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### **PERSONAL INCOME TAX GAPS: BIBLIOMETRIC AND ECONOMETRIC ANALYSIS**

**Abstract.** The article is devoted to the essence and features of the formation of personal income tax gaps. The object of the paper is 1795 publications indexed in the Scopus database on the tax gaps in the national economy. The time horizon of the study was in 1935—2021. On the basis of bibliometric analysis, the main directions of the study of tax gaps are determined, the trend of changing the number of publications on this issue is analyzed. It is concluded that the theory of tax gap management is quite young and is currently only in its infancy. By the VOSViewer tools, five patterns of frequency of use of keywords in scientific works devoted to the issues of forming tax gaps have been identified, their connection with other economic categories have been determined. The analysis of the publications indexed in the Scopus database on a geographical basis is carried out. Clustering international research networks based on bibliometric analysis of scientific papers on the theory of tax gaps management by geographical location have been done. The article identifies the top Scientific Journals indexed by the Scopus database in which the issues of tax gap management were published most often. According to the Scopus database the most popular theories within this problem are: social theories, inequality and tax morality, management and motivation theories, sustainable development theory, production theory, concepts of fiscal policy implementation. A methodical approach to the assessment of tax gaps for personal income tax is proposed. The personal income tax gaps for Ukraine and European Union countries has been estimated. An average volume of personal income tax gaps within 7—28 %, and there is no positive dynamics in its reducing. The countries with the highest volume of personal income tax gaps include Greece, Poland, the Slovak Republic, Turkey, with the lowest — Germany, Belgium, Latvia, Luxembourg. Based on the Multiple regressions test, the hypothesis about the significant impact of tax gaps on personal income tax on the country's economic development indicators was tested. Graphical interpretation of the link between the personal income tax gap and GDP for Ukraine and European Union countries indicates a negative correlation between them.

**Keywords:** tax gap, shadow economy, tax evasion, GDP, economic development, state policy.

**JEL Classification** E60, E63, C23

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## ПОДАТКОВИЙ РОЗРИВ ЗА ПОДАТКОМ НА ДОХОДИ ФІЗИЧНИХ ОСІБ: БІБЛІОМЕТРИЧНИЙ ТА ЕКОНОМЕТРИЧНИЙ АНАЛІЗ

**Анотація.** Присвячено дослідженню сутності та особливостям формування податкових розривів за податком на доходи фізичних осіб. Об'єктом дослідження є 1 795 публікацій, присвячених податковим розривам у національній економіці, що індексуються у наукометричній базі даних Scopus. Часовим горизонтом дослідження обрано 1935—2021 роки. На основі бібліометричного аналізу визначено основні напрями дослідження податкових розривів, проаналізовано тенденцію зміни кількості публікацій з цього питання. Зроблено висновок, що теорія управління податковими розривами наразі перебуває лише на стадії становлення. За допомогою інструментарію VOSViewer виділено п'ять патернів залежно від частоти використання ключових слів у наукових працях, присвячених питанням формування податкових розривів, визначено їхній зв'язок з іншими економічними категоріями. Проведено аналіз публікацій, проіндексованих у базі даних Scopus за географічною ознакою. Проведено кластеризацію міжнародних дослідницьких мереж з теорії управління податковими розривами за географічним розташуванням. Визначено провідні наукові журнали, проіндексовані базою даних Scopus, у яких найчастіше публікувались питання управління податковими розривами. Згідно з базою даних Scopus, найпопулярнішими теоріями є: соціальна теорія, теорія нерівності та податкової моралі, теорії управління та мотивації, теорія сталого розвитку, теорія виробництва, концепція реалізації фіскальної політики. Запропоновано методичний підхід до оцінювання податкових розривів за податком на доходи фізичних осіб. Оцінено розриви з податку на доходи фізичних осіб для України і країн Європейського Союзу. За результатами дослідження зроблено висновок про те, що середній обсяг розриву за податком на доходи фізичних осіб становить 7—28 %, а позитивна динаміка щодо його зменшення відсутня. До країн із найбільшим обсягом розриву за податком на доходи фізичних осіб належать Греція, Польща, Словацька Республіка, Туреччина, з найменшим — Німеччина, Бельгія, Латвія, Люксембург. На основі тесту множинних регресій було перевірено гіпотезу про значний вплив податкових розривів за податком на доходи фізичних осіб на показники економічного розвитку країни. Графічна інтерпретація зв'язку між розривами за податком на доходи фізичних осіб і ВВП для України та країн Європейського Союзу свідчить про негативну кореляцію між ними.

**Ключові слова:** податковий розрив, тіньова економіка, ухилення від сплати податків, ВВП, економічний розвиток, державна політика.

Формул: 1; рис.: 4; табл.: 2; бібл.: 17.

**Introduction.** Structural changes in the economy in recent years, accompanied by a decrease in the level of material well-being and social protection of the population, lead to an exacerbation of the problem of tax evasion by both entrepreneurs and individuals. Rising social contribution rates, inflation and the value of most goods and services are catalysts for finding new mechanisms for employees to conceal their income, one of which is informal employment.

Data from the International Labor Organization show that the share of shadow employment in the non-agricultural sector of the Latin American economy is in the range of 55%, Asia — from 45 to 85%. In Africa, informal employment accounts for almost 80% of non-agricultural employment, more than 60% of urban employment and more than 90% of new jobs over the last decade.

According to the World Bank data on the level of shadow employment, in Ukraine this figure is 26% and is much lower than in Albania, Kazakhstan and Turkey. However, despite this, its importance has a negative impact on the country's economic development.

**Literature review and the problem statement.** A significant number of scientists have studied the formation of tax gaps in the economy. For example, Yu. Kharazishvili [1] estimated the level of shadow employment in Ukraine on the basis of economic and mathematical modeling and concluded that on average this indicator is at the level of 20.3%, which is equal to 30—40% of GDP. The author claimed that most participants in the informal labor market are employed in the formal sector, and their real wages are 85—90% of the officially declared.

O. Zubenko in his paper analyzed the main drivers of informal employment [2]. According to the results, the author determined that only 44.9% of the population has official employment. At the same time, 23.4% of the employed population have an informal job, most of whom are persons who do not have formal employment at all. The smallest part of the sample works at home on orders.

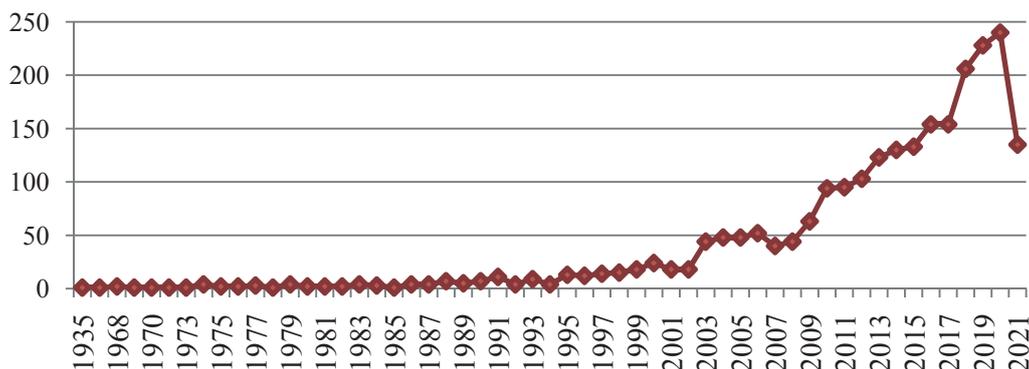
However, even with a slight reduction in the level of illegal employment, its volume is quite critical [3—6] and deserves a more detailed analysis in terms of studying the preconditions for its emergence and consequences for socio-economic development of the country.

The purpose of this research is to estimate the amount of tax gaps on personal income tax in Ukraine and EU countries.

**Research results.** In order to investigate the main trends in the theory of tax gaps development, we will conduct a bibliometric analysis of research on this issue. This will allow us to determine the main directions of further research on this issue, to carry out clustering of research networks according to various classification features, to determine its connection with other scientific schools and areas of research.

In the first stage, we will search for scientific publications indexed by the Scopus database by the keywords «tax gap» and «tax gap management». A total of 2,361 publications were found in the Scopus database, the first of which dates back to 1935. However, given that the most active research on this issue, scientists have been engaged since 2010, the time horizon for the analysis was chosen for the period 2010—2021, and the object of study — 1795 publications (the study excluded conference materials and textbooks).

Based on the results of the search for publications by keywords, we will conduct a retrospective analysis of the development of the concept of forming tax gaps and build a trend of changing the number of publications on this issue (*Fig. 1*).



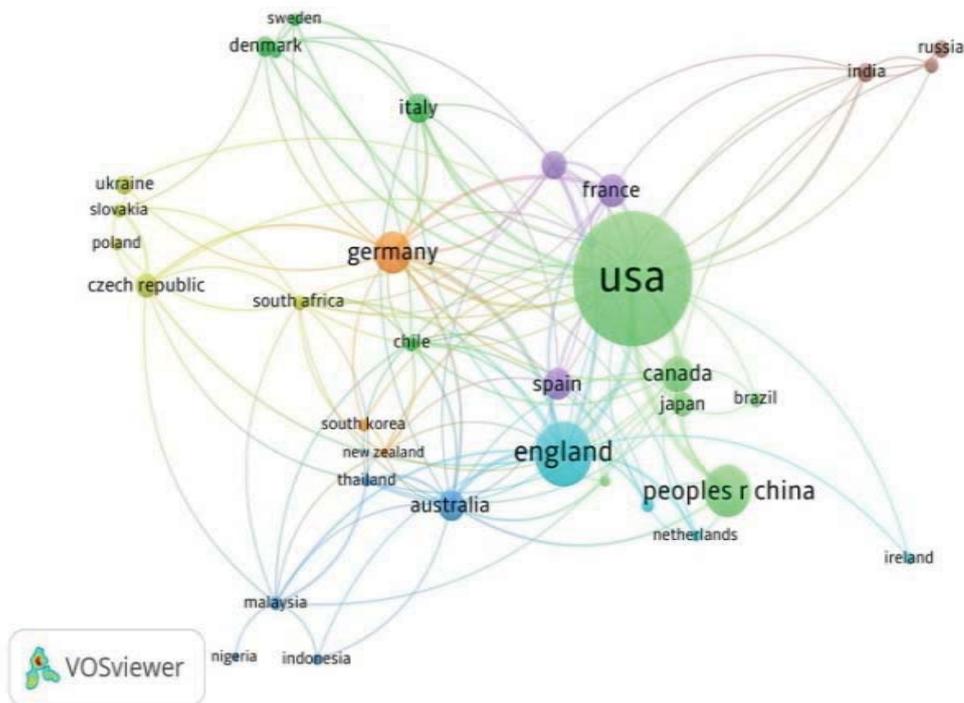
**Fig. 1. The trend in the number of publications on tax gaps in the national economy**  
*Source:* compiled by the authors on the basis of the Scopus database.

According to the results of the study, it is concluded that the theory of tax gap management is quite young and is currently only in its infancy (a significant increase in interest in this issue has occurred only in the last 4 years).

In the second stage, using the software package VOSViewer will conduct a bibliographic analysis of the theory of management of tax gaps. Analysis of metadata of publications (title, authors and country affiliation, annotations and keywords, list of references) allowed us to identify five patterns of frequency of use of keywords in scientific works and their connection with other economic categories (*Fig. 2*).

According to the results of bibliographic analysis, 74 key words (the frequency of use of which is more than 5) were identified and grouped into five structural and functional patterns. Most often the concept of tax gap management is studied in connection with social theories, inequality and tax morality (pattern 1), management and motivation theories (pattern 2), sustainable development theory (pattern 3), production theory (pattern 4), concepts of fiscal policy implementation (pattern 5).





**Fig. 3. Clustering of international research networks based on bibliometric analysis of scientific papers on the theory of management of tax gaps by geographical location**

Source: compiled by the authors on the basis of VOSViewer toolkit.

In general, the results of the analysis can be concluded about a significant level of research on the issues of estimating the volume and management of tax gaps in the economy. At the same time, given the wide variety of types of tax gaps due to the different specifics of accrual and payment of certain types of taxes and fees, it is important to develop methodological approaches to assessing gaps in terms of each type of tax payment. However, if for certain types of taxes and fees (VAT, corporate income tax) there is a significant number of approaches to estimating the amount of tax gaps in the scientific literature [7—10], some of them are poorly studied and require more detailed study.

Thus, one of the least studied types of tax gaps is the gaps in personal income tax. As illegal employment is difficult to predict and manage, a precondition for a range of economic, social and political factors [11—16], timely identification of economic losses due to shadow employment will help to review the current policy to combat illegal employment and increase the effectiveness of measures taken.

Data on the level of average wages per employee formed in the official sector of the national economy will serve as an information base for estimating the amount of tax gaps for personal income tax and the single social contribution (SSC). In the future, depending on the personal income tax rate and the single social contribution, the amount of tax gaps on these payments will be determined by the formula:

$$Tax\ Gap_{IIT} = S_{OE} \cdot r \cdot EMP_{SE},$$

$Tax\ Gap_{IIT}$  — the amount of tax gaps on personal income tax;  $S_{OE}$  — the level of the average salary of one employee, which is formed in the official sector;  $r$  — personal income tax rate;  $EMP_{SE}$  — number of informally employed

Based on the data of the World Bank, we will estimate the amount of uncollected tax payments for Ukraine and the countries of the European Union. The results of the calculations are shown in *Table 1*.

Table 1

**Volumes of tax gaps on personal income tax, million dollars**

Country	2016	2017	2018	2019	2020
Austria	23977,4	243474	241331	204194	207267
Belgium	236088	232240	236818	233603	232699
Bulgaria	4829,05	4914,78	4864,05	4908,11	4923,98
Croatia	21822,9	20630,6	21238,3	20758,8	20514,9
Czech Republic	64204,3	68707,4	68243,5	72974,7	76043,5
Denmark	234133	228232	238921	243033	248009
Estonia	6465,22	6661,01	6848,82	7662,07	8447,1
Finland	154811	152665	156538	162377	166524
France	636253	1404627	1412736	1402200	1514612
Germany	1056272	1093407	1,1E+07	8781773	1,1E+07
Greece	19589,3	196853	200637	173619	179779
Hungary	30248,8	33042,6	311742	267721	329739
Iceland	19483,9	21658,1	22019,7	24064,1	25604,8
Ireland	107847	113986	115168	120077	123984
Italy	1213215	1200868	1200244	1318727	1430665
Latvia	9296,88	9496,25	12983,4	12663,5	13592,5
Lithuania	10073,5	11041,8	11306,1	12029,8	12647,9
Luxembourg	13939,8	16526,4	15812,4	17542,3	18623,2
Netherlands	775080	775242	779744	797680	808489
Norway	95767,2	99632,7	103166	105583	108525
Poland	568446	586740	588335	652438	713393
Portugal	151571	155613	159085	163113	167016
Romania	61068,8	61562,2	38798,2	44068,9	39934,9
Serbia	6110,45	7498,2	5028,82	6604,7	6872,36
Spain	885100	918550	9274379	7578915	9242404
Sweden	210621	216951	222236	230239	237110
Switzerland	24086,8	244581	241268	202269	204055
Turkey	477237	538885	547166	586937	620429
Great Britain	919534	956136	9,4E+07	7,5E+07	9,4E+07
Ukraine	444346.7	586707.6	675810.2	2841625	325301.7

Source: authors calculations based on [17].

Assessment of the volume of tax gaps showed that the level of shadow employment fluctuates within 7—28 %, and there is no positive dynamics in reducing the volume of shadow employment. The countries with the highest level of shadow employment include Greece, Poland, the Slovak Republic, Turkey, with the lowest — Germany, Belgium, Latvia, Luxembourg. Analysis of the rate of change in the volume of tax gaps by these taxes for 2016—2020 showed a gradual increase in almost all countries (by 78 % in the Czech Republic, by 81 % in the Netherlands, by 46 % in Turkey, etc.). The lowest growth rates of these tax gaps were in Austria (3.5 %), Bulgaria (4.35 %), Italy (1.61 %).

The results of the analysis showed an increase in the volume of tax gaps on personal income tax for 2016—2020 by 260.78%. At the same time, the share of the population employed in the shadow sector of Ukraine's economy during this period decreased by only 1.3% (from 22.9% in 2010 to 21.6% in 2018) and does not exceed the world average. Comparison of these data shows the existence of significant problems in the administration of these taxes and the low efficiency of tax reform processes in this area. Thus, after the increase in PIT rates from 15% to 18% in 2016, the annual growth rate of tax gaps on this tax has increased almost threefold (in 2014 — 6%, in 2015 — 14%, in 2016 — 36%, in 2017 — 28%, in 2018 — 20%). At the same time, the reduction of the single social contribution rate in 2016 from 34.7% to 22% did not lead to a reduction in the relevant tax gaps (in 2016 it amounted to UAH 150.43 million, in 2017 — UAH 312.2 million, in 2018 —

UAH 348.06 million). In general, in Ukraine, the total amount of tax gaps for this group of payments in 2018 amounted to UAH 68,158.28 million, i.e. almost 2% of the country’s GDP.

Significant tax gaps in most of the analyzed countries allow us to hypothesize the significant impact of shadow employment on the economic development of these countries.

Graphical interpretation of the link between the analyzed indicators shown in Fig. 4 indicates a negative correlation between them. The growth of the PIT Gaps leads to a deterioration in the country's economic development.

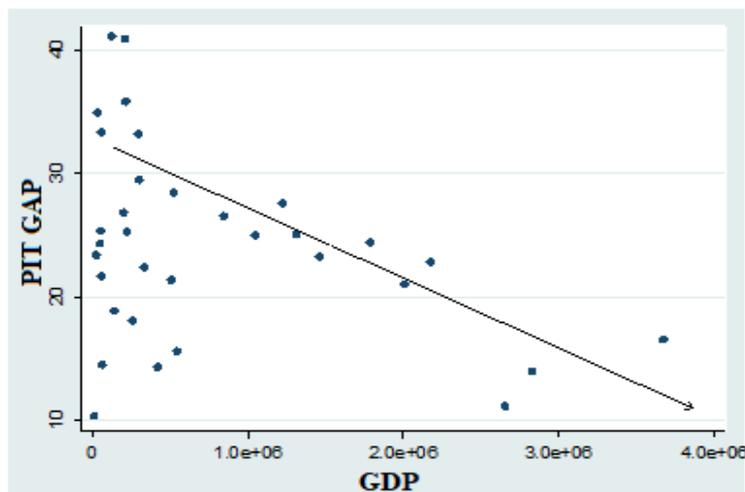


Fig 4. Comparison of the PIT gap and GDP in European countries

Source: Compiled by the authors.

The results of the Multiple regressions test confirmed statistically significant the impact of PIT GAPS on the GDP in European countries (Table 2).

Table 2

The findings of the Multiple regressions test

Country	R	F-value	p-value	Country	R	F-value	p-value
Austria	-3,8684	2,43	0,0106	Latvia	-4,1410	-1,11	0,0039
Belgium	-4,1410	1,11	0,0390	Lithuania	-3,1054	-6,24	0,0439
Bulgaria	-3,1054	-6,24	0,0439	Luxembourg	-0,7845	-1,94	0,0057
Croatia	-0,7845	-1,94	0,0057	Netherlands	-2,6258	0,94	0,0112
Czech Republic	-2,6258	0,94	0,0112	Norway	-0,6018	-0,36	0,0072
Denmark	-0,6018	-0,36	0,0072	Poland	-2,4989	-3,07	0,0376
Estonia	-2,4989	-3,07	0,0376	Portugal	-0,1354	-0,55	0,0093
Finland	-0,1354	-0,55	0,0093	Romania	-2,6698	-0,56	0,0041
France	-2,6698	-0,56	0,0041	Serbia	-0,6356	-0,17	0,0061
Germany	-0,6356	-0,17	0,0061	Spain	-2,1814	-0,23	0,0106
Greece	-2,1814	-0,23	0,0106	Sweden	-0,1853	-0,30	0,0095
Hungary	-0,1853	-0,30	0,0095	Switzerland	-1,4100	2,45	0,0118
Iceland	-1,4100	1,24	0,0146	Turkey	-0,2695	1,98	0,0012
Ireland	-0,2695	-0,10	0,0012	Great Britain	-2,1343	0,26	0,0851
Italy	-3,8684	2,43	0,0106	Ukraine	-1.698	0.17	0.0425
*p < ,05 ** p < ,01 ***p < ,001, Standard errors within parentheses							

Thus, we can conclude about the impact of PIT gaps on a country's economic development. Tax evasion decreases the country's GDP and as a result stimulates the growth of the budget deficit.

**Conclusions.** A retrospective analysis of the study of the tax gap management concept allowed us to make a conclusion about its ambiguous nature. On the one hand, the first single publications on this issue appeared in 1935, and on the other — it can be described as young, given

that most publications appeared only since 2013. The clustering of research networks on a geographical basis showed a low level of cooperation between scientists. Despite the fact that the vast majority of publications are inter-university in nature, the level of its internationalization is insignificant. Only 33 countries have more than 20 publications in this area of research. For most countries, their number is from 1 to 5. The degree of cooperation of scientists is quite low, which leads to the lack of scientific schools dedicated to the study of these issues. Most studies are local. F. Schneider was identified as a leading scientist in this field. The results of the Multiple regressions test confirmed statistically significant differences between PIT Gap and GDP for all analyzed countries. It allowed confirming the hypothesis that shadow employments had a statistically significant impact on the country's economic development.

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