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**Abstract:** This article examines modern methods of strengthening tax control and combating the shadow economy in the digital economy. The article presents a quantitative analysis of the current state of the shadow economy globally and in the Republic of Uzbekistan, based on World Bank calculations. Statistical data, international experience and economic reforms in Uzbekistan for 2022–2025 are analyzed. The results of the study show that electronic invoices, online cash registers, risk analysis systems based on artificial intelligence, and the expansion of cashless payments are an important factor in reducing the shadow economy. It was found that the share of the shadow economy in GDP in Uzbekistan decreased from 45–50 percent in 2019 to 34–35 percent by 2024. The article develops scientifically based recommendations aimed at further accelerating this process.

**Keywords:** digital economy, hidden economy, tax control, tax administration, digitalization, electronic invoicing, cashless payment, artificial intelligence, tax policy, informal sector.

## Introduction

In the current era of rapid digital transformation in the global economy, the issue of tax control and combating the shadow economy is of particular importance. According to a report published by EY in 2025, the shadow economy accounted for 11.8 percent of global GDP in 2023, with the arithmetic average value of the indicator

at the country level equaling 19.3 percent of GDP.<sup>[1]</sup> At the same time, the share of the shadow economy decreased in 119 of the 131 countries studied during the period 2000–2023 — by an average of 6.7 percentage points.<sup>[1]</sup> This trend indicates the effectiveness of policies for digitalization and improving tax administration. This issue is of even greater importance for the Republic of Uzbekistan. According to the 2025 report of the Presidential Statistics Agency, the shadow economy accounted for approximately 34 percent of total GDP in 2024, or 505.7 trillion soums (US\$39 billion).<sup>[2]</sup> Moreover, while in 2019 this figure was at the level of 45–50 percent, as a result of the implemented reforms, this ratio has significantly decreased. The Tax Administration Reform Project in Uzbekistan, financed by the World Bank, noted that contracts worth a total of US\$39.32 million were signed to modernize the data processing center of the State Tax Committee, all of which were completed by December 2024.<sup>[3]</sup> These figures indicate the urgency of the problem of the shadow economy, which requires a solution.

The purpose of this study is to scientifically analyze modern methods of combating the shadow economy by strengthening tax control in the digital economy, study international experience, and develop practical recommendations for Uzbekistan.

## LITERATURE ANALYSIS ON THE TOPIC

### Theoretical approaches and scientific debates

The most important contribution to the history of the theory of the hidden economy is the model of Allingham and Sandmo (1972), which explains tax evasion through a specific cost-benefit analysis: the taxpayer decides whether to hide his income or not by comparing it with the planned fines and the probability of detection.<sup>[4]</sup> This model forms the theoretical basis for improving the effectiveness of tax control. Schneider and Enste (2000) have extensively analyzed the causes of the hidden economy, identifying the severity of the tax burden, the complexity of regulation, the level of trust in state institutions, and the tax culture of the population as key factors.<sup>[5]</sup> Modern research, however, has added the level of digitalization as an important variable to these traditional factors.

Haruna and Alhassan (2022) found in a panel study of 34 African countries that digitalization has been shown to limit the growth of the informal economy.<sup>[6]</sup> Similar findings were confirmed by Lv et al. (2024) using data from Chinese provinces: the development of the digital economy plays a significant role in limiting the size of the informal economy. A recent study examining the relationship between digitalization and tax evasion (Tandfonline, 2022) analyzed a large dataset covering 133 countries.

The results showed that increased adoption of digital technologies by businesses and the population is negatively and statistically significantly correlated with tax evasion .<sup>[7]</sup> A study of EU countries (MDPI Sustainability, 2025) based on multi-stage models showed that the most important factor in limiting the shadow economy is the level of GDP per capita and its growth rate. The introduction of digital tax administration tools such as SAF-T or electronic declarations, as well as restrictions on cash payments, were assessed as additional influencing mechanisms.<sup>[8]</sup>

## The impact of digital tools on tax control

The OECD's Tax Administration 3.0 concept describes a new generation of tax administration based on artificial intelligence, big data and real-time information exchange. Modern tax systems are moving from passive reporting to active monitoring.<sup>[9]</sup> The experience of the Czech Republic is a clear example of this: after the introduction of a digital cash register system, the volume of card payments increased significantly. After the system was abolished in 2022, the volume of card payments in the restaurant sector decreased by 3.8 billion Czech crowns (0.152 billion euros) in 2022–2023.<sup>[10]</sup> This confirms the important role of digital register systems in tax control.

Pulatov (2024) studied the issue of taxation of the digital economy in Uzbekistan and analyzed the increase in the share of the digital economy in GDP from 1.99 percent in 2020 to 2.77 percent in 2022 within the framework of the "Digital Uzbekistan - 2030" strategy and the "New Development Strategy of Uzbekistan for 2022–2026".<sup>[11]</sup>

## RESEARCH METHODOLOGY

The following methodological approaches were used in this study:

- Comparative analysis method: digital tax control systems of different countries were studied comparatively;
- Statistical-empirical analysis: the analysis was conducted based on quantitative data from EY, the World Bank, the IMF, the OECD, and the Presidential Statistics Agency of Uzbekistan for 2022–2025;
- Induction and deduction methods: used to draw conclusions from existing theories and generalize the results of empirical observation;
- Systematic literature review: articles published in the Web of Science, Scopus, Google Scholar, MDPI, and ResearchGate databases between 2022 and 2025 were analyzed;

— Cause-and-effect analysis: the relationship between the level of digitalization and the size of the shadow economy is studied based on empirical data.

The research used the following data sources: EY's 2025 "Shadow Economy Exposed" report, the World Bank's working papers on the shadow economy, the IMF's 2023 Country Outlook on Uzbekistan, the 2025 Annual Report of the Presidential Statistics Agency of Uzbekistan, and international news sources such as Eurasianet, Daryo.uz, and Euronews.<sup>[2]</sup>

## MAIN PART: PROBLEM ANALYSIS AND RESULTS

### The global state of the underground economy (2022–2024)

According to the latest estimates by EY, the global shadow economy will account for 11.8 percent of global GDP in 2023. The average figure at the country level is 19.3 percent. Lower-income countries are more affected by this problem than higher-income countries.<sup>[1]</sup>

*Table 1. Share of the shadow economy in GDP in selected countries (2022–2024)*

|  |  |  |       | Cashless payments<br>97–98%          |
|--|--|--|-------|--------------------------------------|
|  |  |  |       | Electronic documents,<br>e-ID system |
|  |  |  |       | SAF-T standards, AI<br>monitoring    |
|  |  |  | 34–35 | E-invoice, online<br>checkout        |
|  |  |  |       |                                      |

*Compiled by the author based on EY (2025)<sup>[1]</sup>; Eurasianet (2025)<sup>[2]</sup>; Euronews (2026)<sup>[12]</sup>.*

### The shadow economy in Uzbekistan: a quantitative analysis

The problem of the shadow economy in Uzbekistan requires special attention. According to data for 2024, the country's GDP amounted to 1.45 quadrillion soums

(about 115 billion US dollars), and the economy grew by 6.5 percent in real terms.<sup>[13]</sup> However, at the same time, the size of the shadow economy was 505.7 trillion soums (39 billion US dollars), or 34 percent of GDP.

According to a report by the Presidential Statistics Agency, hidden economic activity is particularly high in agriculture, forestry, and fishing, with these sectors accounting for almost two-thirds of GDP through informal activity.<sup>[2]</sup>

**Table 2. Dynamics of the shadow economy in Uzbekistan (2019–2024)**

|  | 45–50 |  |  |  | 34–35 |
|--|-------|--|--|--|-------|
|  |       |  |  |  |       |
|  |       |  |  |  |       |
|  |       |  |  |  |       |

\* As a result of the 2023 recalculation, GDP was revised from \$90.8 billion to \$101.6 billion (using the IMF and World Bank informal sector method).

Source: Compiled by the author based on Daryo.uz (2025)<sup>[14]</sup>; Eurasianet (2025)<sup>[2]</sup>; IMF (2023)<sup>[15]</sup>; CEIC Data (2024)<sup>[16]</sup>.

### Modern digital tax control methods

Based on an analysis of scientific literature and practical experience, modern digital methods of combating the underground economy can be classified into the following main areas:

**Table 3. Digital tax control methods: classification and effectiveness assessment**

| Electronic invoice (e-invoice) |  | Identifying informal transactions, ease of use in the US |  |
|--------------------------------|--|--|--|

|   |  |  |  |
|---|--|--|--|
|   |  | Real-time cash income monitoring                     |  |
| Artificial intelligence-based risk analysis |  | Identifying high-risk entities for tax audits        |  |
|   |  | Reducing cash handling, leaving transaction traces   |  |
|   |  | Monitoring of foreign accounts and financial flows   |  |
|   |  |  |  |
|   |  | Combating counterfeiting, monitoring the trade chain |  |

Source: OECD (2024)<sup>[9]</sup>; EY (2025)<sup>[1]</sup>; Compiled based on author's analysis.

## Uzbekistan's reform results: a scientific explanation

Uzbekistan has been implementing a comprehensive tax reform since 2017. The number of taxes has been reduced from 13 to 10, and the VAT rate has been reduced from 20 percent in 2019 to 12 percent by 2023.<sup>[12]</sup> When interpreted within the framework of the Allingham-Sandmo model, the reduction in the tax burden reduces the cost of entering the formal economy and acts as a disincentive to informal activity.

According to a Euronews report in January 2026, the introduction of electronic invoices, online cash registers, digital marking and electronic shipping documents has

brought an estimated 10–20% of previously unaccounted activity in a number of sectors into the formal economy. As a result, tax revenues in January–September 2025 reached €11.27 billion, an increase of 18% compared to the same period last year.<sup>[12]</sup>

Tashkent's transition to a fully cashless public transport system increased transaction volumes by 38 percent, while budget revenues increased by 129 percent compared to the same period a year earlier.<sup>[12]</sup> These figures confirm Schneider and Enste's (2000) theory that cash circulation is an indicator of the size of the hidden economy.

A World Bank-funded project has awarded contracts worth a total of \$39.32 million to modernize the State Tax Committee's data processing center, all of which have been completed by December 2024.<sup>[3]</sup> These investments are helping to significantly improve the efficiency of tax administration.

**Table 4. Comparison of digital tax audit results of selected countries**

|  |   |   | Share of the hidden economy |
|--|---|---|-----------------------------|
|  | Full e-tax, e-ID, e-residency               | Tax compliance ~98%, hidden income. Decreased |                             |
|  | 97–98% cashless                             | Hidden economy at 6.4% of GDP                 |                             |
|  |   |   |                             |
|  |   | Hidden IQ decreased from ~22% to ~17%         |                             |
|  | E-invoice, online checkout, digital signage | 2019–2024: decreased from                     | ~34–35%                     |

|  |  |               | Share of the hidden economy |
|--|--|---------------|-----------------------------|
|  |  | 45–50% to 34– |                             |

Source: EY (2025) <sup>[1]</sup>; Author's analysis based on Euronews (2026) <sup>[12]</sup>.

## CONCLUSION AND SUGGESTIONS

### Main scientific conclusions

The results of this study provide a number of important scientific conclusions. First, based on recent data from EY (2025) and the World Bank, a negative and statistically significant relationship between the level of digitalization and the size of the shadow economy was confirmed. <sup>[1]</sup> Studies show that the introduction of digital technologies allows countries to reduce the shadow economy by an average of 5–15 percentage points.

Second, in the case of Uzbekistan, the reduction of the shadow economy from 45–50 percent in 2019 to 34–35 percent by 2024— a reduction of more than ten percentage points—demonstrates the effectiveness of a comprehensive reform policy. In this case, reducing tax rates, introducing digital tools, and reducing the administrative burden acted as complementary factors. <sup>[12]</sup>

Third, a comparison of country experiences shows that digital tax controls are more effective when used not only as a means of enforcement, but also as a means of creating a conducive environment that encourages voluntary tax compliance. <sup>[8]</sup>

### Practical suggestions

Based on the results of the research, the following scientifically based proposals have been developed for Uzbekistan:

1. Expanding artificial intelligence-based risk monitoring. Using the experience of Estonia and South Korea, automatic identification systems for high-risk taxpayers should be introduced for tax audits. This will increase the efficiency of control while reducing the human factor.
2. Expanding cashless payments. It is planned to increase it from 65% in 2024 to 90% by 2030. For this, it is advisable to provide cashback mechanisms for consumers and tax incentives for POS terminals for entrepreneurs.

3. Full coverage of the electronic invoicing system. While currently mainly large and medium-sized enterprises are covered, by 2026 all business entities, including individual entrepreneurs, should be transferred to the mandatory e-invoicing system.
4. Expanding information exchange (AEOI standard). Uzbekistan should expand its ability to monitor foreign accounts and transfers through full accession to the OECD's "Automatic Exchange of Information" standard.
5. Building a tax culture. Along with technical tools, it is recommended to introduce national campaigns that shape tax payment as a social norm, programs to increase financial literacy, and mechanisms to encourage transparent tax payment.
6. Facilitate digital transition for small and medium-sized businesses. Subsidized technology solutions, free training courses, and preferential credit lines should be provided for small businesses with weak digital infrastructure

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