of the country is the lack of an innovative component of investment projects (Zeynalli et al., 2022; Kaya et al., 2023; Ibraghimov, 2022). In developing countries, as a rule, there is an urgent need to attract investment resources to the development of infrastructure projects that do not have high profitability and added value but its development can have a significant social effect in the long term. Such investment projects should be financed mainly within the framework of public-private partnerships, while the attraction of private investments should take place in more innovative and promising projects. In addition, the infusion of financial capital into innovative startups will allow not only to implement a specific innovative idea but also to adapt the business management model from the donor country to the investment recipient country. In turn, the implementation of effective business models in developing countries will make it possible to carry out a qualitative transformation of the market and increase green growth performance response to the investment inputs (Njegovanović, 2023).

All this allows to explain the obtained research results. In particular, the absence of a statistically significant relationship between green economic growth performance and investment inputs in the post-Soviet countries is explained by the existence of significant systemic problems in the field of public administration (insufficient level of rule of law, high level of corruption, etc.), as well as fiscal, monetary, and investment policy drawbacks, which significantly restrains the interest of strategic investors in allocating their capital in such countries. For most investors, it is impossible to use the investment channel to ensure green economic growth performance because of high risks of loss or decrease in the value of initial investment capital. Instead, institutional transformation, considering the bottlenecks mentioned above, might result in the inflow of high-quality capital into the country from investors who are interested not only in obtaining a quick extra profit but also in promoting the green economic growth of the recipient country.

CONCLUSION

The aim of the study was to explore the dynamics of the green economic growth performance in the post-Soviet countries, as well as clarify the scale of its outcomes as a response to the foreign direct and portfolio investment inputs. The level of green economic growth performance might be quantified using 11 measurement indicators. The Index of Green Economic Growth Performance for 13 post-Soviet countries was formed based on a complex combination of the mini-max method of data normalization, the method of principal components, ranking, and additive convolution. It showed significant variability of this parameter among the sample countries (from 0.1817 to 0.6233 at the maximum possible value of the indicator "1"). Among the studied countries, Estonia and Latvia made the most progress in ensuring green economic growth, while Ukraine, Uzbekistan, and Kazakhstan were significantly less successful in this direction.

The study of causality between the index of green economic growth performance and different types of investment (direct and portfolio) for the entire panel of countries proved the relevance of only net foreign direct investment, the growth of which contributes to the achievement of sustainable development goals in the analyzed countries. However, the influence of portfolio investments was not confirmed. The study of individual country-specific patterns revealed that green economic growth performance in Estonia and Moldova depends on the growth of portfolio investments, while in Ukraine, it is strongly dependent on the increase of foreign direct investment inflows. The response of the green economic growth performance to the impact of the investment determinants in other sample countries is insignificant. Such a situation eloquently testifies to the existence of significant institutional, political, fiscal, and monetary obstacles caused by the imperfection of the public administration system in these countries, which makes it impossible to use the existing potential of ensuring green economic growth through the investment channel. Qualitative transformation of the public administration system, elimination of corruption, and reduction of the level of shadow economy might strengthen the causality between these processes in the studied countries.

AUTHOR CONTRIBUTIONS

Conceptualization: Bayali Atashov, Elnura Mammadova, Elshan Ibrahimov.
Data curation: Elshan Ibrahimov.
Formal analysis: Bayali Atashov, Elnura Mammadova.
Funding acquisition: Bayali Atashov, Elshan Ibrahimov.
Investigation: Bayali Atashov.
Methodology: Bayali Atashov, Elnura Mammadova, Elshan Ibrahimov.
Project administration: Elnura Mammadova.
Resources: Elnura Mammadova.
Software: Bayali Atashov, Elshan Ibrahimov.
Supervision: Elnura Mammadova.
Validation: Bayali Atashov, Elshan Ibrahimov.
Visualization: Bayali Atashov, Elshan Ibrahimov.
Writing – original draft: Elnura Mammadova.
Writing – review & editing: Bayali Atashov.

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APPENDIX A

Table A1. Regression results on green economic growth dependence on investment inputs (country-specific)

IGEGP	Coef.	Std.Err.	Z	P>z
AZERBAIJAN				
PEnet	7.69e–11	9.52e–11	0.81	.4326
PInet	3.43e–12	3.41e–12	1.01	.3315
FDInet	1.41e–12	2.61e–12	0.54	.5965
Trade	–.0003	.0004	–0.77	.4543
GFCF	.000036	.0006	0.06	.9516
Infl	.0005	.0006	0.86	.4024
GDPg	–.0001	.0003	–0.31	.762
Constant	.2875 ***	.0238	12.09	0
BELARUS				
PEnet	3.79e–10	8.15e–10	–0.47	.6491
PInet	1.97e–12	3.67e–12	–0.54	.5996
FDInet	4.33e–12	4.48e–12	–0.97	.3497
Trade	.0002	.0002	1.05	.3135
GFCF	.0003	.0007	0.38	.7114
Infl	–.0002 ***	.0001	–3.32	.0051
GDPg	.0019 ***	.0006	3.27	.0056
Constant	.2036 ***	.0403	5.06	.0002
ESTONIA				
PEnet	1.94e–11	2.56e–11	0.76	.4624
PInet	2.19e–11 **	7.54e–12	2.90	.0116
FDInet	1.46e–11	1.05e–11	1.38	.1878
Trade	.0019 ***	.0006	3.23	.0061
GFCF	–.001	.0027	–0.38	.713
Infl	.0022	.0041	0.53	.6056
GDPg	–.0017	.0017	–0.95	.3575
Constant	.1615	.1222	1.32	.2074
GEORGIA				
PEnet	3.46e–11	5.06e–11	0.68	.5053
PInet	8.79e–12	9.14e–12	0.96	.3522
FDInet	8.35e–12	8.18e–12	1.02	.3251
Trade	.0005 *	.0003	2.03	.062
GFCF	–.0002	.0008	–0.31	.7637
Infl	.0005	.0008	0.63	.5386
GDPg	0	.0006	0.00	.999
Constant	.3715 ***	.0271	13.73	0
KAZAKHSTAN				
PEnet	9.62e–13	3.42e–12	0.28	.7825
PInet	9.38e–13	5.99e–13	1.57	.1399
FDInet	3.37e–13	1.27e–12	0.27	.7947
Trade	.0009 ***	.0003	3.14	.0072
GFCF	–.0003	.001	–0.30	.7697
Infl	.0002	.001	0.19	.8525
GDPg	–.0005	.0012	–0.42	.6778
Constant	.2945 ***	.0203	14.51	0
KYRGYZ REPUBLIC				
PEnet	9.24e–10	4.87e–10	1.90	.0788
PInet	9.27e–11	8.25e–11	1.12	.2797
FDInet	1.36e–11	9.74e–12	1.39	.186
Trade	.0004 **	.0001	2.75	.0156
GFCF	.0021 ***	.0004	4.94	.0002
Infl	–.0001	.0004	–0.21	.8352
GDPg	.0005	.0007	0.70	.4957
Constant	.4213	.0125	33.59	0

http://dx.doi.org/10.21511/ppm.21(4).2023.23

Table A1 (cont.). Regression results on green economic growth dependence on investment inputs (country-specific)

IGEGP	Coef.	Std.Err.	Z	P>z
LATVIA				
PEnet	3.42e–10	4.14e–10	0.83	.4217
PInet	6.96e–12	7.59e–12	0.92	.3746
FDInet	7.20e–12	3.78e–11	0.19	.8516
Trade	.0019 *	.001	1.91	.0765
GFCF	–.0014	.0054	–0.25	.8048
Infl	.0019	.0057	0.34	.7383
GDPg	.0007	.0024	0.28	.7861
Constant	.3414	.1873	1.82	.0898
LITHUANIA				
PEnet	8.54e–11	9.30e–11	0.92	.3738
PInet	6.35e–12	6.38e–12	0.99	.3368
FDInet	8.01e–12	2.66e–11	0.30	.7673
Trade	.003 ***	.0005	5.75	.0001
GFCF	.0034	.0056	0.60	.5556
Infl	–.0078	.0056	–1.40	.1826
GDPg	–.0042	.0032	–1.33	.2048
Constant	–.0981	.1456	–0.67	.5113
MOLDOVA				
PEnet	1.28e–10	4.76e–10	0.27	.7925
PInet	3.37e–10 **	1.35e–10	2.49	.0258
FDInet	1.22e–11	2.26e–11	0.54	.5979
Trade	–.0001	.0001	–0.92	.3722
GFCF	.0003	.0007	0.38	.7131
Infl	–.0015 **	.0007	–2.22	.0433
GDPg	–.0005	.0004	–1.20	.2486
Constant	.3784	.0171	22.18	0
TAJIKISTAN				
PEnet	1.63e–10	1.16e–10	1.41	.1817
PInet	3.50e–12	1.70e–11	0.21	.8396
FDInet	2.60e–11	1.53e–11	1.70	.1105
Trade	.0003 **	.0001	2.22	.0434
GFCF	.0008 **	.0004	2.15	.0496
Infl	– .0007 **	.0003	– 2.84	.0131
GDPg	.0021 *	.0011	1.79	.0946
Constant	.3883 ***	.0193	20.15	0
UKRAINE				
PEnet	5.50e–12	4.94e–12	1.11	.2848
PInet	8.12e–14	6.13e–13	0.13	.8965
FDInet	2.16e–12 ***	4.31e–13	5.02	.0002
Trade	–.0002	.0001	–1.14	.2736
GFCF	.0022 ***	.0004	6.03	0
Infl	–.0001	.0001	–0.45	.6626
GDPg	–.0003	.0002	–1.15	.271
UZBEKISTAN				
PEnet	1.19e–10	2.59e–10	0.46	.6514
PInet	2.62e–12	5.12e–12	0.51	.6173
FDInet	2.75e–12	2.55e–12	1.08	.2997
Trade	.0002 **	.0001	2.29	.0381
GFCF	0	.0003	0.03	.9753
Infl	.0008	.0006	1.34	.2022
GDPg	.0011	.0006	1.70	.1122
Constant	.2014	.0099	20.43	0

Note: *** – significance at a 1% level; ** – significance at a 5% level; * – significance at a 10% level.