

Tiutiunyk, I., Cieśliński, W., Zolkover, A., & Vasa, L. (2022). Foreign direct investment and shadow economy: One-way effect or multiple-way causality?. *Journal of International Studies*, 15(4), 196-212. doi:10.14254/2071-8330.2022/15-4/12

Journal
of International
Studies

Scientific
Papers

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Studies, 2022
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Foreign direct investment and shadow economy: One-way effect or multiple-way causality?

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Abstract. The article examines the relationship between the size of the shadow economy and indicators of the investment market development. Net inflow of foreign direct investments, volume of net investments in non-financial assets, volumes of portfolio investments, and net outflow of foreign direct investment were used as parameters characterizing the development of the investment market. The dependence between the indicators was analyzed using the regression equation, Shapiro-Wilk test. Research results demonstrate that the increase in the inflow and outflow of foreign direct investments leads to an increase in the size of the shadow economy without a time lag in Ukraine, Poland, Slovenia, Romania, Croatia, Lithuania, Latvia, Estonia,

Received:
December, 2021
1st Revision:
September, 2022
Accepted:
December, 2022

DOI:
10.14254/2071-
8330.2022/15-4/12

and with a time lag of 1 year in Slovakia and Hungary. The largest impact on the size of the shadow economy is made by the volume of inflow and outflow of direct foreign investments, while the volume of portfolio investments has a less significant effect. Consequently, it was concluded that the processes of inflow and outflow of direct foreign investments require enhanced control by specialized state executive bodies given the scale of their potential destabilizing impact on the macroeconomic stability of the country.

Keywords: foreign direct investment, shadow economy, investment potential, economic development, investment channel.

JEL Classification: F21, O17, O11, O17

1. INTRODUCTION

The shadow economy is a complex phenomenon, the consequences of which are reflected in all spheres and links of the national economy. A large size of the shadow economy (its average size in most countries of the world varies from 10 to 40% of GD: in developed countries its value is 10-20% of GDP, in developing countries - 30-35% of GDP, in CIS countries - more than 40 % (Worldbank, 2022)) has a negative impact on various components of the country's development. It is a threat of reductions in budget revenues (mostly tax revenues), growth of budget deficit, reduction of the country's innovative potential and trust of its domestic and foreign investors, declining economic security and the volume of GDP etc. Ongoing shadow financial operations can be considered a guarantee of destabilization of the country and deepening of existing imbalances in it.

Investment is the type of activity that is quite sensitive to increases in the volume of shadow transactions. Foreign investors, international investment funds and other organizations, as a rule, direct their funds to economically developed countries, where their activities are carried out on the principles of transparency and publicity.

The growth of the share of the shadow economy, quite often, serves as a precursor to reducing the volume of foreign investments in the country, ending partnership relations with representatives of foreign countries, implementing investment projects, etc.

At the same time, a characteristic feature of the shadow sector is the expanding range of capital withdrawal mechanisms, including the use of investment instruments. The continental model of the financial market with the significant dominance of the banking sector is replaced by the Anglo-American model built on the basis of the broad participation of financial (including investment) intermediaries. Changes in the structure of the financial market in terms of its main actors led to changes in the structure of its assets. So, if in 2013, in the structure of assets of all financial intermediaries, the assets of commercial banks amounted to more than 80%, and the share of assets of investment funds exceeded 1%, then during the last 5 years the processes of disintermediation were observed in the global financial market, that is, a decrease in the share of bank assets and an increase in assets non-bank financial intermediaries. This led to an increase in the share of investment funds (by 25% on average), an increase in the assets of joint investment institutions and mostly venture funds, and therefore to their more active use in shadow schemes for concealing income (Bukhtiarova et al., 2022; Brychko et al., 2021; Prabhu, 2021; Melnyk et al., 2021).

These transformational processes actualize the need for a more detailed study of the connection between the level of the shadow economy and indicators of the country's investment market.

2. LITERATURE REVIEW

The phenomenon of the shadow economy relates to the constant analysis of its emergence drivers and the search for mechanisms to counteract it (Bozhenko, 2021; Orlov et al., 2021; Remeikienė & Gasparėnienė, 2021; Remeikienė et al., 2021; Tran, 2022). Nowadays, there is no unified understanding of the role of the shadow economy in the functioning of the economy and ensuring its stability. According to the results of the paper's analysis, it can be concluded that the shadow economy negatively affects certain sectors of economic development and the attractiveness of Lithuania (Ginevicius et al., 2021), Ukraine (Kuznyetsova et al., 2017; Shpak et al., 2022), Algeria (Ramli et al., 2022), EU countries (Roszko-Wójtowicz & Grzelak, 2020; Serpeninova et al., 2020; Vasanicova et al., 2022), Croatia (Škare et al., 2020), BRICS (Cheteni, P. & Umejesi, 2022; Tsurai, 2022); Central Asia and Eastern Europe (Kaya & Engkuchik, 2021).

In general, the shadow economy has a negative impact on the social safety components (Mishchuk et al., 2020; Didenko et al., 2020; Bozhenko, 2022; Yelnikova & Kwilinski, 2020), life quality of population (Vasa, 2002; Halicka & Surel, 2022; Svazas et al., 2022), business security (Kulish et al., 2018), corporate transparency (Makarenko et al., 2022; Yelnikova & Barhaq, 2020; Pimonenko & Lyulyov, 2021), innovative development of the country (Vysochyna et al., 2020), its financial security (Vasylieva et al., 2020; Shpak et al., 2020; Al-Faryan, 2022; Nguyen & Duong, 2022), fiscal policy effectiveness (Tiganasu et al., 2022), financial markets (Abou El Hassan, 2022; Bouazizi, 2020; Ahuja et al., 2022; Rajeev et al., 2022), level of trust in the government (Brychko et al., 2021; Yoshimori, 2022).

A significant number of works deals with negative impact of the shadow economy and the investment attractiveness of the country and the foreign direct investment inflow (Cicea & Marinescu, 2021; Garai-Fodor et al., 2022; Kozmenko & Vasylyeva, 2008; Lestari et al., 2022; Millia et al., 2022; Moskalenko et al., 2022a, 2022b; Perovic et al., 2021; Selaković, 2022; Vasa & Angeloska, 2020).

Abed and Davoodi (2002) conducted an empirical analysis of the shadow economy influence on the volume of foreign direct investment on the example of 24 countries with transitive economies. Based on the research results, the authors concluded that there is a negative relationship between these indicators: the shadow economy increase leads to a decrease in the volume of foreign direct investments.

Similar results were obtained by Smarzynska and Wei (2000), who, using the example of firms in Eastern Europe and the former Soviet Union, proved the negative impact of corruption on the total volume of foreign direct investment. At the same time, Habib and Zurawicki (2001), based on an analysis of the corruption and the investment market indicators for more than 25 years, proved that the decrease in the volume of foreign direct investment as a result of the increase in the corruption in the country occurs at a much faster rate than domestic.

Some researchers consider the shadow economy a tool for positive changes in the country, and, therefore, a driver of increasing investment activity in it. The authors emphasize that individual companies are more willing to invest in countries with an underdeveloped legal framework, a high level of corruption, and a significant share of the shadow economy. One of the reasons for this situation is the presence of significant opportunities to evade punishments and implementation of illegal transactions in these countries. At the same time, for multinational companies, striving to preserve their reputation, the level of shadow economy in the country is decisive when making investment decisions.

Some scientists consider the shadow economy a mechanism for increasing the (including illegal) level of material well-being of the population and maintaining the economic entities' viability. It avoids the bankruptcy of individual economic entities. In this sense, the shadow economy is seen as a positive phenomenon that cannot and should not completely disappear.

Misati (2010) substantiated the relationship between the shadow economy and the volume of investments based on empirical calculations on the example of African countries. The author concluded

that the shadow economy has a positive effect on investment inflows. However, this effect is mostly caused by the country's low level of development, high level of unemployment and poverty. Given the small sample of countries, this study contains some limitations, and its results require additional verification on the example of countries with an average and high level of economic development.

The positive impact of the shadow economy on the country's development was claimed by Radulescu et al. (2010). According to the authors, the shadow economy creates ideal conditions for developing innovation and investment processes. It is the cheapest alternative for small businesses in countries with a transitive economy and developing countries.

This opinion was also held by Schneider (2005), who claimed that the normal and effective functioning of the official economy is impossible without its shadow component. More than half of the shadow income is spent in the official sector, and therefore, it is a stimulus for economic development.

Pfau-Effinger (2003) viewed the shadow economy as a framework for solving economic and social needs in a country that may be only partially solved or not solved at all in the formal sector. The author emphasized the imperfection of the existing instruments of state regulation of the economy, and the state institutions' inability to solve the problems of a high unemployment exclusively at the expense of regulation of the official sector of the economy. The creation of new jobs in the shadow sector was considered one of the most important tools for bringing the country out of the crisis.

Egger et al. (2014), based on empirical calculations of data from 73 countries concluded that foreign companies make foreign investments mainly to use various channels of money laundering, corruption schemes of their shadowing and further legalization, obtaining special conditions for carrying out their activities (lower level of taxation or other economic incentives).

Based on the panel data method, Abror (2015) analyzed the regional impact of the shadow economy on the foreign direct investment on the example of four clusters of countries (Europe, South and North America, Africa and the Middle East, Asia and Oceania) from 1999 to 2009. Based on the analysis results, the author concluded that there is no connection between direct foreign investment and the shadow economy. Investors do not pay enough attention to the shadow economy problems and do not take them into account when making decisions. European countries have a statistically significant negative relationship between the shadow economy and the volume of foreign direct investment, while for the countries of South and North America this relationship is positive.

Nowadays, scientists have developed many studies, in which one of the most widely accepted approaches to increasing the country's investment attractiveness and its investment potential is to form and implement a policy of countering shadow operations (Buszko, 2022; Darchia, 2022; Fedajev et al., 2022; Hamzah et al., 2021; Kuzmenko et al., 2020, 2021; Lyeonov et al., 2020; Lyulyov et al., 2021; Mirdamad, 2020; Pakhnenko et al., 2022; Simelyte & Tvaronaviciene, 2022; Roszko-Wójtowicz & Grzelak, 2021).

In these processes, great attention is paid to the digital technologies in implementing financial transactions and the procedures for financial monitoring and control over the movement of investment funds (Kuzmenko et al., 2021b.; Vasilyeva et al., 2021).

One should note that our previous studies focused mainly on a more general analysis of the shadow economy in terms of its impact on economic and social development. Based on the results of the analysis, it was concluded that the shadow economy has a negative impact on the amount of tax revenues, GDP, and budget revenues. In addition, we substantiated the two-way dependence between the levels of the country's social welfare and the shadow economy.

This paper aims to investigate the relationship between the levels of the shadow economy and the volume of foreign direct investment based on testing the hypothesis of a two-way relationship between them.

3. METHODOLOGY

Based on the generalization of empirical studies of domestic and foreign scientists, we conduct a study of cause-and-effect relationships between the volume of investment operations and the shadow economy in terms of indicators characterizing the volume of investment movement in the country, as those that most fully reflect the quality of the investment environment in it.

These indicators include:

- volume of foreign direct investments, net inflow (i_1);
- volume of net investments in non-financial assets (i_2);
- volumes of portfolio investments (i_3);
- volume of foreign direct investment, net outflow (i_4).

The data from the World Bank and the European Commission form the information base of the study. The research period is 2007–2021. The research object is the relationship between the level of shadow economy and the volume of investments on the example of 11 countries of the world (Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Poland, Romania, Slovakia, Slovenia, Ukraine). The methodical tools of the conducted research are the methods of econometric data analysis, the Stata data analysis package.

The study of causal relationships between the levels of shadow economy and the countries' investment market indicators will be carried out by constructing a regression equation of the dependence between the analyzed indicators of the following type:

$$D(t) = d_0 \cdot U_1^{d_1}(t - l_1) \cdot U_2^{d_2}(t - l_2) \cdot U_3^{d_3}(t - l_3) \cdot U_4^{d_4}(t - l_4) \quad (1)$$

where $D(t)$ – is the level of the shadow economy in period t ;

d_0, d_1 – individual parameters of the econometric model, determining the nature of the dependence between indicators;

$U_i(t)$ – the i - indicator of the country's investment market development in period t ;

l_i – time lag.

At the next stage, for each of the analyzed indicators, their distribution normality over time will be assessed using the Shapiro-Wilk test. The feasibility of using this test is due to the possibility of using it for a relatively small sample. For the sample (X_1, \dots, X_n) , statistics are calculated according to the formulas:

$$W = \frac{b^2}{S^2}, \quad (2)$$

where $S^2 = \sum_{i=1}^n (X_i - \bar{X})^2$ and $b = \sum_{i=1}^k a_{n,i} (X_{(n-i+1)} - X_{(i)})$. The value in the last formula is determined as follows:

$k = n/2$, if n – is an even number, $k = (n - 1)/2$, if n – odd number, $\{a_{n,i}, i = 1, \dots, k; n = 3, \dots, 50\}$ - constants are known.

For the calculation of the achieved level of significance, a normal approximation will be used for the following formula:

$$1 - \sigma_{0.1} \left(\left| b_n + c_n \ln \left(\frac{W - d_n}{1 - W} \right) \right| \right), \quad (3)$$

where $\sigma_{0,1}$ is the standard normal distribution, b_n , c_n and d_n are constants, which have tabular values depending on the sample size.

This will make it possible to reduce the list of relevant indicators of changes in the level of the shadow economy and to include in the further analysis only those that are subject to the law of normal distribution.

The use of indicators that are different in nature requires bringing them to a comparable form. For this purpose, we will linearize all components of the equation, as a result of which the equation will have the following form:

$$\ln D(t) = \ln d_0 + d_1 \cdot \ln U_1(t - l_1) + d_2 \cdot \ln U_2(t - l_2) + d_3 \cdot \ln U_3(t - l_3) + d_4 \cdot \ln U_4(t - l_4) \quad (4)$$

4. EMPIRICAL RESULTS AND DISCUSSION

In the first stage, we will conduct a comparative analysis of the trends of changes in indicators of the country's investment activity and the volume of the shadow economy in 11 countries of the world (Poland, the Czech Republic, Slovakia, Slovenia, Romania, Hungary, Croatia, Lithuania, Latvia, Estonia and Ukraine) for the period 2015–2021 (figure 1).

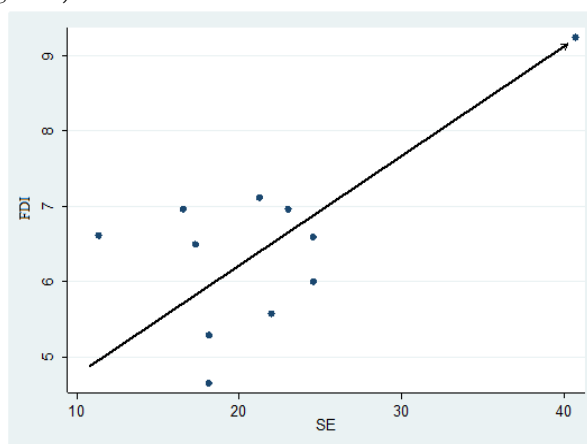


Figure 1. Comparison of the average values of the volumes of foreign direct investments and size of the shadow economy of the analyzed countries of the world for the period 2015–2021.

Source: developed by the authors.

The comparative analysis shows a direct relationship between the volume of direct foreign investment and the shadow economy. Higher average values of the shadow economy are peculiar for countries with higher average volumes of foreign direct investment.

The results of constructing histograms of the distribution of indicators for investment development and the shadow economy (a fragment of calculations based on the example of the Czech Republic is shown in Figure 2) show that the points of relative accumulated frequencies for all indicators of investment development do not correspond to a straight line of normal distribution.

At the same time, the indicators of the shadow economy are subject to the normal distribution law.

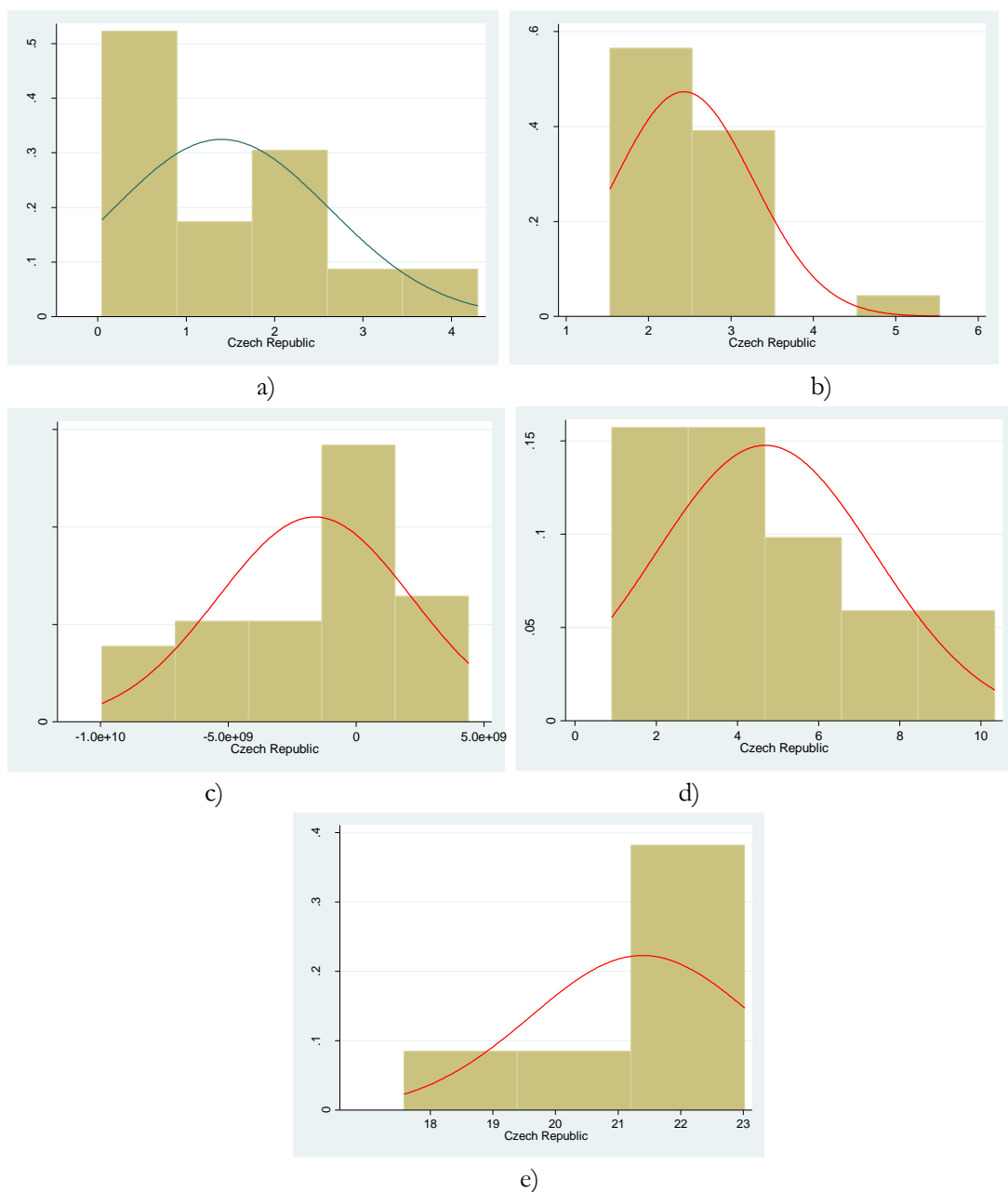


Figure 2. Histogram of sample distribution a) inflow of foreign direct investments; b) volume of net investments in non-financial assets; c) volume of portfolio investments; d) outflow of direct foreign investments; e) size of the shadow economy

Source: developed by the authors.

The values of the relative accumulated frequencies in percentages for the level of the shadow economy, shown in Figure 3, are scattered around a straight line, confirming the previous conclusions about the normality of the data series distribution for the Czech Republic. Similar results were obtained for other analyzed countries.

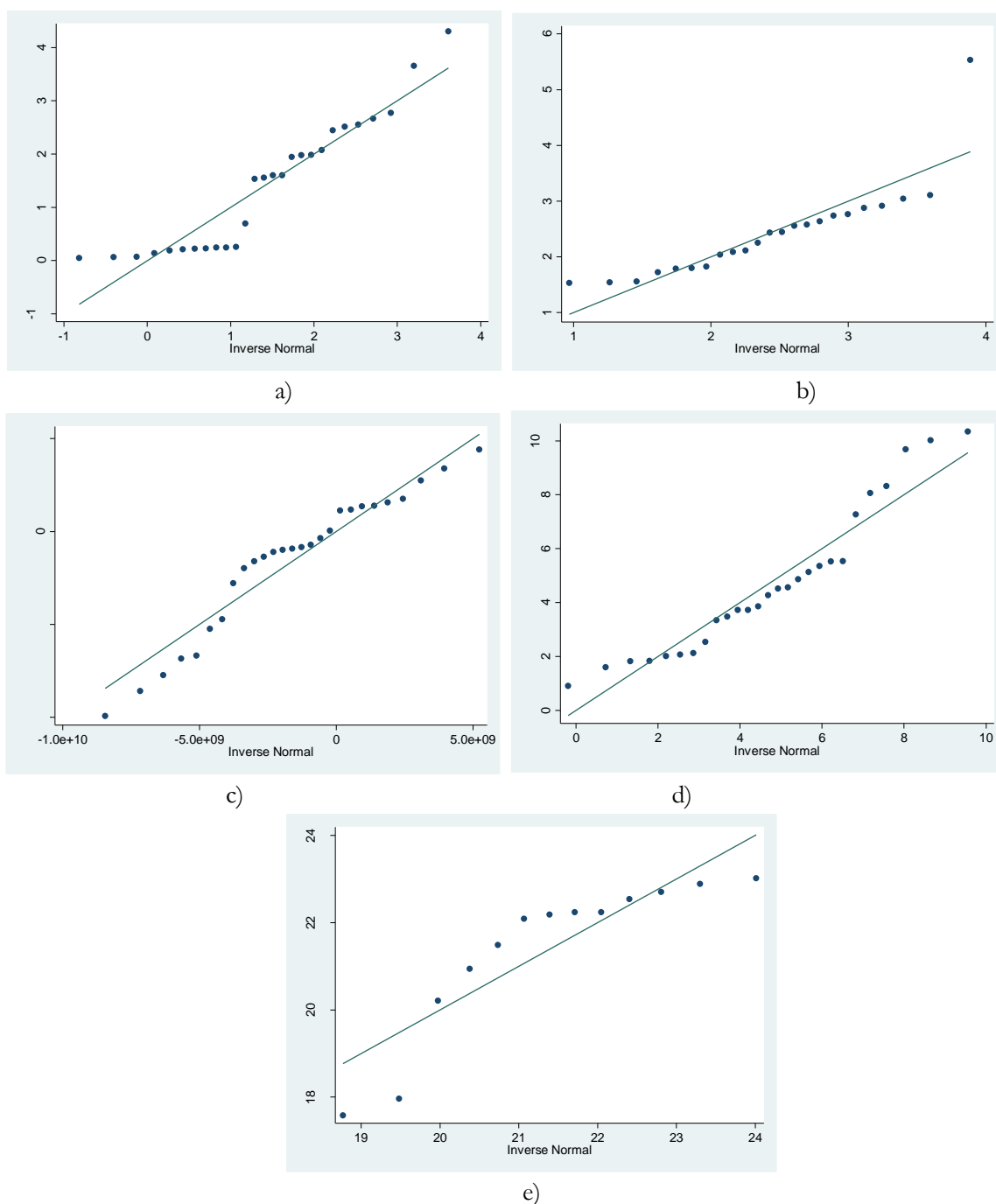


Figure 3. Results of checking the normality of the sample distribution law a) inflow of foreign direct investment; b) volume of net investments in non-financial assets; c) volume of portfolio investments; d) outflow of direct foreign investments; e) size of shadow economy (fragment for the Czech Republic)

Source: developed by the authors.

At the same time, the value of the foreign direct investment and the volume of net investment in non-financial assets significantly deviate from the straight line, allowing to conclude that the analyzed data do not conform to the normal distribution law.

We will evaluate the normality of the distribution of these indicators using the Shapiro-Wilk test to verify the reliability of the obtained results. The obtained critical values for most indicators are lower than

0.05, allowing to reject the hypothesis of their distribution normality at the significance level of $p < 0.05$ (Table 1).

Table 1

Results of assessing the normality of the distribution of investment development drivers using the Shapiro-Wilk test

Country	Indicator	W	V	z	Prob>z
Czech Republic	U ₁	0.91689	2.443	1.835	0.03325
	U ₂	0.82342	5.191	3.383	0.00036
	U ₃	0.93380	1.946	1.368	0.08570
	U ₄	0.88422	3.404	2.516	0.00893
Estonia	U ₁	0.90838	2.693	2.035	0.02091
	U ₂	0.90050	2.845	2.143	0.01607
	U ₃	0.89335	3.135	2.347	0.00945
	U ₄	0.98350	0.485	-1.487	0.93144
Croatia	U ₁	0.96091	1.086	0.169	0.43295
	U ₂	0.86713	3.584	2.603	0.00462
	U ₃	0.94559	1.600	0.965	0.16725
	U ₄	0.88459	3.207	2.382	0.00861
Hungary	U ₁	0.86182	4.062	2.879	0.00199
	U ₂	0.54962	13.240	5.306	0.00000
	U ₃	0.97872	0.625	-0.964	0.83245
	U ₄	0.83763	4.773	3.211	0.00066
Lithuania	U ₁	0.96910	0.859	-0.311	0.62226
	U ₂	0.96942	0.874	-0.275	0.60842
	U ₃	0.89570	3.066	2.302	0.01068
	U ₄	0.93434	1.825	1.229	0.10948
Latvia	U ₁	0.97093	0.808	-0.436	0.66869
	U ₂	0.96828	0.933	-0.143	0.55695
	U ₃	0.83458	4.863	3.249	0.00058
	U ₄	0.96865	0.871	-0.282	0.61104
Poland	U ₁	0.96250	1.102	0.200	0.42071
	U ₂	0.98043	0.575	-1.135	0.87183
	U ₃	0.89296	3.061	2.292	0.01094
	U ₄	0.88332	3.430	2.532	0.00597
Romania	U ₁	0.86056	4.099	2.898	0.00188
	U ₂	0.96004	1.175	0.331	0.37039
	U ₃	0.83416	4.876	3.254	0.00057
	U ₄	0.82147	5.249	3.406	0.00033
Slovakia	U ₁	0.88273	3.448	2.542	0.00550
	U ₂	0.90239	2.791	2.104	0.01771
	U ₃	0.82886	5.031	3.319	0.00045
	U ₄	0.91312	2.554	1.926	0.02704
Slovenia	U ₁	0.87241	3.751	2.716	0.00331
	U ₂	0.90733	2.724	2.059	0.01976
	U ₃	0.90956	2.659	2.009	0.02229
	U ₄	0.89488	3.090	2.318	0.01023
Ukraine	U ₁	0.95295	1.383	0.666	0.25260
	U ₂	0.93039	1.763	1.150	0.12501
	U ₃	0.91960	2.299	1.706	0.04401
	U ₄	0.87403	3.602	2.626	0.00532

Source: developed by the authors.

Taking into account both quantitative (the distribution law of which is not normal) and qualitative (with a normal distribution of indicators) indicators, we will determine the correlation coefficient using the Spearman correlation coefficient. The calculation results are shown in Table 2.

We will evaluate the time lags during which the causal relationship between the analyzed indicators is the highest to increase the reliability of established relationships when building an econometric model of the dependence of the shadow economy on indicators of the investment market development, as an indicator of the volume of shadow investment operations.

The results shown in Table 2 proved that:

1) the increase in the inflow and outflow of foreign direct investments leads to an increase in the shadow economy with a time lag of one year (Slovakia and Hungary), without a time lag in Ukraine, Poland, Slovenia, Romania, Croatia, Lithuania, Latvia, Estonia;

2) a change in the volume of net investments in non-financial assets is accompanied by a change in the level of the shadow economy with a time lag of one year.

Table 2

Correlation coefficients between indicators of investment development and the level of the shadow economy depending on the time horizons of their interaction.

Country	Indicator	Time lag					
		0	1	2	3	4	5
Czech Republic	U ₁	0.23	0.66	0.33	0.18	0.12	0.08
	U ₂	0.36	0.86	0.44	0.32	0.22	0.17
	U ₃	0.44	0.62	0.54	0.21	0.04	0.18
	U ₄	0.87	0.56	0.74	0.51	0.22	0.19
Estonia	U ₁	0.79	0.77	0.59	0.43	0.17	0.15
	U ₂	0.46	0.73	0.58	0.58	0.54	0.57
	U ₃	0.54	0.85	0.68	0.68	0.63	0.66
	U ₄	0.89	0.83	0.67	0.58	0.50	0.20
Croatia	U ₁	0.91	0.76	0.68	0.62	0.40	0.27
	U ₂	0.65	0.81	0.64	0.48	0.35	0.29
	U ₃	0.78	0.66	0.98	0.98	0.91	0.96
	U ₄	0.82	0.74	0.80	0.61	0.44	0.36
Hungary	U ₁	0.45	0.56	0.44	0.33	0.24	0.20
	U ₂	0.36	0.45	0.35	0.27	0.19	0.16
	U ₃	0.41	0.51	0.40	0.30	0.22	0.18
	U ₄	0.21	0.26	0.21	0.16	0.11	0.09
Lithuania	U ₁	0.86	0.83	0.65	0.46	0.31	0.19
	U ₂	0.63	0.79	0.62	0.47	0.34	0.28
	U ₃	0.22	0.28	0.22	0.16	0.12	0.10
	U ₄	0.78	0.76	0.59	0.42	0.38	0.32
Latvia	U ₁	0.84	0.81	0.63	0.45	0.39	0.26
	U ₂	0.66	0.83	0.65	0.49	0.36	0.29
	U ₃	0.54	0.68	0.53	0.40	0.29	0.24
	U ₄	0.89	0.69	0.67	0.48	0.20	0.17
Poland	U ₁	0.83	0.70	0.62	0.45	0.41	0.34
	U ₂	0.66	0.83	0.65	0.49	0.36	0.29
	U ₃	0.78	0.98	0.76	0.58	0.42	0.34
	U ₄	0.84	1.05	0.82	0.62	0.45	0.37
Romania	U ₁	0.86	1.08	0.84	0.64	0.46	0.38
	U ₂	0.61	0.76	0.60	0.45	0.33	0.27
	U ₃	0.52	0.65	0.51	0.38	0.28	0.23
	U ₄	0.91	0.71	0.68	0.49	0.20	0.17
	U ₁	0.22	0.28	0.22	0.16	0.12	0.10

Slovakia	U ₂	0.30	0.38	0.29	0.22	0.16	0.13
	U ₃	0.17	0.21	0.17	0.13	0.09	0.07
	U ₄	0.36	0.45	0.35	0.27	0.19	0.16
Slovenia	U ₁	0.70	0.53	0.53	0.38	0.34	0.26
	U ₂	0.44	0.55	0.43	0.33	0.24	0.19
	U ₃	0.31	0.39	0.30	0.23	0.17	0.14
Ukraine	U ₄	0.87	0.74	0.65	0.47	0.42	0.30
	U ₁	0.92	0.85	0.69	0.50	0.48	0.40
	U ₂	0.66	0.83	0.65	0.49	0.36	0.29
	U ₃	0.32	0.40	0.31	0.24	0.17	0.14
	U ₄	0.74	0.72	0.56	0.40	0.16	0.14

Source: developed by the authors.

3) the influence of portfolio investments on the size of the shadow economy for Poland and Croatia occurs without a time lag, for the rest of the countries - with a time lag of one year;

4) the largest influence on the level of the shadow economy is exerted by the volume of inflow and outflow of direct foreign investments, while the volume of portfolio investments exerts a minor influence on its level.

The obtained values of the time lags, due to which the influence between the indicators is the greatest, form the prerequisites for determining the individual parameters of the model of dependence between the level of the shadow economy and indicators of the country's investment development.

The results of data series linearization are given in Table 3.

Table 3

Results of linearization of the indicators of the econometric model of the dependence of the shadow economy on indicators of investment development (fragment for Ukraine)

	Ln D(t)	Ln(U₁)	Ln(U₂)	Ln(U₃)	Ln(U₄)
2007	3.74	2.21	0.30	21.74	-1.14
2008	3.71	1.65	0.28	22.00	-2.09
2009	3.66	1.97	0.41	22.47	-0.38
2010	3.60	1.78	-0.22	20.97	-0.81
2011	3.77	1.40	-0.27	21.15	-2.32
2012	3.74	1.56	-0.13	22.19	-0.68
2013	3.67	1.49	-0.22	21.17	-2.14
2014	3.68	1.54	-0.93	22.27	-0.58
2015	3.69	0.90	-0.57	22.90	-1.45
2016	3.69	-0.46	-0.50	21.72	-0.89
2017	3.76	-0.90	-0.50	19.72	-3.18
2018	3.71	1.45	-0.73	19.50	-1.69
2019	3.71	1.25	-1.45	21.31	-1.57
2020	3.71	1.25	-2.00	21.46	-2.42
2021	3.71	1.33	-0.47	22.36	-0.91

Source: developed by the authors.

The determination of the individual parameters of the econometric model construction, which determine the nature of the dependence between the indicators (d_i), will be carried out based on regression analysis, the results of which are shown in Table 4.

Table 4

Results of the regression analysis of the causal relationship between the level of the shadow economy and investment development indicators (fragment for Ukraine)

Indicator	Coefficient	Standard error	t-statistic	Lower 95%	Upper 95%
Y-intersection	3.512237	0.0060644	579.15**	3.50035	3.524124
U ₁	0.3750381	0.0002779	18.13*	0.0055828	0.0044934
U ₂	0.2169732	0.0003389	20.57*	0.0063089	0.0076375
U ₃	0.1772031	0.0002697	26.71*	0.0066745	0.0077317
U ₄	0.3306545	0.0003349	-91.55*	0.0313108	0.0299981

Note: * p < 0.05, ** p < 0.01. Standard errors within parentheses.

Source: developed by the authors.

The determined individual parameters of the econometric model formalize the dependence between the level of the shadow economy and indicators of investment development of Ukraine, considering the time lag of their maximum impact using the following equation:

$$D(t)_{UKR} = e^{3.51} \times U_1^{0.37}(t) \times U_2^{0.21}(t-1) \times U_3^{0.17}(t-1) \times U_4^{0.33}(t) \quad (2)$$

The equation of dependence between indicators for the rest of the analyzed countries has the following form:

– for Poland:

$$D(t)_{POL} = e^{3.51} \times U_1^{0.21}(t) \times U_2^{0.17}(t-1) \times U_3^{0.19}(t) \times U_4^{0.25}(t) \quad (3)$$

– for Czech Republic:

$$D(t)_{CZE} = e^{1.17} \times U_1^{0.17}(t-1) \times U_2^{0.08}(t-1) \times U_3^{0.11}(t-1) \times U_4^{0.21}(t) \quad (4)$$

– for Slovakia:

$$D(t)_{SVK} = e^{2.41} \times U_1^{0.23}(t-1) \times U_2^{0.21}(t-1) \times U_3^{0.17}(t-1) \times U_4^{0.19}(t-1) \quad (5)$$

– for Slovenia:

$$D(t)_{SVN} = e^{1.23} \times U_1^{0.26}(t) \times U_2^{0.23}(t-1) \times U_3^{0.24}(t-1) \times U_4^{0.24}(t) \quad (6)$$

– for Romania:

$$D(t)_{ROU} = e^{0.48} \times U_1^{0.31}(t) \times U_2^{0.27}(t-1) \times U_3^{0.21}(t-1) \times U_4^{0.32}(t) \quad (7)$$

– for Hungary:

$$D(t)_{HUN} = e^{2.21} \times U_1^{0.31}(t-1) \times U_2^{0.23}(t-1) \times U_3^{0.19}(t-1) \times U_4^{0.27}(t-1) \quad (8)$$

– for Croatia:

$$D(t)_{HRV} = e^{0.81} \times U_1^{0.29}(t) \times U_2^{0.21}(t-1) \times U_3^{0.17}(t) \times U_4^{0.22}(t) \quad (9)$$

– for Lithuania:

$$D(t)_{LTU} = e^{1.36} \times U_1^{0.33}(t) \times U_2^{0.24}(t-1) \times U_3^{0.19}(t-1) \times U_4^{0.27}(t) \quad (10)$$

– for Latvia:

$$D(t)_{LVA} = e^{1.05} \times U_1^{0.24}(t) \times U_2^{0.17}(t-1) \times U_3^{0.21}(t-1) \times U_4^{0.29}(t) \quad (11)$$

– for Estonia:

$$D(t)_{EST} = e^{1.98} \times U_1^{0.26}(t) \times U_2^{0.15}(t-1) \times U_3^{0.2}(t-1) \times U_4^{0.31}(t) \quad (12)$$

5. CONCLUSION

This article deals with the study of the connection between the size of the shadow economy and indicators of the country's investment market development. We assumed that the size of the shadow economy affects the country's investment attractiveness, and correspondingly, the volume of foreign direct investment inflow. Foreign investors are more willing to invest in the economy of countries with lower levels of corruption and shadowing. At the same time, direct foreign investments directly impact reducing the volume of shadow financial transactions. This hypothesis was verified on the example of data from 11 countries for 2005-2021.

The econometric modelling results of the dependence of the shadow economy on certain indicators of the countries' investment development proved the significant influence of the inflow and outflow of foreign direct investments on the shadow economy development. Thus, the correlation coefficient between the size of the shadow economy and the foreign investment inflow in Ukraine is 0.37, in Romania and Hungary - 0.31, and in Lithuania - 0.37. Net investment in non-financial assets (0.08 in the Czech Republic, 0.17 in Poland and Latvia, 0.15 in Estonia) and portfolio investments (0.11 in the Czech Republic, 0.17 in Ukraine) greatly impact the shadow economy, and Croatia, 0.19 – Hungary and Lithuania). The established dependencies should serve as a basis for implementing measures to increase the macroeconomic stability of the country in terms of bringing investment flows out of the shadows. The inflow and outflow of direct foreign investment in the country deserves more intensive control from the point of view of the movement of investment funds.

ACKNOWLEDGEMENT

This research was funded by the project “Formation of Tools for the Ukrainian Economy Unshadowing Based on Causal Modeling of Interaction Trajectories of Financial Intermediaries” (0120U100473, funding – Ministry of Education and Science of Ukraine, 2020-2022).

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