

## Model of interaction between the government and business towards legalization of unorganized imports

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**Abstract.** Ukraine's economy quickly integrated into the system of shadow financial flows and used standard tools to manipulate export and import prices and financial instruments. In terms of cumulative outflows of shadow capital, Ukraine is among the top twenty countries. The research relevance is predefined by the main directions of legalization of economic processes, including in the segment of shadow imports, which involve the formation of optimal institutional strategies for the behaviour of social agents (government and business). The research aims to select the Government's strategy for legalizing unorganized imports, which will allow the establishment of effective interaction between social agents on mutually beneficial terms. Research methods include mathematical analysis and game theory, used to build mathematical models, which reveal the intrinsic rationality of individual interactions, aggregating a set of social situations into several options and reducing the uncertainty of a set of behavioural options to a clear and stable pattern of regular interaction. The results showed that the level of employees' salaries is not crucial for overcoming shadow imports, but the level of integrity of customs officers is a more important indicator. The article shows that the mechanism of legalization of shadow operations (in particular, unorganized imports) should be based not only on economic but also on social parameters: the level of moral and professional principles of customs officers. The practical value of the research results is to improve the mechanisms of legalization of unorganized imports in Ukraine

**Keywords:** corruption; shadow economic activities; integrity; strategies of import legalization; tax morale

### Introduction

There are two main components of the modern economy: observable and invisible (unobservable). The unobserved economy is a complex phenomenon and combines qualitatively diverse activities that are not fully or partially subject to the supervision of formal economic institutions. The composition of the unobserved economy is complex and includes shadow, informal and criminal economic activities. Although all types of unobserved economic activity are a problem for the economy and social sector of the country, the most acute task from the point of view of state regulation of the economy is to bring non-criminal economic activity out of the shadows.

The shadow economy forms a significant share of the world economy and has a similar organizational and economic mechanism of operation to that which operates in the formal sector. The main difference is that economic activity

carried out in the "shadow" is legal, but it is for some economic or social reasons hidden from public authorities by businesses. In the modern world, there is no country, no economy without a shadow economy, including in the field of foreign goods trade, on a larger or smaller scale. The dynamic development of international relations stimulates and diversifies the shadow economy in the field of foreign goods trade, and it is gaining regional and global scale.

Foreign trade is one of the most illegal areas of the economy in Eastern Europe. Those economies are transit economies (Prytula, 2019). The shadow economy in the field of foreign goods trade is associated with the implementation of foreign economic activity operations that are carried out in violation of applicable law to minimize economic costs, by evading the payment of mandatory taxes and fees. The shadow

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economy in the field of foreign goods trade can be divided into that associated with the activities of exporters and importers.

The study will focus on unorganized imports – informal cross-border trade – the legal import of goods into the country for resale on the domestic market. The existence of this trade leads to the loss of customs duties and taxes and other taxes: income tax and value-added tax. Potential harm to society is caused not only by unorganized imports, in terms of loss of customs duties, but also by the misuse of public resources caused by bribery.

Detailed research on the causes and size of shadow financial flows by K. Brandt (2023), proved that illicit financial flows constitute a major development challenge for low-income countries.

Despite the literature evolving rapidly, several past literature reviews are worth mentioning. These include J.P. Döbel (2022), L. Andriani *et al.* (2022). They review studies that focus on integrity and corruption have been deeply connected throughout history both as concepts and ethical realities. C. Santiso (2022) analyses the rise of integrity-tech and integrity analytics in the anticorruption space, deployed by data-savvy integrity institutions. B. Kelmanson *et al.* (2019) examined the drivers, and reestimated the size of shadow economies in Europe, with a focus on the emerging economies, and recommended policies to increase formality.

The study aims to determine the nature of shadow processes (unorganized imports within cross-border trade), the factors that stimulate the shadowing of imports, and the development of proposals to ensure the strategies of import legalization in cross-border trade.

### Literature review

The study analysed the shadow economy existence theories, in particular in transitional economies, which allowed further formulation proposals for reducing the level of the shadow economy within foreign goods trade. The main goal was to find a certain deviant behaviour of economic agents in theories of the existence of the shadow economy. As a result, the following was singled out: the theory of tax morality, institutional theory, and the theory of rational behaviour.

Following the theory of tax morality, F. Carre *et al.* (2020); C. Daude *et al.* (2013); B. Kastlunger *et al.* (2013), I. Lago-Peñas and S. Lago-Peñas (2010); D.M. Kemme *et al.* (2020) determined, that the level of shadowing of the economy depends primarily not on the economic indicators of the country's development, but on what moral norms prevail in it. Empirical studies conducted by proponents of this theory have shown that for the United States and European countries, there is a statically significant negative correlation at 0.5% between the levels of tax morale and shadow economy (-0.46), for countries with transitional economies – (-0.657) at the level of 0.1% (Alm & Torgler, 2006; Koumpias *et al.*, 2020; Santiso, 2022).

Institutional theory grounds the development of the informal sector of the economy on the imbalance between the moral norms of the functioning of formal and informal institutions in the country (North, 1990; Helmke & Levitsky, 2004; Andriani *et al.*, 2022). Proponents of this theory argue about the duality of the rules governing the behaviour of economic agents. On the one hand, the rules of economic activity in the country are determined by several regulations and provisions, the implementation of which is mandatory for all institutions, and on the other hand state institutions

are often guided by informal rules of conduct that contradict the declared norms and undermine trust. In the case of asymmetry in favour of the latter, the country is developing an informal sector of the economy and shadow activities. Therefore, the shadow economy is becoming a hybrid model of governance between non-governmental institutions in border regulation, creating informal cross-border trade (Titeca & Flynn, 2014).

As far as the theory of rational behaviour of participants in the informal sector of the economy is concerned, G.S. Becker (1968) determines limited resources and the desire to maximize their profits as the motive for the actions of economic entities involved in the shadow economy. According to G. Becker, and C.C. Williams (2021), an increase in public funding for the activities of control bodies in the field of fighting the shadowing of the economy in the short term leads to a decrease in the number of economic offences, and in the long term to its growth.

M.L. Morris and M.D. Newman (1989), and N. Garoupa (2014) concluded that revenues in the shadow sectors are significantly reduced due to the cost of bribes to officials, fines and other economic sanctions imposed on them if the authorities detect the fact of operations in the shadows. With the costs of shadow operations exceeding those of players in the official market for goods and services, the informal sector of the economy begins to grow rapidly. On the other hand, deviant consumer behaviour in the informal sector of the economy has been studied by I.A. Horodnic *et al.* (2021). The authors consider the time spent searching for and purchasing illegal goods as the main expenses of the consumers. The authors proved that the demand in the shadow market of goods will exist as long as these costs do not exceed the difference between prices in the official and shadow markets.

The effect of the probability to be punished for an economic offence was studied by D. Tartani and J. Gibbs (1968). According to the analysis, scientists have come to the opposite conclusions: according to D. Tartani (1970), a reduction in the probability to be punished leads to a decrease in the level of shadowing, while J. Gibbs argued that only the realization of the inevitability of punishment leads to a decrease in the informal economy.

Following the Customs Reform declared in Ukraine (Communications Department of the Secretariat of the CMU, 2021), three areas have been identified according to which it is advisable to reform the Customs Service: reduction of corruption risks; creation of high-quality and transparent services; motivating employees to work honestly.

### Materials and methods

If considering the model of interaction between the state and business as a factor that generates the shadow economy, there is a need to find such patterns and properties of this interaction model that would ensure its balance. In the domestic market of import of goods, there are firms which operate in the legal and shadow sectors and their transition to the legal or shadow sector is adjusted by the actions of the Government.

Businesses which operate in the legal and shadow sectors act rationally. It is believed that the shadow sector maximizes expected profits through the payment of bribes at customs. The legal sector chooses the optimal volume of output, based on the principle of maximum profit with increasing sales, and in the absence of such an alternative, legal business partially or completely transits to the shadow sector.

The government maximizes its benefits through increased tax revenues. Under these conditions there is an exogenous parameter, the value of which depends on (1) the economic parameter: the level of wages of customs officers and (2) the social parameter: the level of integrity of the customs officer. That is, there is a function that grows for each argument (Eq. 1):

$$\mu = f(k; g), \tag{1}$$

where:  $\mu$  – exogenous parameter;  $k$  – the level of wages of customs officers;  $g$  – the level of integrity of the customs officer.

The intensity of growth of shadow activity in foreign trade is influenced by the exogenous parameter, which is formed by the business: the size of the bribe and the endogenous parameter: customs rules in the country, i.e., there is a function of the intensity of the fight against illegal imports (Eq. 2):

$$F = f(\mu z; k), \tag{2}$$

where:  $\mu$  – exogenous parameter;  $z$  – the size of the bribe;  $k$  – customs rules in the country.

This function does not decrease by the arguments in the exogenous parameter in (Eq. 1) and in customs rules in the country in (Eq. 2) and does not increase by the argument: the size of the bribe (Eq. 2). That is, an increase in the salaries of customs officers, the amount of funds allocated to fight illegal imports and an increase in the level of integrity of a customs officer lead to a decrease in the size of shadow activities, and an increase in bribes, on the contrary, leads to an increase in illegal imports.

It should be noted that a bribe will not be effective if it does not reach the level of exogenous parameters. There is also an indicator factor: the lower limit of the level of moral professional principles, which does not exceed the desire to receive a bribe. But if the size of the bribe for illegal imports reaches the appropriate level – this inequality changes the sign (Eq. 3):

$$F = f(\mu g, z; k) = f(\mu, g, k), z < z(g), \tag{3}$$

where:  $g$  – the lower limit of the level of moral professional principles.

The interests of business and the Government are opposite. The Government's interest is to maximize the taxes paid to the budget, which is equivalent to losing a business that has to pay all taxes. It is assumed that each subject can choose only one solution from a finite set of their actions. It

should be noted that each subject knows which strategy the other has chosen, i.e., has complete information about the outcome of the opponent's choice.

That is a classic antagonistic game, which is represented by a game of two subjects with winning functions (Eq. 4):

$$u_1(s_1, s_2) = -u_2(s_1, s_2) = u(s_1, s_2), \tag{4}$$

where:  $u$  – tax revenues.

Saddle point  $s_1^0, s_2^0$  of the function  $u(s_1, s_2)$ , a point at which  $u(s_1, s_2^0) \leq u(s_1^0, s_2^0) \leq u(s_1^0, s_2)$  for any  $s_1 \in S_1, s_2 \in S_2$ . Equivalent notation (Eq. 5):

$$\max_{s_1 \in S_1} u(s_1, s_2^0) = u(s_1^0, s_2^0) = \min_{s_2 \in S_2} u(s_1^0, s_2), \tag{5}$$

it becomes evident that the use of point saddles is justified as a solution to the antagonistic game.

### Results and discussion

The current business environment demonstrates that a significant share of Ukrainian enterprises operates in the informal economy and are forced to adapt to several limitations. The level of uncertainty of the external conditions of an entity's activities in the shadow economy depends on the nature of the uncertain factors, i.e., there is an effect of expanding the set of uncertain factors with increasing the duration of the decision-making process. As an example, there is the situation typical for Ukraine, namely the relationship between the volume of goods legally transported across the customs border of the state, and the share of undeclared volume of goods. During 2019, the largest share was accounted for by operations on the import of goods into the customs territory of Ukraine in the amount of \$50 thousand up to \$150 thousand (Official website of the State Customs Service of Ukraine, n.d.).

As far as statistical research is concerned, it is advisable to focus on the main features of the general population with two random variables X and Y. Let us consider a sample set of finite volume, for example, n. Then, the elements of the sample are pairs of numbers (x, y), and the frequency of these values is denoted by  $n_{xy}$ . The sample results are conveniently recorded in the form of a table (Table 1), where the operations are given by an interval variation series with an interval of \$20,000: 50-70, 70-90, 90-110, 110-130, and 130-150. To simplify the calculations, the interval series of values of the variable  $x_i$  will be replaced with a discrete variation series, choosing the middle of the intervals, and consider the share  $y_j$  of undeclared goods as a percentage of 0 % to 50%.

Table 1. The sample population of finite volume

$x_i \backslash y_j$	0	10	20	30	40	50	$n_{xi}$
50	4	4	3	2	3	4	20
60	5	4	2	3	2	4	20
80	4	5	5	4	5	2	25
100	3	4	5	6	4	3	25
120	2	2	3	2	3	3	15
140	2	1	2	3	3	4	15
$n_{yj}$	20	20	20	20	20	20	120

Therefore, the total sample size is  $n = 120$ .

Mathematical expectations are estimated by the formulas (Eq. 6, Eq. 7):

$$M[X] = \bar{X} = \frac{1}{n} \sum_{i=1}^m n_{xi} x_i = \frac{1}{120} (20 \cdot 50 + 20 \cdot 60 + 25 \cdot 80 + 100 \cdot 25 + 15 \cdot 120 + 15 \cdot 140) \approx 88,3, \quad (6)$$

$$M[Y] = \bar{Y} = \frac{1}{n} \sum_{j=1}^k n_{yj} y_j = 25. \quad (7)$$

The centre of the statistical distribution of values of random variables is a point (83.3; 25). This means that the average value of goods transported over time is \$ 88.3 thousand, where the share of undeclared goods is 25%.

Dispersions and standard deviations are calculated by the formulas (Eqs 8, 9, 10, 11):

$$D[X] = \frac{1}{n} \sum_{i=1}^m n_{xi} x_i^2 - \bar{x}^2 = \frac{1}{120} (20 \cdot 50^2 + 20 \cdot 60^2 + 25 \cdot 80^2 + 25 \cdot 100^2 + 15 \cdot 120^2 + 15 \cdot 140^2) - (88,3)^2 \approx 895,13, \quad (8)$$

$$\sigma_{\bar{x}} = \sqrt{D[X]} \approx 29,9, \quad (9)$$

$$D[Y] = \frac{1}{n} \sum_{j=1}^k n_{yj} y_j^2 - \bar{y}^2 = \frac{1}{120} \cdot 20(10^2 + 20^2 + 30^2 + 40^2 + 50^2) - 25^2 = 291,7, \quad (10)$$

$$\sigma_{\bar{y}} = \sqrt{D[Y]} = \sqrt{291,7} = 17\%. \quad (11)$$

Therefore, the deviation of the undeclared volume can reach 17%.

The value of this indicator can be calculated in the same way based on the analysis of data differences between the partner countries. Differences ( $P_1$ ;  $P_2$ ) in foreign trade data are defined as the difference between the volume of exports of one partner country ( $EX_1$ ;  $EX_2$ ) and the volume of imports of the partner country ( $IMP_1$ ;  $IMP_2$ ), i.e. (Eq. 13, Eq. 14):

$$P_1 = EX_1 - IMP_2 \quad (12)$$

$$P_2 = EX_2 - IMP_1 \quad (13)$$

**Table 2.** The results of calculations of differences in the data of foreign trade of Ukraine and the EU and adjusted differences of data on imports of goods to Ukraine in 2019

Indicators	The value of indicators
Official import of Ukraine, thousand US dollars	25 012 187,7
Official exports from EU countries, thousand US dollars	28 741 374,5
Differences, thousand US dollars	3 729 186,8
Differences, %	13
Affreightment, %	5,1
Time lag	1
Adjusted differences, %	18,1

**Source:** Official website of the State Customs Service of Ukraine (n.d.)

The results of the data differences calculations of the foreign trade of Ukraine and the EU in 2019 confirm that the average level of differences concerning goods imported into Ukraine is 13%. The adjusted discrepancy indicates that during the study period, there was an underestimation of the customs value of imports of goods into Ukraine from the EU countries by 18%.

Besides, the quality of customs services and the level of corruption according to a survey by the European Business Association (Business worsened the assessment..., 2021) show that 43% of foreign trade entities are dissatisfied with the quality of services received at customs, and 78% of businesses report corruption in foreign trade operations.

Based on the calculations of illegal imports to Ukraine, it can be stated that the Government loses significant amounts of revenues from mandatory taxes and fees to the budget without ensuring the appropriate quality of customs services.

The transition to the shadow sector of the economy for the importer will depend on the strategy chosen by the

state in the work of customs authorities. The government, in cooperation with importers, can formulate four strategies that will influence the rationality of the business decision: to work in the legal sector or shadow one:

- $x_1$  – to hire people with a high level of integrity as the customs officer and establish strict customs rules and high wages;
- $x_2$  – hire people with a high level of integrity as the customs officer and a low level of wages and establish loyal customs rules;
- $x_3$  – hire people with a low level of integrity of the customs officer and a high level of wages and establish loyal customs rules;
- $x_4$  – to hire people with a low level of integrity of the customs officer, low wages and establish strict customs rules.

If the value of the indicator is high, a value of (+ 1) will be assigned; if low then (+ 0)

It is determined that three functions of the Government form its strategy (Table 3).

**Table 3.** Matrix for forming the Government's strategy based on functions

	$g$	$k$	$k'$
$x_1$	1	1	1
$x_2$	1	0	0
$x_3$	0	1	0
$x_4$	0	0	1

Positions of the maximum in the columns of matrix A: (1,1), (2,1), (1,2), (3,2), (1,3), (4,3).

Importers can also choose one of four strategies for carrying out their activities:

- ▀  $y_1$  – to import goods and pay taxes and customs duties in full, i.e., to work in the legal sector of the economy;
- ▀  $y_2$  – not to carry out activities, and, accordingly, not to pay taxes, i.e., the costs of carrying out activities will be equal to 0;

- ▀  $y_3$  – carry out import operations and do not pay taxes and customs duties, but it is necessary to pay bribes to customs officers;

- ▀  $y_4$  – to carry out import operations and partially pay taxes and customs duties.

If the value of the indicator is high, a value of (+1) will be assigned; if it low then (+0)

A matrix is formed based on the selected alternatives. There are also three functions for importers, based on which the strategy is formed (Table 4):

**Table 4.** Matrix for forming the strategy of Importers based on functions

	<b>c</b>	<b>u</b>	<b>z</b>
$y_1$	1	0	0
$y_2$	0	0	0
$y_3$	0	1	1
$y_4$	0	1	0

Maxima positions in rows of matrix B: (1,1), (2,1), (2,2), (2,3), (3,2), (3,3), (4,2).

The optimal strategy for the Government is  $x_2$  – to hire people with a high level of integrity of the customs officer and a low level of wages and to establish loyal customs rules.

If a strategy for the importer is picked, the best strategy is  $y_3$  – to carry out import operations and not pay taxes and customs duties, but it is necessary to pay bribes

to customs officers. The net strategy for the legalization of shadow imports in Ukraine for the Government is to choose one of the n rows of the payoff matrix x, and the pure business strategy is to choose one of the m columns of the same matrix.

The Government likely chooses its strategy to maximize its profits, and the business chooses its strategy to minimize the Government’s profits (Table 5).

**Table 5.** The payment matrix for Government and business to choose the best strategy

	$x_1$	$x_2$	$x_3$	$0_4$	min
$y_1$	1	0	2	1	0
$y_2$	1	0	0	0	0
$y_3$	0	0	1	1	0
$y_4$	0	0	1	0	0
max	1	0	2	1	

Check whether the payment matrix has a saddle point. If so, the solution to the game in pure strategies will be recorded. The saddle point indicates the solution of a pair of alternatives  $\{x_2; y_1\}$ .

That is, the optimal strategy for the Government is  $x_2$  – to hire people with a high integrity level of the customs officer and a low level of wages and to establish loyal customs rules. If such a strategy is chosen, the business will choose a strategy  $y_1$  – to import goods and pay taxes and customs duties in full, i.e., to operate within the legal sector of the economy.

If the business operates under the strategy  $y_3$  (carrying out import operations without paying taxes and customs duties but paying bribes to customs), then the Government has chosen strategies  $x_3$  or  $x_4$ , since these strategies imply a low level of integrity of the customs officer and, therefore, and – the amount of revenues from mandatory taxes and fees to the budget will be lower than expected.

It is worth noting that the Strategy for the Legalization of Unorganized Imports is optimal which implies that the cost of customs officers’ salaries should not be too high, and the level of customs officers’ integrity should increase. This position is in line with the researchers of institutional theory, and the authors of this study sought to choose a strategy that would eliminate the imbalance between the moral norms of the functioning of formal and informal institutions in the

country. The authors of this study also agree with the research of J.P. Dobel (2022) that integrity and corruption are linked.

The proposed Strategy for the legalization of unorganized imports, which balances the level of salaries and the level of integrity, can be achieved through IT transformation and the creation of a new IT system for the State Customs Service and the personnel reform of the State Customs Service. This strategy minimizes the impact of the human factor by digitizing all processes, including management. This is consistent with the study by C. Santiso (2022). The researcher emphasizes the integrity benefits of digital strategies used to prevent corruption.

**Conclusions**

The analysis of the Ukrainian customs authorities demonstrated a low level of integrity despite the loyal customs rules and the average level of wages. As a result, part of imports (approximately 17-18%) to Ukraine comes through the shadow schemes. This is facilitated by inefficient classification of goods, customs value, and lack of appropriate clearance monitoring.

The study established that the choice of the Strategy for legalization of unorganized imports was based on the areas identified by the Government: the level of wages, the level of integrity of employees and customs regulations. On the other hand, reasons that for businesses, it will always be



rational behaviour that will be based on minimizing their costs, including shadow activities. Business behaviour strategies were determined by tax payment indicators and duties on imports, profits from activities and the level of bribes paid. The analysis showed that businesses will operate in the legal sector if the level of integrity of customs officers is high, and if the level of integrity is low, there will always be illegal imports.

The results of the study are a continuation of research in the context of the theory of tax morality. The proposed model of interaction between business and the government in the direction of legalizing unorganized imports complements previous studies in that strategies have been formed that are based on the principle of rationality of social interactions: minimizing efforts and maximizing results, without analysing social actions with irrational content. This study also continues the research and confirms the results obtained by academics supporting the institutional theory. It is

the moral norms of customs officers that become decisive in the implementation of the strategy of legalizing unorganized imports and bringing the behaviour of social agents into balance, reducing the level of unorganized imports.

Further research will be aimed at increasing the number of the exogenous parameter, which is formed by the business and the government of import strategy (in particular, it is important to study non-economic functions that influence the deviant tax behaviour of importers and customs officers), which will allow increasing the number of optimal strategies for cooperation between the government and business in the direction of legalizing unorganized imports.

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### Conflict of interest

None.

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## Модель взаємодії уряду й бізнесу щодо легалізації неорганізованого імпорту

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**Анотація.** Економіка України швидко інтегрувалася в систему тіньових фінансових потоків і використовувала стандартні інструменти маніпулювання експортно-імпортними цінами та фінансовими інструментами. За сукупним відтоком тіньового капіталу Україна входить до першої двадцятки країн. Актуальність дослідження полягає в тому, що основні напрями легалізації економічних процесів, зокрема в сегменті тіньового імпорту, передбачають формування оптимальних інституційних стратегій поведінки соціальних агентів (держави та бізнесу). Мета дослідження – обрати таку стратегію уряду щодо легалізації неорганізованого імпорту, яка дасть змогу налагодити ефективну взаємодію соціальних суб'єктів на взаємовигідних умовах. Методи дослідження: математичний аналіз і теорія ігор використовуються для побудови математичних моделей, які виявляють внутрішню раціональність індивідуальних взаємодій, об'єднуючи набір соціальних ситуацій у кілька варіантів і зводячи невизначеність набору варіантів поведінки до чіткої та стабільної моделі регулярної взаємодії. Результати дослідження виявили, що рівень заробітної плати працівників не має вирішального значення для подолання тіньового імпорту, а більш важливим показником є рівень доброчесності митників. У статті показано, що механізм легалізації тіньових операцій (зокрема, неорганізованого імпорту) має базуватися не лише на економічних, а й на соціальних параметрах: рівні моральних професійних засад митників. Практичне значення результатів дослідження полягає в удосконаленні механізмів легалізації неорганізованого імпорту в Україні

**Ключові слова:** корупція; тіньова економічна діяльність; доброчесність; стратегії легалізації імпорту; податкова мораль