ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ

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STATISTICAL ASSESSMENT OF SOCIO-ECONOMIC DETERMINATION OF CRIME IN UKRAINE

Urgency of the research. One of the topical social problems in the world is the criminalization of society in general and the economy in particular. This problem is most acute in countries with transitional economies.

Target setting. In conditions when traditional direct methods of fighting crime are not sufficiently effective, the development of alternative measures of state policy aimed at achieving the desirable results in the sphere of socio-economic relations is required.

Actual scientific researches and issues analysis. The generalization of the conceptual approaches to the study considered in the works [2-6], showed that at the present stage a scientific representation of economic determinism has already been formed. The understanding of the determination of deviant behavior by economic factors has been its basis.

Uninvestigated parts of general matters defining. The lack of expanded characteristics, scientific and methodical tools for analyzing the socio-economic determination of crime complicates the processes of establishing the economic determinants, means, cognition forms and methods, formation of a comprehensive program for its prevention and counteraction.

The research objective. The main task of the study is to assess the socio-economic determination of crime in Ukraine using econometric methods.

The statement of basic materials. The problem of analyzing the socio-economic determination of crime based on the use of econometric models has been studied, the correlation-regression models have been adapted, the applied aspects of the constructed regression equation to solve the problems of crime determination analysis have been considered.

Conclusions. The identifying the mechanism of interrelationships of socio-economic phenomena and the criminal situation has theoretical significance and allows to anticipate possible changes in the crime rate in the future in accordance with the predicted changes in socio-economic phenomena. The analysis of such interrelations allows increasing the effectiveness of socio-economic policy measures at the state level.

Keywords: socio-economic determination; crime rate; correlation-regression analysis; model.

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СТАТИСТИЧНА ОЦІНКА СОЦІАЛЬНО-ЕКОНОМІЧНОЇ ДЕТЕРМІНАЦІЇ ЗЛОЧИННОСТІ В УКРАЇНІ

Актуальність теми дослідження. Однією із актуальних соціальних проблем у світі є криміналізація суспільства у цілому і економіки зокрема. Найбільш гостро дана проблема постає у країнах з перехідною економікою.

Постановка проблеми. В умовах, коли традиційні прямі методи боротьби зі злочинністю не є достатньо результативними та ефективними, потрібна розробка альтернативних заходів державної політики, спрямованих на досягнення бажаних результатів у сфері соціально-економічних відносин.

Аналіз останніх досліджень і публікацій. Узагальнення концептуальних підходів до дослідження, які розглянуті у працях [2-6], показало, що на сучасному етапі вже сформовано наукове уявлення про економічний детермінізм, підґрунтям якого є розуміння детермінації девіантної поведінки економічними факторами.

Виділення раніше недослідженої частини загальної проблематики Відсутність розгорнутої характеристики та науково-методичного інструментарію аналізу соціально-економічної детермінації злочинності ускладнює процеси визначення економічних детермінантів, засобів, форм і методів пізнання, формування цілісної програми її запобігання та протидії.

Постановка задач. Головною задачею дослідження є оцінка соціально-економічної детермінації злочинності в Україні за допомогою економетричних методів.

Виклад основного матеріалу. Досліджено проблему аналізу соціально-економічної детермінації злочинності на основі використання економетрічних моделей, побудовано адаптовані кореляційно-регресійні моделі, розглянуто прикладні аспекти побудованого регресійного рівняння щодо вирішення проблем аналізу детермінації рівня злочинності.

Висновки відповідно до статті. Виявлення механізму взаємозв'язків соціально-економічних явищ і криміногенної ситуації має теоретичне значення та дозволяє передбачати можливі зміни рівня злочинності в майбутньому відповідно до прогнозованих змін соціально-економічних явищ. Аналіз такого роду взаємозв'язків дозволяє підвищувати ефективність заходів соціально-економічної політики на державному рівні.

Ключові слова: соціально-економічна детермінація; рівень злочинності; кореляційно–регресійний аналіз; модель.

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Urgency of the research. The systemic crisis in the field of economic relations in Ukraine has created unequal conditions and opportunities for meeting the vital needs and interests of the individual, which has led to a deterioration of the material conditions of the majority of population. Such facts determined the growth of crime rates and the increase in the share of crimes against property in the structure of crime [1]. Now the role of socio-economic factors in the system of determinants of crime in Ukraine is decisive, since in their totality and interaction they generate, contribute, modify and condition the existence and manifestations of criminal behavior not only of an individual, but also of the criminal situation in society as a whole.

Target setting. Analysis of the socio-economic determinants of crime is an important tool in the development of state programs to stabilize the criminal situation in the country due to economic factors. So, the issue of assessing the social determination of crime in Ukraine is relevant and requires further study.

Actual scientific researches and issues analysis. The economic determinism is revealed most deeply in two approaches: first, in the radical, conflict-radical, Marxist, critical theories, which were declared in Western sociology and criminology in the 1960-1970s, and, second, in economic theories (depression, expansion, social comparison). Proponents of the first approach rely mainly on the ideas of the theory of antagonism, which states that the uneven distribution of benefits in society brings an uneven distribution of power and social differentiation with it, as well as deviance, which is a form of rebellion against existing living conditions, "normal" reaction to abnormal conditions of social life [2]. Thus, according to the radical theories, the basis of criminalization is the property-power structure of states, and the reason is their inequality of property. The interrelation of poverty, unemployment, marginality, crime and other deviations with economic factors is considered in economic theories allowing to interpret the obtained empirical results. The study of socio-economic determination of crime is represented by the economists from different countries, among which are the studies by A. Witte, S. Levit, D. Groger, D. Nagin, D. Waldfogle, H. Tauchen, A. Williams, R. Sikles, L. Lockner, S. Hakim [3, p. 59; 4, p. 4]. They are multidimensional, have disputed nature, they consider different socio-economic determinants of space and time, and justify the need to study the socio-economic factors affecting the crime.

Uninvestigated parts of general matters defining. The lack of expanded characteristics and scientific-methodological tools for analyzing the socio-economic determination of crime complicates the processes of establishing the economic determinants, means, forms and methods of cognition, and the formation of a holistic program for its prevention and counteraction.

The research objective. The purpose of the study is to provide a statistical assessment of the socio-economic determination of crime in Ukraine with the help of econometric methods.

The tasks, which fulfillment will allow to achieve the goals, are: identification of the most significant socio-economic determinants of crime in Ukraine during the period of transformation changes; the establishment of statistical dependence and disclosure of the nature and degree of influence of socio-economic factors on the level of crime in Ukraine by means of correlation-regression analysis and the construction of a regression model; the development of applied aspects of the constructed regression equation to solve the problems of analyzing the socio-economic determination of crime in Ukraine.

The statement of basic materials. In Ukraine, the problems of economic determinism are considered in empirical studies of the determination of the economic crime of criminologists [5; 6] and individual rather scattered works of economists on the issues of social economics and socio-economic security. Socio-economic determination of crime, including crimes against property, is not analyzed systemically or prolongedly. The criminologists' legal approach, which emphasizes the changes in crime under the influence of various factors causes the narrowness of the mathematical apparatus used in existing studies. The scientific achievements of economists establish a range of social economic phenomena and processes that affect crime rate in Ukraine, as well as establish the indicators of economic determinants to detect determination links between crime changes and indicators of economic factors. However, the interrelation of these indicators is not measured, and crime rate as an indicator of the negative effects of socio-economic development of the country during the period of transformation changes is not investigated by economists. Thus, the measurement of the impact of

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socio-economic factors on the level of crime is the main methodological problem of the analysis and evaluation of the socio-economic determination of crime in Ukraine.

Modern mathematical apparatus allows us to exclude those socio-economic factors from the whole variety that are decisive in the determination of crime. The method of correlation-regression analysis was chosen for an empirical test of a probabilistic causal relationship between changes in the crime rate and the characteristics of socio-economic factors. The peculiarity of this method of analysis is the ability to objectively quantify the impact of selected factors on the productive features rate, as well as to model the dynamics of processes and obtain reasonable forecasts for the future.

One of the main methodological approaches to conducting analytical studies of the factors influence on the effective indicator is the stochastic (probabilistic) approach. The latter does not require a strong functional connection between the studied phenomena, on the contrary, it is based on the premise of a correlation dependence between the variables. This allows to include in the modeling environment all factors that theoretically affect the resultant feature, and ensures the completeness and adequacy of the regression model.

In order to identify the typical socio-economic determinants of crime at the initial stage, the analysis of the theoretical basis and the results of previous empirical studies of crime determination was carried out. Proceeding from the fact that the choice of socio-economic factors influencing crime is dictated by the situation that has developed in Ukraine, the main economic processes are characterized and the factors contributing to crime in the country during all years of its independence are highlighted [7-8]. Taking into account the scientific achievements of the authors, in the work more attention is paid to the analysis of changes in crime in the retrospective period from 2000 to the present, when economic activity fluctuations became more intense, volume and duration of negative impacts on crime were more dependent not on the laws of the transition economy, but on content and mechanism of reform.

It is established that the contradictions in the country's market transformation economy create conditions for individuals to satisfy their material needs in antisocial and sometimes criminal ways. The main economic determinants of crime in Ukraine are the following phenomena: the general economic crisis, accompanied by a decline in production and an increase in unemployment; inflation rate; population gradation by income level; inconsistency of living standards of a large part of the population with the level of maintenance of physiological survival; the presence and spread of the shadow economy, corruption, disadvantages of the state economic policy, etc.

According to the systemic approach, it is assumed that crime rate of the population is determined by a set of factors of a social character, most of which can be quantified. There are quantitatively measured and most important socio-economic factors contributing to crime in Ukraine throughout the period of transformational change, which are the manifestation of the mentioned above contradictions. They are a decline in production; inflation factor; unemployment as a classic determinant of crime [9]; the population well-being level and poverty.

As the main indicators characterizing the level of crime in the country, it was proposed to consider the number of registered crimes and the number of convicts per 100 thousand population. As indicators of socio-economic determinants of crime were proposed indicators of economic activity and living standards of the population, namely: the rate of development of the national economy - Gross Domestic Product (hereinafter GDP) per capita in millions of US dollars. The indicator of the general level of consumer prices was proposed the inflation rate, the unemployment rate. As indicators of the welfare rate of the population were proposed the minimal wage at the end of the year and the living wage, as well as the indicator of such a unique phenomenon as the poverty of working people – the poverty of working people rate.

The selection of factors takes into account the availability of statistical information.

The empirical basis of the analytical work is informational and analytical materials of the State Statistics Service of Ukraine [10], the Ministry of Finance of Ukraine [11], the Ministry of Economic Development and Trade of Ukraine, and Ptoukha Institute for Demography and Social Studies of the National Academy of Sciences of Ukraine [12, p. 21].

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Thus, statistically accessible indicators of the crime rate (the number of registered crimes per 100 thousand population (Y1) and the number of convicted persons per 100 thousand population (Y2)) were selected as the efficient indicators for constructing models. The efficient factors are:

x_1 – GDP per capita, USD million;

x_2 – inflation rate;

x_3 – minimal wage at the end of the year, UAH;

x_4 – living wage, UAH;

x_5 – poverty of working people rate, %;

x_6 – unemployment rate, %.

The study was carried out using the statistical package Excel, which allows characterizing most fully the determinacy of crime by social and economic factors using the method of forcibly incorporating all indicators into the model, and step-by-step elimination of the least significant variables.

The tightness and direction of the links between the productive and the factor variables were identified at the first stage of correlation-regression analysis with the help of pair correlation coefficients (Tab. 1).

Table 1

Pair correlation coefficients between statistical indicators of crime rate models in 2000-2015

Crime rate indicator	GDP per capita, USD	Inflation rate	minimal wage, UAH	living wage, UAH	poverty of working people rate, %	unemployment rate, %
Y	x_1	x_2	x_3	x_4	x_5	x_6
number of registered crimes per 100 thousand population, persons (Y_1)	-0,57663	0,313925	0,473478	0,4998	-0,66313	0,384384
number of convicted persons per 100 thousand population, persons (Y_2)	-0,80033	-0,07508	-0,79516	-0,79505	0,545385	0,572364

Calculated pair correlation coefficients showed:

- average feedback between the number of registered crimes per 100 thousand population (Y1) and the size of GDP (x_1) and the level of poverty of working people (x_5);

- strong feedback between the number of convicts per 100 thousand population (Y2) and the size of GDP (x_1), minimal wage (x_3) and living wage (x_4). Also straight average feedback between crime rate (Y_2), unemployment rate (x_6) and poverty of working people rate (x_5).

The revealed directions of the links between the productive and the factor variables, in addition to the feedback between the number of registered crimes per 100 thousand population and the poverty of working people rate (the sign of the correlation coefficient indicates that crime rate decreases with the increase in the poverty of working people rate), are adequate and consistent with theoretical representations. Violation of the adequacy of the revealed feedback can be explained either by the incorrectness of the sample and the statistical data, or with significant latency of crime, or by the actions of other unrecognized factors. This connection requires additional research.

In the course of further analysis, the non-significant variables were deduced and the following equations were obtained:

$$Y1 = 1791,283 - 0,15533 x_1 + 0,402827 x_3 - 21,4446 x_5 - 17,4735 x_6, \qquad (1)$$

$$Y2 = 368,8551 - 0,00189 x_1 - 0,10432 x_3 - 1,59009 x_5 + 10,2006 x_6. \qquad (2)$$

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The analysis of the constructed models showed that the greatest influence on crime rate in Ukraine in 2000-2017 was due to the following factors: GDP per capita (x_1), minimal wage (x_3), poverty of working people rate (x_5) and unemployment rate (x_6).

The adequacy of the obtained multiple regression models is verified by the following indicators.

The determination coefficient of the equation (1) is equal to $R2 = 0,624787$, that is, 62,48% of the change in the level of crime by the relative criterion (the number of registered crimes in Ukraine for the analyzed period) is due to the influence of the factors included in the model. The determination coefficient of equation (2) is $R2 = 0,710641$, that is, 71,06% of the change in the crime rate by the relative criterion of the number of convicts provides more accurate predictive values of the selected factor variables. This conclusion is confirmed by the indicator of tightness of correlation relationships for regression models, that is the multiple correlation coefficient R, and the value of the standard error for estimating the resultant variables.

The coefficient of multiple correlation for the equation (1) is $R1 = 0,790$, and for equation (2) is $R2 = 0,843$, which indicates a rather close correlation between the crime rate and the equation variables.

The standard error for estimating Y_1 is 93,29175, and for Y_2 it is 40,06514. Lesser value of the standard error for the effective variable of equation (2) indicates that the regression function (2) corresponds better to the experimental data.

The estimation of the adequacy of regression models was carried out according to Fisher's criterion F, and since the values for the equations (1) and (2) F_{calc} (accordingly, $F_{calc\ 1} = 23,31$ and $F_{calc\ 2} = 34,382$) exceeds the table value for $\alpha = 0,05$ ($k_1 = 4$; $k_2 = 11$) $F_{crit} = 3,59$, then it can be asserted with 95% confidence that the constructed models are reliable and statistically significant (traditional approach to F-criterion application).

Of two above-mentioned regression models of the impact of socio-economic factors on the crime rate in Ukraine, the model of determination links between the number of convicts per 100,000 population and factor variables is more suitable for forecasting changes in the effective indicator.

According to the model (2), the decrease of factor x_4 (unemployment rate) and the growth of factors x_1 (GDP per capita), x_2 (minimal wage) and x_3 (poverty of working people rate) lead to a decrease in the effective indicator (the number of convicts per 100 thousand population). At the same time, the influence of the factor x_1 (GDP) is negligible, and, on the contrary, the factor x_4 (unemployment rate) is the most significant.

It should be noted that the adequacy of the logical connection between Y_2 and x_2 is violated in the second model (with the increase in the poverty of working people rate, the crime rate decreases). This can be explained either by the incorrectness of the sample and the statistical data, or by the influence of the non-accounted in the model secondary factors such as principle of distribution of working people by five levels of poverty (quintiles), regional (depressed territories) and sectoral characteristics of the labor market, which affect the size of the wage fund of workers and, accordingly, the number of quintet groups, that is the object of crime.

The study of the impact of the main macroeconomic, socio-economic indicators on the crime rate showed that: 1) there is a rather close connection between the crime rate and certain indicators that characterize the level of socio-economic development of the country; 2) socio-economic factors significantly affect the crime rate, which requires additional study; 3) those indicators that show insufficient degree of correlation with the crime rate and, accordingly, are not included in the model, can have a complex impact, so they can act as additional indicators. Thus, the constructed regression model is a very effective tool for factor analysis of the determination of the crime rate in Ukraine, which allows determining the nature of the mediated influence of economic factors on the crime rate, as well as obtaining a more reasonable estimate of the future level of a productive trait, taking into account the various conditions of socio-economic development of the country.

Conclusions. According to 2000-2017 data, during the period of transformational changes in Ukraine, unemployment and poverty among working people were the most important factors of the impact on crime. The deterioration of the economy and, accordingly, the living standard of the population inevitably lead to an increase in crime.

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The connection between the crime rate and socio-economic development in the case of Ukraine is an objective reality, therefore an important direction of research is to improve and expand the methodology for analyzing socio-economic determinants of crime. The connection between the crime rate and socio-economic development in the case of Ukraine is an objective reality, therefore an important direction of research is to improve and expand the methodology for analyzing socio-economic determinants of crime. Detection of the mechanism of the connection of socio-economic phenomena and the crime situation is not only theoretical, but also allows predict more accurately possible changes in the crime rate in the future in accordance with the projected changes in socio-economic phenomena and processes. An analysis of this kind of interconnection allows to increase the effectiveness of socio-economic policy measures, to predict more effectively the system of consequences of the decisions made at the state level, especially in the context of modern economic development and the need to improve market mechanisms.

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