“Shadow tax evasion and its impact on the competitiveness of the country’s tax system”

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ARTICLE INFO	Oleksiy Mazurenko, Inna Tiutiunyk, Vita Cherba, Artem Artyukhov and Yuliia Yehorova (2023). Shadow tax evasion and its impact on the competitiveness of the country’s tax system. *Public and Municipal Finance*, *12*(2), 129-142. doi:10.21511/pmf.12(2).2023.11
DOI	http://dx.doi.org/10.21511/pmf.12(2).2023.11
RELEASED ON	Wednesday, 27 December 2023
RECEIVED ON	Thursday, 15 June 2023
ACCEPTED ON	Tuesday, 12 December 2023

JOURNAL	"Public and Municipal Finance"
ISSN PRINT	2222-1867
ISSN ONLINE	2222-1875
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
46	3	6

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

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SHADOW TAX EVASION AND ITS IMPACT ON THE COMPETITIVENESS OF THE COUNTRY'S TAX SYSTEM

Abstract

Tax competitiveness of the country characterizes the ability of the tax system to obtain permanent competitive advantages in attracting external and mobilizing internal financial resources due to the establishment of the optimal level of tax burden and differentiation of fiscal instruments. The complexity of this indicator determines the presence of a number of drivers of its formation. Shadow tax evasion is one of them. The purpose of the study is to assess the impact of the shadow tax evasion of taxpayers on the level of competitiveness of the tax system on the example of 11 European countries from 2011 to 2021. The methodological tools are regression analysis methods, Shapiro-Wilk tests, and Spearman's rank correlation. It was determined that informal employment, informal production, and unregistered or informal entrepreneurship are the most common methods of tax evasion. Based on the results of the calculations, regression equations of the influence of shadow tax evasion on the level of competitiveness of the country's tax system were constructed. It has been proven that shadow tax evasion exerts the greatest influence on the level of tax competitiveness of Slovenia (0.32), Romania (0.34), and Croatia (0.26). The least sensitive to shadow tax evasion is the competitiveness of the Czech Republic's tax system (0.096). For most analyzed countries, this influence is carried out with a time lag of 2 years. Only in Croatia, this influence is the most substantial with a one-year lag.

Keywords tax evasion, tax competitiveness, macro-financial stability, budget revenues, shadow economy

JEL Classification E26, O17, H26, H87

Received on: 15th of June, 2023
Accepted on: 12th of December, 2023
Published on: 27th of December, 2023

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Conflict of interest statement:
Author(s) reported no conflict of interest

INTRODUCTION

A significant number of income concealment schemes and tools lead to the fact that their negative consequences are manifested in various spheres and sectors of the economy. The tax system is one of the most sensitive to the manifestations of the shadow economy. The implementation of shadow schemes for concealing income leads to the deformation of the tax system, which consists in the appearance of disproportions in the distribution of the tax burden on individual economic subjects by increasing it for participants in official activities. According to Murphy (2019), in 2015 EU countries lost more than 824 billion euros due to tax evasion. This affects the country's economic development indicators and significantly threatens its sustainable development and international competitiveness.

According to the results of the experts of the Institute of Socio-Economic Transformation and the Center of Socio-Economic Research CASE Ukraine (2023), the amount of fiscal losses of the budget due to tax evasion was estimated at over 1,000 billion UAH. The results of a comparative analysis of the volume of fiscal losses of the budget testify

to their significant growth during the last 5 years. If, in 2015, fiscal losses from the use of tax evasion schemes ranged from UAH 110.5 to 168.5 billion, then according to the results of 2020, their volume amounted to UAH 291 – 465.8 billion.

In addition, the excessive share of the shadow sector of the economy contributes to the formation of a gap between the needs of society in providing them with the minimum necessary set of public goods and services and the ability of the country to satisfy them at the expense of tax revenues. This, in turn, leads to an increase in social tension in society, an increase in income inequality, and a deterioration in the level of material well-being of the population.

1. LITERATURE REVIEW AND ANALYSIS

The shadow economy is a complex phenomenon affecting several indicators of the country's development. According to Caurkubule and Rubanovskis (2014), the shadow economy inhibits the country's sustainable economic development. Slowing down the pace of economic growth, the shadow economy negatively impacts the country's sustainable development and the population's standard of living.

The shadow sector of the economy negatively affects the country's ability to finance social programs (Bhandari, 2023; Kuzior et al., 2020), health care measures (Reshetniak & Grifo, 2022; Vasilyeva et al., 2022), effectiveness of public administration tools (Dźwigoł & Wolniak, 2018), the country's investment attractiveness (Khayati & Terzi, 2023), its innovation potential (Kuzior et al., 2022), business performance indicators (Bilan et al., 2018) and the stability of the financial sector as a whole (Kozmenko & Belova, 2015; Orlov et al., 2021; Melnyk et al., 2021a; Melnyk et al., 2021b; Bukhtiarova et al., 2022; Danylyshyn et al., 2022; Kuzmenko et al., 2023b; Njegovanović, 2023; Ogar et al., 2023; Kalaitan et al., 2023).

The characteristic features of shadow tax evasion shown in Table 1 prove that this phenomenon is inherent in any economic system, and the toolkit for combating it should take into account the entire spectrum of its influence on the country's development indicator.

Many scientists consider the shadow economy to be an inhibitor of tax competitiveness growth. Business entities are pretty sensitive to fluctuations in official and shadow exchange rates, and shadow activities lead to excessive risks for domestic and foreign investors (Mohamadi & Glants, 2018; Mujtaba et al., 2018; Yoshimori, 2023).

Mukherjee (2018) considered the reduction of the share of shadow tax evasion as a prerequisite for increasing the level of tax competitiveness of the country due to the formation of additional advantages in the context of the application of international tax differences and the transfer of profits by transnation-

Table 1. Features of shadow tax evasion

Feature	The essence	Authors
Evolutionary	Shadow tax evasion is a natural result of the evolution of the economic system, which goes through four stages of its development: birth, development, maturity, decline	Myrdal (1954)
Uncertainty	Shadow tax evasion is a phenomenon that is difficult to identify and fully evaluate	Enste (2018)
Permanency	Shadow tax evasion is a phenomenon inherent in any economic system that cannot be eliminated entirely	Vasilyeva et al. (2019), Kuzmenko et al. (2023a), Asare and Samusevych (2023)
Structurality	Shadow tax evasion is a complex structural component of the state economic policy, which includes the informal, fictitious, and criminal economy	Gentsoudi (2023), Patel et al. (2023)
A dual nature	Shadow tax evasion has both a positive (support for vulnerable population) and a negative impact on indicators of the country's economic and social development	De Soto (1989), Hart (1973), Vostrykov and Jura (2022)
Deviance	Shadow tax evasion is the result of a decrease in the significance of moral norms and values in society	Alm and Torgler (2006), Torgler (2011), Daude and Melguizo (2010)

http://dx.doi.org/10.21511/pmf.12(2).2023.11

al corporations to more attractive places of taxation. The study shows the desire to optimize financial flows to increase competition between countries for the profits of transnational corporations as the main prerequisite for improving the country's tax policy and the policy of de-shadowing its economy.

Cremer and Gahvari (2000) examined the implications of tax evasion for tax competition and fiscal policy coordination. The authors prove that tax evasion leads to fiscal competition regarding tax rates and the probability of an audit. At the same time, integration can turn an honest country into an evader: tax harmonization can worsen the situation of both countries and force the other honest countries to evade.

An effective tax strategy for businesses and transactions with a cash economy requires a holistic approach to compliance management, in which traditional monitoring and control tools play a key role, such as giving tax administrations access to taxpayer data and matching information from various public and private sources (Awasthi & Engelschalk, 2018; Kobiyh & El Amri, 2023; Kwilinski, 2019).

In general, the results of the conducted analysis prove the lack of sufficient studies on the connection between the shadow economy and the level of the country's tax competitiveness and highlight the need for a more detailed analysis of these issues.

One of the indicators reflecting the effectiveness of the country's tax system is the level of its tax competitiveness, which is often one of the decisive criteria when investors and business representatives make decisions regarding the feasibility of carrying out activities in a given country. In this way, identifying external and internal factors that influence the quality of the internal and external components of its tax policy plays an important role.

Thus, the purpose of the study is to assess the impact of shadow tax evasion on the competitiveness of the tax system. The hypothesis of the study is:

H1: Shadow tax evasion affects not only the indicators of the functioning of the country's tax system but also the level of its international competitiveness.

2. METHODOLOGY

Verification of the validity of the proposed hypothesis is carried out based on regression analysis methods. The level of informal production (InfProd), the level of informal employment (InfEmpl), and the percentage of firms that compete with unregistered or informal firms (FAIF) are used as a factor indicator. The level of tax competitiveness of the country is used as a result indicator.

The information base of the research is data from the World Bank and the Organization for Economic Cooperation and Development. 11 European countries (Poland, the Czech Republic, Slovakia, Slovenia, Romania, Hungary, Croatia, Lithuania, Latvia, Estonia, and Ukraine) were chosen as the object of the study, the period of the study is 2001–2021.

The country's tax competitiveness level is determined in the first stage of the study. An integral indicator combines 17 components of the development of the tax system: VAT rate, corporate income tax, personal income tax, social contributions, the Fiscal Health Index, the Tax Freedom Index, time for preparation of tax reporting and payment of taxes, time for border and customs control during export/import, time for processing documents during export/import, cost of processing documents during export/import, cost of passing control during export/import, number of payments, necessary for settlement with the tax authorities, the Financial Literacy Index, the level of tax morale of the population, the Economic Freedom Index, the volume of GDP, and the level of tax potential.

Bringing these indicators to a comparable form is carried out using the method of normalization based on the minimax approach. Normalization of indicators of stimulators/destimulators is carried out using the formula:

$$\overline{ITCI}_{it} = \begin{cases} \dfrac{ITCI_{it} / ITCI_{it\_\max} - ITCI_{it_{\min}} / ITCI_{it}}{ITCI_{it\_\max} - ITCI_{it\_\min}} \\ 1, \begin{bmatrix} ITCI_{it} \geq \overline{ITCI}_{i\_\max} \\ ITCI_{it} \leq \overline{ITCI}_{i\_\min} \end{bmatrix} \end{cases}, \quad (1)$$

where $\overline{ITCI_{it}}$ is the normalized value of the *i*-th indicator in the *t*-th year; $ITCI_{it}$ the actual value of the *i*-th indicator in the *t*-th year; $\overline{ITCI_{it\_max}}$ is the maximum normative value of the *i*-th indicator; $\overline{ITCI_{it\_mai}}$ is the minimum regulatory value of the *i*-th indicator; $ITCI_{it\_min}$ is the minimum value of the *i*-th indicator during the analyzed period; $ITCI_{it\_max}$ is the maximum value of the *i*-th indicator during the analyzed period.

The determination of the integral indicator of the competitiveness of the tax system is carried out according to the formula:

$$ITCI = \sum_{i=1}^{n} a_i ITCI_i^A, ITCI_M = \sum_{i=1}^{n} \left(ITCI_i^M \right)^{a_i} \quad (2)$$

where $ITCI_A$ and $ITCI_M$ are partial indicators (for the additive and multiplicative form) of the *i*-th component of tax competitiveness; n are the number of indicators; a_1 are the weighting coefficients of indicators for which the condition is fulfilled.

Weighting coefficients are determined using the method of expert evaluations. The prerequisite for building a model of the dependence of the country's tax competitiveness on the indicators of shadowing of the economy is to check the data for compliance with the law of normal distribution, which is carried out using the Shapiro-Wilk test:

$$W = \frac{\left(\sum_{i=1}^{n} a_{(i)} X_{(i)} \right)^2}{\sum_{i=1}^{n} \left(X_{(i)} - \overline{X} \right)^2} . \quad (3)$$

Determining the duration of the time lag due to which the effect of shadowing the economy on the level of tax competitiveness of the country is the greatest (based on the Spearman correlation coefficient):

$$\rho = 1 - \frac{6 \sum d^2}{n\left(n^2 - 1\right)} . \quad (4)$$

The construction of a model of the dependence of the tax competitiveness of the country on the indicators of shadowing of the economy is carried out on the basis of the construction of a regression equation of the following type:

$$ITCI\left(t\right) = m_0 \cdot \prod_{i=1}^{n} SEI_n^{m_n}\left(t - l_1\right), \quad (5)$$

where *ITCI*(*t*) is the level of tax competitiveness of the country in period *t*; m_0, m_1 are individual parameters of the econometric model, which determine the nature of the dependence between indicators; i_i is the *i*-th indicator of the functioning of the shadow sector of the economy; l_1 is the time lag.

3. RESULTS AND DISCUSSION

Calculations of the level of competitiveness of the tax system carried out with the help of formulas 1 and 2 show a slight increase in the levels of tax competitiveness of all analyzed countries during the last 10 years. Ukraine has one of the lowest values of tax competitiveness. This is due to the significant labor-intensiveness of the processes of calculation and payment of tax payments, a significantly lower level of economic freedom, fiscal health and economic development of the country as a whole.

To model the influence of shadow tax evasion on the level of tax competitiveness of the country, in

Table 2. Assessing the country's tax competitiveness level

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Ukraine	0.64	0.64	0.64	0.66	0.66	0.67	0.68	0.68	0.67	0.69	0.69
Poland	0.68	0.68	0.71	0.71	0.7	0.72	0.72	0.72	0.74	0.74	0.75
The Czech Republic	0.71	0.71	0.74	0.74	0.73	0.75	0.75	0.75	0.77	0.77	0.78
Slovakia	0.67	0.67	0.70	0.70	0.69	0.71	0.71	0.71	0.73	0.73	0.74
Slovenia	0.68	0.68	0.71	0.71	0.70	0.72	0.72	0.72	0.74	0.74	0.75
Romania	0.66	0.66	0.69	0.69	0.68	0.70	0.70	0.70	0.72	0.72	0.73
Hungary	0.71	0.71	0.74	0.74	0.73	0.75	0.75	0.75	0.77	0.77	0.78
Croatia	0.72	0.72	0.75	0.75	0.74	0.76	0.76	0.76	0.78	0.78	0.79
Lithuania	0.75	0.75	0.78	0.78	0.77	0.79	0.79	0.79	0.82	0.82	0.83
Latvia	0.76	0.76	0.79	0.79	0.78	0.80	0.80	0.80	0.83	0.83	0.84
Estonia	0.78	0.78	0.81	0.81	0.80	0.83	0.83	0.83	0.85	0.85	0.86

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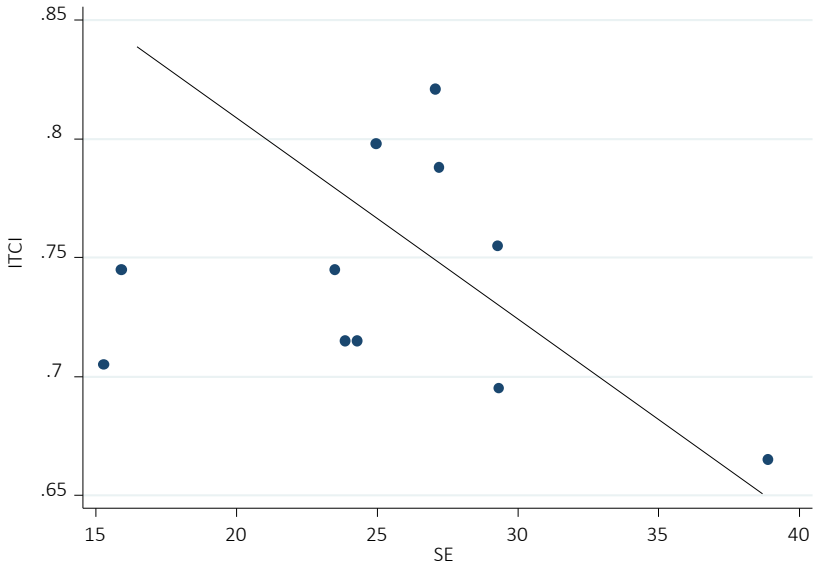


Figure 1. Comparison of the average values of the levels of tax competitiveness and shadowing of the economy for the period 2011–2021

the next stage, a comparative analysis of the average values of these indicators for 2011–2021 was carried out for 11 countries of the world (Ukraine, Poland, the Czech Republic, Slovakia, Slovenia, Romania, Hungary, Croatia, Lithuania, Latvia, and Estonia).

The results of the comparative analysis shown in Figure 1 show that higher values of the level of tax competitiveness correspond to lower values of shadowing of the economy. Thus, it is possible to draw a conclusion about the inverse relationship between the analyzed indicators.

The prerequisite for modeling the relationship between the analyzed indicators should be verifying data series for compliance with the law of normal distribution. For this purpose, the study analyzes data series for 2011–2021 using the Shapiro-Wilk test and builds histograms of the data array distribution. This can improve the quality and reliability of modeling results by excluding from the analysis those data that are not subject to the law of normal distribution.

The histograms of the distribution of the array of data for indicators of the shadow sector of the economy and the level of tax competitiveness shown in Figure 2 allow the paper to conclude that the points of relative accumulated frequencies do not correspond to the law of normal distribution.

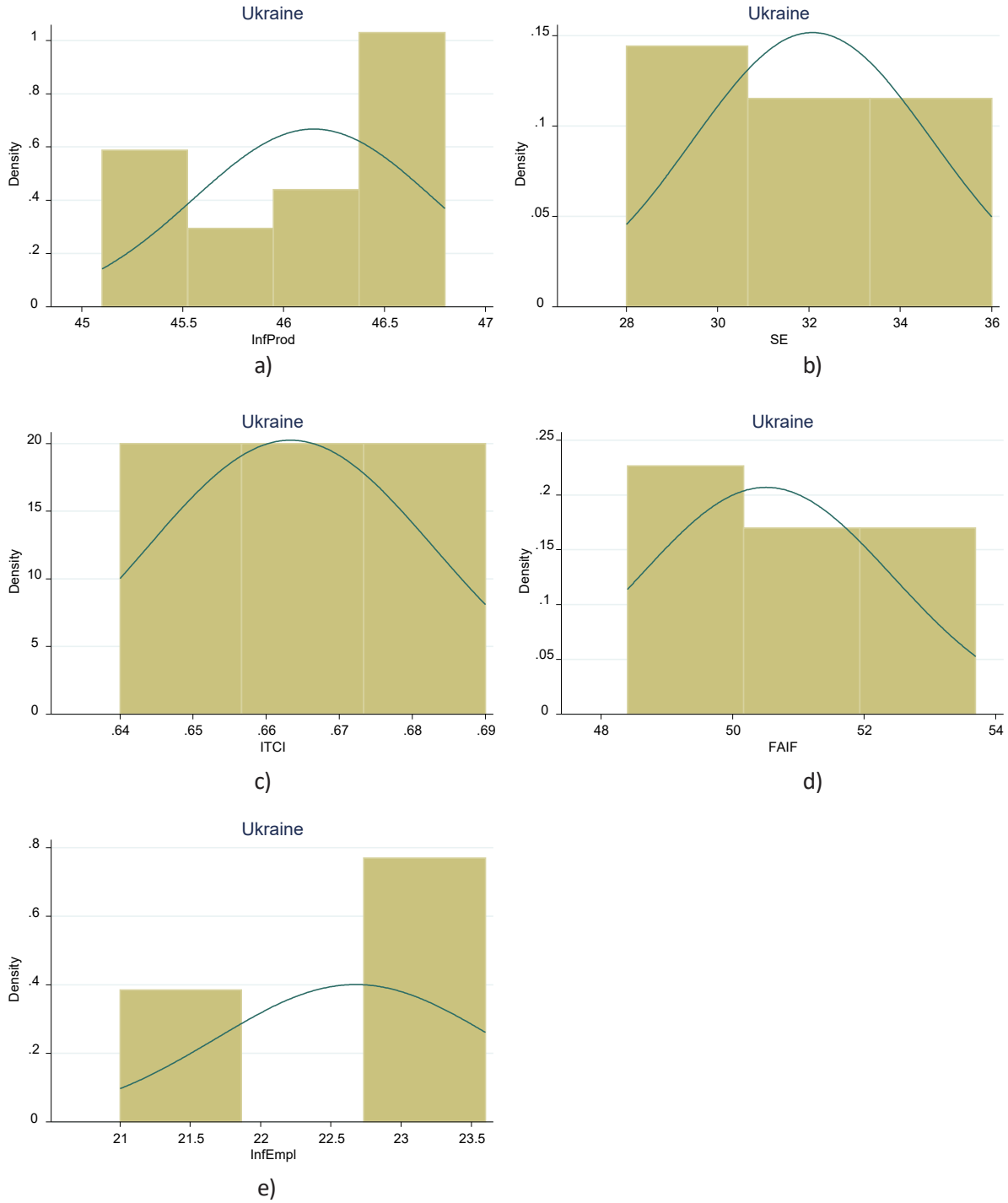
In addition, Figure 3 indicates that individual values of the relative accumulated frequencies in percentages are significantly far from a straight line, which confirms the validity of the previous results regarding the inconsistency of all data series analyzed with the law of normal distribution.

At the next stage, using the Shapiro-Wilk test, the study tests the data series for normality of distribution. Table 2 shows that only a small number of indicators conform to the normal distribution law. For most indicators, the calculated values are lower than the critical (0.05), which accepts the alternative hypothesis of non-compliance with the law of normal distribution at the level of statistical significance $p < 0.05$.

Taking into account the heterogeneity of the data set (the presence of old ones that correspond and do not correspond to the law of normal distribution), the paper evaluates the relationship between the indicators of the development of the shadow sector of the economy and the level of tax competitiveness of the country using the Spearman correlation coefficient (Table 3).

The values of the correlation coefficients given in Table 3 draw the following conclusions:

- the increase in the level of informal production leads to a decrease in the level of tax com-



Note: a) the level of informal production; b) the level of shadowing of the economy; c) level of tax competitiveness; d) shares of firms that compete with unregistered or informal firms; e) the level of informal employment in Ukraine in 2011–2021.

Figure 2. Histogram of the distribution of the array of data regarding indicators of the shadow sector of the economy and tax competitiveness in Ukraine

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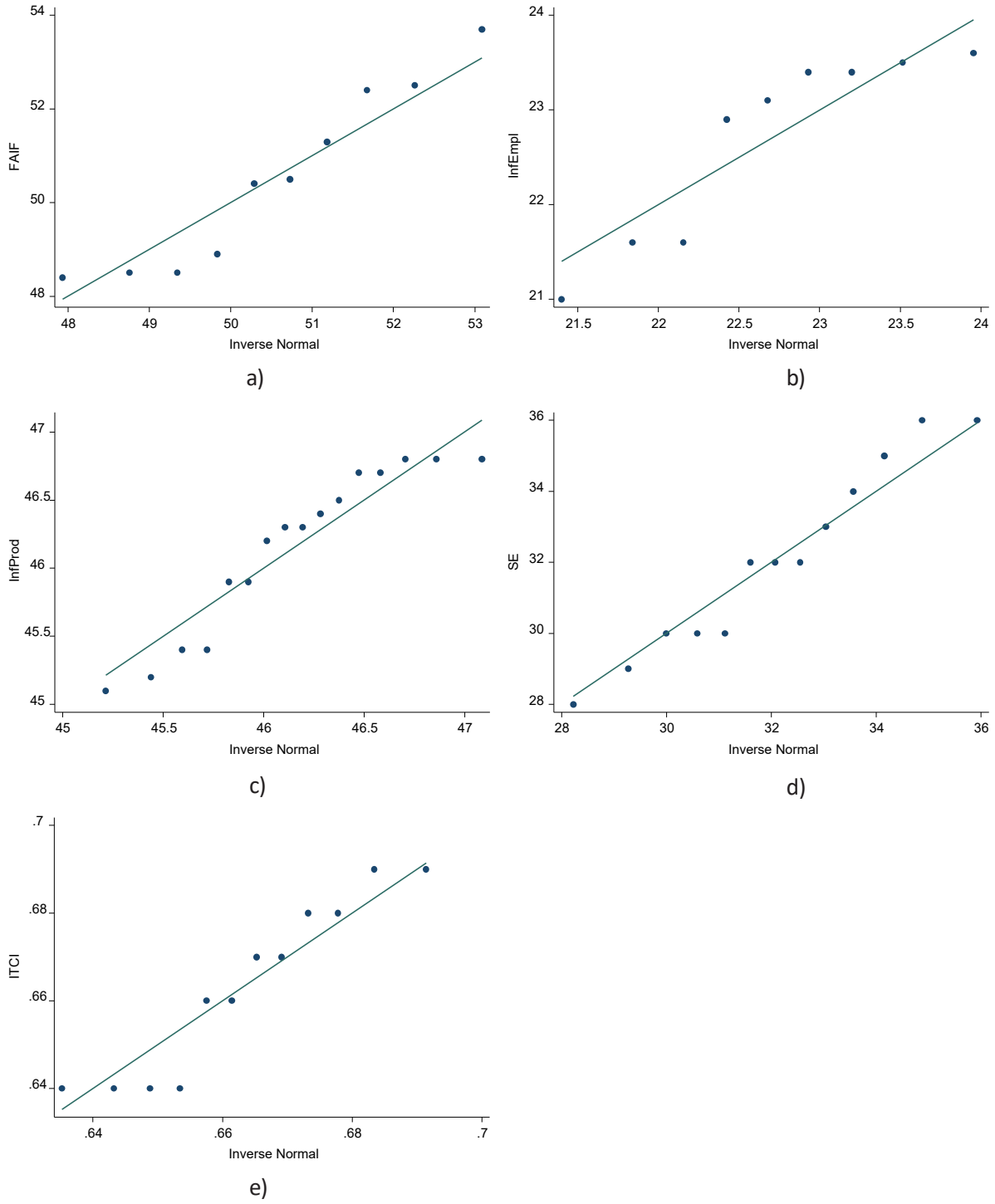

Note: a) level of informal production; b) the level of shadowing of the economy; c) level of tax competitiveness; d) shares of firms that compete with unregistered or informal firms; e) the level of informal employment in Ukraine in 2011–2021.

Figure 3. Scatter diagrams of indicators of the shadow sector of the economy and tax competitiveness in Ukraine

Table 3. Checking the indicators of the functioning of the shadow sector of the economy for compliance with the law of normality of distribution using the Shapiro-Wilk test

Country	Indicator	W	V	z	Prob>z
Ukraine	InfProd	0.93021	1.414	0.688	0.24570
	InfEmpl	0.84048	2.344	1.568	0.05847
	FAIF	0.91211	1.354	0.536	0.29582
Poland	InfProd	0.91061	2.69960	2.03999	0.02096
	InfEmpl	0.90271	2.85197	2.14825	0.01611
	FAIF	0.89554	2.36536	1.77081	0.00947
The Czech Republic	InfProd	0.96326	1.08866	0.16941	0.43401
	InfEmpl	0.86925	2.70413	1.96396	0.00463
	FAIF	0.94791	1.60392	0.96736	0.16766
Slovakia	InfProd	0.86393	2.25238	2.17221	0.00199
	InfEmpl	0.55097	4.69358	2.94218	0.00000
	FAIF	0.98112	0.62653	0.96636	0.83449
Slovenia	InfProd	0.97147	0.86110	0.31176	0.62378
	InfEmpl	0.97180	0.87614	0.27567	0.60991
	FAIF	0.89789	1.70010	1.73686	0.01071
Romania	InfProd	0.97331	0.80998	0.43707	0.67033
	InfEmpl	0.97065	0.93529	0.14335	0.55831
	FAIF	0.83662	2.69653	2.45137	0.00058
Hungary	InfProd	0.96486	1.10470	0.20049	0.42174
	InfEmpl	0.98283	0.57641	1.13778	0.87397
	FAIF	0.89515	1.69732	1.72931	0.01097
Croatia	InfProd	0.86267	2.27290	2.18654	0.00188
	InfEmpl	0.96239	1.17788	0.33181	0.37130
	FAIF	0.83620	2.70374	2.45514	0.00057
Lithuania	InfProd	0.88489	1.91192	1.91794	0.00551
	InfEmpl	0.90460	1.54761	1.58747	0.01775
	FAIF	0.83089	2.78969	2.50419	0.00045
Latvia	InfProd	0.87455	2.07993	2.04922	0.00332
	InfEmpl	0.90955	1.51046	1.55352	0.01981
	FAIF	0.91179	1.47442	1.51579	0.02234
Estonia	InfProd	0.95528	0.76687	0.50250	0.25322
	InfEmpl	0.93267	0.97758	0.86768	0.12532
	FAIF	0.92185	1.27480	1.28718	0.04412

petitiveness of all analyzed countries with a time lag of 2 years;

- when the level of informal employment of the population increases, the level of tax competitiveness of Ukraine, Poland, Slovenia, Croatia, Lithuania, Latvia, and Estonia decreases with a time lag of 1 year; Slovakia, the Czech Republic, and Hungary – with a lag of 2 years;

- the change in the share of firms competing with unregistered or informal firms affects the level of tax competitiveness in Croatia with a time lag of 1 year, for the rest of the countries – with a time lag of 2 years;

- informal employment of the population exerts the greatest influence on the level of tax competitiveness of the analyzed countries.

The obtained results form prerequisites for evaluating the parameters of the regression model, which formalizes the dependence of the level of tax competitiveness on the indicators of the functioning of the shadow sector of the economy.

Based on econometric modeling, the individual parameters of the econometric model were determined, which determine the nature of the dependencies between indicators (Tables 4 and 5). Shadow employment of the population has the greatest impact on the level of tax competitiveness

http://dx.doi.org/10.21511/pmf.12(2).2023.11

Table 4. Correlation coefficients between the level of the country's tax competitiveness and indicators of the functioning of the shadow sector of the economy for 2011–2021

Country	Indicator	Time lag			
		0	1	2	3
Ukraine	InfProd	–0.57240	–0.58467	–0.59720	–0.49239
	InfEmpl	–0.47722	–0.84838	–0.58326	–0.42419
	FAIF	–0.58326	–0.68931	–0.71582	–0.27838
Poland	InfProd	–0.37531	–0.44718	–0.59092	–0.40726
	InfEmpl	–0.55099	–0.61488	–0.47114	–0.34337
	FAIF	–0.39316	–0.49573	–0.62393	–0.49573
The Czech Republic	InfProd	–0.46154	–0.58120	–0.72650	–0.58120
	InfEmpl	–0.58974	–0.57265	–0.70940	–0.49573
	FAIF	–0.43590	–0.58120	–0.64957	–0.52991
Slovakia	InfProd	–0.55556	–0.54701	–0.69231	–0.41026
	InfEmpl	–0.66667	–0.56410	–0.83761	–0.83761
	FAIF	–0.52991	–0.63248	–0.68376	–0.52137
Slovenia	InfProd	–0.38462	–0.47863	–0.54701	–0.28205
	InfEmpl	–0.30769	–0.38462	–0.29915	–0.23077
	FAIF	–0.35043	–0.43590	–0.51282	–0.25641
Romania	InfProd	–0.17949	–0.22222	–0.35043	–0.13675
	InfEmpl	–0.64957	–0.70940	–0.55556	–0.39316
	FAIF	–0.83513	–0.82187	–0.87450	–0.62303
Hungary	InfProd	–0.29163	–0.29163	–0.84540	–0.21210
	InfEmpl	–0.56210	–0.63254	–0.75840	–0.55675
	FAIF	–0.53212	–0.62080	–0.79817	–0.44343
Croatia	InfProd	–0.65036	–0.64051	–0.81788	–0.48285
	InfEmpl	–0.71582	–0.90141	–0.70257	–0.53024
	FAIF	–0.41230	–0.55099	–0.53502	–0.38330
Lithuania	InfProd	–0.46570	–0.49509	–0.56874	–0.35934
	InfEmpl	–0.87490	–0.87560	–0.86164	–0.64954
	FAIF	–0.46315	–0.51107	–0.60689	–0.46315
Latvia	InfProd	–0.51107	–0.53502	–0.65480	–0.49509
	InfEmpl	–0.68674	–0.87450	–0.67077	–0.51107
	FAIF	–0.67606	–0.74234	–0.79536	–0.59652
Estonia	InfProd	–0.68931	–0.78540	–0.86164	–0.50373
	InfEmpl	–0.54467	–0.63796	–0.54301	–0.39128
	FAIF	–0.51163	–0.65117	–0.77563	–0.37210

of the analyzed countries. Unofficial employment, payment of wages in envelopes, and underestimation of the official wage level negatively affect the country's tax system's competitiveness and attractiveness for international investors.

The parameters listed in Table 6 formalize the influence of indicators of the functioning of the shadow sector on the level of tax competitiveness of the analyzed countries of the world as follows:

Table 5. Regression model of the dependence of tax competitiveness of Ukraine on the indicators of the shadow sector of the economy

Indicator	Coefficient	Standard error	t-statistic	Lower 95%	Upper 95%
Y-intersection	4.373789	0.007552	721.22	4.358986	4.388592
InfProd	0.467035	0.000346	22.58	0.006952	0.005596
InfEmpl	0.270197	0.000422	25.62	0.007856	0.009511
FAIF	0.220671	0.000336	33.26	0.008312	0.009628

Table 6. Econometric model of the formalization of the influence the shadow sector of the economy on the country's tax competitiveness

Country	InfProd		InfEmpl		FAIF	
	d_{i2}	l_{i2}	d_{i1}	l_{i1}	d_{i3}	l_{i3}
Ukraine	0.2702	2	0.467	1	0.2207	2
Poland	0.2117	2	0.2615	1	0.2366	2
The Czech Republic	0.0996	2	0.2698	2	0.137	2
Slovakia	0.2898	2	0.2864	2	0.2406	2
Slovenia	0.3168	2	0.3238	1	0.3265	2
Romania	0.3362	2	0.386	1	0.2106	2
Hungary	0.2258	2	0.3547	2	0.225	2
Croatia	0.2509	2	0.3611	1	0.2398	1
Lithuania	0.2989	2	0.2109	1	0.2284	2
Latvia	0.2178	2	0.3175	1	0.3698	2
Estonia	0.1868	2	0.3365	1	0.2491	2

- for Ukraine:

$$ITCI(t)_{UKR} = e^{1.47} \cdot Inf\ \mathrm{Pr}od^{0.2702}(t-2) \cdot InfEmpl^{0.467}(t-1) \cdot FAIF^{0.2207}(t-2), \quad (6)$$

- for Poland:

$$ITCI(t)_{POL} = e^{2.34} \cdot Inf\ \mathrm{Pr}od^{0.2117}(t-2) \cdot InfEmpl^{0.2615}(t-1) \cdot FAIF^{0.2366}(t-2), \quad (7)$$

- for the Czech Republic:

$$ITCI(t)_{CZE} = \mathrm{e}^{0.98} \cdot InfProd^{0.0996}(t-2) \cdot InfEmpl^{0.2698}(t-2) \cdot FAIF^{0.137}(t-2), \quad (8)$$

- for Slovakia:

$$ITCI(t)_{SVK} = \mathrm{e}^{3.19} \cdot InfProd^{0.2989}(t-2) \cdot InfEmpl^{0.2864}(t-2) \cdot FAIF^{0.2406}(t-2), \quad (9)$$

- for Slovenia:

$$ITCI(t)_{SVN} = \mathrm{e}^{0.56} \cdot InfProd^{0.3168}(t-2) \cdot InfEmpl^{0.3238}(t-1) \cdot FAIF^{0.3265}(t-2), \quad (10)$$

- for Romania:

$$ITCI(t)_{ROU} = \mathrm{e}^{1.87} \cdot InfProd^{0.3362}(t-2) \cdot InfEmpl^{0.386}(t-1) \cdot FAIF^{0.2106}(t-2), \quad (11)$$

- for Hungary:

$$ITCI(t)_{HUN} = \mathrm{e}^{1.51} \cdot InfProd^{0.2258}(t-2) \cdot InfEmpl^{0.3547}(t-2) \cdot FAIF^{0.225}(t-2), \quad (12)$$

- for Croatia:

$$ITCI(t)_{HRV} = \mathrm{e}^{4.12} \cdot InfProd^{0.2509}(t-2) \cdot InfEmpl^{0.3611}(t-1) \cdot FAIF^{0.2398}(t-1), \quad (13)$$

- for Lithuania:

$$ITCI(t)_{LTU} = \mathrm{e}^{2.38} \cdot InfProd^{0.2989}(t-2) \cdot InfEmpl^{0.2109}(t-1) \cdot FAIF^{0.2284}(t-2), \quad (14)$$

http://dx.doi.org/10.21511/pmf.12(2).2023.11

- for Latvia:

$$ITCI(t)_{LVA} = e^{3.98} \cdot InfProd^{0.2178}(t-2) \cdot InfEmpl^{0.3175}(t-1) \cdot FAIF^{0.3698}(t-2), \quad (15)$$

- for Estonia:

$$ITCI(t)_{EST} = e^{2.82} \cdot InfProd^{0.1868}(t-2) \cdot InfEmpl^{0.3365}(t-1) \cdot FAIF^{0.2491}(t-2). \quad (16)$$

Thus, the results of the conducted analysis confirm the hypothesis about the significant impact of tax evasion on the level of competitiveness of the country's tax system. This leads to a constant underpayment of tax revenues by the budget, a decrease in the country's investment and financial potential, and a shift in the tax burden to responsible taxpayers. In general, this leads to a decrease in the international competitiveness of the tax system and leads to labor migration, withdrawal of investments from the country, and closure of businesses. Establishing dependence forms the basis for determining the most priority tools for increasing the country's tax competitiveness.

The results of the study confirmed the hypothesis that shadow tax evasion affects the competitiveness of the country's tax system. The obtained results correlate with the results of previous studies (Mohamadi & Glants, 2018; Mujtaba et al., 2018; Cremer & Gahvari, 2000) in which the level of the shadow economy is defined as one of the influential determinants of the formation of the country's international competitiveness.

At the same time, this study does not support that the geographical location of the country (tax competition mainly exists between geographically adjacent counties; Tao et al. (2023)), the share of intangible capital, and the growth of financial globalization (Quadrini & Ríos-Rull, 2024), and capital tax rate (Tamai, 2022) are factors of the country's tax competitiveness.

At the same time, this paper has several limitations that can be considered in further research. This is due to the impossibility of assessing the full amount of tax evasion due to all schemes, the difficulty of considering the indirect impact of shadowing the economy on the competitiveness of the country's tax system, and the latent relationships between them.

CONCLUSION

This study is devoted to assessing the impact of shadow tax evasion on the level of competitiveness of the tax system of the 11 European countries from 2011 to 2021. Regression equations of dependence between indicators were constructed using regression analysis, Shapiro-Wilk tests, and Spearman's rank correlation.

It has been proven that informal employment has the greatest impact on tax competitiveness. With the help of the Spearman correlation coefficient, it was concluded that the increase in informal production leads to a decrease in tax competitiveness in all countries with a time lag of 2 years. Moreover, changes in the share of firms that compete with unregistered or informal firms and the population's informal employment level affect the level of tax competitiveness in individual countries with a lag of 1 year.

Minimizing these impacts is possible by reforming the country's tax policy to increase its attractiveness both at the international level and among representatives of the domestic business environment by counteracting the shadowing of the economy. The most priority measures to increase the competitiveness of the country's tax system include: combating the manipulation of the amount of the tax burden on the incomes of individuals through unofficial employment, payment of wages "in envelopes", etc.; application of tax tools for the regulation of shadow activities (incentive tax benefits); formation of a

coherent and stable legal framework; introduction of tools for assessing and forecasting the amount of tax debt that comes to the budget due to the implementation of shadow tax evasion schemes.

AUTHOR CONTRIBUTIONS

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ACKNOWLEDGMENT

The study is funded by the EU NextGenerationEU through the Recovery and Resilience Plan for Slovakia under the project No. 09I03-03-V01-00042.

The authors are grateful to the participants of projects "National security of Ukraine through the prevention of financial fraud and money laundering: war and post-war challenges" (2023–2025, state registration number: 0123U101945) and "De-shadowing and regulatory efficiency of environmental taxation: optimization modelling to ensure national security and rational use of nature" (2022–2024, registration number 0122U000777) for numerous discussions and comments.

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