

НАЦІОНАЛЬНА АКАДЕМІЯ НАУК УКРАЇНИ

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Науково-практичний журнал

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*Scientific and practical journal*



**Е**кономіка  
**П**ромисловості  
*Economy of Industry*

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### ПРОБЛЕМЫ СТРАТЕГИИ РАЗВИТИЯ И ФИНАНСОВО-ЭКОНОМИЧЕСКОГО РЕГУЛИРОВАНИЯ ПРОМЫШЛЕННОСТИ

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### ПРОБЛЕМЫ ЭКОНОМИКИ ПРОМЫШЛЕННЫХ ПРЕДПРИЯТИЙ И ПРОИЗВОДСТВЕННЫХ КОМПЛЕКСОВ

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## MACROECONOMIC AND REGIONAL PROBLEMS OF INDUSTRIAL DEVELOPMENT

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### IMPLEMENTATION OF THE CONCEPT OF TAX EXPENDITURES IN THE RUSSIAN FEDERATION: THE EVALUATION METHODOLOGY OF EFFECTS AND EFFICIENCY

Relevance of research topic is due to the ability to use tax incentives as a tool of industrial policy, for example, supporting of priority sectors and activities. Despite the distortions that tax incentives introduced in the market resource distribution mechanism, tax incentives can be used as tool for achieving industrial policy. In this case, the government consciously relies on the generation of distortions in the market resource distribution mechanism, because the government is interested in increasing of resources flow in the industry, which get tax incentives [1].

In the Russian Federation, the concept of tax expenditures in practice has not been applied. Tax incentives are always available in Russia for an indefinite period and without evaluation of the relevant expenditures. Also, the effects appearing from the provision of certain tax incentives have never been evaluated quantitatively. The efficiency of tax incentives has not been evaluated also. As a result, the number of tax incentives in Russia increases every year, but the government and society do not have any exact data on the budget losses related to the provision of tax incentives.

A budget formalization of these processes in line with the generally accepted concept of tax expenditures has been long overdue. But just two years ago a difficult task regarding the optimization of tax incentives has been set for the first time before the Ministry of Finance in the government document "Guidelines for the tax policy of the Russian Federation for 2012 and the planning period of 2013-2014" [6]. In par-

ticular, it is necessary to develop a practice of impact assessment of the tax incentives that would allow to make decisions about their renewal or termination, as well as a system of estimating the loss of fiscal revenues resulting from tax incentives for the purpose of their accounting as a tax budget expenditure in the budgets planning processes and budgets performance reports. In this case, the task is accompanied by a target setting of the Russian Government that in the medium term a draft budget law for the next year at all levels of state power and local self-government has to be accompanied by a report indicating budget "tax expenditure" and their efficiency.

Taking into account that this problem in our country (and in general in the former Soviet Union) has not been worked out either in theory or in practice, the possibility of any objective assessment of all tax expenditures and evaluation of the efficiency of all tax incentives within the time frame specified seems to be unrealistic. And this complex (which requires appropriate analysis and evaluation) is significant, if we understand privileges in a broader context as any tax incentive mechanisms. According to preliminary estimates of the Ministry of Finance, the total number of tax incentive mechanisms (privileges and exemptions) amounts to 191 points, 60 of them – regarding the income tax on profits, 80 – regarding the value-added tax, 20 – regarding the property tax, 16 – regarding the land tax, 12 – regarding the income tax on mineral extraction and 3 – regarding the fees for the use of fauna and water biological resources.

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Significant impediments to the solution of this problem in Russia are, firstly, the methodological vacuum in the identification and evaluation of tax expenditures, as well as in evaluating the effects and efficiency of the use of different-directed tax incentives, and secondly, the lack of an organizational system, which would monitor and assess these indicators. In fact, even the following question has not yet been answered: who and how will be solving this task?

In this article authors will try to identify some methodological solutions for the task of estimation of tax expenditures and the efficiency of tax incentives in Russia, apart from the organizational and technical aspects of the problem.

As known, tax incentives are not the ideal instrument of state regulation and stimulation of priority processes. Significant use of tax benefits leads to a lower neutrality of the tax system, increases the cost of tax administration, and as a result - reduces the efficiency of the tax system, differentiates the tax burden between different industries and categories of taxpayers, and therefore, reduces the system's fairness and complicates the construction of taxes and the system in general. An alternative tool is the direct government financing (subsidies, grants, loans), which often demonstrates greater flexibility and stimulation targeting.

The competition between the instruments of tax and fiscal stimulation is obvious. It makes it necessary to give preference to one or another instrument. But this choice has to be made not on the basis of theoretical reasoning and qualitative assumptions, as it is being done in Russia now, but it has to be made on the basis of comparative analysis of the alternative instruments efficiency and quantitative estimations (and not only direct estimations, but also side-effects). It should be noted that in Russia the use of fiscal stimulation instruments has long been accompanied by more or less effective control of their expenditure and evaluation of the efficiency of their use. The use of tax incentives is burdened only by the tax authorities' control procedures, quantification of tax expenditures and evaluation of their performance in Russia, unlike most developed countries, is still not being carried out.

The basis for the solution of these problems in Russia should be made up from the works of the founders of the assessment practic-

es of the tax expenditures in the United States [18, 11, 19, 14, 13, 22, 20, 7, and others). The studies of the best practices of tax expenditures assessment in the United States and OECD countries are also extremely important [10, 17, 9, 15].

A methodological approach to the assessment of tax expenditures and evaluation of the efficiency of their implementation in Russia will then be proposed. However, together with that we want to emphasize that the originality of the approach is related only to the methods of costs and efficiency estimation. The essence of the approach is based on the famous "concept of tax expenditures" [18]. The positive practice of using this concept in the USA and OECD countries during 40 years confirms the need to follow the developing economies in line with this concept.

In general, the assessment of the costs and the assessment of their efficiency are the two independent and large-scale problems, but they are consistently connected: the second problem cannot be solved without the first. In addition, these two problems have different scales of solution. They are necessary for assessment of tax expenditures and their efficiency in the whole country, and also for estimation by industry, regions, and municipalities, as well for estimation of each of tax incentives (or type of tax expenditures). Together with this the solution of the first as well as of the second problem is connected with some issues that are not solved even by those countries that have been practicing the concept of tax expenditures for a long time, not to mention those who have recently joined or are only going to join the process.

It is necessary to make another note on better understanding of tax expenditures.

The founder of the concept of tax expenditures S. Surrey argued that any tax is made up of two elements (parts). The first part is the structural norm, which is necessary for the normal functioning of the tax. The second part are the norms introducing special incentives. He wrote that "these provisions, often called tax incentives and tax subsidies represent deviations from the normal tax structure and are designed for particular industries, activities or groups of taxpayers. They take many forms, such as permanent exclusion from taxable income, deduc-

tions, deferred tax liabilities, tax credits and special tax rates. Whatever form they take, these deviations from the normative tax structure are the government expenditures on exempt activities or groups of taxpayers and made through the tax system rather than through direct expenditures, loans, or other forms of state assistance [18, 19].

As known, there are many definitions of tax expenditures - almost every country has its own. T. Malinina has conducted scrupulous analysis of these definitions (we do not repeat it) and identified four distinctive characteristics [3]. Tax expenditures are:

loss of tax revenue, so they lead to lower budget revenues;

appear from the tax incentives and exemptions relative to the base (normative) tax structure;

used for the realization of the goals of national social and economic policy;

an alternative to direct government expenditures.

In our opinion the first two features are seen as really necessary to identify tax expenditures, and the other two are redundant. But it takes one more - an additional feature - creation of any advantages for certain activities or groups of taxpayers. This is a very important feature, because it allows considering the basic structure of taxes as one that did not originally contain any advantages for certain activities or groups of taxpayers, representing some ideal theoretical tax construction.

However, the OECD [10] recommends distinguishing between the basic and normative tax structure. If the basic structure of taxes should demonstrate uniqueness and universality for the different countries, the normative structure of taxes should reflect the national identity of the tax, i.e. those rules which are recognized as essential parts of the considered tax in the country, although those rules are not established in the framework of the basic structure. And, accordingly, these rules cannot be considered as tax expenditures in this country. This distinction is a very important and promising feature of the process of adaptation of the basic theoretical structure of taxes to the existing national practice of their application, and as a result – of a more precise definition of the standard against

which national identification of tax expenditures and a more precise calculation is made.

For example, the basic structure of the income tax, as it is known, is considered to be the comprehensive income Schanz-Haig-Simons model. At least, S. Surrey insisted on it. This model provides for taxation of the difference between revenues and expenses incurred from obtaining these revenues. However, this model provides for taxation in equal measure of all income from all sources: salary, income from business activities, capital income (dividends, interest, rents), inheritance, gift, transfers from the budget (pensions and social assistance), imputed rent for the use of your own home, goods produced and consumed in the household or your own company, and other income. Such a model of the tax is unlikely to be administered in practice.

As a normative structure of Russian income we can consider taxation in various degrees (different rates applied) of different types of income, and the taxation of one part of the total income according to the model Schanz-Haig-Simons [1, 2, 4]. In particular, the taxation of the following is excluded from full income: the imputed rent for the use of own housing, goods produced and consumed in a household or a private firm. Thus most often only those parts of income are excluded, which are almost impossible to administer. Accordingly, if the normative structure of tax (and not the base tax structure) is used as a standard these deviations should not be treated as tax expenditures (incentives). Thus, we offer the following definitions.

The basic tax structure is a set of structural elements (rules), that provides a such tax construction, which does not produce any benefits for certain activities or groups of taxpayers.

The normative tax structure is a set of structural elements (rules) and deviations from them, that provides a tax structure that is adapted to the practical implementation in the current national tax administration system and thus is most relevant to the principle of minimizing the administrative costs.

Tax expenditures are losses of tax revenues of the budget system connected with the application by the legislation of various deviations from the normative tax structure, which in

this case provide some benefits to certain types of activities or groups of taxpayers.

### **Evaluation of tax expenditures**

Thus, assessment of tax expenditures in Russia should be made for a separate article (tax incentives), for a particular tax, by type of tax, for all taxes and fees. A sequence of estimations of tax expenditures for a specific tax is given below. This assessment should include several successive operations:

first, the development of the normative structure of the tax in the context of all its major elements (of taxpayers, the object of taxation, tax base, tax rate, the tax period, the order and timing of payment)

secondly, completing a list of deviations from the normative structure of the tax (that deviations thus will be the types of tax expenditures);

thirdly, the development of a method of quantitative assessment of tax expenditures and the way of their assessment on practice;

fourth, the preparation of the statistically quantifiable indicators, which are necessary for quantitative assessment by the selected method and way;

fifthly, an assessment of tax expenditures on this tax.

Overall assessment of tax expenditures will be the result of adding quantitative estimations of these expenditures for the full range of Russian taxes and fees.

As to the choice of the estimation method of tax expenditures, the OECD Review of the best practices (Best, 2004) suggests the possible use of three methods.

1. Assessment of tax expenses based on income loss. This method involves the assessment of tax expenditures as the amount of tax revenue that the budget system will not receive as a result of (or loses as a result of the action) of any incentives.

2. Assessment of tax expenditures based on reduced income. This method involves the assessment of tax expenditures as the amount of tax revenue that the budget system can receive as an additional result of the proposed cancellation of incentives. It provides a fairly complex accounting of economic agents behavioral effects due to the abolition of incentives.

3. Assessment of tax expenditures based on equivalent costs. This method involves the assessment of tax expenditures as the sum of the direct costs of the budget, which must be paid to all taxpayers who use incentives so that their total income would be the same as when using this incentive.

Most practical relevance is the method of income loss. According to experts [20], it is the most simple and reliable method. A practical way of calculating the tax cost of this method is reduced to the following steps. To assess the existing incentives one should consider the difference between the amount of tax that would have been obtained in the absence of the analyzed tax incentives, and the actual amount of the tax, which comes to the budget system in terms of the incentives.

### **Evaluation of annual tax expenditures based on the analyzed incentives**

The formula for this calculation will be the following:

$$TE^i = TI_{w/i}^i - TI^i + \Delta ICTA^i + \Delta ICTH^i,$$

where  $i$  – year, of the given incentives' introduction;

$TE^i$  – tax expenditures  $i$ -th year;

$TI_{w/i}^i$  – the sum of tax revenue from taxpayers using this incentive, calculated in the absence of incentive in  $i$ -year (if data are used by  $i-1$ , they need correction and reduction to the  $i$ -th year);

$TI^i$  – the sum of tax revenue from taxpayers using this incentive, calculated in terms of providing incentives in the  $i$ -th year;

$\Delta ICTA^i$  – the increasing of the tax administration costs due to additional costs of administering state incentive in the  $i$ -th year;

$\Delta ICTH^i$  – the increasing of the tax harmonization costs due to additional costs for the use of taxpayers' incentives in the  $i$ -th year.

### **Evaluation of tax expenditures for the period analyzed incentive**

For the purpose of tax incentive efficiency evaluating the tax expenditures should be evaluated not for one year but for period from its establishment to the display of effect -  $t$ . Then all parameters are summarized by year. In addition, for comparability they are brought to the

same point in time by discounting. The simplified formula would look like:

$$\sum_{i=1}^t TE^t = \sum_{i=1}^t TI_{w/i}^i - \sum_{i=1}^t TI^i + \sum_{i=1}^t \Delta ICTA^i + \sum_{i=1}^t \Delta ICTH^i,$$

where  $t$  – the period of time from the establishment to the end of the display of effect of this incentive;

$$\sum_{i=1}^t TE^t - \text{tax expenditures of the period } t;$$

$$\sum_{i=1}^t TI_{w/i}^i - \text{the sum of tax revenue from}$$

taxpayers using this incentive, calculated in the absence of incentive of the period  $t$ ;

$$\sum_{i=1}^t TI^i - \text{the sum of tax revenue from}$$

taxpayers using this incentive, calculated in terms of providing incentives of the period  $t$ ;

$$\sum_{i=1}^t \Delta ICTA^i - \text{the increase of the tax ad-}$$

ministration costs due to additional costs of administering state incentive of the period  $t$ ;

$$\sum_{i=1}^t \Delta ICTH^i - \text{the increase of the tax har-}$$

monization costs due to additional costs for the use of taxpayers' incentives of the period  $t$ .

Taking into account the time lag of the incentive action and the costs of tax administration increases the accuracy of the estimation. But even taxation expenditures calculated by such a complicated way will be not exact. The main sources of these errors are:

this method takes into account only the primary effects of tax incentives, it is not possible to take into account its secondary effects on changes in the tax base, in particular, due to changes in the behavior of recipients of incentives;

enability of accurate determination of the amount of the tax that the state loses by giving exemptions to taxpayers, especially if this exemption is valid for a long time;

the complexity of an accurate assessment of time  $t$  can lead to using as a time  $t$  the period of incentives exemption or any extended period ( 5-6 years), when the effect of benefits must clearly appear. All these assumptions will reduce the accuracy of the estimation;

the precise estimation of the increase of the tax administration costs and tax harmoniza-

tion costs is a costly and difficult task, simplified procedures will not consider these indicators.

So the simplified formula for calculating the tax expenditures for the period would have the form:

$$\sum_{i=1}^t TE^t = \sum_{i=1}^t TI_{w/i}^i - \sum_{i=1}^t TI^i.$$

### Initial requirements for assessing the incentives efficiency

Significant problems arise in formulating this methodology. Evaluation of tax expenditures has been learned by most developed countries (this process has been improved there for decades, especially in the USA), but adequate assessment of the efficiency of these tax expenditures still has not been elaborated. Moreover, there are opinions that a scientifically based methodology for evaluating the efficiency of incentives is extremely difficult to create. There are several reasons. Let's formulate them.

First, during the provision of incentives it is impossible to predict how the process of its shifting in each case will end, who will get this benefit, who will be the final beneficiary of it. The shifting processes in the taxation are difficult for studying and exact description in general. All this applies also to the incentives shifting. Even a long-term operation of an incentive sometimes doesn't allow identifying who is the final beneficiary, predicting its future behavior and carrying out its planning. So it is impossible to plan who would bear the newly introduced incentives. This problem is not significant for the tax incentives for individuals (the tax on personal income, transport and property), as opposed to tax incentives from legal entities. For example, the incentive in form of accelerated depreciation is given to a particular enterprise. This company reduces its liability on income tax, but doesn't spend its freed funds on purchasing fixed assets, and spend them, for example, on increasing the salaries of the employees. Thus, the final beneficiary of these incentives suddenly becomes a person to whom this privilege was not intended.

Second, the time lag before the affect appears after the introduction of appropriate incentives is not certain, which (lag) may be specific for each incentive, so it is not clear when the

expected effect of incentives will be experienced. It should be noted that the existence of a significant time lag between the introduction of the incentives and the real impact of its actions is a characteristic feature of this type of preferences. Identification of the time lag is required to adequately relate the cost of the relevant tax period (year) to the corresponding effect (fiscal, economic, social) of the period, in which the effect becomes visible. Correct time correlation of tax expenditures and effects is a necessary requirement (if it comes about an adequate assessment) for an adequate assessment of incentives.

For example, the investment tax credit is given for promotional activities of the company in the years  $i$ -th and  $i + 1$ , respectively. Let's suppose that the process of implementing covers a two-year period of the credit, but a different kind of effect will occur with different time lags due to objective time processes. The real expansion of the tax base will start much later - after commissioning works, approaching to the planned production capacity, debugging logistics and distribution operations, etc. Thus, increase of the tax revenue actually will start, for example, in the 4-th year, and the increase of the living standards of the area will be seen with a greater lag of 5-6 years. How should we relate tax expenditures and effects in this case? If one make all assessments relating to the year of these costs incurrance, the effect will be negative as well as efficiency, but if the time lag is identified correctly, the evaluation of the efficiency and outcome may be fundamentally different. One basic conclusion can be made: efficiency of the tax incentives may be defined only for a full period  $t$  - from its introduction to the end of the action (although this conclusion can be also discussed because the effects can also occur after the application of the incentives). This requirement will be very important in the transition to total determining of the period of the incentives' action and their effectiveness evaluation during their limited use period with a following obligatory examination of their extension feasibility.

Third, besides identification and accounting the time lag under the circumstances of a significant inflation the problem of the different cost of tax expenditures and the corresponding

effect (fiscal, economic, social) of the period arises. It is necessary to reduce the values being compared to the same period of time by discounting.

Fourth, it is not always clear how much the resulting effect of the introduction of the incentives will be free of influence from the actions of others (objective and subjective) factors that lead to the formation of the same effect, regardless of the application of the privilege. Thus it is required to separate the effect of incentives from the effect produced by the action of a general economic process and other economic instruments: stimulating (budget subsidies, for example) and other regulatory.

For example, how can we cleanse the effect of the application of the incentives in the form of exemption for 3 years from the tax on property of organizations in relation to the newly commissioned facilities with high energy efficiency and the effect of the introduction of the same facilities as a result of the overall scientific and technological progress and the natural desire of the company to reduce their costs for electricity. In fact, the approach to such cleansing of the effect should be a three-step algorithm. In the first step it requires the initial identification of the effect of newly high energy efficiency facilities, which is achieved without the action of the incentives. In the second step - the identification effect achieved under the same terms but with using tax incentives. Finally, the third step - obtaining a purified effect by subtracting from the effect achieved under conditions of actual incentives and effect that would be achieved under the same conditions, but without incentives.

Fifth, it is important to consider the process of interdependence of some tax bases, which leads to the fact that the tax incentive for one can influence the change of revenues for other taxes to which this incentive was not introduced. Thus, incentives administered by a specific tax can also affect a different tax due to the interpenetration of the tax bases. For example the tax base for the personal income tax and social contribution and income tax, business property tax, and transportation taxes are interdependent. For example, the incentive of the income tax in the form of accelerated depreciation reduces not only the income tax in the early

periods of equipment using, but also deform obligations of the enterprise for the property tax, as the residual values begin to be measured nonlinearly. This process can bring a significant distortion into the determination of the tax incentives efficiency (monetary, fiscal). Interdependence of tax bases on the value added tax and profit is more obvious, so any benefit to the value added tax will deform the profit obligations of the enterprise.

The problem of the tax expenditures efficiency measuring requires finding the adequate indicators of tax incentives. The Russian practice of assessment is very inferior and methodologically undeveloped. It is formed in a pioneering manner at the municipality level, and sometimes – at the level of the subjects of the Russian Federation. In this case, regional and local practice of incentives assessment is based on a "random walk". After analyzing more than 20 of these techniques, one can make the following conclusions, which are not comforting.

1. There are no typical methods. Every municipality is developing their own indicators and way of incentives selection for their use.

2. In general fiscal and social efficiency indicators are measured, the first - quantitatively, the second - qualitatively.

3. Efficiency evaluation is often replaced with the estimation of annual effect as some gross indicator, for example, the tax base increase as a result of the incentives.

4. These techniques do not consider any of the above requirements for assessing the efficiency.

#### The essence of the proposed approach

It is offered to evaluate the efficiency of tax incentives proceeding from the definition of the economic, social, fiscal and budgetary efficiency. It is important to understand that calculations for different types of efficiency of the aggregate activity of tax incentives are not very needed (except to prove the efficiency of tax incentives as a whole). It is important to evaluate the efficiency of every specific incentive, in some cases – of a group of incentives that focus on recurrent or unidirectional effects. Also we do not take into account factors of taxes shifting, but it is offered to consider the time lag of the incentives, inflation, the process of the tax

bases interaction, as well as the presence of other factors that influence the receipt of this effect.

In addition, it is important to understand that during the introduction of incentives all kinds of effects should not become apparent. They will still appear, but their value and even the direction is different. And we cannot claim only the positive evaluations of the effects of any specific incentives (excluding the effect on the budget). Therefore, different effects should be considered, because the objectives of each different incentive are different, so the situation when the incentives achieve just one or two kinds of effect including a budgetary one is normal. This incentive shall be considered effective. We want to offer an original methodological approach to the definition of the relevant types of effects and the efficiency of tax incentives.

*The fiscal impact of the tax incentives* should be a subsequent increase in tax revenues over the current tax expenses. Increase in tax revenues is the difference between the sum of tax revenue from a number of interdependent taxes, which is calculated in terms of incentives submitted in the period when a real effect from the action of the incentives takes place, and the sum of tax revenues in the absence of incentives in a period of the same duration before their introduction. All indicators are considered for the period  $t$ , they should be discounted to the same period of time. If the desired value is positive and exceeds the sum of tax expenditures (i.e., the budget revenues exceed the expenditures on incentives provision - the loss of the budget), the provision of this incentive has a fiscal effect, otherwise – no:

$$FE^t > \sum_{i=1}^t TE^i;$$

$$FE^t = \sum_{i=1}^t TI^i - \sum_{i=1}^t TI_{w/i}^i,$$

where  $FE^t$  – fiscal effect of tax incentives;

$t$  – the period of time from the introduction to the end of action of the effect of this incentive;

$\sum_{i=1}^t TI_{w/i}^i$  – the sum of tax revenue from taxpayers using this incentive, calculated in the absence of incentives over the period  $t$ ;

$\sum_{i=1}^t TI^i$  – the sum of tax revenue from taxpayers using this incentive, calculated in terms when incentives are provided over the period  $t$ .

*Fiscal efficiency* of tax incentive is the ratio of the fiscal effect of the provision of incentives received in the period  $t$ , when a real effect from the action of the incentives appears to the tax expenditures in the same period  $t$

$$Ef_{fiscal} = \frac{FE}{\sum_{i=1}^t TE_i} = \frac{\sum_{i=1}^t TI^i - \sum_{i=1}^t TI_{w/i}^i}{\sum_{i=1}^t TE_i},$$

where  $Ef_{fiscal}$  – fiscal efficiency of the tax incentive;

$\sum_{i=1}^t TE^t$  – tax expenditures on this incentive of the period  $t$ .

If  $Ef_{fiscal} < 1$ , then the analyzed tax incentives are inefficient. If  $Ef_{fiscal} = 1$ , then increase of taxes incomes is equal to tax expenditures, so this incentives is fiscally neutral. And if  $Ef_{fiscal} > 1$ , an increase of taxes incomes exceeds tax expenditures and the incentive is fiscally efficient.

*Social impact of the tax incentives* is to be seen in the increase of the standard of living of the population, the preservation and development of socially significant spheres of activity, the formation of favorable living conditions for vulnerable categories of the population, preserving and creating jobs. The demonstration of this effect for the area is clear, but it precise quantification is difficult. There are two main reasons for this.

First, it is necessary to separate this effect from the overall natural background of increasing living standards and improving social well-being of the population area, which is difficult to do, because in this area several companies may exist (and benefits they receive, of course, can be different) that form this effect. But the main analyzed error causes the possibility of achieving this effect by the means of the social program financed by the budget system.

Secondly, there is no single indicator of the population social well-being of a territory, increase of which over the natural level could be evaluated in relation to the social effect of the action of any additional stimulus in the area. Of

course, there are integral factors of the United Nations (UN) like "index of quality of life" and "human development index", but they are supported only in the cross-country dimension. These indicators are not calculated by the statistical authorities of the municipality and the region. Here it is necessary to use a range of well-known indicators of the population life quality of the area interactively.

Thus, the accurate calculation of the social impact is difficult. For some incentives purely focused on production, this effect will be almost absent (for example, exemption from the value added tax on the importing to the Russian territory of process equipment analogues which are not produced in Russia is not accompanied by any noticeable social impact). In this case, the social effect of such incentives will be zero. For an approximate estimation of the socially orientated incentives we can offer two approaches.

*The 1st basic approach.* If for the social orientation incentives it is possible to set appropriate territorial social indicators (for example, giving tax preferences on disabled persons labor will be well correlated with indicators of disabled persons employment and wages levels of persons with disabilities), then the analyzed effect of social incentives should be assessed in relation to the dynamics of cost estimations of these parameters. This dynamic will adequately reflect the effect of the tax incentives under the terms of constant budget financing of relevant social programs. If a significant change in the budget financing takes place it is necessary to carry out appropriate correction of the increase of indicators. As a result, the social effect can be represented as a result of the excess of social indicators in terms of providing incentives for the period  $t$  over the corresponding indicators in its absence. The social effect will take place under the condition that the occurred difference exceeds the amount of tax expenses over the period:

$$Se > \sum_{i=1}^t TE^t.$$

If a positive difference is absent the budget will benefit from achieving this effect using the money that must come in the form of tax when the tax incentive is absent.

$$Se = \sum_{i=1}^t SI_i^t - \sum_{i=1}^t SI_{w/il}^t,$$

where  $Se$  – social impact of the tax incentives;

$$\sum_{i=1}^t SI_i^t - \text{total cost estimations of social}$$

indicators, calculated in terms when incentives are provided for the period of  $t$  years;

$t$  – the period of time from the introduction to the end of the action of the effect of this incentive;

$$\sum_{i=1}^t SI_{w/il}^t - \text{total cost estimates of social in-}$$

dicators, calculated in terms of absence of the incentive for the period of  $t$  years.

*The 2nd auxiliary approach.* When a strict correspondence between social indicators and social orientation incentives is difficult to define (in particular, when the dynamics of social indicators determines the unidirectional effect of not one but several benefits) it is necessary to calculate the social effect for several incentives, and then divide it by the number of incentives that form it.

$$Se = \frac{\sum_{i=1}^t SI_i^t - \sum_{i=1}^t SI_{w/il}^t}{n},$$

where  $n$  – number of incentives forming the social effect.

*Social efficiency of the tax incentive* is the ratio of the social impact of the provision of incentives received in the period  $t$ , when the real effect of the action of this incentive appears to the amount of tax expenditures over the same period  $t$ .

$$Ef_{soc.} = \frac{Se}{\sum_{i=1}^t TE} = \frac{\sum_{i=1}^t SI_i^t - \sum_{i=1}^t SI_{w/il}^t}{\sum_{i=1}^t TE},$$

where  $Ef_{soc.}$  – social efficiency of tax incentive;

$$\sum_{i=1}^t TE - \text{tax expenditures over the period } t.$$

od  $t$ .

If  $Ef_{soc.} < 1$ , then analyzed tax incentives are socially inefficient. If  $Ef_{soc.} = 1$ , so this incentive is socially neutral. And if  $Ef_{soc.} > 1$ , the increase of social indicators exceeds tax

expenditures and the incentive is socially efficient.

*The economic effect of the tax incentives* becomes evident in the form of growing financial resources of the taxpayer that are at his disposal due to the absence of the need to transfer the funds to the state budget in the form of taxes. This can significantly improve the financial condition of the enterprise, by giving it a higher paying ability and liquidity to solve the problems of rapid modernization of fixed assets, to increase profits, etc. The effect can be seen in the outperformance of fixed investment, in expansion and upgrading of production and technology in order to increase the volumes of production of competitive products and create new jobs (including upgraded) and in the profits increase.

The economic effect is increasing of the following economic indicators taxpayers who use this incentive over current tax expenditures for this incentive. It is proposed to use the amount of working capital as a result economic indicator. This indicator is supported by the state statistics and called "organizations turnover". The organizations turnover include the cost of shipped goods of own production, works and services performed in-house, as well as revenue from the sale of previously acquired on the side of the goods (excluding VAT, excise duties and similar payments).

The excess of this indicator is understood as the difference between the sum of enterprises sales, calculated in terms of providing incentives to the period of appearance of the real effect of the action of the incentives, and the sum of organizations sales in the absence of incentives in a period of the same duration before its introduction. All indicators are calculated for the period  $t$ , thus they should be discounted to a single period of time. If the desired value is positive and exceeds the sum of tax expenditures, the provision of this incentive has an economic effect, otherwise – no:

$$Ee > \sum_{i=1}^t TE^t.$$

$$Ee = \sum_{i=1}^t OT_i^t - \sum_{i=1}^t OT_{w/il}^t,$$

where  $Ee$  – economic effect of the tax benefits;

$$\sum_{i=1}^t OT_i^t - \text{turnover of organizations using}$$

this incentive, calculated in terms of providing benefits for the period of time of  $t$  years;

$t$  – the period of time from the introduction to the end of the action of the effect of this incentive;

$$\sum_{i=1}^t OT_{w/l}^t - \text{Turnover of organizations using}$$

this incentive, calculated in the absence of incentives for the period of time of  $t$  years.

*The economic efficiency of the tax incentives* is the ratio the economic effect from the provision of incentives received in the period  $t$ , when the real effect of the action of this incentive appears to the sum of tax expenditures of the same period  $t$ .

$$Ef_{econ} = \frac{Ee}{\sum_{i=1}^t TE} = \frac{\sum_{i=1}^t OT_i^t - \sum_{i=1}^t OT_{w/l}^t}{\sum_{i=1}^t TE},$$

where  $Ef_{econ}$  – economic efficiency of the tax incentives;

$$\sum_{i=1}^t TE - \text{tax expenditures on this incentive of the period } t.$$

If  $Ef_{econ} < 1$ , then the analyzed tax incentives are economically inefficient. If  $Ef_{econ} = 1$ , then the increase of economic indicators is equal to tax expenditures, so this incentive is economically neutral. And if  $Ef_{econ} > 1$ , the increase of economic indicators exceeds the tax expenditures and the incentive is economically efficient.

*Budgetary effect of tax incentives* is evident not only in the future increase in budget revenues generated through the expansion of the tax base as a result of the incentive, but also in a saving of the budget funds spent previously on solving social and economic problems that due to the exemption companies have to solve themselves. Thus as a result of the incentives there are additional budget funds that can be spent on the most territories of the country. These additional budget money is a result of the increase in tax revenue, i.e. budget revenues and budget savings during the realization of some socio-economic tasks, i.e. expenditures.

Part of the budgetary effect consists of an increase of tax receipts, i.e. budget revenue is a

fiscal effect. If the budget savings are considered from the standpoint of alternative costs, i.e. consider budget subsidies granted by the budget of businesses in the absence of incentives to address certain socio-economic problems, then this economy can be regarded as the approximation of the sum of social and economic effects. As a result, it can be said that the budget effect includes three previously presented effects of the individual terms, and the budgetary effect is a kind of integral index, which must be positive. We offer the following approach to the definition of budgetary effect.

Budgetary effect of tax incentives may be represented as the sum of the fiscal, social and economic effects, and if any of these effects is negative, it will decrease the budgetary effect. However, the most important characteristics of budgetary effect should be a comparison of the sum of all growth indicators (income tax, social indicators, organizations turnover) obtained during the period  $t$ , when the real effect of the action of this incentives takes place with the amount of tax expenditures for the same period  $t$ . In our opinion, we should not calculate the arithmetic average of these effects, they need to be just summarized.

So, if the sum of these effects exceeds tax expenditures, the budgetary effect is present, if less - no. Incentive will be effective if the budgetary effect exceeds the effect of tax expenditures

$$Be > \sum_{i=1}^t TE^t$$

$$Be = Fe + Se + Ee = \sum_{i=1}^t TI_i^t - \sum_{i=1}^t TI_{w/l}^t + \sum_{i=1}^t SI_i^t - \sum_{i=1}^t SI_{w/l}^t + \sum_{i=1}^t OT_i^t - \sum_{i=1}^t OT_{w/l}^t,$$

where  $Be$  – budgetary effect of tax incentives.

*Budget efficiency of tax incentive* is the ratio of the sums of fiscal, social and economic effects from granting the incentives received in the period  $t$ , when the real effect of the action appears to the tax expenditures of the same period  $t$ . Again, the specific nature of the integral indicator is that we are not dealing with the arithmetic average of the three types of efficiencies, we relate to the sum of the effects from tax expenditures.

$$Ef_{bud} = \frac{Be}{\sum_{i=1}^t TE^t} = \frac{Fe + Se + Ee}{\sum_{i=1}^t TE^t} = \frac{\sum_{i=1}^t TI_i^t - \sum_{i=1}^t TI_{w/l}^t + \sum_{i=1}^t SI_i^t - \sum_{i=1}^t SI_{w/l}^t + \sum_{i=1}^t OT_i^t - \sum_{i=1}^t OT_{w/l}^t}{\sum_{i=1}^t TE^t},$$

where  $Ef_{bud}$  – budget efficiency of the tax incentive.

If  $Ef_{bud} < 1$ , then analyzed tax incentives are budgetary inefficient. If  $Ef_{bud} = 1$ , then the increase of all indicators is equal to tax expenditures, so this incentive is budgetary neutral. And if  $Ef_{bud} > 1$ , the increase of all indicators exceeds tax expenditures and the incentive is budgetary efficient.

*The allocation of the environmental effects* is the controversial question. On the one hand, the process of active development of environmental taxation in all countries indicates that it is necessary to allocate, as well as, the searching of adequate tax incentives for reproduction of environmentally oriented behavior of taxpayers. On the other hand, complex quantitative estimate of this effect can be done only in perspective but not in the nearest future.

But it should be noted that the allocation of environmental effects is necessary, it requires by realities. Contents of environmental impact should be reflected in reduced damage to the environment and human health. In our opinion, the evaluation of this effect should be made on two parameters. There are amounts of avoided environmental damage and improvement of health of population.

In conclusion it should be noted that each of the indicators of the tax incentives efficiency (fiscal, social, economic) can serve as a criterion by which one can estimate the efficiency (or inefficiency) of any incentives. The presence of even one type of the effect, i.e. exceeding of the increase of any type of indicators over tax expenditures (i.e. a positive effect) allows us to assume that this exemption is effective. But only the budget efficiency can be the integral index, as it accumulates the three other efficiencies. When one of the effects from the incentives can be seen clearly, this incentive has to be considered effective. In this case we have a positive effect, for example, the fiscal or social. It is likely that the budgetary effect would be positive also. Much more complicated is the case with

incentives having an impact on several areas of activity. In this case, each of the effects (fiscal, social, economic) may not be as great and may seem vague. And the individual growth of all kinds of indicators will not exceed the tax expenditures, but in the aggregate the value of the total increase of these parameters may exceed the tax expenditures. Therefore, this exemption should also be considered effective.

Thus, the indicator of fiscal efficiency has to make sense as the final criterion indicator, basing on the positive value of which the efficiency of the relevant incentives is stated.

**Directions for further research.** To find a successful solution to the problem stated by the Russian Government it is necessary first of all to work out theoretically the full range of problems associated with the use of tax incentives in Russia:

- to form a new understanding of the tax incentives;
- to develop a normative structure for all taxes;
- to identify the whole range of deviations from the normative structure as tax expenditures;
- to develop a qualimetry methodology for these tax expenditures;
- to develop a methodology of efficiency assessment of the tax expenditure implementation;
- to develop new approaches to a statistical state-supported indicators and statistic reports.

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## STRATEGIC DIRECTIONS OF UKRAINIAN TAX POLICY IN THE SPHERE OF INDUSTRIAL DEVELOPMENT REGULATION

In recent years tax policy of Ukraine strategically remains in the state of uncertainty. The documents which would reflect a national consensus on the main trends of the national tax system in the long term or at least in the mid-term prospects haven't been worked out yet. The strategy of tax system reforming approved by ordinance of the Cabinet of Ministers of Ukraine of 23.12.2009 № 1612-р was cancelled in six months before the adoption of the Tax Code of Ukraine. After that the new long-term strategy or development concept of tax system which determined the main directions of state tax policy and as a result strategic guidelines for doing business and industrial development wasn't elaborated. Although, as the international experience shows [21], the clear definition and consistent observance of long-term priorities of social and economic development in a whole and the taxation in particular maintains stability of business operations and is of key importance for investment decisions making.

Ukrainian school of financial science has already offered a number of decisions related to the substantiation of tax policy directions (Z. Varnaly [37] T. Efimenko [25] Y. Ivanov [40] K. Schwabij [56]), that are also based on a critical generalization of the experience of developed countries, especially the European Union (EU) (V. Melnik [33] A. Sokolovskaya [43, 44], I. Lunina [32]). The appeal to this experience was logical because it was corresponded to the general directive of government authority toward the Ukraine's integration into European political and economic structures<sup>1</sup>.

<sup>1</sup>Atropertime (2001-2005) even one of key Ukrainian ministries was called 'Ministry of economy and on the questions of European integration of Ukraine'.

However, recently the situation has significantly changed. The global financial and economic crisis of 2008-2009 has vividly demonstrated that the EU is going through the hard times nowadays and obviously loses the global economic competition to the South. Moreover, as the analysis shows [42] the directive toward the economic integration with EU<sup>2</sup> goes against the Ukrainian economic interests at least in point of development prospects of industry which as it is shown firstly is a generally accepted generator of economic innovations and secondly is still the leading sector of the national economy that supports close cooperation ties with countries of the Custom Union (CU).

At the present time Ukraine relates to the post-Soviet countries with incomes that are below average. In this connection it is necessary to solve the problems which are typical for developing countries: to reduce poverty on the basis of keeping stably high economic growth rate, to industrialize the economy over again, to rise productivity and efficiency of the agro-industrial complex, to increase the quantity of qualified workforce. Therefore it is necessary to find new growth opportunities related to including of value generation in global chains focused on the South which is on the upswing in a present historical period. In particular in such developing and growing markets which in contradiction to developed markets don't put forward high requirements to the quality of business processes and manufactured goods, Ukraine can find new

<sup>2</sup>Eeas. europa. eu. (2013). European Union – EEAS (European external action service) | EU-Ukraine association agreement – the complete texts. [online] Retrieved from: [http://www.eeas.europa.eu/ukraine/assoagreement/assoagreement-2013\\_en.htm](http://www.eeas.europa.eu/ukraine/assoagreement/assoagreement-2013_en.htm) [Accessed: 31 Jan 2014].

market niches for distribution of its production, especially high-tech and the new sources for economic development. And namely there it makes sense to search for a positive experience and ways of forming 'developmental state' and strategic guidelines for the tax system modernization, solving the problem of tax support and stimulation of economic growth.

That is why at the present time it makes sense to develop the tax system with caution to the developing countries which also use the achievements of modern economic theory (but taking into account own realities and needs) but

not to Europe which is forced to solve the problems of systemic crisis of the West [20].

In this connection the aim of this paper is to examine the experience of the tax incentives of economy of successfully developing countries – the BRICS (Brazil, Russia, India, China, South Africa) and TC (Russia, Kazakhstan, Belarus) which have achieved notable successes in industrial sphere (Fig. 1 and 2) and to substantiate proposals concerning the strategic directions of the national tax policy in the matter of industrial development regulation.

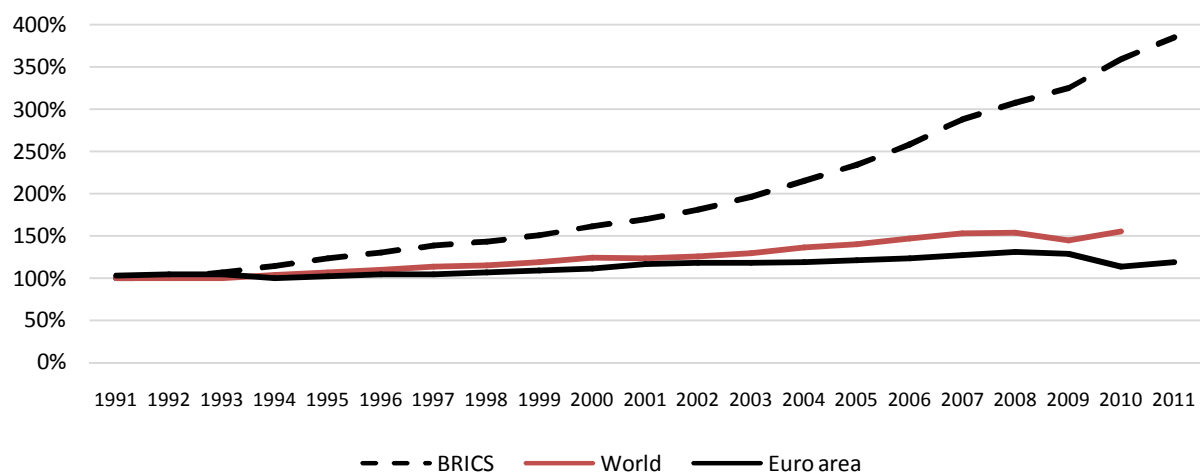


Fig. 1. The dynamics of industrial value added in the world, Euro-zone countries and BRICS (1990-100%). Composed by: [15]

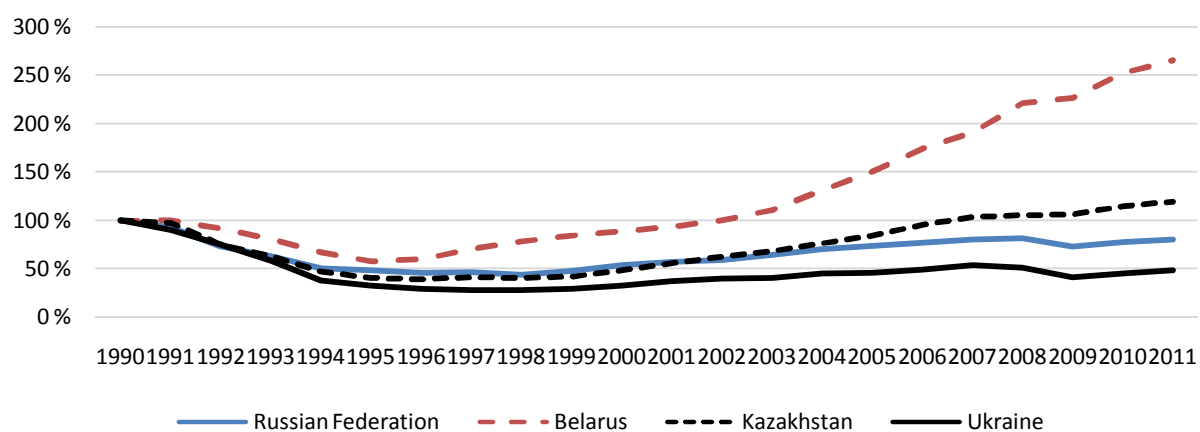


Fig. 2. The dynamics of industrial value added in countries of the CU and Ukraine (1990 – 100%). Composed by: [15]

In People's Republic of China (China) which over historically short period managed to

take first positions in the world and become the industrial 'world workshop', the tax system of

regulation of economic development acts upon such directions as stimulation of innovations, and also encouragement of individual industries development of urban regions and districts [13].

The policy of R&D stimulation in China is carried out more than ten years including the use of tax instruments. Companies, whose core business is the high and innovative technologies, have the right to reduce the corporate income tax to 15% within three years; tax deduction of 150% of R&D expenses accrued within one year is practiced. It is also determined to exempt from customs clearance charge, to exempt (or refund) from VAT upon purchase of facility for carrying out of R&D [11, p. 2, 4-5].

Chinese government provides funding of 'green' projects at profitable interest rates. The entry of China into the 'green' energy market has permitted to expand the production of solar photoelectric cells and wind energy, reduce costs, making this product more affordable for other developing countries [8, p.136]. Within a country the national program 'China Torch Program' has been developed, under which a Centre of industrial development and high technology was established, public funding was devoted for creation of more than 400 business incubators each of which maintains services to 20 - 90 technological companies.

Assistance in development of priority sectors in China is carried out by preferential tax treatment for enterprises connected with the development of high and innovative technologies, software, and also projects for agriculture, forestry, fisheries, public infrastructure, and environmental protection. Tax regime includes the reduction of corporate income tax rate from 25% to 15-10%. The individual industries can use tax holidays with full (100%) exemption from this tax in the next two, three or five years and charge in the amount of 50% in the next three, three and five years [13].

Preferential taxation of corporate profits is also used for the development of certain regions: reduction of tax rate to 15% assuming that 70% of their total income was received in the industry sectors that are priority for economic development of the country. Upon that the branches of companies located outside of these regions don't have such preferences [13].

The stimulations of investment activity in cities and districts are carried out by way of re-funding of 10-20% of paid profit tax, return of land use fees and exemption from utility payment for the period of building and also appropriation up to 35% of the value of high-tech intangible assets to company capital investments (in contrast to 20% adopted by legislation) [13].

In order to support the innovation processes in China the tax holidays for free zone companies and other basic types of privileged zones which have the right for total exemption from payment of profit tax for the first two years after the first year of income generation, and in the next three years – the right of a partial exemption (50% from the current rate) were imposed [29].

During the last decade *India* is one of the countries with the fast growing economy and industry. According to the new industrial policy, adopted in 1991, the main directions of economic modernization were imposed; the policy was oriented on securing of the markets autonomy, entrepreneurship, transparency and export orientation of economy. Investment plan was developed, its realization permitted to simplify the control for the capital flow, remove quantitative restrictions on total imports that led to improvement of the investment climate.

The tax burden for foreign companies was facilitated in order to attract foreign investments: the rate of corporate tax was reduced by means of allowances and exemptions and applying of tax holidays in Special Economic Zones [4, p. 65]. At the state level the stimulation of investment activity is carried out by tax deduction of profits received from construction industry and operation of infrastructure facilities, and the total exemption from corporate tax payment which was obtained during export operations within 10 years and at the local level - the exemption from payment of sales tax [14, p.17-18].

The department of industrial policy and development of Ministry of Commerce and Industry in India has worked out the special incentive mechanisms of the industrial growth and investment in R&D, including tax mechanisms. Particularly the legislation of India stipulates such tax deductions of expenses related to R&D implementation:

total deduction (100%) of the capital costs for research activity (except of land value);

deduction of current expenses for research activity during the first working year connected with business planning and dealing and borne during last three years before the beginning of such activity;

deduction equal to 175% of sum of expenses, borne by companies due to the payments to scientific and research institutes, equal to 125% of sum – to scientific and research companies, and equal to 125% of sum – to research associations in the field of social sciences or statistical estimations;

tax deduction equal to 200% of current expenses on research activity the list of which is regulated by Department of science and industrial researches (DSIR) and this deduction is provided for companies which carry out researches for own purposes ("in-house R&D") and are not on manufacture oriented of such socially harmful products as alcohol, tobacco, etc. [10, p. 7].

Besides Indian tax legislation provides tax holidays for companies which export services related to research activity. Such companies should operate in free economic zones (FEZ) and pay alternative minimum tax at the rate of approximately 19,5% in order to obtain tax holidays in the volume of total exemption from export revenue taxation for a period of five years and 50% during the next five years [10, p.7].

Specific FEZ and parks are created in such sectors as information technology, oil-refining industry, aerospace industry, manufacture of agricultural, textile, chemical and nutritive products, automotive components, auto cars and tractors, electronics [28]. In accordance with the law 'On specific economic zones' (SEZ Act, 2005) the state government whose territory FEZ accommodates is obliged to impose the taxes on manufacture and transportation of electric energy inside a zone as well as taxes and duties on goods delivery from internal customs enforcement area into FEZ [26].

In *Brazil* that takes the 8<sup>th</sup> place in the world in manufacture of steel, the 5<sup>th</sup> place in shoes export and the 4<sup>th</sup> place in production of aircrafts (Embraer) in 2008 the new industrial policy called 'Productive Development Policy' was announced. Its main tasks were the increase

of capital investments, R&D investments, small and medium export-oriented enterprise development, an increase of export. The government has planned to allocate more than \$U.S. 9 bln in tax allowances for investment in the manufacture and competitive growth of enterprises.

Among tax instruments of industrial development stimulation are:

the list extension of fixed assets (some-machines, equipment, devices and tools) for an appliance of accelerated depreciation, and the use of the tax credit equal to 25% of the total amount of the depreciation;

imposing a zero tax rate for financial operations (instead of current rate of 0,38) payable by private and public credit institutions (Special Agency of industrial financing, The Agency of project research and financing of Ministry of science and technology);

an exemption from federal excise tax;

payroll tax reduction (from 20% to 10%) for IT companies providing that there is the export revenue in the gross revenue of the company;

double deduction within payment of corporate income tax for the purpose of employee training in sphere of software;

the additional deduction of R&D expenses for technologic companies, decreasing to zero tax rate on profits of companies that provide logistics services for Brazilian exports [2].

In 2012 the government made decision concerning the tax reduction on electricity. Formerly the cost of electricity was increased by means of 28 different taxes which put together almost the half of relevant expenses. In whole according to Brazil government forecasts the private consumption should be reduced on at least 16% and business expenditures should be reduced on 19-28% [8, p.87].

In *South Africa*, which economy is the largest on the continent, the Trade, Export and Investment Financial Assistance (Incentives) was developed by Ministry of Trade and Industry. This program includes the tax incentives in the form of tax allowances meant for supporting of investments in new industrial projects and also for widening and modernization of already-existing ones.

During 2010-2013 through the program 13 projects with total investment of about \$US 2 bln were boosted. All projects have been

designed for the development of priority economic sectors identified in the Plan of Action of state industrial policy: 8– in the chemical industry, 2– in the pulp and paper industry, 2 – in the production of bio fuels, 1– in agriculture. The main tasks of the tax incentive program are: renewal of industrial complex by means of business assets fundraising, an implementation of the new "green" technologies in production, efficiency upgrading of energy use, providing of general economic linkages within the country and the increase in population employment [16].

Such strategic directions of reforming are examined in countries of CU. In *Russian Federation* – this is an improvement of investment climate by means of control strengthening with tax evasion by short-lived companies and offshore companies, the use of accelerated depreciation on newly introduced equipment, tax credits for research and development, etc. Financial support of economic entities can take the forms of:

special tax regimes or tax incentives for industrial clusters and industrial parks;

tax allowances for individuals involved in financial lease (leasing) in the field of industrial activity;

tax allowances for individuals of industrial activity who implement the projects related to the environmental safety improving of the industrial productions [53].

The tax legislation of Russian Federation stipulates the usage of bonus depreciation (lump-sum debit on costs to 30% of asset value which is come on stream or expenses for its completion, retrofitting, renovation, technical upgrading, modernization, partial liquidation). The right to use the multiplying factors to the enforceable standards of depreciation (fixed assets which are used when dealing under conditions of corrosive environment and / or increased shifting for the purpose of exclusively scientific and technical activity, etc.) is given for certain types of assets. It is also permitted to practice non-linear amortization method with the use of higher depreciation rates than with the use of linear method [18].

For innovation centre "Skolkovo" – scientific and technological complex concerning the development and commercialization of new technologies – the government of Russian Federation has adopted a package of laws providing

the simulative changes in tax legislation. In particular, the residents of the innovation centre (the organization that received status of project participant concerning the implementation of research, development and commercialization of the results) receive tax allowances for 10 years in the form of exemption from corporate income tax, under the stipulation that the annual output of sales proceeds is not more than 1 bln rubles, and exemption from VAT, under the stipulation that the total profit margin does not exceed 300 mln rubles. Then, when tax liabilities appear, the profit is taxed at the rate of 0%, provided that it does not exceed the aggregate amount of 300 million rubles. An insurance payment to the Pension Fund shall be paid at the rate of 14%, and to Social Insurance Fund and medical insurance funds – 0% [54].

For creation of network of specific territories of superior economic growth (special economic zones, industrial parks, technological parks, agroparks) and stimulation of regional investment projects implementation on territories of the Far Eastern federal district and the individual subjects of Russian Federation<sup>3</sup> the tax incentives are also provided in the form of corporate income tax at zero rate for 10 years providing that incomes from sales of goods produced as a result of regional investment project implementation; these tax allowances sum not less than 90% of all incomes calculated at determining of taxation base [55]. The government of Russian Federation also considers the opportunity of 5 years holiday assignation related to the corporate income tax, tax on the extraction of commercial minerals (apart from oil and gas), land tax, corporate property tax, and imposing of reduced rates of obligatory payments concerning the insurance fee for start-up companies allocated in the faster growth territories [38].

The military industrial complex (MIC) of Russian Federation is not ignored too. Being the

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<sup>3</sup>Among these are the Buryat Republic, the Sakha Republic (Yakutia), Republic of Tuva, the Zabaikalye, Kamchatka Krai, Primorsky Krai, Khabarovsk Territory, the Amur region, the Irkutsk Region, the Magadan Region, the Sakhalin Region, Jewish Autonomous Region, the Chukotka Autonomous District. Siberia and Far East of the Russian Federation were declared a national priority for the whole XXI century by the President in an annual address to the Federal Assembly [38].

biggest budget item of expenditure the defence procurement represents ‘огромный ресурс для инноваций и модернизации всех отраслей промышленности, развития науки и высокотехнологического производства’<sup>4</sup> [26]. Russian President has supported the idea of tax breaks for start-ups related to defence contracts in the Far Eastern federal district and in Krasnoyarsk. In the nearest future the Ministry of Finance and Ministry of Economic Development and Trade are planning to examine the question of the possibility of exemption from income tax the enterprises of MIC, which bear expenses of production modernization.

The Federal law project ‘About the industrial policy in Russian Federation’ sets out an imposition of specific tax regimes and tax allowances to industrial clusters and industrial parks; tax exemption of subjects of industrial activity which carry out specific investment projects; extension of tax allowances for those who deals with financial lease (leasing) in industrial activity and implements projects concerning the improvement of the environmental safety of industrial productions [53].

The industrial enterprises that implement the investment projects are exempted from tax payment on the period of 10 years. This rule is already applied to the residents of the Special Economic Zone in the Kaliningrad Region (Art. 288.1 and Art. 3851 of Tax Code of Russian Federation) [17] where the subjects of industrial activity implementing the investment projects can be exempted from tax paying for 10 years or it may be possible to apply other measures of incentives. This requires that the investment project has been included in the list formed by the government of Russian Federation in the prescribed order. An organization or an individual entrepreneur implementing this investment project should make a special investment contract with state under which the investor is obliged to develop industrial production, and the state - to enact the stimulating benefits and exemptions to him. Besides, the application rules of specific privileges can be imposed by federal, regional or municipal regulations.

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<sup>4</sup> ‘a huge resource for innovations and modernization of all industrial sectors, science development and hi-tech manufacture’.

According to ‘The strategy of innovative development of Russian Federation for the period until 2020’ for the purpose of tax incentives of companies to R&D funding, getting of the modern equipment the next measures for realization are planned: to optimize the mechanism of managing costs for research, development and engineering, that are taken into account when the corporate income tax is calculated using a factor equal to 1,5; to optimize the exemption from property tax for energy-efficient equipment (on the list of classes and energy efficiency) [46, p. 61].

In *Kazakhstan*, the Strategy of Industrial and Innovation Development of Kazakhstan for the period up to 2015 [52] and the State Program of Forced Industrial-Innovative Development for 2010-2014 were adopted for the implementation of innovation policy and the acceleration of scientific and technical progress [23]<sup>5</sup>. The main tasks are creating a favourable investment climate and the development of high technologies and technologies that provide high added value. For the formation of a unified system of support and development of innovation the innovative development Plan up to 2030 was developed in Kazakhstan, according to which 60 priority areas were identified, and it is provided an increase of funding of “break through” projects to \$U.S. 450 billion by 2015 [31].

For realization of these tasks it is provided to reform the fiscal system of the country by ‘...создания условий для модернизации и диверсификации экономики через фискальное стимулирование процессов индустриализации и финансирование развития индустриальной инфраструктуры, науки и инноваций, человеческого капитала’<sup>6</sup> [23]. In order to develop non-resource sector the changes in tax legislation aimed at reducing the overall tax

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<sup>5</sup> Mentioned programs are a part of the global development plan of Kazakhstan which stipulates development programs for mid-term (‘Strategy – 2020’, ‘Strategy – 2030’) and long-term (‘Strategy - 2050’) perspectives each of which is detailed by short-dated (five year) programs.

<sup>6</sup> ‘...creating the conditions for the modernization and diversification of the economy by means of fiscal stimulus of industrialization processes and development financing of industrial infrastructure, science and innovations, human capital’.

burden were made. At the same time an 'accent' of the tax burden is planned to move on the mining sectors of the economy [45].

At present an improvement of investment environment is being carried out in the country. For example, for investment projects which are implemented in the territories of free economic zones (FEZ)<sup>7</sup>, the special tax procedure was imposed for enterprises, selected according to the criteria of support and export orientation with further access to foreign markets and creation of new working places. According to the new Tax Code of Republic of Kazakhstan the participants of FEZ are exempted from payment of corporate income tax, property tax, land tax, the royalty of land parcels use but not more than 10 years from the day of land parcel provision. Goods which have been realized on the territory of FEZ and fully consumed in activities (according to the list of goods identified by the Government) are taxed at a zero rate of VAT.

The incentives in the form of a 100% reduction of social tax, an increase of marginal rate of depreciation used for tax purposes (software from 15% to 40%) are additionally provided for members of the FEZ 'Park of innovative technologies'. Besides that the principle of extraterritoriality operates for the participants of this zone until 2015, i.e. its members can be located outside the FEZ and enjoy tax allowances, except of VAT and customs duties.

In order to attract foreign direct investments and promoting of R&D development the reduction of the taxable base was provided by state program of forced industrial-innovative development for 2010-2014 for corporate income taxes equal to 150% of the costs accrued when R&D results were implemented. It is also considered the possibility of changes in tax legislation in a part of increasing of the deduction coefficient from the tax base for this tax of 150% of the costs accrued by the company in

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<sup>7</sup> 13 industrial, 16 regional and 9 functional development programs have been worked out in terms of Strategic development plan of Republic of Kazakhstan until 2020 [46]. Each of the regions of Kazakhstan is specialized in the development of certain sectors of the economy and contains clusters with special tax regime and special privileges. There are only nine special economic zones in Kazakhstan.

case of the implementation of international standards (GMP) and European medical standards, in accordance with directive 93/42/EEC.

The program of innovations development and contribution to technological modernization in Republic of Kazakhstan for the period of 2010-2014 is focused on solving problems related to: development of a system for promotion of technological modernization by demand creation for new technologies, innovation offerings and implementation and distribution of innovations, creation of own competence by technological forecasting and planning, orientation of applied science on the needs of business and the formation of innovation clusters; development of innovation environment by improving coordination elements of the national innovation system, promotion of the innovation activity and perfection of legislative base [38]. The financial support instruments are taken into account in such tax incentives:

the commercial buildings and constructions, machinery and equipment, which include those that were resulted from own developments are subject to 100% accelerated depreciation;

the list of the imported goods with respect to which value added tax is paid by set-off has been revised;

the deductions equal to 100% of expenses on research and scientific and technical works from the corporate income taxes have been provided;

the decrease of taxable income in the amount of 50% of the costs of such work has been provided in order to stimulate R & D investments.

It is necessary to pay attention to the experience of the Republic of Belarus – the only one of former Soviet republics that has managed to increase the volume of industrial added value compared with the Soviet period more than two-fold (Fig. 2). By National strategy of sustainable social and economic development of republic for the period until 2020 the R&D and innovation economic stimulation has been provided by means of tax burden reduction on innovatively active enterprises, tax exceptions of extra budgetary funding sources for R&D, as well as a reduction of customs duties and taxes on the equipment, tools, materials for scientific purposes and innovations [35, p. 48]. In order to

confirm the realization of this strategy the exemption from taxation by import customs duties and VAT of the equipment, instruments, materials and components meant for R&D imported by residents of the Republic of Belarus in the territory of the country has been provided by the Presidential Decree 'On the exemption from import customs duties and value added tax of goods intended for scientific, research and innovation activity' [48].

Since 2009, the benefits in the form of income tax at a reduced rate of 10% (excluding income tax, calculated, withhold and enumerated during the performance of duties of a tax agent) have been provided for hi-tech parks and technology transfer centres by Tax Code of the Republic of Belarus (§ 6, art. 142) [34].

Also, in order to foster the innovation activity, production incentives of high-tech products a range of legislative acts which include the regulations in preferential taxation have been developed and adopted in recent years. According to the Decree of the President of the Republic of Belarus 'On taxation of high-tech organizations,' a register of high-tech industries and enterprises has been developed and approved; their profit earned from the sales of own production is taxed at the rate decreased by 50%. The funds released as a result of exemption are allocated for funding of technical re-equipment of manufacture [49]. According to the other Decree – 'On the incentive measures of the production of laser and optical equipment in the Republic of Belarus' - the organizations producing laser-optical equipment (assuming that the share of this technique in terms of value in the total production is at least 50%), pay income tax at the rate of 10%. Goods for laser and optical equipment, machinery and accessories used by businesses for the production of laser and optical equipment are exempted from customs duties and VAT in case of import by these enterprises into the customs territory of the Republic of Belarus (except imported from the Russian Federation) [47].

The Decree of the President of the Republic of Belarus 'On some incentive measures of innovation in the Republic of Belarus' provides:

an exemption from payment of fee to the republican supporting fund of agricultural producers, foodstuffs and agricultural science,

companies revenue received from the sale of the registered research and development;

the right to attribute costs of goods (works, services) and include the expenses considered in taxation up to 2% of the proceeds from the sale of goods (works, services) which are recounted by organizations for the usage of results of completed R&D within three years from the start of production with the use of R&D results;

granting of the right for scientific organizations to build up unitary enterprises by means of excess of receipts which are in disposal over expenses and the share of revenue of unitary enterprises from scientific, technical activities, the production of high-tech goods (works, services) in total revenues must be at least 70% of [51].

According to the Decree of the President of the Republic of Belarus 'On some issues of development stimulation of highly efficient productions' for 2011-2013 the companies that carry out development business plans and providing high profitability indexes in industry and ratio of shipped innovative products in its gross volume over proof level have been exempted from payment to the budget equal to excess amount of profit tax paid in fiscal year over the amount of tax payment in previous year. Released funds have been at their disposal and have been directed to research and development, the development of high-tech products, modernization, technical re-equipment of production and improvement of product quality, process certification in accordance with international standards, as well as credit repayments, loans received for these purposes and interest payment owing to them [50].

Generally this review shows that successfully developing countries don't rely only on 'invisible hand of the market' anymore but develop and take measures of tax policy as well, aimed to gradual expansion and improvement of industrial production within long-term national strategies and development plans. In fact, there is a 'revenge of visible hand' of which V. Volpi and F. Matsei have written [21]. Those who achieve success today –are the proactive states, i.e. accepting responsibility for themselves, rather than passively waiting for a favourable combination of circumstances formed by the

supposedly 'free' play of market forces, '...с активным правительством и, зачастую, аполитичной элитой, которые считают быстрое экономическое развитие своей первоочередной целью'<sup>8</sup> [41, p. 66]. The philosophy that stands behind this approach – is congruence of state and market, coming from the fact that they '...не противопоставлены друг другу, а дополняют друг друга как *инь* и *янь*. В этой модели государственное управление не враждебно частному сектору: более того, оно исполнено большего уважения к предпринимателям, с которыми вступает в переговоры на взаимовыгодных условиях, на основе подхода *выигрыш-выигрыш (win-win)*'<sup>9</sup> [21, с. 119].

Of course, to achieve such congruence is very difficult. In particular, a lot depends on the quality of public servants. In the countries of the Confucian tradition the governmental employment traditionally gives a higher status, that makes it relatively easy to hire the best and most creative employees, and therefore the bureaucracy there is '...является элитарной, образованной, эффективной, честной, имеет "самурайско-мандаarinское" происхождение'<sup>10</sup> [21, p. 119]. In the former Soviet republics, especially in Ukraine, in this respect, the situation is much worse. Traditionally low efficiency of Ukrainian bureaucracy and an absence of continuity in economic policy are well known because under severe political confrontation emanating from socio-cultural differences between the Western (mainly Uniaten) and Southeast (predominantly Christian) parts of the country up to now the situation has been such that election of each new President of Ukraine was accompanied by a radical overhaul of economic reforms of the forerunner and mass layoffs and redeployment of officials in central and local levels.

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<sup>8</sup> '...with an active government and often apolitical elite who believe in rapid economic development as their primary objective'.

<sup>9</sup> '...are not opposed to each other, but complement each other like *yin* and *yang*. In this model, state management is not hostile to the private sector: in fact, it performed greater respect for entrepreneurs, which enter into negotiations on mutually beneficial terms, on the basis of *win-win* approach'.

<sup>10</sup> '...elite, educated, efficient, honest, has a samurai-mandarin 'origin'.

Nevertheless, despite these problems, Ukraine has to form a more thorough strategic concept of taxes as an integrated system, which would identify the priority areas of its development not only for the near-term, but for the long-term prospect. This will contribute to the development and implementation of a set of consistent measures for the effective state regulation of the economy, stimulation of the activity of domestic investors and the greater engaging of foreign investments.

Such a "long" approach corresponds to the modern world trends. In the developmental states for solution of strategic objectives the long-term programs and plans are worked out with the use of special authorities. In China, for example – this is the National Commission for Development and Reform, which develops and organizes the implementation of strategies, programs for the medium and long term periods, suggests targets and policies for the development of the national economy and optimization of the most important economic structures, develops proposals for the application of various economic instruments and policies [24]. Planned structures successfully operate in India, Brazil, South Africa [8] and in the former Soviet republics – Belarus and Kazakhstan. In Russian Federation a draft law "On state strategic planning" is under consideration and provides the development of strategic forecasts for 30 years, the main directions of activity of the Russian government in the medium term (6 years), and the formation of long-term fiscal strategy, which must be prepared every six years for a period not exceeding the forecast period of social and economic development.

In Ukraine the long-term directions of tax system reforming should also correspond to the overall strategic goals of social and economic development on the basis of accelerated growth of material production sphere, and its leading sector – industry. In this connection it is important to note that traditional variant of industrial development which is actively used in Ukraine on the basis of exploitation of cheap resources (labour and materials), environmental nihilism and monopolization of production, is not a strategic perspective any more. It is associated with such risks as the final transformation of national industry into the raw materials enclave of the

world industrial system which is ecologically destructive for own citizens, strengthening of economic and political external pressure, technological dependence on the import and others [42, p. 140].

The worldwide trends of accelerated development of own industrial production based on the newest advanced technologies predetermine the choice of neo-industrial developmental variation of Ukrainian industry as an optimal in the modern period. Presenting itself in the modern dynamically changing global industrial structure as an active participant and an equal partner of the new international division of labour and the implementation of global and regional industrial and economic strategies, Ukraine should provide a new and modern structural format and modern parameters of its own industry [42].

Taking into account this context, *the creation of favourable conditions for the sustainable development of the country and neoindustrialization by means of shifting from taxation of results of production (profits and income) to levy-*

*ing of resource usage, especially natural and gradual transition to the principles of "green" tax reform should be the main direction of tax policy for long-term perspective (10-15 years). It is determined by several reasons.*

Firstly because nowadays the natural and human resources are underestimated in Ukraine (with some exemptions) that is shown in high material and energy intensity of GDP, unacceptably severe environmental pollution, low wages and pensions of citizens, inadequate public expenditure on health, education, science and culture, low life expectancy of people with birth.

Secondly this direction of tax policy corresponds with neoclassical principle of tax neutrality in the presence of large-scale externalities.

Thirdly this direction complies with global trends of environmental pressure contrariety particularly in developing countries (Table).

Fourthly with a present focus on European integration environmental taxes will have to be increased in Ukraine.

Table

*Public initiatives of sustainable development endorsement in BRICS countries*

Country	The examples of "green" industrial policy initiatives
1	2
China	<p><i>Green finance</i> Following the 11th Five Year Plan (FYP) 2006-10 and the 12th FYP 2011-15, China's state-owned banks favour loans to emerging green strategic industries.</p> <p><i>Legal Framework</i> 2006 Renewable Energy Law, which introduced feed-in tariffs in China and 2008 Circular Economy Law</p>
India	<p><i>National Development Planning</i> Priority area in the National Five Year Plan. Five-year targets for renewable energy development.</p> <p><i>Institutional upgrading</i> Creation of Indian Renewable Energy Development Agency (IREDA) and the Ministry of New and Renewable Energy (MNRE, formerly Ministry of Non-Conventional Energy Sources) to ensure political and financial support.</p> <p>Green Manufacturing Committee</p> <p><i>Government support to green R&amp;D programs</i> Special clause will be included for green projects in the Technology and Acquisition Development Fund.</p> <p><i>Government Investment</i> Jawaharlal Nehru National Solar Mission. In 2009, the government announced a USD 19 billion plan to produce 22 GW of solar power by 2022, up from 2 GW in 2009</p>

1	2
Brazil	<p><i>National Development Planning</i> The Brazilian Energy Research Company (EPE), the research arm of the Ministry of Mines and Energy, set a ten-year Energy Plan. It envisages an expansion of 60% in energy demand over the next decade, and investment of BRL 190 billion (Brazilian reais) of which BRL 100 billion would go on renewable energy contracts (55% on hydro and 45 % on wind, biomass and small hydro).</p> <p><i>Government support to green R&amp;D programs</i> The National Development Bank, the Ministry of Science and Technology and several agencies involved in supporting R&amp;D development have targeted programs for R&amp;D in green areas, including ethanol, which has been supported since the 1970s.</p> <p><i>Green Finance</i> The BNDES manages the Amazon Fund (a USD 1 billion international funding effort) and is investing in developing new criteria for assessing the financial viability of green projects. BNDES is investing in several green projects including the creation of new ethanol pipelines.</p> <p><i>Public procurement and auctions</i> In December 2009, Brazil's National Electric Energy Agency (ANEEL) held the country's first wind power auction, offering 1.8 GW in power contracts for wind power plants, with delivery beginning in July 2012. The Brazilian Wind Energy Association with government support has set a goal of reaching 10 GW of wind power capacity by 2020</p>
South Africa	<p><i>National Development Planning</i> South Africa has an official goal of producing 4% of the nation's electricity from renewable sources by 2013 and improving energy efficiency by 12% by 2015.</p> <p><i>Green Finance</i> The Clean Technology Fund (CTF) of USD 500 million created by the African Development Bank in conjunction with the World Bank. It targets renewable energy projects encompassing grid-connected solar thermal power, wind power and energy efficiency projects in both the industrial and commercial sectors</p>

Source: [8, p. 138].

We need to act in this direction of tax policy consistently and steadily, but gradually, giving a chance for business entities to adapt to new requirements. Indeed price escalation for resources is good for economy only if it is based on scientific-and-technological advance and innovations which are able to boost labour productivity, to decrease the consumption of natural resources per unit of GDP and human pressure on environment. In other words, the focus on "green" tax reform can be successful only if the national innovation system is able to generate and widely use the advanced technique and technology. Neoindustrialization, which provides accelerated development of advanced manufacturing based on the development of key technologies, is needed for this purpose. Now

these opportunities of Ukrainian innovation system are obviously insufficient, by reason of broken links between science and production. *That is why the creation of favourable conditions for innovative development by means of formation of new industrial environment with radically reduced transaction costs in the field of taxation and management as a whole and the provision of efficient tax incentives for scientific, research and innovative activity should be the main directions of tax policy for mid-term (5-7 years).*

Tax incentive of R&D, which is actively used in both developed and successfully developing countries can become one of the most important measure in this direction. Public funding of R&D operates countercyclical, filling the gaps in financing caused by the reduction of pri-

vate R&D in the period of recession. This is the reason why governments of developed countries pay so much attention to creation of new ways of R&D and innovation stimulation and also on the basis of public-private partnerships [6, p. 160]. Tax incentive of R&D is operated in 26 of 34 countries of OECD and also in most of developing countries. Moreover this form of indirect financing is used more and more in the world significantly complementing the direct financing of R&D by means of contracts, subsidies and grants [10, p. 161]. The main ideas of such policy are an involvement of business structures into science financing, state support of business corporations and society in a strategically important area of innovation, and its usual form – tax credits and tax allowances for research and development.

In Ukraine, which frequently falls behind not only developed countries, but also the former Soviet republics in terms of R&D funding, and its share in the GDP [17], R&D tax incentives and rebirth of public-private partnership in the field of science and technology on this basis are the obligatory conditions for overcoming of financial and economic crisis and stagnation based on development of leading production and advanced technologies.

Proceeding from long experience of state independence there is no point to rely on the rebirth of major R&D government financing in Ukraine. That is why the potential of their private funding should be involved. Therefore it makes sense (by the example of successfully developing countries, Brazil, for example) to impose a tax allowance for R&D in Ukraine on a regular basis. Based on the features of the Ukrainian institutional environment, it can be the simplest form of such a discount – volume, when the obligations of the payer of corporate income tax are additionally reduced by a certain part (e.g. 60%) of its qualified research and development expenditures.

Of course, there is no guarantee that this measure will help to solve the problem. The problem is not in funding but also in interest of dominant business owners to get profit not by rent-seeking but by means of elaboration and implementation of emerging technology, in availability of scientific and technical personnel

capable to solve assigned tasks, modern scientific equipment, etc. However there is no any alternative for this so the follow researches should be focused on substantiation of economic mechanisms of sustainable economic growth providing on innovative basis.

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**MAIN DIRECTIONS OF FORMING STATE STRATEGY  
OF SUSTAINABLE REGIONAL DEVELOPMENT IN UKRAINE:  
REALITIES AND PERSPECTIVES**

Currently, Ukraine is facing the strategic task of economic modernization on the basis of transition to the innovative way of social and economic development. According to experience of developed countries, raising this problem is connected with “environmental” dilemma: to implement environmental technologies at the “end of pipe” or on its “beginning”<sup>1</sup>. It should be noted that the second type of technologies is the most effective in the long-term period but also more expensive and significantly hinders economic growth. Efficiency of its implementation largely depends on the methods used to manage and control this process. One of the most popular methods of state regulation of sustainable development is a strategic planning system that balances economic, environmental and social goals of long-term community development.

Correlation between economic development and environmental safety has been studied by both national and international scientists. Problems of production greening were covered by R. Costanza, W.E. Rees, S. Harichkov [1-3], forming strategy and creating conditions for transition to sustainable development – by T. Panayotou, O. Polovyan, O. Veklich, O. Garkushenko [4-7], increasing economic efficiency of natural resources usage – O. Balatsky, L. Melnyk, O. Popova [8-9].

However, there is still no single approach to the definition, creation and development of an integrated strategy for sustainable development

based on a holistic vision. Therefore the aim of the work is to identify key principles, directions and features of a strategy for sustainable development of the regions of Ukraine.

Sustainable development presupposes co-evolutionary interaction between economic, social and ecological subsystems. Managing this process relies on the use of methods and techniques of change management (management of evolution), which is based on the theory of synergetics, self-organization and evolutionary economics. For these theories it is typical to consider qualitatively new modes of behavior of complex managed structures – bifurcations, attractors, multiple optimal solutions etc., that is caused by possibility of emergence of space-time dissipative structures<sup>2</sup>.

Methodical basis for sustainable development management are:

evolutionary management (change management) on the basis of a hierarchically controlled dynamic system;

environmental innovation management, which is the first step aimed to co-evolutionary development of society and nature;

approach of process innovation that allows to organize the generation and realization of required resource saving technological solutions;

regulatory and legal framework of transfer of knowledge and technology that allows to consolidate environmental imperative of sustainable development.

<sup>1</sup> “End of pipe” – neutralization of pollution at the last stage of the production cycle.

“Beginning of pipe” – the introduction of environmental technologies at all stages of the production cycle.

<sup>2</sup> Dissipative structures are the sets that draw attractors that can generate efficient intersystem connections. As a result, coherent, coordinated movement occurs in the managed system.

Evolutionary management suggests that, while planning and implementing economic development based on innovation, it is possible to manage evolution of society. Society that is evolving faster wins in the historic race. Evolutionary management tries to combine continuous training and development of human capital within biogeocoenose that is occupied by territorial community. This type of management is required to make gradual changes in reflective way by using the procedure of selection and variability, that is the basis for further changes. It synthesizes the advantages of decentralized coordination types (based on the adaptive properties) and the benefits of long-term planning.

Conceptually, the achievement of sustainable development is only possible with the use of tools for strategic planning, which involves determining long-term scenarios and consequences of management actions on the managed system. The effectiveness of development of strategic goals of sustainable development is largely dependent on the use of active methods of interactive planning. The result is recommended (possible) targets for the regulator of the lower level. Appropriate directions to implement objectives of sustainable development are developed with appropriate forms of interaction and scenario approach based on economic and mathematical modeling, interactive planning, logical incrementalism. These directions are the basis for developing appropriate targeted programs, strategies for the development of individual regions and businesses, voluntary agreements between business and the state etc.

Sustainable development does not apply to processes with the end: each generation puts their own goals, taking into account environmental constraints and needs and their own idea of social justice [10]. In this process, it is necessary to make correlation between top-down planning and bottom-up incrementalism<sup>1</sup>.

The following key issues of change management in social processes should be considered:

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<sup>1</sup> In strategic management incrementalism is the approach of phased problem solving and represents a process that aims to get the result through adopting a plurality of small decisions taken during a long period of time [11].

1) contradictions. Contradictions related to the objectives, methods and ways of their solution often arise during dealing with complex social problems. It should be noted that each of the alternative solutions have both positive and negative aspects. The uncertainty of outcomes in the long run is of particular note;

2) distribution of control. In pluricentric societies control is distributed between different members of society, with their own ideas, interests, resources, that may conflict with each other;

3) identification of short-term steps. The way short-term solutions help to achieve long-term goals is of great importance;

4) danger of “lock”. There is a danger that once the selected solution will not be the optimal solution in the long run. This is compounded by the fact that the choice of one solution and its active use in the process of change while ignoring other options will lead in the future to the domination of selected solution over others. The list of options may become the solution of this problem;

5) political shortsightedness.

The key element of the strategy of sustainable development is the greening of economy, which includes the transformation of economic subsystem by regulating economic development in the direction of reducing the eco-destructive impact on development conditions of environmental and biotic subsystems. Greening requires a reorientation of the economy on eco-sustainable goals at the macro level [12].

The issue of sustainable development is especially important for Ukraine because of the high level of technogenic burden on its environment. The main factors of ecological crisis in Ukraine are primarily industrial complexes – the leading consumers of raw materials, energy, water, air, land and at the same time the most powerful source of almost all kinds of pollution. During 2012 the atmosphere has received 6.8 mln tons of pollutants (64% are from stationary sources). The volume of toxic substances is 11.3 t per 1 km<sup>2</sup> of the country and 150 kg per one person.

It should be noted that indicators of technogenic burden on the atmosphere differ at the regional level. In particular, in the Donetsk region emissions per 1 km exceed the average lev-

el in 5.7 times and per person – 2.6 times, Dnipropetrovsk region – respectively 3.3 and 2.4 times, Lugansk region – 1.8 and 1.6 times, Ivano-Frankivsk region – 1.6 and 1.2 times.

According to the State Agency of Land Resources of Ukraine in 2012 1.2 thousand hectares of land were damaged. In general, at the end of 2012, the area of damaged land was 144.5 hectares (0.24% of the total land area of Ukraine), exhausted – 45.8 hectares (0.08%).

According to the State Agency of Water Resources of Ukraine in 2012 10.5 bln cubic meters of water were taken from natural water bodies (54.3% – for production). During 2012 8.1 bln cubic meters of water were dropped in reservoirs, of which almost 19% fell into the water in a polluted state (3.6% – without any treatment).

In 2012, the volume of waste generation was 450.7 mln tons. Wastes of fourth danger level make up 99.7%, wastes of third danger level – 0.22%. wastes of the first and second danger level make up respectively 3.2 thousand and 357.5 thousand tons.

As of January 1, 2013 there were accumulated 14.9 bln tons of waste in specially designated places and on the territory of enterprises. 96% of country's waste are stored on the territory of five regions, particularly in Dnipropetrovsk (9548 mln tons), Donetsk (2887 Mt), Zaporizhia (154 mln tons), Kirovograd (270 mln tons) and Lugansk (1470 mln tons) regions<sup>1</sup>.

Thus, the analysis of the current environmental situation in Ukraine indicates that the load on the components of the environment is significant. This is caused by large resource-intensiveness of national economy with a predominance of polluting, outdated technologies. The specificity of the gross national product indicates the raw material oriented industries. Long-term comprehensive exploitation of natural resources has led to a loss of the ability of ecosystem to heal itself, that is accompanied by deterioration and depletion of mineral properties of the main biosphere components, increasing the negative impact on public health, deteriorating working conditions and overall quality of life.

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<sup>1</sup> All calculations are carried out according to the Statistical Yearbook of Ukraine for 2012 [13]

The grouping of regions of Ukraine is made in terms of economic and environmental conditions using cluster analysis. As the result the following groups are received: 1) Autonomous Republic of Crimea, Mykolaiv Region; 2) Vinnytsia, Volyn, Zhytomyr, Kirovograd, Rivne, Sumy, Ternopil, Kherson, Khmelnytsky, Cherkasy, Chernivtsi and Chernihiv regions; 3) Dnipropetrovsk and Donetsk regions; 4) Transcarpathian, Ivano-Frankivsk, Kyiv, Lviv, Poltava regions; 5) Zaporizhia region; 6) Lugansk, Odessa and Kharkiv regions. The mean values of the groups, constructed on standardized values, are shown in Fig. 1.

So, the groups significantly differ from each other. The elements of the first group show small values for all indicators except waste generation. The representatives of the third group (industrial regions) are characterized by large values of parameters, in contrast to the second group, that consists of the regions with traditionally favorable ecological situation, but with a less-developed heavy industry. Zaporizhia region refers to a particular group due to the specific character of the selected indicators. The large part of industrial sector, availability of nuclear power engineering has led to the large volume of wastes and material costs.

Two types of rating are built for the overall assessment of the economic and ecological situation in the regions of Ukraine. The rating “A” (Table 1) defines the level of production greening in regions. It is built on the basis of the following indicators: materials consumption, generation and accumulation of wastes, draining of polluted wastewater per 1 UAH of industry, local public expenditures on environmental protection per 1 UAH of industry. According to the rating “A” the level of production greening is sufficiently low across the whole country. Differences in its regional values are caused by differences in levels of concentration of industrial production.

The rating “B” (Table 2) defines the level of ecological load on the population of the region. It is based on the following indicators: emissions of pollutants, carbon dioxide emissions, generation and accumulation of wastes, draining of polluted wastewater per 1 person.

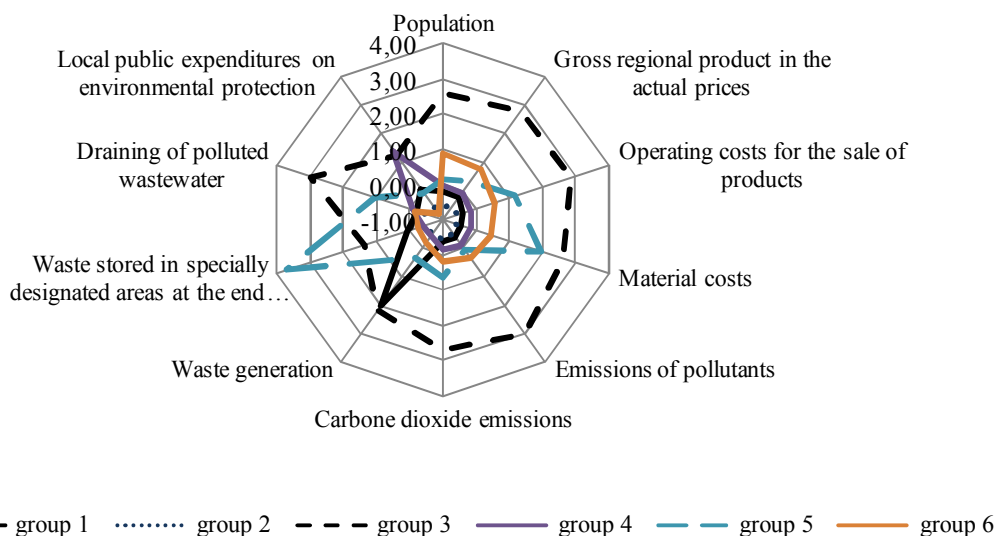


Fig. 1. The mean values of obtained groups in 2012

Table 1

The rating (A) of regions of Ukraine in terms of greening of production

№	Region	Integral Index
1	Kharkiv	1.365
2	Dnipropetrovsk	1.446
3	Odessa	1.493
4	Volyn	1.773
5	Donetsk	1.811
6	Kyiv	1.867
7	Transcarpathian	1.878
8	Lviv	2.002
9	Poltava	2.106
10	Chernivtsi	2.209
11	Rivne	2.223
12	Khmelnitsky	2.256
13	Zhytomyr	2.319
14	Lugansk	2.490
15	AR of Crimea	2.827
16	Kirovohrad	2.840
17	Chernihiv	2.841
18	Cherkasy	2.973
19	Ivano-Frankivsk	3.024
20	Mykolaiv	3.043
21	Vinnytsia	3.108
22	Ternopil	3.276
23	Zaporizhia	3.421
24	Sumy	3.458
25	Kherson	4.368

Table 2

*The rating (B) of regions of Ukraine in terms of ecological security of the population*

№	Region	Integral Index
1	Chernivtsi	0.079
2	Volyn	0.085
3	Ternopil	0.154
4	Zhytomyr	0.159
5	Transcarpathian	0.160
6	Khmelnitsky	0.175
7	Rivne	0.179
8	Chernihiv	0.399
9	Kirovohrad	0.403
10	Odessa	0.407
11	Cherkasy	0.445
12	Vinnitsia	0.507
13	Kharkiv	0.648
14	Poltava	0.657
15	Kherson	0.765
16	Sumy	0.875
17	Kyiv	0.962
18	Lviv	0.994
19	Ivano-Frankivsk	1.102
20	AR of Crimea	1.200
21	Mykolaiv	1.460
22	Lugansk	1.512
23	Dnipropetrovsk	2.729
24	Zaporizhia	3.136
25	Donetsk	3.417

According to the rating “B” the first place is taken by the Chernivtsi region, the last one – by the Donetsk region. This situation is explained by the level of concentration of production and pollution. It must be clearly understood that the positive situation in some regions is caused by the lack of polluting industries, but not the efficiency of environmental activities.

Thus, the analysis confirms the existence of significant anthropogenic impact on the environment of Ukraine, which appreciably differs by regions. This, in its turn, confirms the need to develop a state strategy for sustainable regional development in Ukraine.

It should be noted that there was developed the State Environmental Policy Strategy of Ukraine till 2020 [14]. Its purpose is to stabilize and improve the state of the environment in Ukraine through the integration of environmental policy into socio-economic development of Ukraine to ensure ecologically safe environment for life and health of population and implement ecologically sustainable system of nature man-

agement and preservation of natural ecosystems. According to this document, the National Environmental Policy of Ukraine is aimed at a number of strategic objectives (Table 3).

The strategy of State Environmental Policy of Ukraine includes steps of its implementation and instruments of this policy, such as: intersectoral partnership; environmental examination; environmental audit; environmental management system, environmental labeling; environmental insurance; technical regulation; standardization and registration in the field of environmental protection, environmental management and ensuring environmental safety; education and scientific support for the formation and implementation of national environmental policy; economic and financial mechanisms; environmental monitoring and control in the field of environmental protection and environmental security; international cooperation in the field of environmental protection and environmental safety.

*Strategic goals and objectives of the National Environmental Policy of Ukraine*

Strategic goals of the National Environmental Policy	Strategic objectives of the National Environmental Policy
1	2
1. Increasing the level of public environmental awareness	<ul style="list-style-type: none"> <li>- creating national information system of environmental protection;</li> <li>- increasing the share of environmental information and public service announcements with environmental orientation that are regularly distributed by the media (till 2015 – by 15%, till 2020 – by 30% from the level of 2010);</li> <li>- creating till 2015 a nationwide automated information system for ensuring access to environmental information, till 2020 – system of environmental information management, in accordance with EU standards;</li> <li>- developing till 2012 and implementing till 2020 program to support projects of environmental organizations and bringing the volume of funding: in 2015 – to the level of at least 2% of the total expenditures of the State Fund for Environmental Protection of Ukraine, in 2020 – to the level of at least 3% of expenditures;</li> <li>- creating till 2015 system of environmental education;</li> <li>- providing state support to creation and development of settlements, that use energy and resources saving technologies of house building, and comprehensive implementation of such technologies till 2015</li> </ul>
2. Improving environmental situation and increasing level of environmental safety	<ul style="list-style-type: none"> <li>- protecting the air by reducing emissions of pollutants; defining target indicators of content of hazardous substances in the air; optimizing the structure of energy sector of the national economy by increasing the use of energy sources with low carbon dioxide emissions;</li> <li>- protecting water resources through implementation of basin-based integrated management, reconstructing existing and creating new municipal wastewater treatment plants;</li> <li>- protecting land resources through reducing arable land; providing till 2015 full consideration of environmental requirements in the process of land allocation for placing objects of various fields of industry and solving issues related to withdrawal (redemption), changing the purpose of land plots; development and implementation of agricultural landscapes management system on the basis of sustainable development till 2020;</li> <li>- protecting forests through increasing the area of afforestation of territory up to 17% of the state territory till 2020;</li> <li>- protecting geological environment through implementation of environmentally friendly technologies of mining till 2020; ensuring land recultivation on the area of at least 4.3 thousand hectares; ensuring the fullest possible use of extracted minerals, minimizing waste during their production and processing;</li> <li>- improving safety of waste management; increasing the volume of procurement, disposal and use of waste as secondary raw materials by 1.5 times till 2020; ensuring final disposal of accumulated unusable pesticides till 2020; creating system of medical waste management till 2015</li> </ul>
3. Achieving safe for human health state of environment	<ul style="list-style-type: none"> <li>- creating system of automatic monitoring and strengthening environmental monitoring of air quality till 2015;</li> <li>- ensuring the full compliance with regulatory requirements for centralized drinking water supply sources till 2015;</li> <li>- introducing environmental labeling of products and food till 2020;</li> <li>- developing state system of environmental monitoring through its modernization, strengthening the coordination of activities of monitoring subjects, improving data management systems as a basis for decision-making</li> </ul>

1	2
4. Environmental policy integration and improvement of integrated environmental management system	<ul style="list-style-type: none"> <li>- implementing environmental management systems and preparing national target programs of industry greening, that provide technical re-equipment, the introduction of energy-efficient and resource-saving technologies, low-waste, waste-free and environmentally friendly manufacturing processes;</li> <li>- developing and implementing system of incentives for businesses that implement environmental management, principles of corporate social responsibility, apply environmental audit, certification of production, its quality in accordance with international environmental standards, improve environmental performance in line with established international environmental standards</li> </ul>

So, implementation of this strategy will help to increase the environmental awareness of citizens of Ukraine, improve the environment to a safe for human life level, permanently reduce the level of dependence between economic development and the deterioration of the environment, create a system of sustainable environmental management, provide transition to a system of integrated environmental management in all sectors of the economy, reform the tax system to reinforce the importance of environmental taxation, improve the state system of environmental monitoring and system of information support of decision-making process.

However, this strategy does not take into account the specifics of development and technological burden in individual regions of Ukraine. In addition, it seeks only to solve environmental issues and is not associated with the strategy of socio-economic development. This is contrary to the essence of sustainable development and holistic approach to solving economic and environmental problems.

Removal of the first deficiency must be made within the State Regional Development Strategy, which was approved on November 21, 2013 at the meeting of the Cabinet of Ministers of Ukraine [15]. This paper identifies three main objectives of the state regional policy:

1. Increasing competitiveness of regions (support of regional competitiveness is determined as the main element of development policy of Ukraine).

2. Territorial socio-economic integration and spatial development (ensuring the unity of whole national territory, leveling disparities in regional development to ensure adequate quality of life, regardless of geographic location).

3. Effective state management in the field of regional development (it is necessary to create a framework for implementation of effective regional policy, mechanisms and instruments of state administration, regional development, which would meet the requirements of time and problems facing the region).

Analysis of this regulatory document from the standpoint of sustainable development has allowed to reveal significant shortcomings. In spite of its sufficiently clear socio-economic orientation it completely ignores the issue of environmental development of the country and problems caused by anthropogenic impact on the environment. So, this document does not solve the above-mentioned problem of sustainable regional development. Thus, Ukraine has no state strategy based on a holistic approach to solving the environmental problems of economic development. Existing documents highlight some aspects of sustainable development, but they are not complex.

Development strategy of European countries «Europe 2020: A European strategy for smart, sustainable and inclusive growth» may be an example of solving this problem.

Europe 2020 puts forward three mutually reinforcing priorities:

1. Smart growth: developing an economy based on knowledge and innovation.

2. Sustainable growth: promoting a more resource efficient, greener and more competitive economy.

3. Inclusive growth: fostering a high-employment economy delivering social and territorial cohesion.

Within the selected directions of development Europe has set itself the following objectives:

the employment rate of the population aged 20-64 should increase from the current 69% to at least 75%, including through the greater involvement of women, older workers and the better integration of migrants in the work force;

investing 3% of GDP in R&D;

reducing greenhouse gas emissions by at least 20% compared to 1990 levels or by 30%, if the conditions are right; increasing the share of renewable energy sources in final energy consumption to 20%; and a 20% increase in energy efficiency;

a target on educational attainment which tackles the problem of early school leavers by reducing the drop out rate to 10% from the current 15%, whilst increasing the share of the population aged 30-34 having completed tertiary education from 31% to at least 40% in 2020;

the number of Europeans living below the national poverty lines should be reduced by 25%, lifting over 20 mln people out of poverty [17].

Member States should adopt the strategy "Europe 2020" to their particular situation. The European Commission proposes them to transform EU objectives into their national strategies. Objectives reflect the essence of smart, sustainable and inclusive growth, but they are not exhaustive. In this regard, the Commission identifies 7 directions of primary importance:

1. "Innovation Union" to improve framework conditions and access to finance for research and innovation so as to ensure that innovative ideas can be turned into products and services that create growth and jobs.

2. "Youth on the move" to enhance the performance of education systems and to facilitate the entry of young people to the labour market.

3. "A digital agenda for Europe" to speed up the roll-out of high-speed internet and reap the benefits of a digital single market for households and firms.

4. "Resource efficient Europe" to help decouple economic growth from the use of resources, support the shift towards a low carbon economy, increase the use of renewable energy sources, modernize our transport sector and promote energy efficiency.

5. "An industrial policy for the globalization era" to improve the business environment, notably for small and medium enterprises (SME), and to support the development of a strong and sustainable industrial base able to compete globally.

6. "An agenda for new skills and jobs" to modernize labour markets and empower people by developing their skills throughout the life-cycle with a view to increase labour participation and better match labour supply and demand, including through labour mobility.

7. "European platform against poverty" to ensure social and territorial cohesion such that the benefits of growth and jobs are widely shared and people experiencing poverty and social exclusion are enabled to live in dignity and take an active part in society.

These targets are interrelated. For instance, better educational levels help employability and progress in increasing the employment rate helps to reduce poverty. A greater capacity for research and development as well as innovation across all sectors of the economy, combined with increased resource efficiency will improve competitiveness and foster job creation. Investing in cleaner, low carbon technologies will help environment, contribute to fighting climate change and create new business and employment opportunities.

Sustainable growth in the context of European development strategy means building a resource efficient, sustainable and competitive economy, exploiting Europe's leadership in the race to develop new processes and technologies, including green technologies.

In the environmental sector, the European Commission distinguishes two main directions: "Resource efficient Europe" and "An industrial policy for the globalisation era".

*Flagship Initiative: "Resource efficient Europe"*

The aim is to support the shift towards a resource efficient and low-carbon economy that is efficient in the way it uses all resources. The aim is to decouple economic growth from resource and energy use, reduce CO<sub>2</sub> emissions, enhance competitiveness and promote greater energy security.

At EU level, the Commission will work:

to mobilise EU financial instruments (e.g. rural development, structural funds, R&D framework programme) as part of a consistent funding strategy, that pulls together EU and national public and private funding;

to enhance a framework for the use of market-based instruments (e.g. emissions trading, revision of energy taxation, state-aid framework, encouraging wider use of green public procurement);

to present proposals to modernise and decarbonise the transport sector thereby contributing to increased competitiveness. This can be done through a mix of measures e.g. infrastructure measures such as early deployment of grid infrastructures of electrical mobility, intelligent traffic management, better logistics, pursuing the reduction of CO<sub>2</sub> emissions for road vehicles, for the aviation and maritime sectors including the launch of a major European “green” car initiative which will help to promote new technologies including electric and hybrid cars through a mix of research, setting of common standards and developing the necessary infrastructure support;

to accelerate the implementation of strategic projects with high European added value to address critical bottlenecks, in particular cross border sections and inter modal nodes (cities, ports, logistic platforms);

to complete the internal energy market and implement the strategic energy technologies plan, promoting renewable sources of energy in the single market would also be a priority;

to present an initiative to upgrade Europe's networks, including Trans European Energy Networks, towards a European supergrid, “smart grids” and interconnections in particular of renewable energy sources to the grid. This includes to promote infrastructure projects of major strategic importance to the EU in the Baltic, Balkan, Mediterranean and Eurasian regions;

to adopt and implement a revised Energy Efficiency Action Plan and promote a substantial programme in resource efficiency (supporting small and medium enterprises as well as households) by making use of structural and other funds to leverage new financing through existing highly successful models of innovative investment schemes; this should promote

changes in consumption and production patterns;

to establish a vision of structural and technological changes required to move to a low carbon, resource efficient and climate resilient economy by 2050 which will allow the EU to achieve its emissions reduction and biodiversity targets; this includes disaster prevention and response, harnessing the contribution of cohesion, agricultural, rural development, and maritime policies to address climate change, in particular through adaptation measures based on more efficient use of resources, which will also contribute to improving global food security.

At national level, Member States will need:

to phase out environmentally harmful subsidies, limiting exceptions to people with social needs;

to deploy market-based instruments such as fiscal incentives and procurement to adapt production and consumption methods;

to develop smart, upgraded and fully interconnected transport and energy infrastructures and make full use of ICT;

to ensure a coordinated implementation of infrastructure projects, within the EU Core network, that critically contribute to the effectiveness of the overall EU transport system;

to focus on the urban dimension of transport where much of the congestion and emissions are generated;

to use regulation, building performance standards and market-based instruments such as taxation, subsidies and procurement to reduce energy and resource use and use structural funds to invest in energy efficiency in public buildings and in more efficient recycling.

*Flagship Initiative: "An industrial policy for the globalisation era"*

Industry and especially small and medium enterprises have been hit hard by the economic crisis and all sectors are facing the challenges of globalisation and adjusting their production processes and products to a low-carbon economy. The impact of these challenges will differ from sector to sector, some sectors might have to “reinvent” themselves but for others these challenges will present new business opportunities. The Commission will work closely with stakeholders in different sectors (business, trade

unions, academics, NGOs, consumer organisations) and will draw up a framework for a modern industrial policy, to support entrepreneurship, to guide and help industry to become fit to meet these challenges, to promote the competitiveness of Europe's primary, manufacturing and service industries and help them seize the opportunities of globalisation and of the green economy. The framework will address all elements of the increasingly international value chain from access to raw materials to after-sales service.

At EU level, the Commission will work:

to establish an industrial policy creating the best environment to maintain and develop a strong, competitive and diversified industrial base in Europe as well as supporting the transition of manufacturing sectors to greater energy and resource efficiency;

to develop a horizontal approach to industrial policy combining different policy instruments (e.g. "smart" regulation, modernised public procurement, competition rules and standard setting);

to improve the business environment, especially for SMEs, including through reducing the transaction costs of doing business in Europe, the promotion of clusters and improving affordable access to finance;

to promote the restructuring of sectors in difficulty towards future oriented activities, including through quick redeployment of skills to emerging high growth sectors and markets and support from the EU's state aids regime and/or the Globalisation Adjustment Fund;

to promote technologies and production methods that reduce natural resource use, and increase investment in the EU's existing natural assets;

to promote the internationalisation of SMEs;

to ensure that transport and logistics networks enable industry throughout the Union to have effective access to the Single Market and the international market beyond;

to develop an effective space policy to provide the tools to address some of the key global challenges and in particular to deliver Galileo and GMES;

to enhance the competitiveness of the European tourism sector;

to review regulations to support the transition of service and manufacturing sectors to greater resource efficiency, including more effective recycling; to improve the way in which European standard setting works to leverage European and international standards for the long-term competitiveness of European industry. This will include promoting the commercialisation and take-up of key enabling technologies;

to renew the EU strategy to promote Corporate Social Responsibility as a key element in ensuring long term employee and consumer trust.

At national level, Member States will need:

to improve the business environment especially for innovative SMEs, including through public sector procurement to support innovation incentives;

to improve the conditions for enforcing intellectual property;

to reduce administrative burden on companies, and improve the quality of business legislation;

to work closely with stakeholders in different sectors (business, trade unions, academics, NGOs, consumer organisations) to identify bottlenecks and develop a shared analysis on how to maintain a strong industrial and knowledge base and put the EU in a position to lead global sustainable development.

Thus, the analysis of the strategy "Europe 2020" confirms its holistic platform, complexity and focus on the coordination of social, economic and environmental objectives of society development. The document clearly identify both general priorities and specific goals and objectives facing both to the whole European Union and to each individual region.

Analysis of above mentioned documents shows that the integration of environmental policy into sectoral policies, obligatory consideration of the environmental component during preparation of development strategies, plans and programs, introduction of environmental management at enterprises, the greening of economic activity is the way to modern sectoral environmental policy, implemented in Western and Central Europe.

However, in Ukraine the process of integrating environmental policy is at the initial

stage. It is necessary to develop the State strategy of sustainable development, which should be based on the following principles:

1) complexity and security: economic development programs should take into account the full range of possible environmental threats, risks and their economic, social and environmental consequences;

2) scientific validity: strategic decision-making in all areas should be based on research and practical developments in the field of sustainable development;

3) preclusiveness: preventing damage, that includes economically effective prevention of the negative impact on the environment;

4) innovativeness: the priority of innovative technologies and equipment, focused on creating environmentally friendly products;

5) avoidance of waste: complex use of natural resources with maximum approach to cleaner production of economic goods, organization of industrial cycles by analogy with natural ecosystems on the basis of avoidance of waste, recycling and cooperation;

6) balance between economic, social and environmental needs: maintenance of volume of natural resources use and pollutants within the regenerative and assimilative capacity of ecosystems;

7) social justice: guaranteeing the equality of citizens before the law, equal opportunities to achieve financial, environmental and social welfare;

8) motivation: creating the process of formation of organizational, social and economic conditions that are constantly updated due to the occurrence of pulses, existing motives and intentions set and achieve strategic objectives;

9) internalization of externalities: compensation for harm, damaging components of the environment and public health, that is made by entities (physical or legal), whose activities led to a negative impact on the environment;

10) transparency of management: consideration of public opinion during determination of economic and environmental regional policy.

Priority directions for sustainable regional development should be directed to:

implementation of cluster oriented industrial policy strategy to improve the competitive-

ness and productivity of the cluster members through innovation and synergy;

intensification of innovation and investment model of industrial upgrading in order to increase production greening, import substitution, technological renovation of fixed assets and provision of energy efficiency;

construction of industry structure that meets the latest international requirements and national priorities of socio-economic development – technology intensity, research intensity and competitiveness;

introduction of special regimes to promote domestic production and export of home industrial products using the latest technologies with deep processing of natural resources, high added value and output of final consumption products;

strengthening of fiscal discipline, optimization of budget costs and improvement of efficiency of budget planning while financing programs of industrial development based on criteria of environmental safety;

greening of the tax system, shift of emphasis in taxation from final results on resource costs;

implementation of structural reforms aimed at reorienting the production from raw materials to the finished process cycles;

strengthening of responsibility for inefficient use of all resources;

extension of waste recycling technologies; educational reform towards improving the quality of knowledge, development of eco-oriented ethics;

formation of new social and personal psychology of employers and workers, focusing on compliance with the requirements of sustainable development;

implementation of the range of financial and economic measures that promote industrial transition to sustainable development principles.

Thus, the practical implementation of the proposed recommendations for a sustainable regional development will promote a process of changing qualitative characteristics of socio-economic systems within environmental constraints to provide opportunities to meet the needs of future generations.

Further research can be directed towards building economic and mathematical model,

which allows to obtain different scenarios for sustainable development of regions.

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## EVALUATION OF INVESTMENT AND INNOVATIVE DEVELOPMENT OF UKRAINIAN ECONOMY: EVOLUTIONAL APPROACH

The development of industry in Ukraine depends on effective government regulation. It manifests itself in the creation of conditions for sustainable economic growth based on investment and innovation, and the tax system that convenient for taxpayers. However, in modern conditions Ukraine occupies one of the last positions among the emerging market economies by purchasing power parity gross domestic product (GDP) per capita [23]. There are reduced total investments in the economy, the share of the costs of implementing the scientific and technological work in the total GDP etc. [21].

One of the sets of regulatory instruments of socio-economic development, which is actively used by different countries of Organization for Economic Co-operation and Development (OECD) and major emerging national economies of Brazil, Russia, India, China and South Africa (BRICS), are tools of tax policy [18; 26; 27].

Problems of socio-economic development using the methods of tax policy need to be addressed in Ukraine. And in order to tax regulation has become more predictable in the domestic institutional environment, the economic and mathematical instruments, which allow substantiating the use of some tax measures in the long term, are used.

In economic thought of developed countries the impact of tax policy on the rate of GDP growth is often studied from the standpoint of the neoclassical approach by assessing the factors of production – capital and labor – in the process of taxation (K. Judd [1], J. Corsetti, N. Roubini [2], Ch. Chamley [3]).

Accordance to the views of the tax neoclassic the incentives of investment and innovation development of industrial enterprises should be considered in an evolutionary approach. It reflects the change in the behavior of economic agents in the conditions of the government policy and used as in Western economic thought

(S. Bowles [4], R. Nelson, S. Winter [5], J. Hodgson [6]), and representatives of the Russian and Ukrainian economic schools (B. Maevskiy [7], V. Makarov [8], O. Suharev [9], V. Vishnevskiy [10]). This methodology may be useful from the standpoint of research tools of tax policy to stimulate investment and innovation activities of industrial enterprises in Ukraine. However, the use of the evolutionary approach for the analysis of tax instruments in the promotion of investment and innovation has not received sufficient development [24].

The objective of this study is to provide an improved evolutionary model, which is based on agent-oriented approach and describes the inertial scenario of the investment and innovation development of Ukrainian economy.

To estimate the tax incentive investment and innovative development of the industry it is proposed to investigate the socio-economic system, which consists of the components of the innovation economy, that interacting through causal relationships (Fig. 1). It is assumed that such components are

- (1) the government, namely: tax sector, through which the government forms tax politics; budget sector, through which the government allocates public goods;
- (2) economic agents as business entities;
- (3) R&D sector, where research institutions form knowledge and provide the creation of an innovative product;
- (4) households as a set of individuals.

Nominated on the basis of assumptions, an evolutionary model of tax incentives for investment and innovation enterprise development of industry is developed. Its formal description is based on

- determining the form of the production function of economic agents, the value of which depends on the growth rate of the economy;
- imposing of restrictions, which relate to the behavior factor of selected subjects;

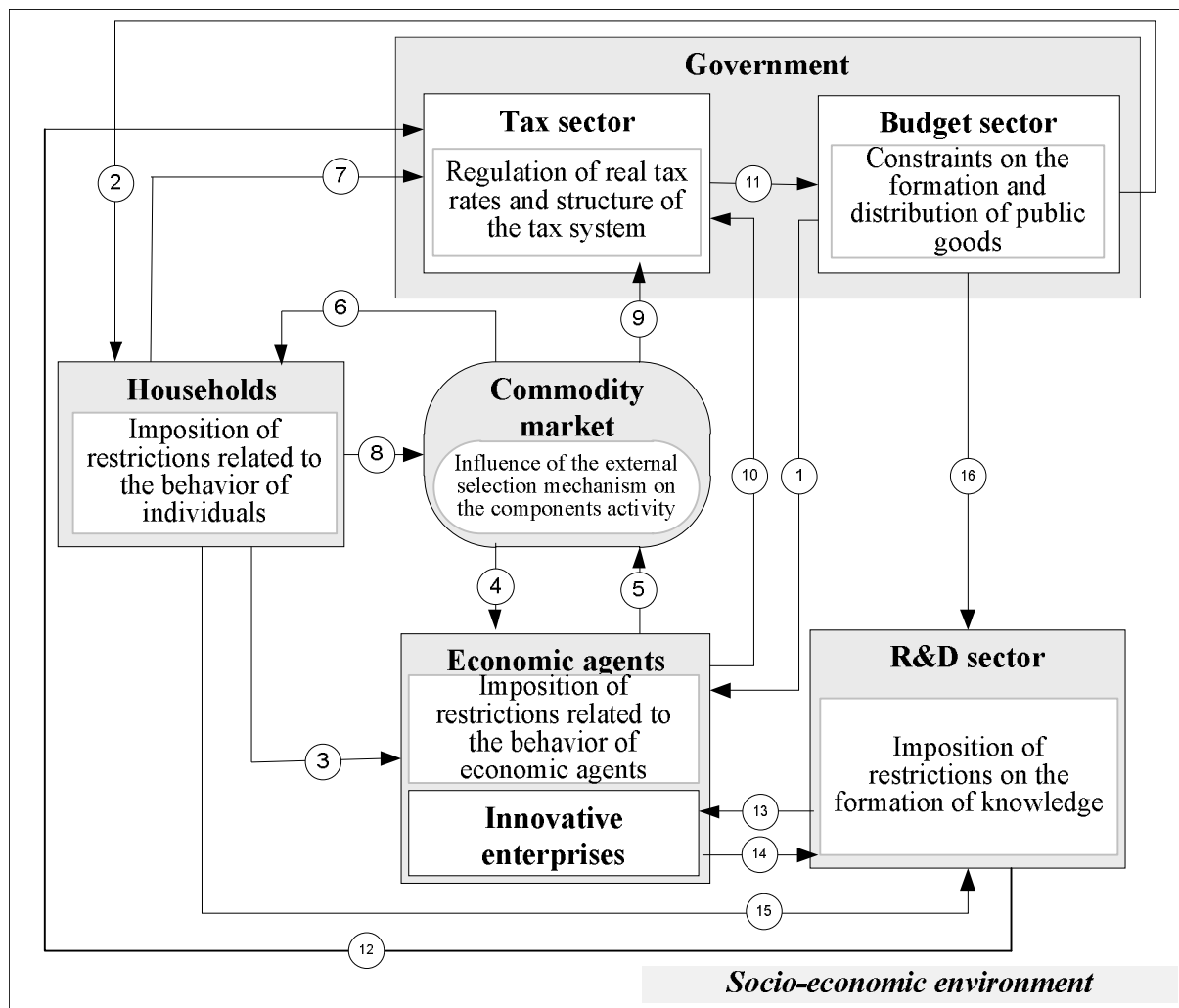


Fig. 1. Causal diagram of the innovation economy

imposing of restrictions on the budget and tax sectors of socio-economic system;

introduction of prerequisites and restrictions on the operation of socio-economic components of the system.

All agents ( $I$ ) in the socio-economic environment are divided into categories [11, p. 215-234]:

- producers of knowledge ( $S$ )—R&D sector;
- transporters of knowledge ( $Z$ ) – innovation-active agents (innovative industrial enterprises) that are actively implement innovations that are developed by R&D sector;

- consumers of knowledge ( $C$ ) – enterprises that can adopt approaches to improving the efficiency of its own production in innovative companies. Innovations of transporters of knowledge

contribute to the quality of technology or routines.

So each agent  $i$ ,  $i \in I$  refers to one of the categories:  $s \in S$ ,  $z \in Z$  and  $c \in C$ . Agents of any category appear randomly and can use the material resources (stream 4, Fig. 1), which are consumed in the market for goods and services with the aim of production. Manufactured products are sold on the market (stream 5, Fig. 1).

However, goals of economic agents are different.

The objective of the innovative enterprises is production and dissemination of knowledge among consumers. According to the performing research [12, 13, p. 21] the economic activity of these agents is described by the Constant elasticity of substitution production function (CES-function) of the form

$$Y_{t+1}^z = \xi^* \cdot \left[ \left( E_0^{K^z} \cdot \exp\{\eta^{K^z}\} \cdot K_{t+1}^z \right)^{\frac{\sigma-1}{\sigma}} + \left( E_0^{L^z} \cdot \exp\{\eta^{L^z}\} \cdot L_{t+1}^z \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} + \varepsilon^*, \quad (1)$$

where  $Y_{t+1}^z$  – the final product of innovative enterprises;  $\xi^*$  – parameter of neutral efficiency of technologies;  $E_0^{K^z}$  – the initial level of capital efficiency of innovative enterprises;  $\eta^{K^z}$  – technical progress due to the capital factor of innovative enterprises;  $K_{t+1}^z$  – physical capital of innovative enterprises at time  $t+1$ ;  $\sigma$  – elasticity of substitution between production factors of innovative enterprises;  $E_0^{L^z}$  – the initial level of efficiency of innovative enterprises labor;

$\eta^{L^z}$  – technical progress due to the labor factor of innovative enterprises;  $L_{t+1}^z$  – labor as a payroll on innovative enterprises at time  $t+1$ ;  $\varepsilon^*$  – random errors of observation, that can take place under the influence of different factors of socioeconomic environment.

The objective of the consumer enterprises is the production as a result of consumption as much as potential technology. Their economic activities described by CES- function, the form of which is similar to the production function of innovative enterprises:

$$Y_{t+1}^c = \xi \cdot \left[ \left( E_0^{K^c} \cdot \exp\{\eta^{K^c} \cdot t\} \cdot K_{t+1}^c \right)^{\frac{\sigma-1}{\sigma}} + \left( E_0^{L^c} \cdot \exp\{\eta^{L^c} \cdot t\} \cdot L_{t+1}^c \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} + \varepsilon, \quad (2)$$

where  $Y_{t+1}^c$  – the production of finished goods company-consumers of knowledge;  $\xi$  – parameter of neutral efficiency of technologies;  $E_0^{K^c}$  – the initial level of efficiency of capital companies;  $\eta^{K^c}$  – technical progress due to the capital factor of enterprises;  $K_{t+1}^c$  – physical capital agents consumer knowledge at time  $t+1$ ;  $\sigma$  – elasticity of substitution between production factors of enterprises;  $E_0^{L^c}$  – the initial level of labor efficiency of enterprises;  $\eta^{L^c}$  – technical progress due to the labor factor of enterprises;  $L_{t+1}^c$  – labor used by agents as knowledge consumer;  $\varepsilon$  – random observation errors, which may occur under the influence of various factors of internal and external environment.

The total production of finished goods of industrial enterprises amounts to

$$Y_{t+1} = Y_{t+1}^z + Y_{t+1}^c. \quad (3)$$

Capital factor of innovative enterprises included in their production function. It value accounts as the cash flows that come from the use of the acquired knowledge, and is determined by a combination of non-current assets and working capital of innovative enterprises as well as costs for future periods:

$$K_{t+1}^z = M_{t+1}^z + \lambda R_t^z + (\beta^* F_{t+1}^{K^z} + I_{t+1}^{K^z}) \cdot \frac{k_{t+1}^z}{N^z}, \quad (4)$$

where  $M_{t+1}^z$  – non-current assets of innovative enterprises at time  $t+1$ ;  $\lambda$  – share of profits invested in production,  $0 \leq \lambda \leq 1$ ;  $R_t^z$  – profit of innovative enterprises after taxation at time  $t$ ;  $\beta^*$  – coefficient of effective distribution of funds between R&D sector, industrial and social systems,  $0 \leq \beta^* \leq 1$ ;  $F_{t+1}^{K^z}$  – public investment in capital of innovative enterprises at time  $t+1$ ;  $I_{t+1}^{K^z}$  – investments in innovative enterprises from other funding sources at time  $t+1$ ;  $k_{t+1}^z$  – the number of innovative enterprises that consume knowledge and use them as innovations at time  $t+1$ ;  $N^z$  – the total number of innovative enterprises.

It is assumed that  $M_{t+1}^z = K_t^z$ .

Sum of innovative enterprises profit prior taxation can be represented as

$$X_t^z = \psi^* \cdot \Psi_0^* \cdot \ln K_t^z,$$

where  $X_t^z$  – profit of enterprises as knowledge transporters prior taxation at the moment of time  $t$ ;  $\psi^*$  – part of the capital, directed at the economic activity of innovative enterprises as knowledge transporters in order to create profit;  $\Psi_0^*$  – approximation parameter,  $\Psi_0^* > 0$ .

Sum of profit of innovative enterprises after taxation can be represented as

$$R_t^z = X_t^z - T_t^{K^z},$$

where  $T_t^{K^Z}$  – the corporate income tax of innovative enterprises at time  $t$ .

Capital factor of consumers of knowledge is part of their production function, taking into account the cash flow that comes from the use of innovation as technology in the economic activity. The sum of its capital is defined similarly to calculations of capital for innovative enterprises, namely as a set of negotiable and non-negotiable funds of enterprises and costs for future periods.

In general the capital factor, that means net book value of fixed assets (machinery and equipment) of enterprises, is expressed as

$$P_t = P_{\min} + \frac{(P_{\max} - P_{\min})}{1 + \exp \left[ a_1 - a_2 \frac{F_t^{K^S} + (1 - \lambda^Z)R_t^Z + (1 - \lambda^C)R_t^C}{F_t^{K^S} + R_t^Z + R_t^C} \right]}$$

where  $P_t$  – the probability of occurrence of new knowledge at time  $t$ ;  $P_{\min}$  – the minimum probability of new knowledge occurrence;  $P_{\max}$  – maximum probability of new knowledge occurrence;  $F_t^{K^S}$  – public investment in the activities of R&D sector at time  $t$ ;  $R_t^Z$  – profit of innovative enterprises after taxation at time  $t$ ;  $R_t^C$  – profit of knowledge consumers after taxation at time  $t$ ;  $\lambda$  – share of profits, that is invested in production,  $0 \leq \lambda \leq 1$ ;  $a_1, a_2$  – parameters.

For the first time such type of function was used by P.F. Verhulst in the modeling of the population dynamics. In modern economic theory the logistic function is used in foreign and domestic researches (by R.M. Nizhegorodtsev [14] for the analysis of technological

$$K_{t+1} = K_{t+1}^Z + K_{t+1}^C. \quad (5)$$

Innovative enterprises interact with the R&D sector (streams 13-14, Fig. 1) to maintain competitiveness in the market of goods and services through the introduction of an innovative product, that are developed by the R&D sector. Therefore the aim of the R&D sector is to produce as much as possible knowledge and pass it to innovative enterprises.

The probability of new knowledge occurrence is given by logistic function as

structures; by G.Y. Silkina [15] for the simulation of the propagation of innovations).

All agents are equal bearers of knowledge, and all kinds of knowledge are equivalent in the sense that the consumption of knowledge is 1.

Innovation is generated from knowledge. Knowledge as innovation is transmitted to innovative enterprises. Since not all knowledge can be transformed into innovations, then there is their complete forgetfulness. The probability of occurrence of knowledge innovation is subject to an exponential distribution.

Households form labor resources used by economic agents (stream 3, Fig. 1) and used in the R&D sector (stream 15, Fig. 1).

There are relations for each category of agents, that shown in Table.

Table

Calculation of the employed population

Factor	Designation	Category (X)		
		R&D sector (S)	Innovative enterprises (Z)	Consumer enterprises (C)
Labor as a payroll on enterprises	$L$	$L_{t+1}^S = H_{t+1}^S \cdot w_{t+1}^S$	$L_{t+1}^Z = H_{t+1}^Z \cdot w_{t+1}^Z$	$L_{t+1}^C = H_{t+1}^C \cdot w_{t+1}^C$
The economically active population of working age	$H$	$H_{t+1}^S = H_t^S \cdot \Omega_t$	$H_{t+1}^Z = H_t^Z \cdot \Omega_t$	$H_{t+1}^C = H_t^C \cdot \Omega_t$
The current value of wages	$w$	$w_{t+1}^S = w_t \cdot \Delta w_t^S$	$w_{t+1}^Z = w_t \cdot \Delta w_t^Z$	$w_{t+1}^C = w_t \cdot \Delta w_t^C$

Designations:  $H_{t+1}^S$  – economically active population of working age from the category of

producers of knowledge at time  $t+1$ ;  $H_t^S$  – an economically active population of working age

from the category of knowledge producers at time  $t$ ;  $L_{t+1}^S$  – labor of knowledge producers at time  $t+1$ ;  $w_{t+1}^S$  – the current value of wage of knowledge producers at time  $t+1$ ;  $H_{t+1}^Z$  – an economically active population of working age from the category of innovative enterprises at time  $t+1$ ;  $H_t^Z$  – an economically active population of working age from the category of innovative enterprises at time  $t$ ;  $w_{t+1}^Z$  – the current value of innovative enterprises wages at time  $t+1$ ;  $H_{t+1}^C$  – economically active population of working age from the category of consumers enterprises at time  $t+1$ ;  $H_t^C$  – economically active population of working age from the category of consumers enterprises at time  $t$ ;  $w_{t+1}^C$  – the current value of consumer wages at time  $t+1$ ;  $\Delta w_t^S$  – changes in wages of producers of knowledge at time  $t$ ;  $\Delta w_t^Z$  – changes in wages of innovative enterprises at time  $t$ ;  $\Delta w_t^C$  – changes in wages of knowledge consumers at time  $t$ .

The overall size of the economically active population of working age is

$$H_{t+1} = H_{t+1}^S + H_{t+1}^Z + H_{t+1}^C. \quad (6)$$

Labor factor, expressed payroll, generally defined as

$$L_{t+1} = L_{t+1}^S + L_{t+1}^Z + L_{t+1}^C. \quad (7)$$

Taxes on household's labor (stream 7, Fig. 1), consumption (stream 9, Fig. 1) and the incomes of economic agents (stream 10) and R&D sector (stream 12, Fig.1) comes in the tax sector, where is implemented state fiscal policy.

Function of total tax revenue in the budget is

$$T_{t+1}^G = \Sigma T_{t+1}^K + \Sigma T_{t+1}^L + \Sigma T_{t+1}^V, \quad (8)$$

where  $T_{t+1}^G$  – the total tax payments to the budget at time  $t+1$ ;  $\Sigma T_{t+1}^K$  – income tax at time  $t+1$ ;  $\Sigma T_{t+1}^L$  – tax on personal income and payroll charges at time  $t+1$ ;  $\Sigma T_{t+1}^V$  – consumption tax at time  $t+1$ .

Enterprise income tax of enterprises is defined by

$$\Sigma T_{t+1}^K = \tau^K \cdot X_{t+1}, \quad (9)$$

where  $\tau^K$  – the income tax rate.

Tax on labor is defined by

$$\Sigma T_{t+1}^L = \tau^L \cdot L_{t+1}, \quad (10)$$

where  $\tau^L$  – the effective tax rate on personal income and accrued payroll.

Calculation of consumption tax as value added tax (VAT) is done by the formula

$$\Sigma T_{t+1}^V = \tau^V \cdot V_{t+1}, \quad (11)$$

where  $\tau^V$  – value-added tax rate;  $V_{t+1}$  – total consumption of gross output at time  $t+1$ .

According to the performing research [16, p. 116] consumption of the gross output means the value of goods that sold to consumers for a certain period of time  $t+1$ , and is calculated as a percentage of GDP:

$$V_{t+1} = \varphi \cdot Y_{t+1},$$

where  $\varphi$  – the share of consumption in GDP.

In this case consumers are the agents of both production and social spheres.

The calculation of the tax indicators is performed according to the initial condition  $\tau^K \cup \tau^L \cup \tau^V \subseteq \tau$ , where  $\tau$  is the total tax rate,  $\tau \in (0; 1]$ .

Formed government revenues (stream 11, Fig. 1) are redistributed through the budget sector to economic agents (stream 1, Fig. 1), households (stream 2, Fig. 1) and in the R&D sector (stream 16, Fig.1) in the form of public goods.

Public investment ( $F_{t+1}$ ) depends on the tax revenues to the budget and satisfies the relation

$$F_{t+1} \leq T_t^G.$$

Then

$$F_{t+1} = F_{t+1}^K + F_{t+1}^H, \quad (12)$$

$$F_{t+1}^K = \theta_K \cdot T_t^G,$$

$$F_{t+1}^H = \theta_H \cdot T_t^G,$$

where  $\theta_K$  – the share of money that the government invests at the development of the activities of the research institutions and enterprises;  $\theta_H$  – the share of money that the government invests in human capital;  $\theta_K + \theta_H \leq 1$ ,  $\theta_K, \theta_H > 0$ .

Value  $\theta_K$  is defined as the ratio of public expenditures for financing of economic activities to the total value of budget revenues, multiplied by the share of taxes in total revenues.

Value  $\theta_H$  is defined as the ratio of public expenditures on financing of social activities by

total budget revenues, multiplied by the share of taxes in total revenues.

Further public investment in capital allocated to spheres:

$$F_{t+1}^K = F_{t+1}^{K^S} + F_{t+1}^{K^Z} + F_{t+1}^{K^C} = \\ = \theta_K^S \cdot T_t^G + \theta_K^Z \cdot T_t^G + \theta_K^C \cdot T_t^G,$$

where  $\theta_K^S$  – the share of money that the government invests at the development of the R&D activities;  $\theta_K^Z$  – the share of money that the government invests at the development of innovative enterprises;  $\theta_K^C$  – the share of money that the government aims at development activities of enterprises-consumers of knowledge,  $0 < \theta_K^S + \theta_K^Z + \theta_K^C \leq 1$ .

Households spend part of their income (stream 8, Fig. 1) on consumption of goods and services (stream 6, Fig. 1), as well as direct part of the savings in the form of investment in the manufacturing sector (stream 3, Fig. 1).

The value of capital investments is expressed as a sum of money, which remains at the disposal of households after consumption:

$$I_{t+1}^K = (1 - \Delta I^H) \cdot I_{t+1}^H, \quad (13)$$

where  $\Delta I^H$  – the share of funds that by households are invested in human capital.

The coefficient  $\Delta I^H$  is determined for all agents as the average value of the share of total household expenditures in the overall structure of their costs.

Then for each category of agents such relations are valid:

$$I_{t+1}^{K^S} = (1 - \Delta I^H) \cdot I_{t+1}^{H^S},$$

$$I_{t+1}^{K^Z} = (1 - \Delta I^H) \cdot I_{t+1}^{H^Z},$$

$$I_{t+1}^{K^C} = (1 - \Delta I^H) \cdot I_{t+1}^{H^C},$$

where  $I_{t+1}^{K^S}$  – private investments in the physical capital of R&D sector at time  $t+1$ ;  $I_{t+1}^{K^Z}$  – private investments in the physical capital of innovative enterprises at time  $t+1$ ;  $I_{t+1}^{K^C}$  – private investments in the physical capital of other enterprises at time  $t+1$ .

Value of private investments in the human capital is defined as

$$I_{t+1}^H = \Delta I^H \cdot L_{t+1}. \quad (14)$$

It is assumed that the government can use a variety of techniques that promote the growth of investment in research and innovation. Such methods of tax incentives for innovation are regulation of the volume and structure of innovation cost;

stimulation the intensity of public and private partnership bonds [18, p. 160].

In addition, the tax sector affects the components of the simulated economic system indirectly by the application of the regulatory framework for all business entities.

The result of functioning of components of the innovation economy is a quantitative assessment of factors of economic growth that determine its rate in terms of agents' behavior change in the socio-economic environment.

The mechanisms of formation of agents' behavior are evolutionary characteristics such as:

- selection namely
- internal selection of information;
- external selection of agents;
- variability namely
- changing of agent's behavior;
- changing of decision-making rules;
- heredity namely
- fixing of agents' behavior;
- fixing of decision rules.

They have an impact on the each component's behavior in the socio-economic environment. Thus the economy is growing (or evolves) in a fast changing environment [17, p. 8].

External and internal selection is carried out according to the mechanism of selection. The influence of such mechanism is demonstrated in the ability of the selecting object to continue activities in the changed circumstances, when not adapted (i.e. uncompetitive ones) objects disappear and adapted objects survive [5].

Agents of the external selection are interactors:

- producers of the knowledge (R&D sector);
- transporters of the knowledge (innovative enterprises);
- consumers of the knowledge (enterprises of different types of economic activity).

Objects of the selection are limited in their ability to consume some resources (material, financial, information etc.) from the sur-

rounding external environment. However, their number can be increased by use of some information, that is useful for survival.

Internal selection objects are replicators: ideas and knowledge at the level of the R&D sector,

innovative product, that can be developed and implemented in the process of production, at the level of innovative enterprises;

technology or routine at the level of other enterprises.

It is assumed that the knowledge and ideas appear randomly and can be used within a certain interval of time. At the level of innovative enterprises if knowledge is consumed it can go to the category of innovative product. If innovative product is used successfully, it can be passed as routine to other economic agents for use in their business.

The emergence of any new such replicators is possible at the level of each component of the socio-economic system. A set of them reflects the information content of components of the system, i.e. the standard models, procedures and activities.

The mechanism of variability is manifested in the established patterns of behavior and decision rules making at all levels of socio-economic system in such a way. There is a set of agents engaged in similar activities. Each of them has replicators, which generally may be the same, but there may be variations in their individual characteristics. So the economic activity of agent is not absolute replication of each other. In the case of changes in environmental conditions effect of the variability allows some of them to survive.

Evolutionary changes in the economic activity of agents is determined and conditioned by the evolution of factors of external and internal environment. Therefore the main sources of variability can be [19, p. 97]:

internal changes that may occur through specific and random "mutation" replicators (including through innovation and R&D, dissemination of best technologies);

external changes that lead to changes of (1) technologies through information exchange ("crossover" routines) with other agents (as a result of changing of suppliers, type of economic activity, a market segment etc.), (2) manage-

ment (patents, licenses, consulting recommendations, hiring of qualified staff), (3) the legislative framework.

The mechanism of heredity (or reproduction) generates an optimal variant of decisions and manifests itself in maintaining of rules and behavior norms. It allows to components of the socio-economic system to implement their economic activity effectively. It facilitates the transfer (copying) of the key characteristics and is one of the basic values, which manifests itself in the fact that basis, as well as replicators of the respective components of the socio-economic system, is survived through the process of reproduction of the information.

These mechanisms influence on the behavior of agents of socio-economic environment.

The activity of R&D sector consists of the production of a new knowledge and its transmission. Graphically this behavior is shown on Fig. 2.

Knowledge transfer can occur from the agent of R&D sector to the innovative enterprise. So knowledge is transformed into innovation. Innovation at the level of innovative enterprises is converted into a routine and routines can be transmitted to other enterprises. Graphically this behavior is shown on Fig. 3.

Enterprises-consumers of knowledge accumulate technologies as routines. Graphically this behavior is described on Fig. 4.

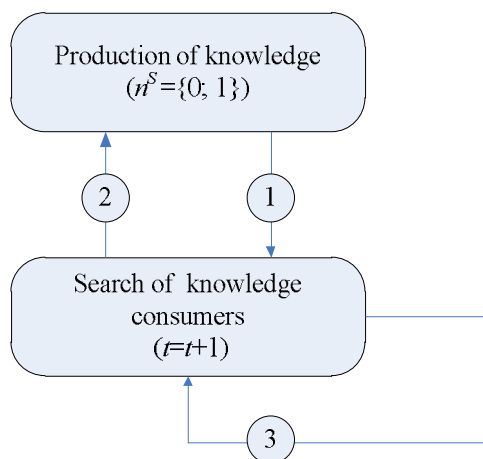
Time of emergence of evolutionary characteristics in the system is determined by the changes in the socio-economic system under the influence of internal and external factors. So it's assumed that it is a probabilistic value.

The evolutionary model of tax incentives for investment and innovation development of industrial enterprises is represented by basic formulas (1)-(14).

Thus the scientific interest is to study changes in the behavior of economic agents in the field of investments and innovations taking into account the tax policy.

Implementation of the model is made in the program Any Logic 6 with additional calculations in MS Office Excel 2007.

Primary data for the implementation of the model is the statistical information about Ukraine.



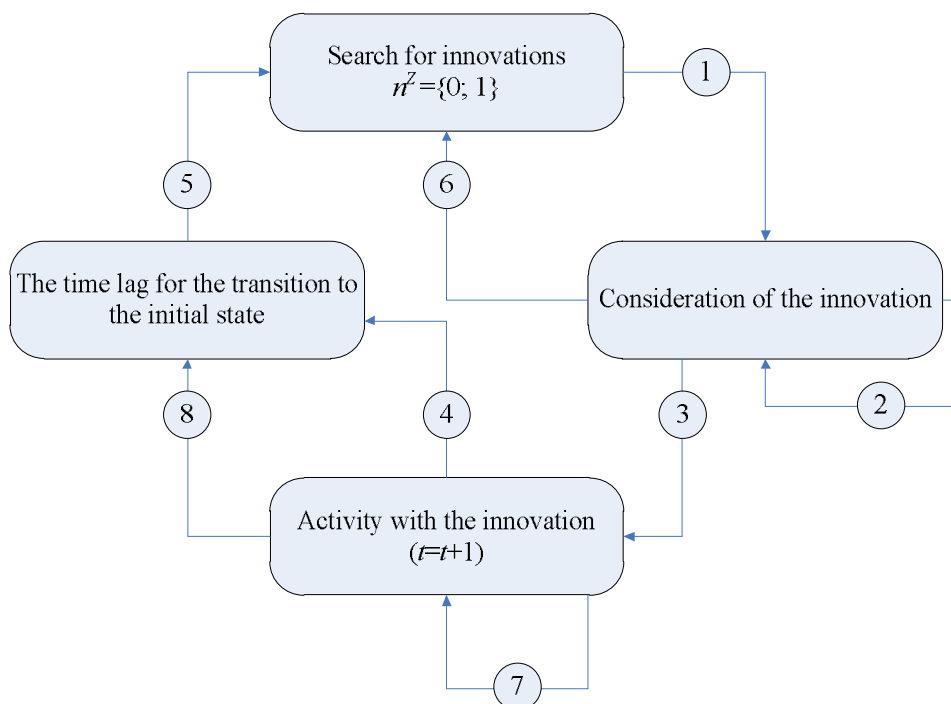
*Designations:*

1. Move to a state, in which the agent of R&D sector have a new knowledge for transfer to the innovative enterprise. Such a transition occurs with a probability that depends on the amount of knowledge of scientific institutions. In turn the amount of knowledge depends on public financing of R&D sector.

2. Go to the initial state. This transition occurs either with the transfer of knowledge or after 12 months as a result of the forgetting process.

3. Time counter that define the deadline of forgetting of existing knowledge.

*Fig. 2. The behavior of R&D sector*



*Designations:*

1. Move to a state in which the innovative enterprise considers a knowledge of R&D sector. The transition occurs in a case when there is knowledge for transmission.

2. Selection: transition in which it is determined whether innovative enterprises takes knowledge or not. It occurs with a certain probability, and other enterprises have a chance to pick up the available knowledge.

3. Variability: transition to a state in which an innovative enterprises works with existing knowledge. In this case, the knowledge transforms into the category of innovation.

4. Go to a state of inactivity. It occurs in the case of obsolescence of the innovation through 18 months after its occurrence.

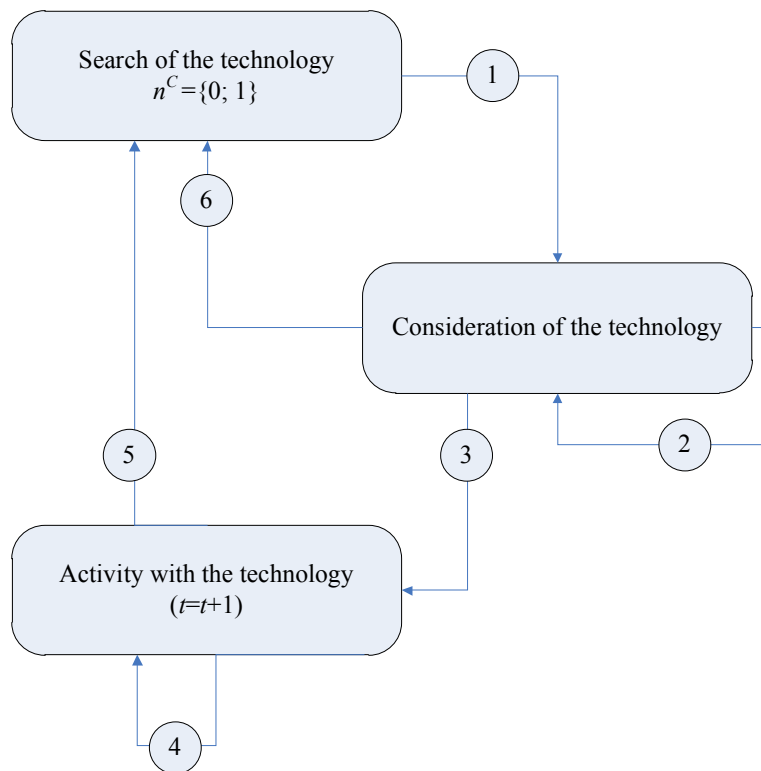
5. Go to the initial state. The transition occurs after 6 months. This term needs of innovative enterprises to implement of the innovation.

6. Go to the initial state. The transition occurs on a monthly basis and is required in order to check availability of knowledge in R&D sector.

7. Time counter that define the term of forgetting innovation.

8. Heredity: transition to a state of inactivity. The transition occurs when the innovation transforms in the technology.

*Fig. 3. The behavior of the innovative enterprise*



*Designations:*

1. Transition to a condition, in which an industrial enterprise considers available technology. Transition occurs in the case when there is an innovation for its transfer as a technology.
2. Selection: transition, when an enterprise takes the technology itself or not. There is a chance to pick up available technology for other enterprises.
3. Variability: transition when an enterprise has been working with new technology.
4. Heredity: transition at which the technology can be transferred to other industrial enterprises.
5. Go to the initial state. The transition occurs when enterprise receives new technology.
6. Go to the initial state. The transition occurs on a monthly basis and is required in order to check innovations availability that can be used in the form of technologies.

*Fig. 4. The behavior of the industrial enterprise*

This approach is explaining how the behavior of agents has changed with time. Calculation results are presented in discrete time. Simulation period is 20 years. A program step is 1 year.

The behavior of each agent is influenced by such factors:

signals about the exchange of replicators at a meeting with agents from the same population;

signals about the exchange of replicators at a meeting with agents from other populations;  
current replicators characterizing internal state of the agent;

changes in the state of agent's replicators.

At the beginning of each simulation there is given a certain number of interacting agents whose behavior changes for the specified model periods. These changes are associated with each of components replicators in the socio-economic environment.

The purpose of the experiment is to investigate the behavior of agents in a changing set of corresponding groups of replicators. So it is necessary to verify the proposed evolutionary model for accurate and adequate description of the real socio-economic processes and phenomena, and to identify trends in the development of Ukraine's economy in the long term in modern conditions.

Implementation of the model in real conditions allows comparing estimates and statistical data obtained over the same time interval in order to determine its accuracy.

The initial data are the indicators of the Ukrainian economy in constant prices in 2011 [20-21]. Tax rates vary according to the tax laws [22]. The share of state funding of public goods is taken at the level in 2005-2012.

The model is implemented in the base conditions to check its accuracy and reliability. Base data (2005-2012) are compared with data obtained with the help of the model at similar period of time. The correlation coefficient (Pearson)  $R$  and quadratic correlation coefficient  $R^2$  are used to compare the original data with the statistics. Values of such coefficients for the social indicators are 96.46% and 93.04% respectively. Values of such coefficients for the economic indicators are 88.67% and 78.63% respectively, taking into account the smoothing of time series. In general the relative error of approximation is less than 15%, which indicates a strong correlation of statistical and calculated data, and confirms the hypothesis of whether to use this model in the given conditions.

Implementation of the model for the given conditions of simple reproduction reflects its correctness in the long term: the volume of production of industrial enterprises, including innovative enterprises, increased marginally: by an average of 0.018% per year, or by 0.334% at the entire simulation period. Capital value of industrial enterprises is constant 931.52 blnUAH at each stage of calculating. In general, the employed population of working age is reduced by an average of 89.5 thousand people per year or 1.7 mln people for the entire period. Such dynamics are caused by the insufficiency of public investment in human capital. As a result the labor supply is reduced; population, which starts to work, is declined; and the rate of people's retirement is increased. In general, the reduction in tax revenues is observed at the level of 1.38% per year, or 24.11% at the end of the period (from 271.86 mlnUAH in 2006 to 206.29 mln UAH in 2025).

In view of the values of accuracy and reliability, as well as economic development trends of simple reproduction the proposed approach is used for further study of behavior change of agents in the real socio-economic conditions in Ukraine.

Output of new knowledge of R&D institutions, that will be used by industry in the form of innovation, increased by an average of 0.86% per annum or 0.76% in 2025 compared to 2005 due to reduction of the employed population in R&D sector (with 105.5 thousand in 2005 to 56.5 thousand in 2025) and reduction of the chances of creating new knowledge.

The total output of industrial enterprises in Ukraine, including innovative enterprises, is increased on average by 3.29% per year due to reduction economically active population, a slight increase of capital and industrial wages.

Total tax revenues are increased from 279.78 mln UAH in 2006 to 394.54 mln UAH in 2025 by an average of 1.89% per year. This trend is due to the growth of revenues from corporate income tax by an average of 1.41% per year, value added tax – 2.73% per year, individual income tax – 3.55% per year.

However the total number of employees people in industry, including innovation enterprises, and R&D sector has decreased steadily at an average of 2.83% in 2013-2025, or 43.72% in 2025 compared to 2005. According to the International Monetary Fund (IMF) forecast for the population of Ukraine, there is a negative dynamics of its development also: population is reduced from 45.5 mln in 2013 to 45.3 mln in 2018 declining on 0.08% at average.

Overall performed calculations are consistent with the forecasted values of the IMF in Ukraine [23].

Thus in 2025 the output of industrial enterprises is expected to increase in more than 1.9 times. It has positive impact on the growth of tax revenues (more than 1.4 times), including corporate income tax – in 1.28 times, value added tax – in 1.65 times, tax on personal income – in 1.94 times.

However, such public income is not enough to finance the sphere of production and human capital. Therefore, there is development of national economy with low rate in Ukraine. It eliminates the possibility of using of modern innovative technologies actually. There is decrease of the employment of R&D sector in the structure of agents – in 1.87 times; of industrial enterprises, including innovative enterprises, – more than 1.77 times. Such negative trends are caused by insufficient supply of public goods, whereby there is a long decline in population quantity of Ukraine: on the one hand, it is due to

reduced fertility, and a population quantity that starts to work is decreased accordingly; by on the other hand, there is increased a level of mortality including employees people, that leads to their fast out flow.

The acceleration of economic growth in Ukraine requires the development of industrial enterprises on the investment and innovation base. So the basic directions of tax policy should be

(1) the partial transfer of the tax burden from the factors of production to consumption, environmental and resource payments.

This direction is reflected in the decline of real tax rates on profits of enterprises and individual income to 15%. These will provide incentives in capital inflows in the context of globalization, reducing tax distortions as a result of converting of the income taxation of individuals and legal entities.

To compensate losses of the budget from the reduction charges on wages there is appropriate to increase revenues from rental payments of the mining industry and significantly (in 5-6 times) increase the real revenue from environmental taxes. This increase will allow, on the one hand, to reduce the effect of negative externalities associated with environmental pollution, and on the other hand, to reduce the welfare losses due to high charges on wages;

(2) provide system-wide (rather than industrial or other partial) benefits, aimed at correcting of market failures in the field of scientific and technical progress, investment and innovation.

This direction is based on the use of investment tax credits, designed to maintain the activity of industrial enterprises in the sphere of innovations and investments [25]. To enhance tax incentives for the development of such enterprises there is recommended to use an investment tax credit in the form of discounts for qualified investments. Such investments must meet the strategic directions of economic development, including industry, and the priorities of social welfare of the country.

Thus, the proposed approach considers taxes as a tool to stimulate investment and innovation development of industrial enterprises. Accumulation of funds at the state level allows to reallocating them to production and social spheres of the country in order to reach a higher

level of socio-economic development. However, in modern Ukrainian conditions such funds are insufficient for innovative development of industrial enterprises, for R&D sector and for increase the living standards of the population. Therefore, in the long term there is a slight growth along with a reduction of research and development, as well as, of the economically active population. Accordingly, the direction of further research is the analysis of tax incentives for investment and innovation activities in industry and their impact on the development of neo-industrial development of Ukraine taking into account the institutional features of its socio-economic environment.

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**MODELING OF BUDGET SPENDING OF DONETSK REGION**

Current Ukrainian economic development is characterized by problems in tax and expenditure policy caused by imperfection of budgetary laws which regulates organizational and financial relations within public finance. The successful administration of public finance apart from everything else means the creating conditions for effective industrial development.

The planning and forecasting of local budget expenditures is an integral part of such administration. In domestic practice the development of scientifically-based techniques of forecasting of local budget expenditures using the mathematical economic models will contribute to effective regulation of social and economic processes in public finance area.

In practice, the process of budget forecasting is an element of a budget planning. However, there are some differences in this field. Firstly, the planning is a kind of strategic prediction of performance of the local government and the community, whereas the forecasting is a revision of the local budget to reflect changing market conditions [13, p. 410]. C. Swanson noted that an effective forecast model presents a range of possible outcomes, based on a set of diagnosed variables and assumptions [14, p. 60]. A. Harvey explained that forecasts of the budget categories are made by extrapolating the components estimated at the end of the sample [10, p. 14].

But, according to P. Galinski, the accuracy of this method is especially tied with the economic, legal and political stability, both in the country and the community. However, using only time-series forecasts in local governments during the budget preparation may cause some negative consequences, such as:

the constraint of the activity of the local authorities in the field of anticipating the potential future events which determine the local budget;

repeating the wrong decisions from the past;

the appearance of uneconomical operations in local authorities;

preparing the future budget taking advantage of the data from the actual budget, which is still the kind of the plan [9, p. 219-220].

Moreover, the EU practices showed that the Medium-Term Expenditure Framework (MTEF), based on simple extrapolation of expenditure and revenue appropriations, assuming similar trends set by the current policies, and introduced in several countries of South Eastern Europe was not very successful, because there are rather frequent changes in local government funding schemes, which cannot be predicted by the MTEF [12, p.7].

To avoid those negative consequences, the bulk of issues, related to budget forecasting, includes other econometric techniques for planning the budget revenues and spending at local level.

Thus, the experts of World Bank explained the expenditure forecasts on local levels for different parameters: personnel expenditures, non-personnel current Expenditures, direct payments to special-needs households, capital expenditures and debt service. They said that “*Multiyear projections of spending are generally built from accounting identity models under specific assumptions regarding levels of service*” [11, p. 69], however they noted that “*Different techniques can be used to forecast both revenues and expenditures. They range from simple judgmental approaches that rely on the knowledge of experts to sophisticated multivariate statistical techniques*” [11, p. 74]. The World Bank experts distinguish following general forecasting techniques, which can be more applicable to forecast local revenues and expenditures.

*Judgmental Techniques*

Judgmental forecasting essentially relies on the forecaster’s special expertise – that is, knowledge of the local revenue system and the factors that tend to affect annual flows of revenue. Because this subjective approach is pri-

marily dependent on the idiosyncrasies of the specific situation and forecaster, not much can be said about it other than that its implementation cost is likely to be low and that it can yield fairly accurate short-term forecasts.

#### *Time-Series Techniques*

Time-series techniques link expected future revenues or expenditures to past experience. These techniques can differ greatly in terms of complexity. Trend techniques are simple to use and to explain, but they rest on the assumption that the factors that have influenced a revenue or expenditure in the past will continue to exist.

#### *Deterministic Techniques*

Forecasters may find variables other than the passage of time more realistic as determinants of future revenues or expenditures. Forecasters use deterministic forecasts extensively in making projections of expenditures. Deterministic approaches to forecasting are quite simple. Unlike time-trend techniques, they do not require that the forecaster assume that future revenues or expenditures will rise (or fall) inexorably as they have in the recent past. The technique does, however, require that the forecaster make explicit assumptions regarding the variable(s) thought to drive the revenue or expenditure being forecasted. Such assumptions may turn out to be erroneous.

#### *Statistical Models*

Statistical forecasting models, sometimes termed econometric models, constitute the most complex approach to forecasting and require the most extensive amount of data. They allow the forecaster to attempt to capture the effects of one or more variables that conceptually should affect a revenue or expenditure and to base the relationship between those variables and the one being forecasted on statistical estimation techniques. Because local economic conditions are likely to affect local government revenues, revenue forecasts from statistical modeling are more common than spending forecasts from such modeling. The accuracy of forecasts from this technique relies on selection of reasonable independent variables, the correctness of the projected values of those variables, and the stability of the statistical relationship into the future.

Unlike judgmental techniques, the method makes explicit the factors that the forecaster is using to generate forecasts and therefore permits ex-post analysis of erroneous forecasts so that future forecasts might be improved. Unlike projections from trend-based forecasts, projections

from a statistical model will depend on the expected changes in one or more independent variables; hence, the revenue or expenditure series may show decreases as well as increases into the future. Unlike the deterministic approach, the statistical technique permits the analyst to learn whether the hypothesized relationships between the chosen independent variables and the revenue/expenditure series are statistically relevant (statistically significant) [11, p. 54-57].

In USA, notably in New-York state, to forecast different local expenditures one can use different techniques. Thus, medicaid forecast provides a point-in-time estimate for program spending based on an analysis of current and historical claims and a number of other known factors. These estimates can be subject to considerable variance and are highly sensitive to economic conditions. The welfare program forecast methodology includes welfare caseload equations. Caseloads are estimated to vary based on factors such as entry-level employment levels and the State's minimum wage. The models also contain measures that attempt to capture the impact of administrative and programmatic efforts at the national, State, and local levels to reduce welfare dependency. debt service forecast methodology involves a multi-faceted approach to forecast debt service costs. This includes forecasts for both fixed and variable interest rate costs and projections for the amount of new fixed and variable rate debt that is planned to be issued to finance capital projects over the next five year period [8, p. 181-226].

Ukrainian economists, in contrast, pay insufficient attention to forecasting local spending and revenues. I. Lukyanenko et al. [3] developed a set of econometric models in order to forecast different local revenues and expenditures. B. Sylenkov [4] proposed a forecasting model of local budget expenditures based on program-oriented and goal-oriented approach. S. Legkostup and G. Sukrusheva [2; 5] analyzed the forecasting techniques based on mathematic economic models. I. Chugunov proposed the methodology of forecasting of revenue part of local budgets [6]. V. Vishnevskyy et al. [1] developed a system of monitoring of local budgets which involves the forecasting of local revenues and spending.

In current Ukrainian forecasting practice budget expenditures are often planned according to achieved results, taking into account the inflation rate. But this principle does not allow defin-

ing medium- and long term trends, which provides evidence of lack of adequate forecasting of local budget expenditures. Now the scientifically-based approach to forecast local budget expenditures is required; the latest is impossible without using of mathematical and economic models.

So, this paper is aimed to develop scientifically based methods and models in order to forecast local budget expenditures and to make a medium-term forecast of local budget expenditures for Donetsk region.

OECD's experts in their work "A Comparative Analysis of Health Forecasting Methods" analyzed the classification of mathemati-

cal economic models, used to forecast health expenditures. Adjusting this analysis to local budget expenditures, we distinguished the following classes of forecasting models.

Forecasting models typically project local budget expenditure at the level of individuals, groups of individuals or the community as a whole. At the same time, models can focus on specific sections of expenditure, such as health, housing and community amenities, education etc. By considering both the level of aggregation of the units analyzed and the level of detail of budget expenditure to be projected, it is useful to identify three broad categories of budget expenditure forecasting models (Fig. 1).

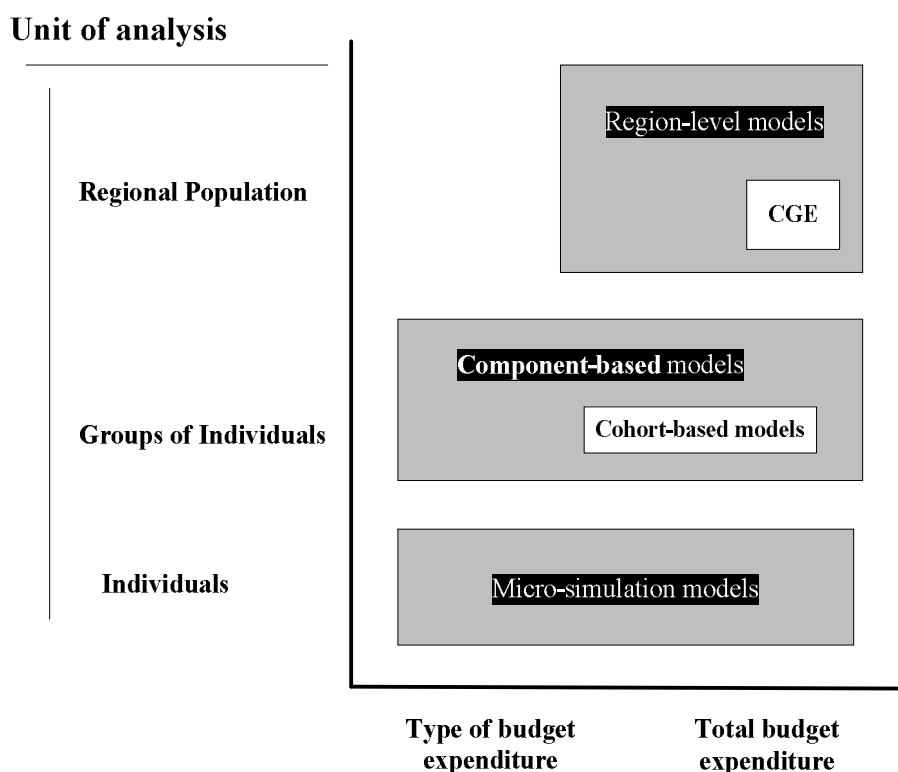


Fig. 1. Classes of local spending forecasting models

Models focusing on individuals as the unit of analysis for the projection are referred to as micro models. All examples of micro models in this review use microsimulation techniques. Those stratifying sections of budget expenditure into groups, or stratifying individuals into groups, or combinations of these two dimensions, are identified here as component-based models. Finally, macro-level models focus on total expenditure as the unit of analysis. Within this group, some regional-level models (for example, computable general equilibrium models,

constructed on regional level) project future local budget expenditure trends within the context of the whole economy.

#### Microsimulation models

Microsimulation models are powerful tools which allow analysis and testing of relatively detailed "what-if" scenarios resulting from a variety of policy options. The scenarios can be very informative for policy makers as they may provide information beyond what is available from retrospective population studies. The units of analysis of the microsimulation

models are individuals. These individuals can be aggregated into policy-relevant groups and analysed using relevant indicators such as inequality and poverty indices.

Microsimulation models reproduce the characteristics and behaviour of a large sample of individuals representing the whole population of interest. To test the potential impact of a new policy, the microsimulation model is run twice – once with the base case or status quo scenario and then again with a policy change or variant scenario perturbing the environment in which the individuals operate. These scenarios produce a chain reaction where individuals react to the policy changes first and then, depending on the design of the model, may also react to the reaction of other individuals.

The results are the potential future outcome of the reform and are often compared with the base case to evaluate the potential impact of the reform. Microsimulation models require large amounts of data to effectively assemble a sample that adequately represents the whole population of interest and includes all of the characteristics of interest. Data are often gathered from a variety of sources, and sophisticated statistical techniques are often required to standardize the various databases so that they can be used to populate all of the desired attributes of individuals included in the sample.

#### *Component-based-models*

The most widely used class of models is component-based-models. This class includes a large variety of forecasting models that analyse budget expenditure by financing agents, by providers, by goods and services consumed, by groups of individuals or by some combination of these groups. When expenditures are grouped by financing agents, the models often consist of different layers, each of which may use a different technique to project a sub-component of expenditure. An important sub-class of component-based models is represented by cohort-based *models*. In cohort-based models, individuals are grouped into cells according to several key attributes. Further refinements are obtained by sub-dividing the cohorts according to other commonly-used attributes.

These models are often referred to as actuarial models or cell-based models, where the term cell identifies the sub-categories into which each cohort is divided. Each cell in the model is associated with an average cost of public goods

and services (usually expressed in real terms). Future health expenditure is determined by multiplying the average costs by the projected number of individuals included in each cell. Cohort-based models have been very common over the years, probably because they offer a number of advantages. First, their implementation and maintenance tends to be simple and relatively inexpensive. This is because this class of models can be developed in an interactive spreadsheet, requiring a limited amount of data and generally including only a few parameters. Many of these parameters can be found in the literature, rather than being estimated. Secondly, the impact of policy changes can be assessed easily by simply modifying the policy parameters. Component-based models are typically less data demanding than microsimulation models which partially explains their popularity. However, the development of more sophisticated versions of the component-based models could require additional information.

#### *Regional-level models*

Regional-level models restrict the analysis to local budget expenditures. They are most appropriate for short-term projections in the presence of clear and undisturbed trends and in the absence of structural breaks. Therefore, these extrapolation methods can benefit from the inertia in the financial systems in the short-run.

Econometric regression analysis is used to fit time-series data. Projections can be based on pure extrapolation of the statistical models fitting the data or they can be based on the projected values of the critical explanatory variables, whenever included. The accuracy of forecasts was then compared to the results obtained from three different pure extrapolation methods (exponential smoothing, moving average and ARIMA methods). Within the class of regional-level models are “computable general equilibrium (CGE)” models on regional level.

These are models that allow for the measurement of broader consequences to the economy resulting from budget spending growth and for feedback or reaction from individuals and companies.

Regional-level models are typically the least demanding in terms of data requirements. This is particularly the case for pure extrapolation methods which use a single time series and for regression-based models which very often include just a few explanatory variables. The

computational and data requirements for Dynamic Computable General Equilibrium Models, on the other hand, are generally much higher and depend on the specification of the equations included in the model [7, p.18-22].

The aforesaid analysis allowed us to determine the forecasting technique which is the mixed variant of deterministic and econometric models. It based on using of correlatable factors, which influence directly on benchmark parameter – budget expenditures. This technique provides the forecasting of budget expenditures in Donetsk region for 2014-2016. The volatility of economic situation causes the reasonability for medium and short term forecasting. We should note that such forecasting is conceptually possible since the local budgets are inertial whereas they are related to financial of social expenditures, which can be sharply modified, so they are sufficiently predictable.

Developing and parameterization of model of budget expenditures in Donetsk region

Ukraine as the rest transformation countries inherited some problems related to forecasting the local budget expenditures, particularly:

lack of statistical data, caused by both of their inaccessibility and sharp changes in social and economic state policies, and also by strong propensity for spillover externalities, which even in presence of large arrays of economic data, makes them less informative and allows using only up-to-date information;

large relative share of inter-budgetary transfers in local budget; the disproportionality of formers distorts essentially the conceptual logics of expenditures and complicates the forecasting of budget spending based on classical techniques which evaluate total expenditures on account of standard sectional expenditures;

lack of control on budget revenue and spending on local level, which involves to take into account the “contingencies” in forecasting process; at this time such contingencies are hard to account since they are not considered in sets of regional economic indicators.

All aforesaid does not provide the possibility of using the deterministic model at this stage; one should be limited by set of stochastic (or even trend) models for some indicators and to test forecast accuracy on current statistical data.

## Verification of forecasting models of local budget expenditures in Donetsk region

### *Model assumptions*

Concerning the forecasting model of local budget expenditures, we assume that:

it can be classified as stochastic multi-dimensional model (additive, multiplicative or transcendental logarithmic one);

model of budget expenditures at national level conceptually is similar to model of budget expenditures at local level;

parameters which influence on amount of local budget expenditures, are the following: global economic indices, macroeconomic indexes and regional economic indexes (economic indexes at regional level).

### *Independent variables*

As independent variables, according to the last assumption, we defined the following indexes:

*global economic indices* – world energy prices [15], particularly:

average oil price: Brent (Great Britain), West-Texas Intermediate (USA) and PEC Reference Basket of Crudes ( $x_{h1}$ );

steam coal price (Australia) ( $x_{h2}$ );

Russian natural gas border price in Germany ( $x_{h3}$ );

### *macroeconomic indexes:*

official exchange rate (UAH vs USD) ( $x_{m1}$ );

inflation rate (on an accrual basis) ( $x_{m2}$ );

GDP ( $x_{h3}$ );

### *regional economic indexes:*

population size in region ( $x_{l1}$ );

average wage in region ( $x_{l2}$ ).

The choice of indexes is determined by their direct influence on local budget expenditures: buildings maintaining needs energy expenditure; population size is directly related to amount of social expenditure; also, wages rate influences directly on amounts of inter-budgetary transfers.

### **Statistical information**

Input model data includes official statistical data for all considering indexes and also for benchmark parameter – local budget expenditures, covering period 2006-2013, by half-year (Table 1). The forecast was made for Donetsk region for period of 2014-2016 both dates inclusive.



### Choice of model type

Since the forecast was made on the basis of statistical samples, we've chosen the possible stochastic models (more specifically – models of multivariate regression type)

We've made a choice between four dilemmas:

- linear or non-linear model;
- additive or multiplicative model;
- use of all independent variables or only naturally independent ones;
- use as variable the minimum wage in country or average wage in region.

Consequently, four dilemmas resulted in sixteen variants of models. During three stages of comparison, we've omitted the following groups:

- average wage in region was statistically more adequate than minimum wage in country;
- modeling using all initial variables showed more adequacy in comparison with naturally independent variables, which are weakly correlated;
- models which are represented as additive and multiplicative polynomials (transcendental

logarithmic function), regardless of virtually absolute approximation of real data, showed the poor forecast accuracy, compared to simple additive (multivariate linear function) and multiplicative (linear logarithmic function).

As a result the final comparative verification was made for two models:

*additive model* – model of multivariate regression type for eight initial variables:  $y = \sum_{i=1}^8 x_{x_{hi}}^{a_{hi}}$ .

*multiplicative (logarithmic) model* – model of multivariate regression type for logarithms

of eight initial variables:  $y = \prod_{i=1}^8 x_{x_{hi}}^{a_{hi}}$ .

### Results of verification

For each of model we've built corresponding regression equation by 16 points (2006-2014 period). Predicted independent variables are presented in Table 2 (information for forecasting was taken from open sources).

Table 3 presents comparison of modeling results.

Table 2

Forecast values of independent variables for model of budget expenditure

Period	Oil price, USD per barrel	Natural gas price, USD per thousand cubic feet	Steam coal price, USD/t	Exchange rate (UAH vs USD)	Inflation rate (on an accrual basis)	GDP, USD billion	Population size, thousands	Average wage, UAH
2014,1	107,35	406,38	83,00	8,500	1,005	90,113	4341322	3795
2014,2	105,70	406,88	88,00	9,000	1,008	92,198	4326230	4104
2015,1	103,85	398,04	89,00	9,200	1,010	94,283	4311138	4263
2015,2	102,00	389,19	90,00	9,500	1,013	96,368	4296046	4642
2016,1	101,35	387,42	90,50	9,700	1,015	98,453	4280955	4807
2016,2	100,70	385,65	91,00	9,800	1,018	100,538	4265863	5266

Both models sufficiently exactly approximate initial statistical data. Thereat, the multiplicative model appears more exact in control forecasting for first half-year (Table 3), while the additive model is more stable in long-term forecasting (Table 4, columns 2, 3).

Such conclusion does not allow choosing either model for forecasting; thereat, it's advisable to made forecast as interval within predicted values of additive and multiplicative models.

<sup>1</sup> At this case we might choose between prices for all energy products or only coal prices.

### Analysis of dependence between budget expenditures and GDP

It can be made a logical assumption that the benchmark parameter – budget expenditures, depends proportionally on GDP, i.e. this ratio is constant. Forecasting of budget expenditures by means of multivariate regression *a priori* confirms this hypothesis, but only in the case when other variables do not mar up because of autoregression.

Comparison in fact both of real statistical and forecasting data (Table 5, Fig. 2) shows that the given hypothesis is completely plausible for real economic indicators for 2006-2013.

Table 3

## Comparing of forecasts made by additive and multiplicative models

Period	Real budget expenditures, UAH million	Additive model	Multiplicative model
2006, 1	2918,20	3129,77	2992,905
2006, 2	3441,72	3070,15	3339,779
2007, 1	3704,83	3454,70	3584,707
2007, 2	4544,61	4420,25	4488,189
2008, 1	5302,82	5685,98	5442,340
2008, 2	5639,41	5831,45	5813,456
2009, 1	4903,16	4594,89	4797,156
2009, 2	6144,56	7190,37	6755,466
2010, 1	6792,60	6868,72	6740,357
2010, 2	8256,27	7947,33	8080,356
2011, 1	9202,07	8819,93	8922,352
2011, 2	11311,77	10967,72	10895,395
2012, 1	10064,62	10035,28	9927,105
2012, 2	11649,20	11133,82	11184,619
2013, 1	9511,26	9916,03	9882,421
2013, 2	10860,64	11181,32	11244,678
Approximation error		0,0069	0,0084

Table 4

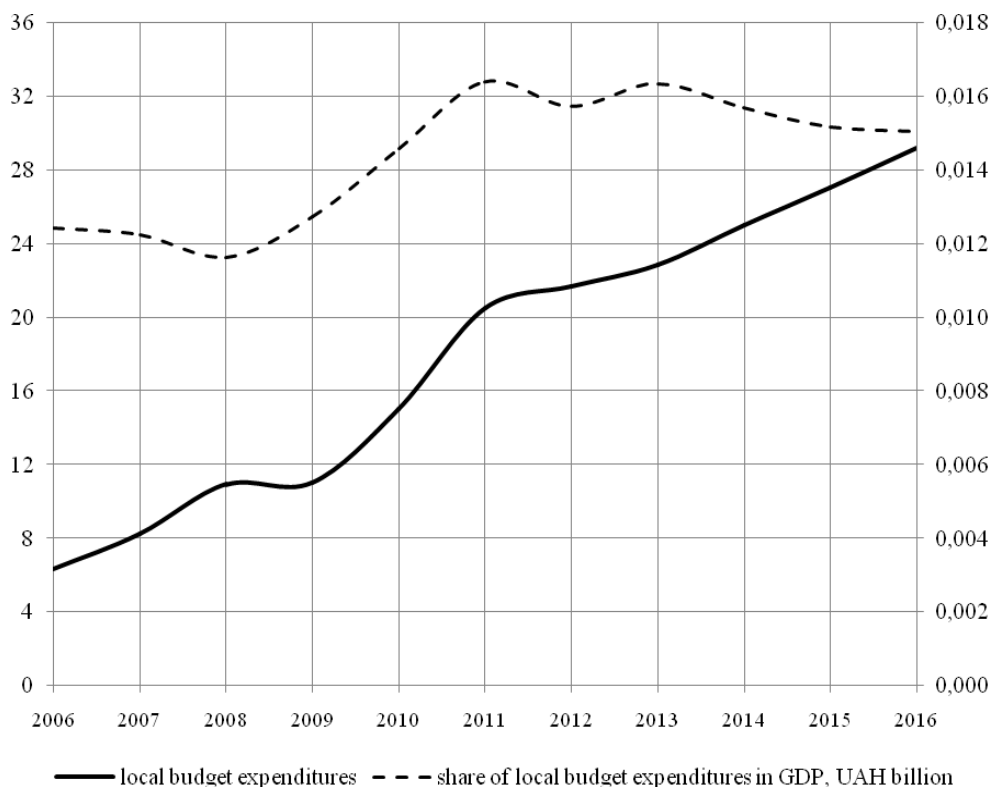
## Comparing of forecasts of local budget expenditures for Donetsk region for the period until 2016

Period	Additive model	Multiplicative model
2014, 1	10914,87	11108,767
2014, 2	11711,32	12023,861
2015, 1	11880,75	12225,008
2015, 2	12514,41	12862,257
2016, 1	12754,72	13094,455
2016, 2	13243,74	13454,115

Table 5

## Share of budget expenditures of Donetsk region in GDP according to model of multivariate linear regression

Year	GDP of Ukraine, GDP, USD billion	Donetsk region	
		Budget expenditures, GDP, USD billion	Share of budget expenditures in GDP
2006	511,392	6,360	0,0124
2007	672,717	8,249	0,0123
2008	939,976	10,942	0,0116
2009	867,540	11,048	0,0127
2010	1032,045	15,049	0,0146
2011	1249,544	20,514	0,0164
2012	1379,537	21,714	0,0157
2013	1398,020	22,875	0,0164
2014	1595,749	25,050	0,0157
2015	1782,903	27,071	0,0152
2016	1940,266	29,187	0,0150



*Fig. 2. Comparative dynamics of budget spending of Donetsk region and its share in Ukraine's GDP*

Thus, in 2006-2009 the share of budget expenditures of Donetsk region in Ukraine's GDP stably reached the 1,23-1,27% and only in crisis year of 2008 it declined to 1,16%. Hereafter, most likely because of political factors, the value of this parameter has been increased to 1,46% in 2010; in 2011-2013 it ranged from 1,57-1,64%. According to forecast (made by means of multivariate linear regression), starting from 2014 this share should decrease nearly to 1,5% in 2016.

Such observations show on the one side the plausibility of developed model concerning its accordance to natural expectations and on the other side – the tendency of state policy in area of distribution of state funds.

#### Conclusions

According to findings we developed the theoretical and methodological basis of forecasting of local budget expenditures, particularly we explained the expediency of use the econometric methods and models, based on correlative factors, influencing directly in benchmark parameter – budget expenditures.

In order to forecast local budget expenditures we developed some mathematical economic models. Their further analysis allowed choosing two models satisfying in the best way to research goals: the additive model – the model of multivariate linear regression for initial data and the multiplicative (logarithmic) model for logarithms of initial data.

Further we made verification for those two models. The comparison of modeling results showed that both models sufficiently exactly approximated initial statistical data. At this, the multiplicative model occurred more exact for short-term forecasting, while the additive one is more stable at long-term forecasting.

This conclusion does not allow choosing either model for forecasting; thereat, it's advisable to made forecast as interval within predicted values of additive and multiplicative models

Modeling results showed that ratio between budget expenditures in Donetsk region and Ukraine's GDP is sufficiently stable, it changes continuously according to political and economical government decisions; the saccadic

changes can be naturally explained by hypothesis of external pulse effects (as it was in the second half of 2008). This confirms the adequacy of proposed model of expenditure forecast.

According to the model results for medium-term forecast in 2016 with the expected exchange rate 9,8 UAH/USD and expected inflation rate 0,5%, the budget expenditures of Donetsk region can be expected approximately as 26 UAH billion, that will be 1,5% of GDP. Forecast values are defined at the current prices.

It should be noted that modeling results should be defined more exactly in further, whereas only by means of broaden economic analysis one can improve accuracy of forecasting of local budget expenditure in Ukraine.

Results of forecasting, as well as analytical conclusions can be useful for budget management in Donetsk region. Developed mathematical economic models can be used to forecast spending of local budgets of Ukraine.

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## TAXATION AND ECONOMIC GROWTH: AN EVOLUTIONARY APPROACH

Taxes play an extremely important role in assuring of the activities of the state, financing the production of public goods and income redistribution. There is no doubt also that taxes have a significant impact on the economic growth of the country, and also on the development of industry. The last is the base of national economy for many developing and transitive countries of the world, including Ukraine.

To the investigation of this aspect of taxation, a wide range of academic resources is devoted, that reflects the results of both theoretical and empirical studies, the rationale of the recommendations for reforming tax systems of different countries. Among the most significant recent works on this issue, it can be mentioned, for example, the works of Engen E. and Skinner J. [1], Myles G. [2], Lee Y. and Gordon R.H. [3], Scully G.W. [4-5], Johansson A., Heady C., Arnold J., Brys B. and others [6-7], Bird R. [8], McBride W. [9], Mazerov M. [10]. At the same time, despite lots of research, great variety of approaches, based on the models of endogenous and exogenous economic growth, econometric modeling, analysis and subsequent aggregation of decisions made by economic agents about investments, savings, labor supply and capital at the micro level, the obtained results are contradictory enough. Various scientists claim and provide some empirical evidence that reduction of the tax burden leads to economic growth, or hinders economic growth or its effect is very weak. Such uncertainty prevents the justified establishment of fiscal policy, aimed on assuring of economic growth, also in the field of industry.

New horizons in the study on the impact of taxation on economic growth are opened by the evolutionary economics [11-13] and concept of tax population, originated on its base [14-16]. The main idea of this concept is that the formal and informal tax institutes of different levels, from the tax mentality and morality to, for example, tax planning routine in industry, formed during the prolonged socio-economic evolution,

not universal for all countries, but very similar for their individual groups. These groups are denoted as tax populations and tax subpopulations. According to the current understanding of tax populations, there can be expected that the impact of taxation on economic growth will vary to some extent in different countries belonging to different tax populations and subpopulations.

The purpose of this paper is to study the influence of the taxation level on economic growth within the boundaries of the various tax populations and subpopulations. Achievement of this goal is entirely connected with the construction and analysis of the specificity of econometric models for different tax populations and subpopulations, which include a sufficient number of countries, allowing provision of statistically adequate models.

Before turning to the direct analysis of the obtained models, it is necessary to make some preliminary observations on the variables used in them.

Using official economic growth ( $G_{\text{official}}$ ) and tax ratio ( $TR_{\text{official}}$ ) as models' variables can lead to misconceptions about the nature of the considered dependence, as it does not take into account the size of the shadow economy. Thus, at high tax ratio and a substantial scale of the shadow economy, the real tax ratio ( $TR_{\text{real}}$ ) is moderate or even low. Official economic growth also comprise insufficient information for the purposes of this study. For instance, it is possible that the fall in official GDP occurs simultaneously with the growth of the informal (shadow) sector, then, at a certain scale of the latter, the real economy, including both formal and informal sector can grow.

It should be noted that, as usual, national state and international organizations show economic growth and tax ratios, calculated on the basis of official GDP. This also applies to the database Heritage Foundation [17-19], used in our research, so it is necessary first of all to provide the calculation of indicators of real economic growth and the real tax ratio. To take into

consideration the impact of the shadow economy, the results of Buehn A. and F. Schneider [20] have been used. Note that in their work it is presented estimates of the shadow economy as a share in official GDP for a substantial number of states, but at the same time, these figures are related to the period from 1999 to 2007, as well as average figures over the period. In order to calculate the real tax ration ( $TR_{real}$ ) in a particular year (period), as follows from formula (1), official figures of tax ratio ( $TR_{official}$ ) should be divided by  $(1 + SE)$ , where  $SE$  - the share of the shadow economy in the relevant year. But since estimates of the shadow economy for the latest years are not available, the average figures for the following period are used in the calculations:

$$TR_{real} = \frac{Total\ Tax}{GDP_{real}} = \frac{Total\ Tax}{GDP_{official}(1 + SE)} = \frac{TR_{official}}{(1 + SE)} \approx \frac{TR_{official}}{(1 + SE_{av})}. \quad (1)$$

In this case, if the average share of shadow economy in Ukraine is 49.7% of the official GDP and the official tax ratios are equal to -38.1% (according to the database – Heritage Foundation Index of Economic Freedom 2013 [19]), 36.9% (according to the database – Heritage Foundation Index of Economic Freedom 2012 [18]) and 37.7% (according to the database – Heritage Foundation Index of Economic Freedom [17]), then the corresponding real tax ratios are -25.45%, 24.65% and 25.18% respectively.

The most widely used measure of economic growth is the real GDP growth rate ( $Growth_{real}$ ):

$$k_{SE} = \frac{1}{8} \left[ \frac{(1+0.522)}{(1+0.527)} + \frac{(1+0.514)}{(1+0.522)} + \frac{(1+0.508)}{(1+0.514)} + \frac{(1+0.497)}{(1+0.508)} + \frac{(1+0.488)}{(1+0.497)} + \frac{(1+0.478)}{(1+0.488)} + \frac{(1+0.473)}{(1+0.478)} + \frac{(1+0.468)}{(1+0.473)} \right] = 0.995088.$$

Then, taking into consideration the fact that the official economic growth in Ukraine is estimated at 5.205%, the real growth calculated by the formula (5) constitutes:

$$Growth_{real(t)} = (0.05205 + 1) \cdot 0.995088 - 1 = 0.046882 \approx 4.69\%.$$

Similar calculations of real economic growth and the real tax ratio were performed for the group, comprising 117 countries. It should

$$Growth_{real(t)} = \frac{GDP_{real(t)}}{GDP_{real(t-1)}} - 1 = \frac{GDP_{official(t)}(1 + SE_t)}{GDP_{official(t-1)}(1 + SE_{t-1})} - 1. \quad (2)$$

The formula can be transformed as follows:

$$Growth_{real(t)} = \frac{GDP_{official(t)}(1 + SE_t)}{GDP_{official(t-1)}(1 + SE_{t-1})} - 1 = \left( \frac{GDP_{official(t)} - GDP_{official(t-1)}}{GDP_{official(t-1)}} + 1 \right) \frac{(1 + SE_t)}{(1 + SE_{t-1})} - 1 = (Growth_{official(t)} + 1) \frac{(1 + SE_t)}{(1 + SE_{t-1})} - 1. \quad (3)$$

Since, as was already noted, the calculations of the share of shadow economy A. Buehn and F. Schneider are limited by the period from 1999 to 2007, and our task is to determine the real economic growth of various countries in the later period, so the impact of the shadow economy is accounted using the ratio ( $k_{SE}$ ), which describes the average dynamic of the shadow economy of the country according to the calculations of these scientists, that is:

$$k_{SE} = \frac{1}{8} \sum_{t=2000}^{2007} \frac{(1 + SE_t)}{(1 + SE_{t-1})}; \quad (4)$$

$$Growth_{real(t)} = (Growth_{official(t)} + 1)k_{SE} - 1. \quad (5)$$

So, for example, based on estimates of the share of the shadow economy in Ukraine, we obtain:

be noted that since the shadow economy remains enough inertial informal institute, the dynamics of its share in GDP, in a relatively short period (less than ten years), covered by paper of Buehn A. and F. Schneider, have been sufficiently slow. Following this discrepancy between the official and the real economic growth appears in a small range from -0.27% to 0.72%. However, discrepancies of the official and the real tax ratios are really substantial.

As practice shows, the impact of taxation on economic growth usually occurs some period of time after certain changes held in the tax field, including those related to the level of taxation. Because of this, it is assumed that the greatest impact on real economic growth will have a variable that displays the level of taxation with a certain lag. Taking into account the fact that the level of taxation and the shadow economy is closely interrelated and can have a joint effect on real economic growth, the model of real economic growth in general is defined in a following way:

$$Growth_t = f(TC_{real(t-2)}, SE_{av}) \quad (6)$$

To find the most statistically adequate models, the procedure of stepwise selection of variables was used, implemented in the program Statistica (version Statistica 10.0.1011.0 Trial Version Application). Wherein the set of possible variables has formed the average share of the shadow economy and tax ratio with a two-period lag, taking into account the various possible forms of interrelation (linear, quadratic, logarithmic, and other).

The most statistically adequate econometric model of real economic growth, based on data of the sample of 117 countries, has the form:

$$Growth_{real(t)_{all}} = -92.2424 + 0.0006SE_{av}^2 + 0.0459TR_{real(t-2)}^2 + 100.9237 \frac{1}{TR_{real(t-2)}} - 7.2255TR_{real(t-2)} + 48.5027\sqrt{TR_{real(t-2)}} \quad (7)$$

The coefficient of determination of this model is equal to 0.2177, and the adjusted coefficient of determination – 0.1825. Wherein most estimates of the model are statistically adequate at a significance level not exceeding 2%, estimates of variables  $SE_{real(t-2)}^2$  and  $1/TR_{real(t-2)}$  – at a significance level not exceeding 10%. The model includes the variables connected with the level of taxation, so as with the scale of the shadow economy. A positive coefficient of variable  $SE_{real(t-2)}^2$  indicates the real economic growth caused by increase in the share of the shadow economy. At the same time, the insertion of this variable in the model allows increase of adjusted coefficient of determination only by 0.015 compared with a model that takes into account only the effect of the level of taxation ( $R^2_{adjusted}=0.1673$ ):

$$Growth_{real(t)_{all}} = -100.249 + 0.050TR_{real(t-2)}^2 + 112.343 \frac{1}{TR_{real(t-2)}} - 7.913TR_{real(t-2)} + 53.002\sqrt{TR_{real(t-2)}} \quad (8)$$

The model (8) reflects the non-linear relationship between the real economic growth and the real tax ratio. Insight about the nature of this correlation in the existing range of variation of the real tax ratio gives the curve in Fig. 1, built on the basis of the calculated values of the real growth according to the model (8). There can be distinguished three ranges of changes of the real tax ratio with different characteristics of its impact on real GDP growth. The model shows that with the growth of the real tax ratio ranging from 5.2% to 14% an increase in real GDP growth can be expected. The real tax rates of 48 countries of the original totality (41%) belong to the specified range of values.

The growth of the real tax ratio from 14% to 35.5%, on the contrary, is followed by a decrease in real GDP growth rates from 5.14% to 1.06 %. This range of variation of the real tax ratio comprises 59 countries, that constitutes 50.4 % of the original totality. And finally, the third range includes 8 countries and is determined by the variation of the effective tax ratio, fluctuating from 35.5% to 48.4 %. The growth of real tax burden in this range is connected with the expectation of increase in the rate of growth of real GDP.

Thus, analysis of the impact of taxation and the level of the shadow economy on the growth of real GDP according to the data of undivided sample of 117 countries, doesn't let us come to any unambiguous conclusions and makes it necessary to consider this issue in the context of individual tax populations and subpopulations.

In the static aspect, the tax population remains a group of countries in which tax systems operate in a similar way, equally responsive to variations of the same factors and characterized by a relatively close values of various indicators of institutional and socio-economic development. Cluster analysis allows to identify such groups of countries in a relatively independent clusters. Following the results of research of 117 countries in Gurnak A. (2013) [21], the most numerous are the European tax population, in-

cluding Western and Eastern European subpopulation, a subpopulation of post-colonial countries, and also mixed subpopulation, which in-

cludes a subpopulation of the Muslim countries. The detailed composition of these populations and subpopulations is shown in Table.

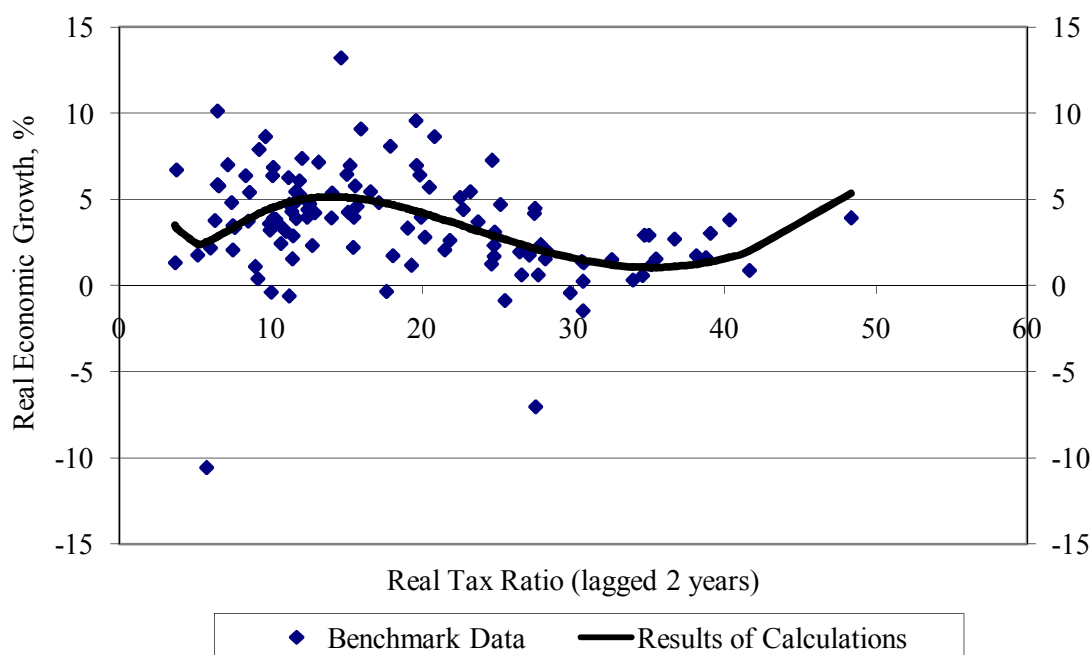


Fig. 1. Dependence of the real economic growth and the level of taxation according to the undivided sample of 117 countries

Table

The composition of the most numerous tax populations and subpopulations

European tax population			Mixed tax population	
Subpopulation of Western European countries	Subpopulation of Eastern European countries	Subpopulation of post-colonial countries	Subpopulation of Muslim countries	Other countries
1	2	3	4	5
Switzerland	Argentina	Botswana	Albania	Benin
United States	Armenia	Chile	Algeria	Bolivia
Austria	Bosnia and Herzegovina	Colombia	Azerbaijan	Bulgaria
New Zealand	Burundi	Costa Rica	Bangladesh	Cameroon
United Kingdom	Croatia	Dominican Republic	Burkina Faso	Ecuador
Netherlands	Czech Republic	El Salvador	Chad	Ethiopia
Australia	Hungary	Ghana	Egypt	Georgia
France	Kyrgyz Republic	Guatemala	Guinea	Guyana
Iceland	Latvia	Haiti	Indonesia	Hong Kong
Canada	Lithuania	Honduras	Iran	Israel
Ireland	Montenegro	Kenya	Jordan	Mauritius
Germany	Poland	Lesoto	Kazakhstan	Nepal
Denmark	Romania	Liberia	Mali	Nicaragua
Finland	Russia	Madagascar	Mauritania	Norway
Sweden	Serbia	Malawi	Morocco	Paraguay

1	2	3	4	5
Belgium	Slovakia	Malaysia	Nigeria	Peru
Spain	Slovenia	Mexico	Pakistan	Singapore
Portugal	Tajikistan	Mozambique	Senegal	Sri Lanka
Malta	Ukraine	Namibia	Sierra Leone	Taiwan
Cyprus	Venezuela	Panama	Turkey	Thailand
Estonia		Philippines	Yemen	Vietnam
		Rwanda		
		South Africa		
		Uganda		
		Uruguay		
		Zambia		
		Zimbabwe		

Econometric model of real economic growth for Western European countries tax subpopulation is characterized by adjusted coefficient of determination, which is equal to (on the level??) 0.2571. It is significantly higher than the value of this parameter for the model constructed on the basis of the undivided sample of countries. Besides this model shows that the real economic growth will be only affected by the scale of the shadow economy:

$$Growth_{real(t)_{West\_European}} = -85.5515 + 0.1180SE_{av}^2 - 11.7294SE_{av} + 61.4352\sqrt{SE_{av}} \quad (9)$$

All estimates of the model's parameters are statistically significant at the 5% level. Model (9) and built on its basis graph in Fig. 2, show that the scale of the shadow economy in the borders of Western European tax subpopulations have nonlinear impact on real GDP growth. Wherein the majority of this tax subpopulations fall into such a range of relatively small values of the shadow economy in which its growth is not associated with an increase in the rate of growth of real GDP, as the model, built according to the data of the undivided sample of countries, and moreover it leads to reduction in growth of the real economy.

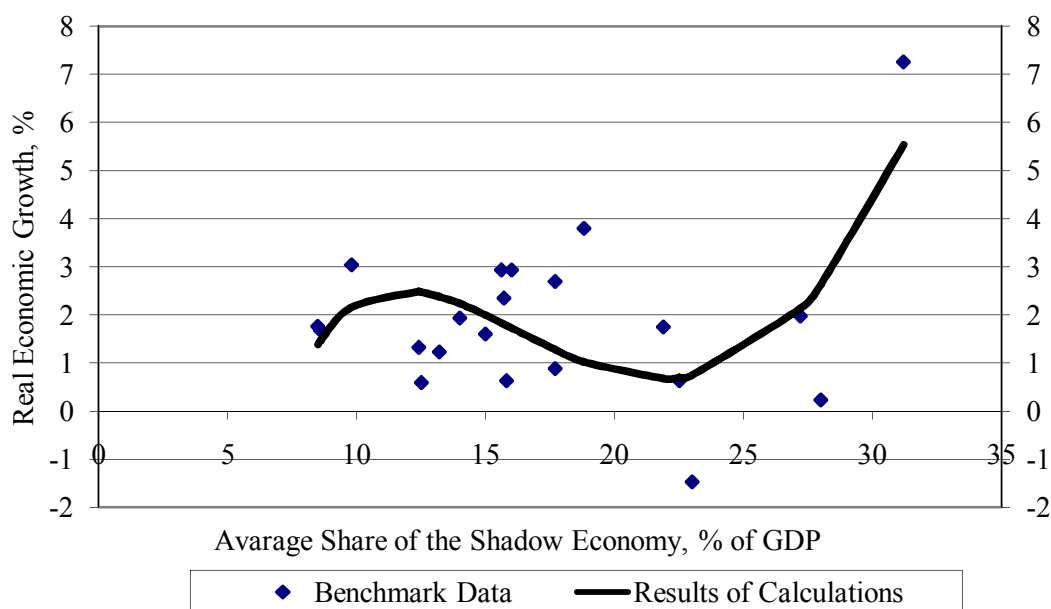


Fig. 2. Dependence of real economic growth on the shadow economy for Western European tax subpopulation

So according to the constructed model (9), the level of taxation has no significant effect on real economic growth. The main reason of this virtually is the construction of the tax systems and tax policies in the countries of Western European tax subpopulation is based on the recommendations of the neoclassical theory of taxation in the aspect of its neutrality.

To the other results can be got through the analysis of the model, constructed according to the Eastern European tax subpopulations:

$$Growth_{real(t)\_East\_European} = 5.5571 - 0.0039TC_{real(t-2)}^2 \quad (10)$$

Both estimates of model coefficients are statistically adequate at the 5% significance level. The coefficient of determination is 0.2242, and adjusted coefficient of determination - 0.1811.

Taking into account that analyzed models are used to study the impact on economic growth of only two factors (level of taxation and the size of the shadow economy) from a sufficiently large set, including technical progress, capital, labour, etc., the obtained coefficients of determination indicate an acceptable adequacy of the constructed models.

Model of the real economic growth of Eastern European tax population shows that at a sufficiently high level of the shadow economy for countries in this group, the variation of this parameter does not have a statistically significant effect on economic growth. Concerning, changes in the real tax ratio, its growth is associated with an expected slowdown in real GDP growth. Conversely, a decline in real tax burden increases the growth rate of real GDP. At the same time the maximum growth rate of real GDP is on average 5.56 %. Such character of the impact of taxation on economic development of Eastern European tax subpopulation is caused by their institutional features. These features are mainly interrelated with the fact that the government expends financial resources, that were accumulated through taxes, not in a proper way, carrying out increasingly social spending, rather than funding programs related to economic development. Moreover, in these countries there are cases of financial abuse and uncovered embezzlement of public funds.

The model of the real economic growth for tax subpopulation of post-colonial European countries comprises both size of the shadow economy and the level of taxation, and is described by the following equation:

$$Growth_{real(t)\_Postcolonial} = 4,2366 + 0,0014SE_{av}^2 - 16,4748 \frac{1}{TC_{real(t-2)}} \quad (11)$$

Statistical characteristics of the model are a bit worse in comparison to previous models. Thus, the coefficient of determination of the model is 0.1926, and adjusted coefficient of determination - 0.1253. Only estimates of the free variable and the coefficient of the variable  $SE_{real(t-2)}^2$  are statistically significant at the 5% level. In this model, as well as in the model, constructed according to the undivided sample, the size of the shadow economy is positively correlated with economic growth. Nevertheless, the increase in the level of taxation (real tax ratio over the entire range of its values for this subpopulation) stimulates the growth in rates of real GDP in future that distinguishes a subpopulation of post-colonial countries from other subpopulations European tax population.

For the mixed tax population and, included in it, the tax subpopulation of Muslim countries, econometric models have the following form:

$$Growth_{real(t)\_Mixed} = 4,7271 - 10,5508 \frac{1}{TC_{real(t-2)}} \quad (12)$$

$$Growth_{real(t)\_Muslim} = 1,7063 + 0,0089TC_{real(t-2)}^2 \quad (13)$$

Both models reflect a positive correlation between the real tax ratio and economic growth across the entire range of the variation of tax ratio. The shadow economy factor has no significant influence on the variation of economic growth in these groups of countries. However, the two latest models both have very low values of the coefficients of determination and the adjusted coefficient of determination: for the model constructed according to mixed tax population - 0.0327 and 0.0085, and for the subpopulation of Muslim countries - 0.0826 and 0.0343, respectively.

It should be noted that outside of this study were such large in area and population,

rapidly developing countries as India and China. This is because of that India and China, in fact, are unique in the evolutionary-biological and civilizational-cultural aspects, and are regarded as those who form two separate tax populations: the Indian and the East Asian Asian respectively. Therefore, the study on the impact of the implemented their tax policy on the economic growth is impossible on the basis of cross-country analysis.

Thus, the results of the research show that the significance and nature of the impact of the level of taxation on the economic growth, considering the size of the shadow economy, differs substantially within the boundaries of the various tax populations and subpopulations. At the same time, for the countries of the mixed tax population, including subpopulations of Muslim countries, as well as a subpopulation of post-colonial countries of the European tax population, an increase in real tax ratio contributes the growth of real GDP. In countries of Western European tax subpopulation correlation between the level of taxation and variations in real economic growth is absent. This reflects the tendency of countries of Western European tax population to follow the principle of tax neutrality in the formation of the tax policy and providing tax systems reforms.

Unlike other tax populations and subpopulations, for Eastern European tax subpopulation, comprising Ukraine, the real growth of the level of taxation reduces the growth rate of real GDP that is explained by a clear priority of social spending and inadequate government funding programs for economic growth, and low efficiency of state institutions.

So it is clearly evident that the level of taxation influence in different ways on the economic growth of various tax populations and tax subpopulations. However, a perspective direction for further research is to study the features of the impact of various taxes, such as direct and indirect, on economic growth in the context of different tax populations and subpopulations.

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# PROBLEMS OF DEVELOPMENT STRATEGY AND FINANCIAL-ECONOMIC REGULATION OF INDUSTRY

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## ENSURING OF FINANCIAL SUSTAINABILITY OF RAILWAY TRANSPORT IN UKRAINE

*Railroads are as important to a well-functioning, modern society as clean water and electricity*  
*M. Sussman, President, «Strategic Rail Finance»*

Transport is a specific sector of the national economy of Ukraine, providing its internal and external transport and economic relations and satisfying the manufacturing and non-manufacturing needs in freight and passenger transport, promoting more rapid development of the productive forces of society, regional relations and involvement in the process of social reproduction of resources all over the country. Transport, linking production factors in a complex network of relationships between producers and consumers, it is not itself a sufficient condition for economic development, but the lack of a developed transport infrastructure can be seen as a deterrent factor in the development of the national industry. Its optimal structure and efficient operation is a prerequisite functioning of the economy as a whole, its stabilization and growth, development of foreign economic relations, improvement of living standards.

A special place in the transport infrastructure of Ukraine remains for the railway, which is manufacturing and technological complex of organizations and enterprises of the railway transport, designed to meet the needs of social production and population in transportation on domestic and international communications and provision of other transport services to all consumers without restrictions featured with ownership and activities [1]. System advantages of railway transport allow it to retain the priority position as the main mode of transport back-

bone, not only now but also in the long term.<sup>1</sup>

The railway transport plays an important role in the economy of Ukraine. So, the industry in 2013 provided over 83% of freight (excluding pipelines) and 38% of passenger (including city train) transportation, implementation of all modes of transport.<sup>2</sup>

Meaning of industry in the national economy shows TU-indicator as well.<sup>3</sup> As can be

<sup>1</sup> System advantages of railway transport is the ability to handle large passengers and cargo; higher speed compared with other modes of transport; higher energy efficiency, including electric, a limited adverse effect on the environment, including visual, minimum area land, no delays and traffic impediments related to road congestion, lack of time spent on registration; possibilities by railway stations in cities, including in the central portion thereof, a higher degree of security compared to other modes of transport [2, p. 269].

<sup>2</sup> In terms of turnover of railway transport of Ukraine takes 1st place in Europe and 2nd in the CIS, in terms of passenger traffic – 2nd in the CIS and 4th in Europe. In terms of freight railways of Ukraine take the 4th place on the Eurasian continent, second only to the railways of China, Russia and India. Traffic density Ukrainian Railways (annual traffic for 1 km) is 3–5 times higher than that of developed European countries [3].

<sup>3</sup> TU (Transportation Unit) – specific transport unit representing a particular ratio of turnover (in tonne-kilometers) and passenger (passenger-kilometers) to the country's GDP in U.S. \$ and characterize the contribution of individual modes of transport in GDP.

seen from Fig. 1, the railway transport contribution to GDP of Ukraine exceeds more than three times the contribution of road transport, which is a major competitor in the market for freight and

passenger traffic. The contribution of the sector in the period from 2005 to 2012, not only did not decrease, but increased from 48,2% to 54.4% (Table 1).

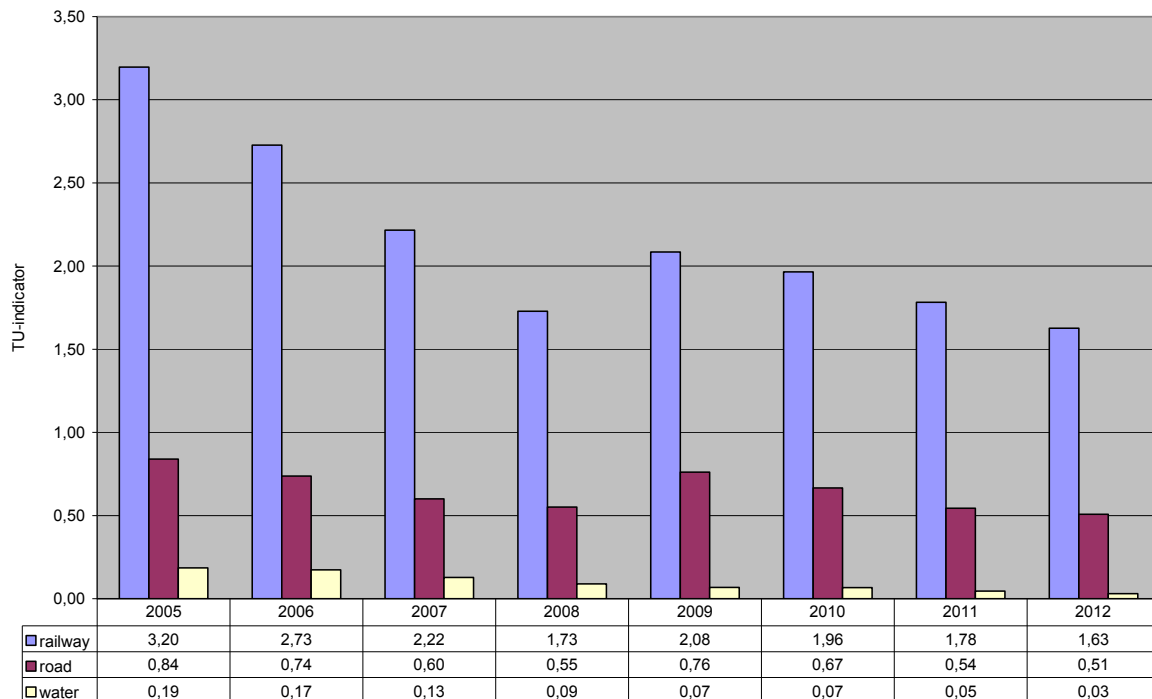


Fig. 1. The changes of the TU-indicator for certain types of transport of Ukraine (calculation based on the data [4])

Table 1  
Structure of the contribution of individual modes of transport in Ukraine's GDP, % (according to [4])

	2005	2006	2007	2008	2009	2010	2011	2012
All modes of transport, including	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
railway	48,2	49,5	49,3	54,7	47,9	50,1	52,5	54,4
road	12,7	13,4	13,4	17,4	17,5	17,0	16,0	17,0
water	2,8	3,2	2,8	2,8	1,6	1,7	1,3	1,0
other modes of transport	36,3	33,9	34,5	25,1	33,1	31,2	30,1	27,6

As «Ukrzaliznytsya» is one of the largest employers and budgeting enterprise in many regions of Ukraine (over 352 thousand employees) [3].

Now in Ukraine railway transport is experiencing quite a difficult period, involving both the «stalling» of the process of its reform,<sup>1</sup> and

<sup>1</sup> Researchers transport sector reform process railway transport of Ukraine is seen as a key factor in

the economic crisis in Ukraine, one manifestation of which is to reduce the volume of production, the basis of the nomenclature of rail

the future development of the industry, its effective adaptation to the market environment. However, as noted by Yu.M. Tsvetov, M.V. Makarenko et al, «Ukraine as of 01.01.2012 actually no started to reform rail industry...» [5, p. 7], as there is no specific (developed) reform program. By the end of 2013 the situation has not changed.

freight.<sup>1</sup> The result was the deterioration in the financial condition of the industry (Table 2), which adversely affects its capacity to transport cargo and passengers with the necessary quality and speed.<sup>2</sup>

Railway transport is a strategically important sector of the national economy, the condition and quality of which depends not only on the prospects for economic and social development, but also the ability of the state to effectively carry out its functions relating to the protection of national sovereignty and national security, to ensure the needs of citizens in carriages, creating conditions to align the socio-economic development of regions and other. Deterioration in the financial condition of the industry, reducing its financial sustainability negative impact on funding opportunities and investment activity and, thereby, conveyances<sup>3</sup> and opportunities of railway infrastructure ca-

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<sup>1</sup> The basis of the nomenclature of rail transportation in Ukraine is made by coal and coke, petroleum and petroleum products, ore, ferrous metals, chemicals and fertilizers, the weight of which is more than 67 % of the transported cargo (calculation based on the data [4]). Thus in 2013 the carriage of coal and coke amounted to 99.6%, petroleum and petroleum products – 95.5%, ore – 194.7 %, ferrous metals – 105.6 %, chemical and mineral fertilizers – 77.3 % of level in 2012, overall freight volumes fell by 3.4%. [4] The decrease in traffic was observed in 2012 by 2.5%.

<sup>2</sup> Depreciation of railway transport in the period from 2005 to 2012 increased from 56.7% to 98.4% (calculated on the basis of the financial statements of «Ukrzaliznytsya»), which is accompanied by a significant technological gap: in Ukraine is used rolling stock (locomotives and wagons) of the second generation, while in developed countries is used rolling stock of fifth generation. Obsolescence and depreciation affects the quality of freight and passenger.

<sup>3</sup> According to experts on current trends in financing and investment activity of railway transport will be reduced of potential traffic volumes at the far post: in 2014 – to 48.9 million people, in 2015 – to 45.8 million people, 2016 – up to 41.5 million people [6]. In 2014, the deficit of the rolling stock will be 580 cars and 102 electric locomotive in 2015 – 1465 cars and 143 electric locomotive in 2016 – 1869 cars and 175 locomotives in 2017 – 2364 cars and 213 locomotives [7].

capacity. Therefore, the problem of improving the financial condition and improve the financial sustainability of railway transport is very relevant in the circumstances.

Theoretical background and practical approaches to ensuring financial sustainability is widely reflected in the works of Russian and foreign scientists. Change issues of financial condition and financial sustainability are devoted to the works of Blanc I.A., Bocharov V.V., Braley R., Brigham Yu., Grachev A.V., Eletsikh S.Ya., Zabrodskiy V.A., Kizim N.A., Kostyrko L.A., S. Myers et al [8–15]. Significant contribution to the development of methodology for assessing the financial sustainability was introduced by E. Altman, R. Taffler, Tishov G., Bakanov M.I., Melnik M.V., Sheremet A.D. et al [16–19].

However, it should be noted that, with regard to railway transport special studies have been conducted. This can be explained as follows. First, railway transport considered and continues to be regarded as a kind of «perpetuum mobile», which will operate at all times and under all conditions, that allows to «ignore» on the severity of existing problems in the industry.<sup>4</sup> Secondly, the attention of the leading researchers focused on railway transport to identify key areas of industry reform, resolving complex issues to improve the efficiency of its industrial and financial-economic activity. In this case the financial administration of railway transport, including its financial condition and financial sustainability are not considered that in the context of non-stationary institutional environment can lead to disastrous results not only for the industry, but also the national economy of Ukraine as a whole [20].

Hence the purpose of this article is a study of the peculiarities of the financial condition of railway transport of Ukraine and the formation of the system of constraints to maintain its financial sustainability in unsteady conditions of the institutional environment.

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<sup>4</sup> Modern history provides examples of virtual elimination of railway transport (Colombia, Latvia, etc.) or a significant deterioration in its parameters (UK) due to lack of proper attention to its problems and needs.

*Ratio analysis of the financial condition of railway transport of Ukraine  
(according to financial statements «Ukrzaliznytsya»)*

Indicator	on 01.01.09	on 01.01.10	on 01.01.11	on 01.01.12	on 01.01.13
Return on investment ratio	0,003	0,001	0,004	0,008	0,005
Net profit ratio of operating activities	0,005	0,003	0,010	0,013	0,008
Absolute liquidity ratio	0,049	0,008	0,009	0,138	0,015
Current ratio (cover)	0,526	0,523	0,508	0,711	0,534
Financial stability ratio	1,830	1,770	1,992	2,493	2,190
Financial independence (autonomy) ratio	0,646	0,639	0,666	0,713	0,684
Decrease / increase in liabilities	153,5	148,3	107,0	98,5	115,5

In world practice, financial management adopted the financial condition of any entity (corporation, industry) to characterize using liquidity ratios, financial sustainability and economic activity, for which fairly strict limits are set «allowing» uniquely diagnose the financial condition of the object. However, current approaches to the assessment of the financial condition and financial sustainability in modern conditions cause major issues.

So, Grachev A.V. notes that a) the formula for calculating of the coefficients used and recommended boundary of changes are not certain, and b) the accounting policies have a significant impact on the value of the calculated coefficients c) these ratios are not linked to a very important indicator for the enterprise – value added, d) calculation of coefficients at the beginning and end of the reporting period and the identification of their deviations from the standard values still does not disclose the mechanism of achieving themselves normative values; and e) evaluation of financial and economic condition of the company only at the beginning and only at the end of the reporting period does not provide information on the work of the enterprise for the entire reporting period [21].

Also it should be noted that methods of calculating financial performance indicators are considered universal and, therefore, suitable for the analysis of any production and economic system. However, they do not address specific industrial and financial-economic activity of a specific object, which can lead to incorrect results. This is true for the railway transport of

Ukraine. As seen from Table 2 level of financial stability and financial independence of railway transport increases from 2009 to 2012. At the same time the established standards are maintained: values of financial sustainability ratio exceeds 1, and financial independence ratio - 0.5. This testifies to the strengthening of the financial condition of the railway transport. However, analysis of the formation of financial resources of «Ukrzaliznytsya» (Table 3), on the contrary, show an increase in the industry depending on external sources of credit. In addition, the net increase in cash of «Ukrzaliznytsya» in 2012 was –2115 million UAH (compared to 2011 +1317 million UAH), the ratio between the amount of the repayment of loans and the amount of interest income from interest-bearing loans amounted to 0,931 (in 2011 year – 0,821).<sup>1</sup>

Thus, the coefficients describing the financial condition of railway transport of Ukraine do not reflect the real state of the finance industry. In addition, the current trend for railway transport is very dangerous because it affects not only the current financial condition, but also has long-term negative effects (decrease in investments, primarily in the rolling stock and modernization of railway infrastructure). Thus, already in 2013 attracting of loans was carried out at a price above the market average. This indicates an increase in the riskiness of investing in the industry and is recognized as an

<sup>1</sup> Calculations based on official data of «Ukrzaliznytsya» [3].

Table 3

*Dynamics of formation of financial resources of railway transport,  
% of the previous year (according to the financial statements of «Ukrzaliznytsya»)*

Indicator	2009	2010	2011	2012
Net profit	–	193,1	129,9	56,3
Long-term bank loans	132,2	55,7	144,6	99,7
Short-term bank loans	148,0	168,9	117,8	97,8
Return borrowed funds	58,5	129,8	181,9	82,9
Decrease / increase in liabilities	153,5	148,3	107,0	98,5

opportunity to attract loans,<sup>1</sup> and their price,<sup>2</sup> that in the I half of 2013 it resulted in a reduction of financial income by 62.9%, while financial expenses by 7.5% compared with the same period in 2012.

During the first half of 2013 the growth rate of long-term liabilities amounted to railway transport 134.3%, while the short-term – 70.6%.<sup>3</sup> При In this case for the purchase of fixed assets was spent only 53.2% of the amount borrowed long-term interest-bearing borrowings. In general, the cost of updating the fixed assets industry decreased by 57.1%. Decline in investment activity in the sector is not surprising and expected after significant investments undertaken «Ukrzaliznytsya» in preparation for Euro-2012.<sup>4</sup> However, failure to use borrowed

funds for the purchase of fixed assets (46.8%) indicates the problems of financing operations branch,<sup>5</sup> which is a very alarming signal.

Existing negative trends are reflected in the processes of generating cash flows of railway transport. So, for the I half 2013 compared with the same period in 2012 net cash generated from operating activities decreased by 54.8%, net cash flows used in investing activities decreased by 56.7%, and net cash flows received/used in financing activities increased by 2.2 times from the proceeds of loans, bond placement and reduction of the cost of repayment obligations.

Analysis of the factors that could determine the future of railway transport in Ukraine (the state and prospects of development of the infrastructure sector, maintaining demand and efficiency of freight transport demand satisfaction and efficiency of passenger traffic, the implementation of the reform process of railway transport of Ukraine) [20, 24] showed that under the conditions of non-stationary institutional environment as a result of mismanagement of finances and, as a consequence, reduce the financial sustainability of the industry, there is a real danger of phasing freight and passenger

<sup>1</sup> In 2013 it was planned to raise funds through the placement of Eurobonds in the amount of 1 billion EUR, were actually placed bonds worth 500 million EUR. At the same time the industry is highly dependent on foreign loans: own funds industry can not finance more than 33% of the required investment [22], and a sharp decline in net profit (in 2012 – 43.7%) further reduces its investment opportunities.

In 2012 there was a reduction of credit ratings «Ukrzaliznytsya» to the level of «B- (negative)» (from S&P) and «B- (stable)» (from Fitch) [3].

<sup>2</sup> According to financial statements of «Ukrzaliznytsya» growth in 2008 financial costs amounted to railway transport 220.0%, in 2009 – 163.6%, in 2010 – 122.2%, in 2011 – 104.5 %, in 2012 – 108.7% of the previous year.

<sup>3</sup> Calculation based on data from the report of Ernst & Young Audit Services LLC «State Administration of Railway Transport of Ukraine «Ukrzaliznytsya»: interim condensed consolidated financial statements as of June 30, 2013» [3].

<sup>4</sup> «Ukrzaliznytsya» to prepare for Euro 2012 spent 18.9 billion UAH equity in the absence of budgetary funding. From January to September 2012, due to distortions in capital investment cash gap be-

tween revenues and expenditures for transportation operating activities amounted to 2.2 billion UAH. Also provided at the beginning of the year indexation of tariffs did not take place – «Ukrzaliznytsya» sustained a loss of about 2 billion UAH. [23].

<sup>5</sup> The report of Ernst&Young Audit Services LLC «State Administration of Railway Transport of Ukraine –: consolidated financial statements as of December 31, 2012, 2011, 2010 years» notes that as one of the sources of additional funds to finance working capital deficit industry guidance of «Ukrzaliznytsya» is considered a reduction of capital investments «if necessary, without creating unfavorable conditions for operations...» [3].

traffic, which would be disastrous not only for railway transport, but also for the national economy as a whole. Therefore, to prevent the further accumulation of negative trends in the industrial, financial and economic activity of the industry seem to be necessary to develop and implement a system of severe constraints governing the processes of generating cash flows of the railway transport of Ukraine.

Development of a system of constraints to ensure financial sustainability in the planning and the current period should be based on two conditions [25]: 1) the current (available) working capital needs exceed it for each time period, 2) own working capital should not be below zero.

Then, taking into account these two conditions, such a system would include restrictions five basic requirements.

**1. Priority to financing of the continuously operation.** Financial highlights of railway transport are formed as a result of ordinary operations for freight and passengers, so to save the source of receipt of funds is a necessary priority to ensure sufficient financial resources of continuous operations industry, and its gradual development through the implementation of the necessary investment and innovation.

The need to introduce this restriction follows from the peculiarities generating of the financial flows in railway transport of Ukraine: the possibility of implementation of operational activity in the future depends directly on financial results received in the current period. In addition, the potential development of the industry (the possibility of capital investments in rolling stock and infrastructure improvements) as defined by the financial result. Then, this restriction can be represented by the following relationship:

$$R_i(t) + R_f(t) \leq FR_d(t) - R_o(t), \text{ for } \forall t, \quad (1)$$

where  $R_o(t), R_i(t), R_f(t)$  – the total cost of the industry in the period  $t$  ( $t \in [1, T]$ ), associated with the operating, investing and financing activities, respectively;  $FR_d(t) = f(R_o(t-1), R_i(t-1), t)$  – the available financial resources of the industry.

**2. Balanced amounts of positive and negative cash flows of the railway transport.**

The implementation of this restriction involves the generation of negative cash flows, depending on the amount of positives ones for each period  $t$ . The deficit and surplus of the total cash flow will have a negative financial impact on the industry [26, 27]. Thus, the generation of the total cash flow deficit will reduce the level of liquidity and solvency of the industry, resulting in increase in accounts receivable and payable, increase in the share of overdue financial credits received, increase in the duration of the financial cycle and, consequently, reduction of the profitability of equity capital, and assets of the railway transport.

Total surplus of the cash flow will also have negative consequences associated with a decrease in the real value of temporarily not used funds, as well as the loss of the potential revenue from the unused portion of cash assets, which also affect the efficiency of their use, as well as equity industry.

Then to balance the positive and negative cash flows of railway transport and prevent the appearance of deficit or surplus in each period  $t$  it is necessary to adhere to the following relationship:

$$\frac{DP_p^o(t) + DP_p^i(t) + DP_p^f(t)}{DP_o^o(t) + DP_o^i(t) + DP_o^f(t)} \cong 1, \quad (2)$$

where  $DP_p^o(t), DP_p^i(t), DP_p^f(t)$  – a positive cash flow from operating, investing and financing activities for the period  $t$ , respectively;  $DP_o^o(t), DP_o^i(t), DP_o^f(t)$  – a negative cash flow from operating, investing and financing activities in the period  $t$ .

**3. Synchronization of the generation of operational, financial and investment cash flows.** Implementation of this restriction involves setting a rigid relationship between cash inflow (positive cash flow) and their expenditure (negative cash flow) over time. Total cash flow timing circuit can be described by the following equation:

$$ODC_k(t) = ODC_p(t) + S^{DC}(t) = ODC_p(t) + [P_d^{DC}(t) - P_p^{DC}(t)] \geq ODC_{opt}(t), \quad (3)$$

where  $ODC_p(t), ODC_k(t)$  – the cash balance at the beginning and end of the period  $t$ , respec-

tively;  $S^{DC}(t)$  – cash balances in the period  $t$ ;  
 $P_d^{DC}(t), P_p^{DC}(t)$  – forecast of the revenue and  
 expenditure of funds in the period  $t$ ;  
 $ODC_{opt}(t)$  – the optimal balance of funds in  
 the period  $t$ .

Since timing of cash flow of the railway  
 transport should provide reciprocal linking flows  
 related to operating, investing and financing ac-  
 tivities, the restriction (3) can be represented as  
 follows:

$$\begin{aligned} ODC_k(t) = & ODC_p(t) + [P^{ODC}(t) + P^{IDC}(t) + \\ & P^{FDC}(t)] = ODC_p(t) + [(P_d^{ODC}(t) - P_p^{ODC}(t)) + \\ & + (P_d^{IDC}(t) - P_p^{IDC}(t)) + \\ & + (P_d^{FDC}(t) - P_p^{FDC}(t))] \geq ODC_{opt}(t), \end{aligned} \quad (4)$$

where  $P^{ODC}(t), P^{IDC}(t), P^{FDC}(t)$  – the fore-  
 cast cash flows from operating, investing and  
 financing activities in the period  $t$ , respectively;  
 $P_d^{ODC}(t), P_p^{ODC}(t), P_d^{IDC}(t), P_p^{IDC}(t), P_d^{FDC}(t),$   
 $P_p^{FDC}(t)$  – the forecast income and expendi-  
 ture of funds related to the operating, investing  
 and financing activities in the period  $t$ .

The use of the expression (4) as the re-  
 striction will provide the necessary and suffi-  
 cient level of solvency of the railway transport  
 in each period  $t$  ( $t \in \overline{1, T}$ ) and, thus, reduce the  
 severity of the two issues specific to its financial  
 and economic activities:

1) the necessity of withholding of the  
 funds from the market to maintain the optimal  
 balance of funds to compensate for arrhythmia  
 of cash flows in the industry over the period  $t$ ,  
 arising as a result of pronounced seasonality of  
 its activities. The positive effect of this is the  
 ability to reorient the released resources to  
 finance investment;

2) increase in the investment attractive-  
 ness of investment in the railway transport, as  
 well as the level of confidence of financial insti-  
 tutions, which results could increase the flow of  
 external financial resources to the development  
 of the industry.

**4. Maintenance of the optimal cash bal-  
 ance as a reserve for sustainable financial  
 position of railway transport.**

Cash as a type of the working capital is  
 characterized by three main features, determi-  
 ning the need to maintain an optimal (necessary  
 and sufficient) its balance as the reserve of en-  
 suring of as a stable financial state of the indus-  
 try [14]:

1) routine: they can be used to pay off  
 current liabilities, resulting in a gap in time be-  
 tween the incoming and outgoing cash flows  
 and, consequently, the need for constant accu-  
 mulation of surplus funds in the current account;

2) caution: railway transport is characte-  
 rized by a pronounced seasonality, as reflected  
 in the intensity of the generation of operating,  
 investing and financing cash flows. In this sea-  
 sonal peaks of various cash flow of the industry  
 is not the same: the operating cash flow has its  
 generation peak in June-August and January  
 (increase in freight and passenger turnover), in-  
 vestment – in April-May and September-  
 October (holding of planning and renewal re-  
 pairs of the infrastructure of the sector, as well  
 as its investing in development), financial – in  
 June and December (settlements on external fi-  
 nancial liabilities). Consequently, there is a need  
 for creating a safety stock of cash to cover the  
 gap between expected income and possible costs  
 in the each period  $t$ , as well as for contingency  
 fees, which will aim to prevent the reduction of  
 financial stability and solvency of the industry;

3) speculation: the cash reserve is needed  
 because there is always a chance of causing un-  
 expected investment to generate an additional  
 revenue (increase in operating cash flow), and  
 for the elimination of emergency situations that  
 require certain costs (increase in negative oper-  
 ating or investment cash flow).

In the literature on financial management  
 in order to determine the optimal cash balance is  
 proposed to use of models of Baumol-Tobin,  
 Miller-Orr, Stone et al. [10, 28-31, etc.]. How-  
 ever, the assumptions of these models do not  
 meet the characteristics of the operation of the  
 railway transport in Ukraine and do not allow  
 displaying a specific of generation of operating,  
 investing and financing of cash flows, so their  
 use is inefficient.

In addition, the professionals involved in  
 financial management, note that the decrease in  
 cash below by 10% of the amount of working  
 capital is a "wake-up call" for the corporation  
 [32, p. 28, etc.], as it shows a decrease in its

ability to pay and, as a consequence, financial sustainability, and therefore should not be allowed to reduce the balance of funds to this level. At the corporation «Amtrak»<sup>1</sup> minimum cash balance is maintained in the amount of about \$ 200 million to meet the operational requirements [33]. However, a rigid fixation of the fund balance for the railway transport of Ukraine also appears to be ineffective, because at different times different financing needs that should be taken into account in determining it.

Then taking into account the comments the optimal cash balance as a reserve for sustainable financial position of the railway transport should be planned according to the following equation:

$$DC_{\max}(t) - DC_{\min}(t) \geq ODC_{opt}(t) > 0, 1 \cdot OA(t), \quad (5)$$

where  $DC_{\max}(t), DC_{\min}(t)$  – the forecast of maximum and minimum need in cash in the period  $t$ , respectively;  $OA(t)$  – the value of working capital in the period  $t$ .

The performance of the restriction (5) will not allow on the one hand, cash shortages as a result of arrhythmia of generating cash flow of railway transport and maintain the solvency and creditworthiness at a high level, and, on the other hand, the excessive costs of lost opportunities due to subsidence of money on the account.

### 5. Providing the liquidity of cash flow (liquidity cash flow, LCF).

Liquidity cash flow is one of the characteristics of the financial sustainability of the enterprise, showing the changes in net credit position of the company within a certain period (month, quarter). Liquid cash flow is closely linked to the concept of financial leverage, which characterizes the extent to which the activities of the company can be improved through bank loans.

Cash flow liquidity test for each period  $t$  ( $t \in [t_0; t_1]$ ) can be represented as expressions

$$LCF(t) = LCF(t_1) - LCF(t_0) = (K_{\delta}(t_1) + CL(t_1) + CASH(t_1)) - (K_{\delta}(t_0) + CL(t_0) + CASH(t_0)) \geq 0, \quad (6)$$

where  $K_{\delta}(t_0), K_{\delta}(t_1)$  – the long-term credits and loans at the beginning and end of the period  $t$ , respectively;  $CL(t_0), CL(t_1)$  – short-term borrowings;  $CASH(t_0), CASH(t_1)$  – cash funds on the settlement and currency accounts.

Limitation (6) characterizes the possibility of timely payment of obligations to foreign creditors, so adding it to the model of financial planning in railway transport will allow:

1) to prevent the generation of a negative total cash flow in the industry, which will have a positive impact on the attractiveness of investments in its development and, consequently, the intensity of investment in infrastructure renewal and rolling stock;

2) timely detection of symptoms of the crisis in the financial activities sector, which is extremely important in a non-stationary and dynamic environment, and the increased uncertainty associated with the process of reforming of the railway transport in Ukraine.

**Conclusions.** Thus, due to the difficult financial situation of railway transport of Ukraine, there is an objective need for the formation of severe restrictions managing its financial assets to improve their effectiveness in the short and long term. Implementation of the proposed system of constraints will contribute to a) improve the operational management of cash flows from a position of balance income and expenditure of funds, and b) increase the liquidity of the balance of the industry, and c) increase the investment attractiveness of the railway transport of Ukraine for financial institutions that will not only accelerate the renewal of a non-negotiable assets, but lower financial costs, and d) the release of funds from the operational turnover for capital investment in the development of the industry.

Maintaining the financial sustainability of railway transport will not only contribute to its effective development, but also to overcome the negative trends and accelerated development of leading industries of the national economy, the implementation of neo-industrial variants of the

<sup>1</sup> National railway passenger transport corporation «Amtrak» (The National Railroad Passenger Corporation «Amtrak») is the largest company engaged in passenger traffic in the United States focused on the implementation of intercity passenger rail.

national industry, «as the best at the present stage...» [34, p. 104], the creation of infrastructural conditions for the development of trade and economic relations of Ukraine with the countries of the Customs Union and the EU, restore and strengthen the cooperative ties between the industry-leading domestic and foreign enterprises, etc.

To improve the management of the financial condition and financial sustainability of railway transport it is necessary to bring regulatory framework governing the financial management of railway transport into line with modern requirements;

develop a methodology for assessing the financial position and financial stability of the state for structural units, and the industry as a whole taking into account their operational and financial performance;

implement the necessary changes in the organization of the financial work as in subdivisions and «Ukrzaliznytsya» in general;

introduce a system of financial planning, including short-term, long-term and strategic planning to ensure sufficient financial resources targeted progressive development of industry in the context of non-stationary institutional environment;

develop a system for monitoring production, financial and economic activities through the application of modern information technology.

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## IMPROVING THE PRACTICE OF FINANCIAL SUPPORT OF INDUSTRIAL DEVELOPMENT

**The modern requirements for ensuring the effective industrial development.** New industrial strategies can foster the structural transformation of the economy towards increased economic diversification and ensure long-term economic growth through the creation of a more sophisticated production structure, introduction of the of scientific and technological advances, application of the different sources of financing, as well as considerate, reasonable, long-term state program of industrial development.

The development of the industrial sector is one of the main conditions of creating a modern Ukrainian industrial complex, which can be a powerful engine of long-term economic growth of the state and respond to changes in the world market conditions. The technical development of Ukrainian industrial sector does not meet the current requirements and is characterized by unhealthy tendencies because of the low activity of industrial enterprises which deal with the advanced manufacturing technologies. The national industry is technologically backward with underdeveloped industrial and economic system which is vulnerable to external and internal market fluctuations.

Currently, the basic form of financing of industry development is a self-financing with some state's influence on this economic process. However, since the own funds are not usually enough for developing and upgrading the production capacity in terms of overcoming the effects of the global economic crisis, it is necessary to use outside financing (external funds).

To address the new development challenges, some developing countries are implementing industrial policies to sustain growth by diversifying and upgrading domestic production. The renewed interest in industrial policy poses new challenges and opportunities for their policy makers. The new forms of foreign direct in-

vestment (FDI) and the delocalisation of high-value-added activities, previously kept in-house in advanced countries, are opening up new opportunities for learning and for entering into new activities and sectors. Some developing countries are recognising the importance of well-functioning development banks to channel resources to production development, innovation and infrastructure; reducing their skills mismatch is also a key priority for many developing countries to facilitate production transformation [1, p. 21].

The analysis of contemporary practice of research of improving the financial support showed a comprehensive approach to modern economic models, in coordination with the social and political aspects of society. In the works of Ukrainian scientists A. Amosha [2], I. Blank [3], L. Lysyak [4], Y. Zhalilo [5] more attention is paid to financing of own funds for industrial development. Some Russian scientists O. Sukharev [6], S. Glazyev [7], V. Lepsky [8] consider the issues of improving the mechanism of financial support regulation, the developing of its infrastructure and optimizing its management. Foreign authors D. Green [9], Zhou Xiaochuan [10], L. Gitman [11], M. Djunks [11] pay greater attention to credit support of industrial development, as well as different financing instruments especially securities and the stock market. All these aspects require further research, theoretical generalizations and methodological substantiation as well as specification for the modern industry development in Ukraine.

In this regard, the objective of this paper is to study the main influence on the financing activities and define the main directions of improving the practice of financial support of industrial development.

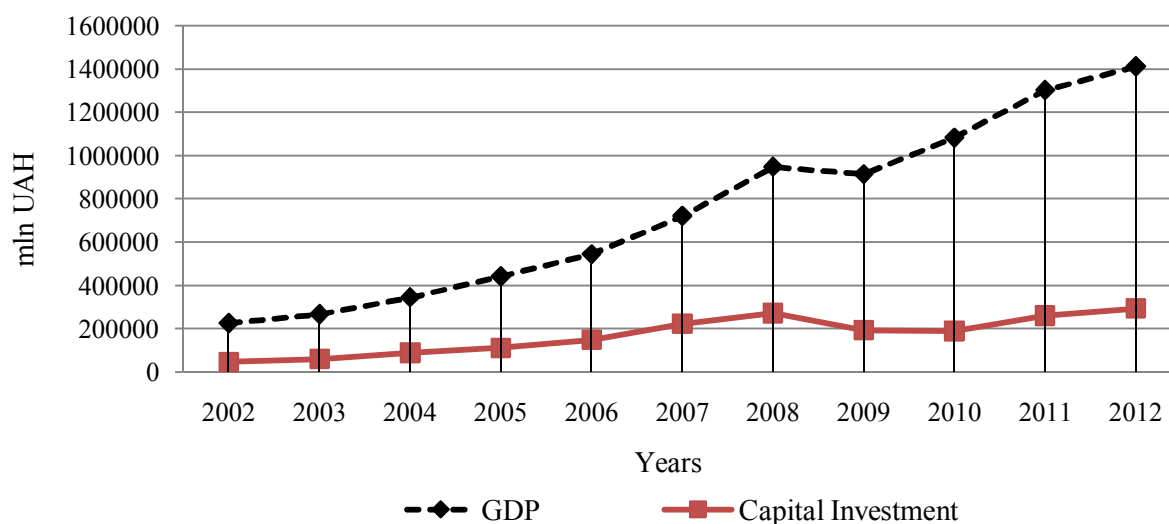
Activation of industry technical development is possible based only on advanced finan-

cial and credit system which aims at contributing to the solution of critical economic and social problems. Implementation of these tasks starting from preservation and development of industrial potential of strategic and priority areas of development to creation the necessary pre-conditions for the implementation of technical and technological innovations in all spheres of national economy as well as to ensure its structural and technological restructuring.

**Industrial development in Ukraine: an analysis of the dynamics of Ukrainian investment activity in 2005-2012 years.** The technical and technological level of industry has been decreasing since Ukraine gained independence. The financial assets were directed to

equipment maintenance and to partial modernization of existing equipment and technology. Thus, the strategic issues of technical development of domestic production were pushed into the background giving place to the current problems. In general, the problem of technical development of enterprises received little attention both on the enterprises and at the state levels.

The dynamics of basic indices of industrial development, one of which is the gross domestic product (GDP) and capital investments, clearly illustrates the sad condition of the Ukrainian economy. Figure 1 shows the dynamics of gross capital investment in an industry which shows a little stabilization in the last two years.



Source: State Statistics Service of Ukraine.

Fig. 1. The Dynamics of Capital Investments and GDP in Ukraine

According to Figure 1, there is a close relationship between the volume of capital investment and the volume of Ukraine's GDP. There is a positive trend of increasing capital investment and GDP during the 2005-2011 period, however, the crisis worsened the situation in the financial sector, including the field of investment, as a result we can observe the equivalent decrease in the fixed asset investment and GDP in 2009.

The World Bank (WB) has retained its October forecast for Ukraine's economic growth in 2014 to 2 percent, but has worsened its forecast of the economic growth in 2013 from "zero" to the "minus" 1.1 percent that was previous-

ly planned. This is stated in the research of "Global Economic Perspectives" [12].

This prediction corresponds to the so-called pessimistic scenario of Ukrainian economy specified by the WB experts in October 2013. The World Bank considered two scenarios of the economic development of Ukraine. The first scenario known as "deferred correction" allowed the improvement of economic situation in the world at a constant situation in Ukraine. The second scenario is the immediate implementation of structural reforms particularly raising gas prices for households, with simultaneous optimization of targeted assistance for low-income citizens, as well as introduction of a

flexible exchange rate and increasing the investment attractiveness of the country.

In the first scenario, the World Bank has predicted GDP growth of 2% in 2014, shrink of country's GDP by 1% in 2015 as well as zero GDP growth in 2016. The bank experts suppose that the inflation rate in Ukraine will be 2% in 2014, 11% in 2015 and 7% in 2016. Balance of payments deficit was estimated at 9% of GDP in 2014, 5.5% in 2015 and 4.2% in 2016. Ukraine's state budget deficit reached 4.4% of GDP in 2013 and 3.2% in 2015, as well as 2.4% in 2016. External debt predicted by the Bank, should reach 68.1% of GDP in 2014 and 77.5% in 2015, as well as 75.2% in 2016.

In the second scenario, the World Bank has predicted GDP growth of 1.5% in 2014, 3% in 2015 and 4% in 2016. The bank experts suppose that the inflation rate in Ukraine will be 12% in 2014, 6.6% in 2015 and 4% in 2016. Balance of payments deficit was estimated at 5.4% of GDP in 2014, 4.5% in 2015 and 3.1% in 2016. Ukraine's state budget deficit will reach 2.5% of GDP in 2014, 2% in 2015 and 1.7% in 2016. External debt predicted by the Bank, should reach 76.8% of GDP in 2014, 75.8% in 2015 and 73.7% in 2016.

In addition, the World Bank has placed Ukraine among the countries inclined to acute risk of deteriorating of trade positions and possible capital outflows.

The World Bank made an annual ranking of doing business, where Ukraine has scored 112 line in 2014. Ukraine has improved its position on 112 lines as compared with 2013, when Ukraine has scored only 137 line. The World Bank experts noted that our country has great unrealized potential particularly a third of the world's black soil, a favorable geographical location, a large domestic market and well-developed infrastructure as well as industrial base. However, according to experts, despite the fact that Ukraine has implemented more reforms than any other country in the world, we must do much more.

Heritage Foundation in cooperation with experts from Wall Street Journal made an annual ranking of countries according to degree of economic freedom, where Ukraine has scored only 161 line rating in 2013. According to the latest

data, Ukraine occupies only 155 line in the Index of Economic Freedom 2014 [13].

In January 2014 the WB experts drew attention of country's authorities to the need of urgent reforms especially in the private sector, including the improvement of regulatory policy, reducing inefficient audits, establishment of internal supervisory and monitoring mechanisms to fight corruption. These factors are the main challenges for development in the private sector, including small and medium businesses [14].

It should be mentioned that the EBRD is also lowered the expectations of Ukraine's economy in 2014 to 1.5% compared to 2.5% predicted in May 2013. The International Monetary Market forecast the GDP growth in Ukraine to 1.5% in 2014.

The analysis of the development and impact of science and technology on the production shows that the production assets of enterprises are the main "backbone" of production and determine the further development of the Ukrainian economy. A technical modernization should become the entrance admission to the world positions of a developed economy. The regularity of technical development denominates the necessity of moving towards the new generations of machines and is the basic cause of the mass renovation of the technology.

The implementation of industrial productive capacity depends on the state and terms of financial provision of industry investment. The financial crisis in Ukraine has led to a collapse in investment activity and has reduced all financing sources of industrial sector.

The analysis of investment activity including industries, fields of investments, the pace of modernization, and innovation activity of Ukrainian enterprises showed that the policy of financial security as a set of production goals, ways and facilities of updating and development of Ukrainian industry based on the market relations during the of post-socialist transformation period of the economy has not been formed. The reason of this situation is lack of common views of legislative and executive branches on the specific goals of economic reform, which are understandable to the public and supported by all government agencies.

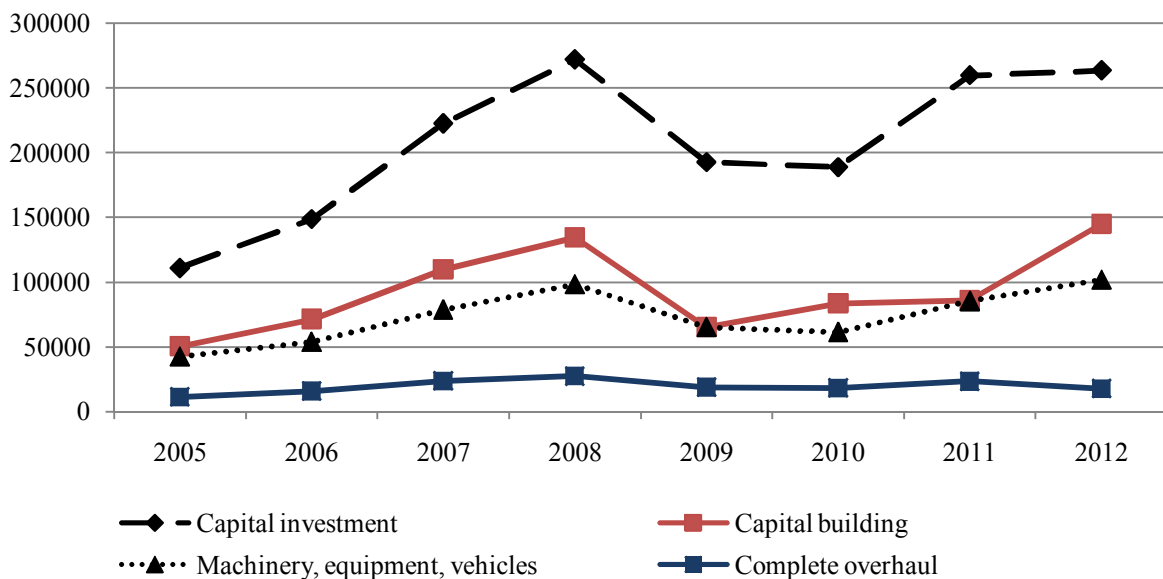
The general economic crisis that has covered almost all spheres of social production par-

ticularly the investment sphere has led to the most difficult condition. The volume of investment in 2011 was 2.3 times lower than in 1990, when economic output in 2011 amounted to about 70% by volume in 1990. The trend of investment decline ceased in 2012, but the position in the investment area remains unsatisfactory.

The investment climate in Ukraine in 2008-2012 has deteriorated and was characterized by the significant capital outflow from Ukraine, including a decrease in investment in different sectors of the nation economy, as the result of the global financial crisis and political

instability as well as economic weaknesses in the management system. A severe crisis has led to decreasing the pace of capital investment attraction and the introduction of new production capacity, increase in the volume of unfinished construction, low technological parameters and reproductive structure of capital investments despite the fact that the process of renewal and development of productive capacity was defined as the investment sector.

Fig. 2 shows the dynamics of gross capital investment in an industry which shows a little stabilization in the last two years.



Source: State Statistics Service of Ukraine.

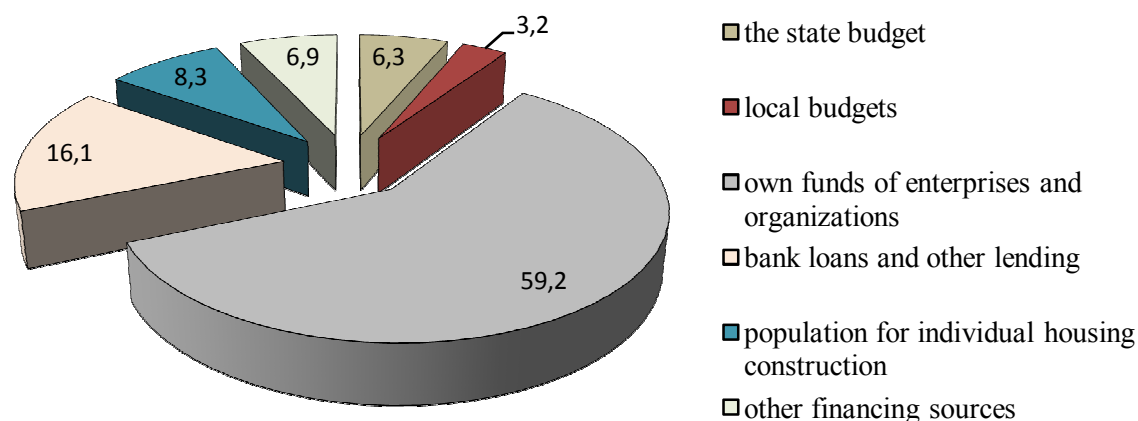
Fig. 2. The Gross Capital Investment in Ukrainian industry in 2005-2012

The largest volume of capital investments in the industry was made in 2008. The largest share of the structure of total capital investment of industry enterprises accounted for investments in the building, purchase of machinery, equipment, vehicles and capital repairs.

The volume of capital investments is 259932.3 million UAH in 2011 in Ukraine including the 209130 million UAH of fixed assets investments (excluding *value added tax*), which is on 22.4% more than in 2010 [15]. The volume of capital investments is 263.73 billion UAH in 2012 in Ukraine, which 8.3% more than in 2011 [15].

The largest part of the total capital investment was made at the expense of the own funds of enterprises and organizations 156,149.3 million (59%); 42.53 billion (16%) was made by bank loans; and only 6% at the expense of the state budget. The main source of capital investment is the funds of enterprises and organizations (Fig. 3).

The largest amount of investment of total capital investment was sent in tangible assets by 255.84 billion UAH, and 17.89 billion UAH of which in complete overhaul.



Source: State Statistics Service of Ukraine.

Fig. 3. The capital expenditure by financing sources in 2012

For comparison, the largest number of capital investment in 2012 was mastered in manufacturing (38.07 billion UAH), building (36.4 billion UAH), transport and communication (34.7 billion UAH), trade including wholesale, retail trade and repair of motor vehicles (23.34 billion UAH). The increase of volumes of the capital investments was only in some branches. Thus, the 2012/2011 index in the industry was 179.8%.

It should be noted that the majority of capital investment carried out into the fixed cap-

ital which requires constant updates and improvements for achieving the competitiveness of domestic products.

The volume of capital investment during the 2007-2010 periods demonstrated a negative tendency, as the result of which this indicator was 27.2% in 2011 of the 1990 level, and the volume of building works was on 0.7% more than the 1990 level according to the State Statistics Committee of Ukraine (Table 1).

Table 1

The basic indicators of investment\*

Years	Fixed assets investments		The volume of contract work performed by its own		The residential commissioning		Fixed investment in building	
	million UAH	% by 1990	million UAH	% by 1990	thousand m <sup>2</sup> of total area	% by 1990	million UAH	% by 1990
1990	555368	100	44826,8	100	17447	100	8970	100
2005	93096	16,8	25462,3	56,8	7816	49,5	12017	134
2006	125254	22,6	38038,0	84,8	8628	58,7	18581	2083
2007	188486	33,9	53524,6	119,4	10244	58,7	30343	338,3
2008	233081	42	62678,7	139,8	10496	60,2	35533	369,1
2009	151777	27,3	40843,5	91	6400	36,7	18052	210,2
2010	150667	27,1	43174,9	96,3	9339	53,5	27999	312,1
2011	238175	42,9	54024,7	120,5	9700	55,6	28413	316,8
2012	248034,7	44,7	58040	129,5	10749	61,6	-	

\* Source: State Statistics Service of Ukraine.

The volume of fixed assets on account of own funds decreased by 1.9 times in 2011 compared to the previous year [15]. Thus the specific weight of own funds is 59% (56% in 2010). But it should be noted that the own funds form mostly by depreciation, because profits after tax and dividends significantly fell in 2009-2010 as a result of financial crisis.

The volume of fixed assets amounted to 238.2 billion UAH in 2011, it is more than 22.4% compared with 2010. The structure of the fixed assets investments by ownership in January -September 2011 was as follows: 5.5% public, 2.5% local budget, 61.1% own funds, 12% credits, 2.0% foreign investors, 12.2% population, 4.7% other sources.

The possibilities of the state budget usage for industry to financing are limited because of the great budget deficit as well as lack of unified strategy of industrial development. The lack of information and statistical tools for analysis of Ukrainian high-tech industrial sector prevented the state support of priority industries. Nowadays, there is no uniform classification of high-tech products in Ukraine, which significantly complicates the determination of public financing priorities of industrial production [4, p. 15].

The state budget funding in Ukraine ranges from 4.4% to 6.3% and 5.35% during the 2005-2010 period, and 5.35% on the average in the structure of fixed assets investment by source of financing; as well as the local budgets founding ranges from 2.7% to 4.3% during the same period, and 3.5% on the average; and GDP ranges from 0.003% to 1.2%. This is a confirmation of insufficient government participation in financing of investment process [15].

The largest share of budgetary provisions accounted for fuel-energy complex. The funding of fuel-energy complex increased by 38.6% during the 2006-2010 period while spending on research and development in the energy sector increased by 3.7 times. The volume of the processing industry funding including high-tech production is decreased by 5.1%, at the same period.

The reproductive structure of fixed capital investments defined the increasing the share of intensive investment of modernization and reconstruction of existing enterprises. The share of this indicator was 60-73% in 2005-2012.

The industrial structure of capital investments has significantly changed for the worse because the major part of it accounted for the manufacturing industry (58.5% of the total capital investment in 2010) and also for the mining industry (26.75%). The investment activity in mechanical engineering has fallen by 12 times because 29.3% of industrial investment accounted for mechanical engineering in 1990, but only 7.5% in 2010.

The reduction of capital investment in machinery and building industries as the main producers of investment resources are particularly serious consequences for the prospects of investment activity. The mechanical engineering ceased to be the basis of technical equipment of the national economy. One way to increase demand for domestic engineering products is growing solvency of its customers with a wide usage of leasing.

The bank lending should be the most important mechanism of industry development financing in in terms of the limited capacity of budget support and lack of own funds. The largest volume of bank lending in industries was spent for manufacturing industry 86.6% in 2008, 84.7% in 2009, 82.6 % in 2010 of the total cost. The largest volume of bank lending came into the food industry (25.7% of all loans in the manufacturing industry at the average of 2008-2010 period), engineering (23.0%), industry (18.6%), chemical production (8.1%), and manufacture of other non-metallic mineral products (7.4%). The share of bank lending to other industries did not exceed 6%. The term structure of credit in the industrial sector is unbalanced because the majority of loans are short-term. One must admit that short-term credits forwarded the renovation of circulating assets of enterprises. The funding of investment and innovation activities performed exclusively by long-term loans, but the share of long-term loans in the structure of the lending industry remains rather low.

The banks should be the main centers of industrial development financing in current condition of economic development and in particular issue loan on the new products, development of the new technologies. The banks should recommend innovations based on alternative projects and business plans for which it is rea-

sonable to take a loan and be a shareholder with further participation in profits not only issue a long-term loan.

The alternative funding mechanisms of structural changes in the industry have not received sound development. The share of non-bank segment is less than 7 % of the total assets of financial institutions in the structure of the Ukrainian financial market. The financial institutions of Ukraine provide rather narrow range of financial services as well as the majority of which have unsatisfactory quality while the legitimate rights and interests of consumers of these services are not adequately protected. The low capitalization of financial institutions slows the financial sector development. The serious barrier for long-term financial resources provision in a real sector of the national economy is low capacity of banks and financial companies.

The innovative activity of industrial enterprises favors the development of economy, provides the introduction of scientific and technological advances. Meanwhile, the appropriate financial support for innovation is one of the most important conditions of innovative processes implementation. The financial support for innovation means the system of economic relations about searching, attraction and effec-

tive usage of financial resources. The 1758 companies were engaged in innovative activities in 2012 or 17.4% of the total number of enterprises for comparison the 1679 companies in 2011 or 16.2%. The number of companies which spend money on innovation increased by over 20% in 2011. The volume of innovation expenditures is 14.3 billion in 2011 (8 billion in 2010).

The main funding sources in the field of innovation are their own funds, particularly 63.9 % of the total cost in 2012 compared to 52.9 % in 2011, the state budget was 2.2% (3.7%), the loans was 21.0% (38.3%), the foreign and domestic investors was 8.6% and 1.3% (0.4% and 0.3 %, respectively) (Table 2) [16].

The 1037 companies launched the innovative production by 36.2 billion UAH or 3.3% of the total volume of industrial production in 2012 (42.4 billion UAH in 2011, or 3.8% respectively). Almost every fourth company launched a product which was new for the market. The volume of such products amounted to 14.5 billion UAH, it is more than half of sum total (52.4%). It should be noted that the majority of companies almost 85.7% of total amount in 2012 have launched completely new products. The volume of new products was 21.7 billion UAH in 2012 or 26.6%.

Table 2

*The dynamics and structure of funding sources in the field of innovation*

	2005	2007	2008	2009	2010	2011	2012
The total funding of innovation activity in Ukraine, mln.UAH	5751,6	10821	11994,2	7949,9	8045,5	14333,9	11480,6
in % of GDP	1,3	1,5	1,3	0,9	0,7	1,1	0,81
including (%):							
own funds	87,7	73,7	60,6	65,0	59,3	52,9	63,9
the state budget	0,5	1,3	2,8	1,6	1,1	1,0	2,0
local budgets	0,3	0,1	0,1	0,1	0,1	0,1	0,2
extra-budgetary funds		0	0	0	0	0	0
domestic investors	1,4	0,2	1,4	0,4	0,4	0,3	1,3
foreign investors	2,7	3,0	1,0	19,0	30,0	0,4	8,6
Loans	7,1	18,5	33,7	11,8	7,8	38,3	21,0
other sources	0,3	3,2	0,4	2,1	1,3	6,9	3,0

The 1371 companies were engaged in introduction of innovative products in 2012, it is the 78% of total amount of innovative companies. The 704 companies have launched 3403 innovative products, notably 962 of them are in machinery, equipment field. The 598 companies

introduced the 2188 new processes in the reporting period, including 554 resource-saving processes.

Thus, the analysis of the dynamics of investment processes in Ukraine suggests that the active phase of their development in 2005-2008

changed recession in 2009-2011, which constrains the development of the country significantly. It should be noted that the financing of industry investment in Ukraine arises from the difficult conditions which is closely associated with the global financial crisis as well as a certain number of internal factors, such as: the political instability; the imperfection of appropriate law; the tax burden on businesses; narrow domestic market; inflation; the undeveloped industrial and social infrastructure; the lack of information provision and the low level of investor protection; the lack of a clear investment policy of the relevant implementation mechanisms at national and local levels; the lack of incentives and mechanism of investment attracting; the reduction of investment activity in the world.

The existing problems of financing of industrial development in Ukraine lie in structural imbalances such as technological, sectoral and regional as well as by funding sources. These problems can lead to aggravate existing imbalances in the economy, monopolization of strategic sectors of the economy, as well as misallocation of raw materials sources and production capacity.

The burning problems of investment in Ukraine have been ignored for a long time in particular the investment of real economy. The development of industrial production was not accompanied by adequate investment support with the result there has been a collapse of production and investment since Ukraine gained independence. The permanent deficiency of investment has led to functional and physical depreciation as well as reducing the output and falling competitiveness.

There is a decrease in investment processes in the world in concordance with global economic crisis. The annual inflow of FDI in the world in 2009 decreased by 37% compared with 2008 [17]. There is a high level of shadow economy in Ukraine due to poor tax policy and lack of budgetary support of the real sector as well as global economic crisis.

The high inflation in Ukraine discourages potential investors and threatens devaluation of investment income. Consumer Price Index (CPI) in Ukraine increased to 100.5 Index Points in December of 2013 from 100.20 Index Points in December in 2012. The country's annual aver-

age headline inflation for the year 2013 is 100.5% [5].

The great energy intensity of Ukrainian industry makes domestic goods production much more expensive as compared with majority of imported analogues. As the result, domestic enterprises can not afford to make additional funding available for investment of production development and innovation.

**Industry development in the leading countries of the world: a study of international experience of financing of industry development and its possible application in Ukraine.** Industry of the most developed countries of Southeast Asia is one of the most dynamic and attractive sectors of these countries. First of all, it refers to the branches generated by the information revolution of recent decades, and is closely associated with the global trends of scientific and technological development. Cumulative production of products and services of the ASEAN countries is 2 % of the world.

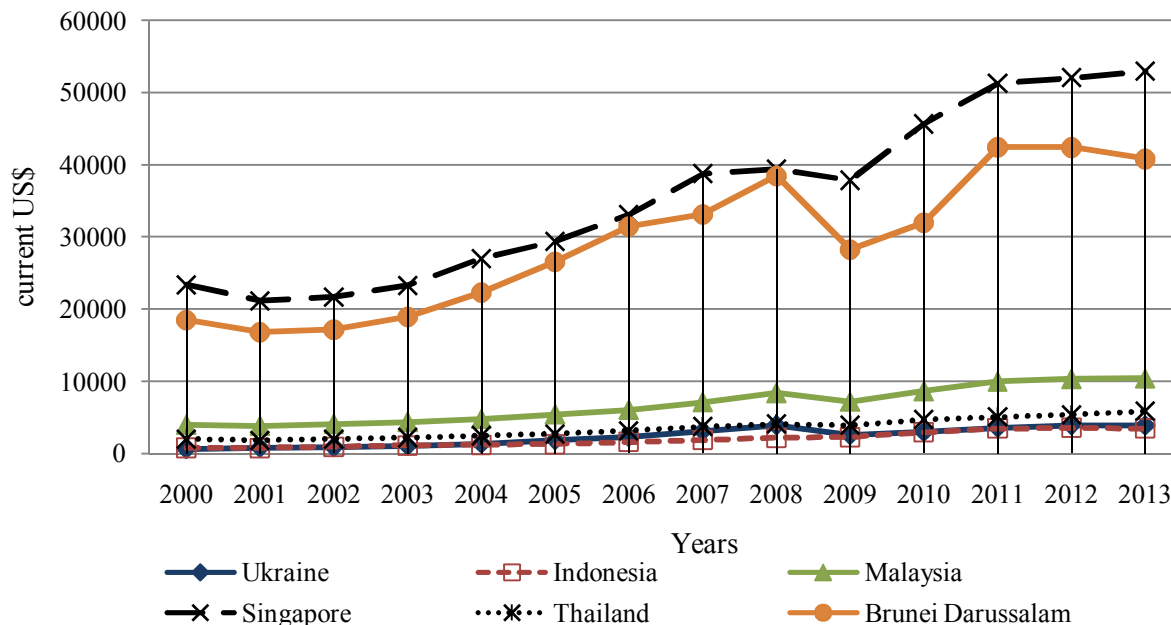
In the context of the global trend of rapid development of transnational corporations and the information revolution greatly accelerated the spread of the world's new production and management technologies. Generators of such technologies are mainly highly industrial and postindustrial countries. Unprecedented technology innovation and entering to the new market as well as new types of high-tech products with improved quality occurs under the pressure of competition. There is constant growth of living standards in these countries and the corresponding increase of wages as well as outpacing productivity growth lead to increase in the costs of the products produced by high-tech industries, as the result we can observe the significant transfer of production to other countries of the ASEAN region, China and others in the last decade.

Leading ASEAN countries were able to create a dynamic developing sphere of high-tech industries of the national economy. This is due to constructive government policy of ASEAN countries to provide favorable economic environment for foreign investors and domestic business.

ASEAN concentrates on the harmonization of the business environment in the region and convergence of the level of technological

development of all participating countries, focusing on the creation of a single market space. In modern conditions it is necessary to study experience of consistent policy which will ensure macroeconomic stability and rapid accumulation of assets and capital, as well as their dis-

tribution, support the competitiveness of national products, the development of agricultural production and the service sector, along with the development of high-technology industries for uniform and balanced economic development.



Source: IMF World Economic Outlook, October 2013.

Fig. 4. The Dynamics of Gross Domestic Product per capita (current US\$) of ASEAN-5 countries and Ukraine

The experience of the economic mechanism formation of the industry development in ASEAN countries as example of effective state building and harmonious economic development is of a great interest for Ukraine. This policy requires the next organizational and economic principles:

- the formation of the modern legislative, regulatory and legal framework in the field of attraction and usage of FDI;

- the full mobilization of domestic resources which suggests the possibility of synergies in the development, the public funding of promising projects, the promotion of private investment in domestic enterprises, granting preferential tax treatment, the development of information security, simplifying of bureaucratic procedures for national industries;

- the mechanism formation for attraction and implementation of FDI, through the crea-

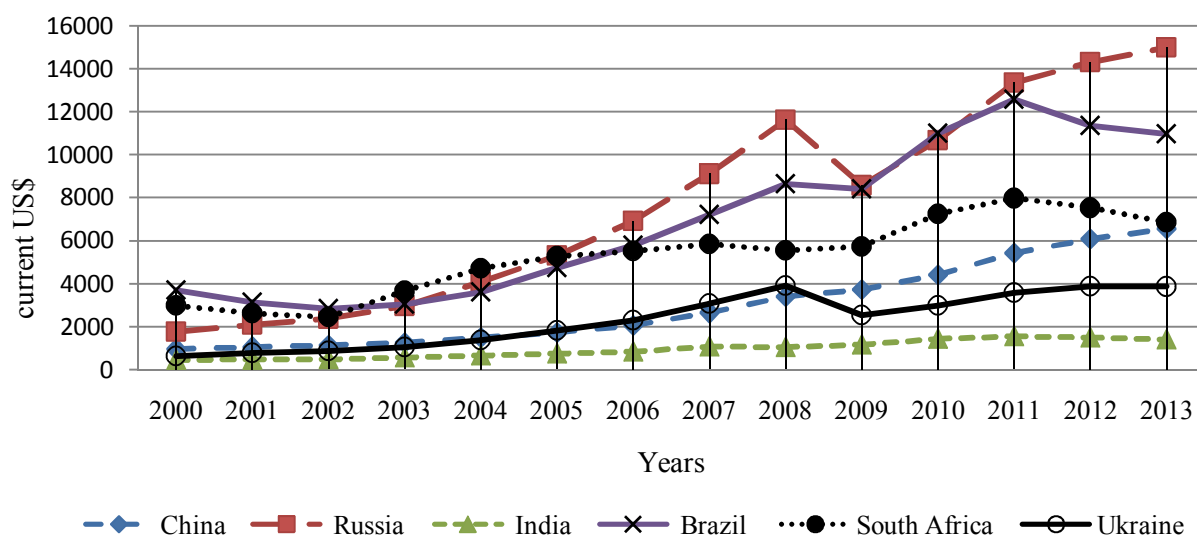
tion of a positive image of the investments profitability, safety and convenience of doing business, improving of financial system, standardization of companies reporting, the development of the institute of investments insurance. The Investment Attractiveness Index of Ukraine calculated by the European Business Association (EBA) after the growth to 2.39 in the third quarter, fell to 1.81 in the fourth quarter, it is the lowest level in the history of its measurement [14];

- the priority development of industrial infrastructure. The identification of the most priority branches of industry development subject to long-term prospects.

BRICS countries (Brazil - Russia - India - China - South Africa) play the special role in the world economies which are characterized by dynamic development, even in the post-crisis, recessionary conditions. At the moment, the

share of the total GDP of the five states in the global GDP exceeds 21%, with an increase of this indicator over the past 15 years more than three times. At the present stage BRICS

cooperation is developing in different directions, but the main task is the effective economic cooperation.



Source: IMF World Economic Outlook, October 2013.

Fig. 5. The dynamics of Gross Domestic Product per capita (current US\$) of BRICS countries and Ukraine

Currently China opens up new sources of research funding for foreign companies making "The Celestial Empire" as a great example to follow. China is pursuing aggressive policies by developing its own high-tech production and global market penetration with the tools of active state support, encouraging foreign investment inflows as well as supporting their own research sector [10]. Thus, considering Chinese experience of effective economic mechanism formation Ukraine should bet on the instruments and leverage of the development of the real sector of economy, the development of productive capital on conditions of existence of a single reform center as well as observance of the gradual manner of new elements introduction of the economic mechanism taking to account national identity and national interests.

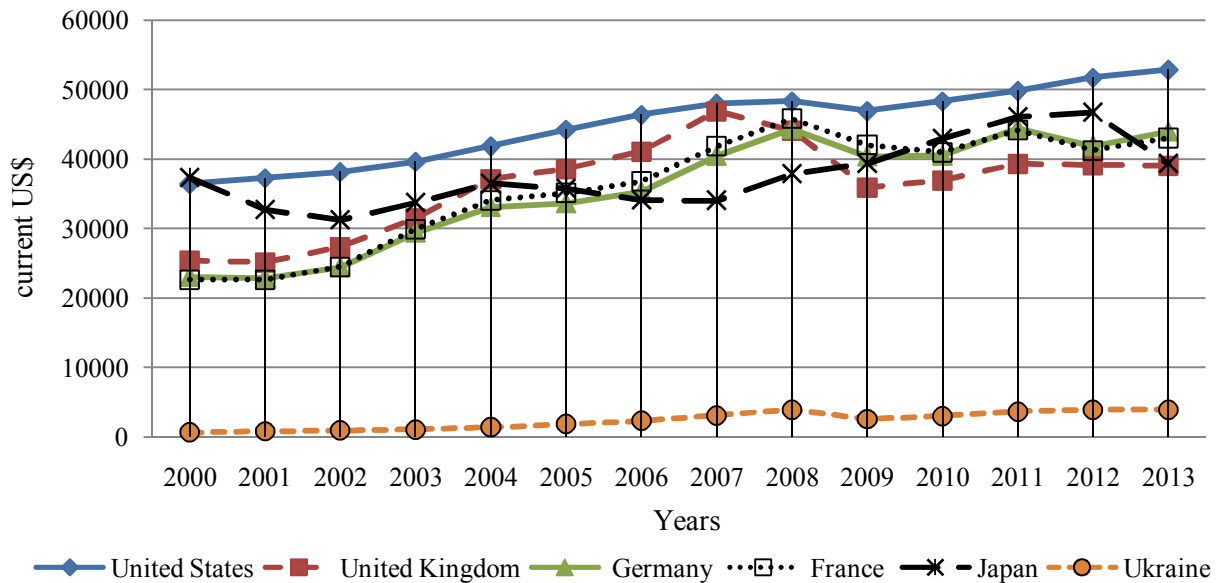
The priority areas of improvement of the economic mechanism of industry development in Russia are defined as the creation of large state-owned enterprises and vertically integrated holding companies. The aim of this transformation is to preserve the scientific and industrial capacity through consolidation and centraliza-

tion [18]. Currently, the internal resources for improving the economic mechanism in Russian would be found in the use of income of the primary sector for general economic goals by increasing the rent payments, introducing of a progressive scale of income taxation, saving public funds, as well as involving the population funds in the real economy more actively. It is necessary to change the system of commercial law, taxation, as well as increase the government regulation of social development. An important prerequisite for technological development is increase of government funding for fundamental and applied research and experimental development.

Germany is the leading European country and the basis and the driving force of the structural transformations in the German economy are the financial and monetary policies. First of all, they include a variety of financial incentives, transfer of funds from the state budget for the training and retraining of personnel, financing for the productive potential modernization, the tax reduction or exemption from them, the reduction of excess capacities by providing of ap-

appropriate compensation [19, p. 151]. The financial system is the main institutional element of the market economy, because the allocation of resources follows the allocation of capital, so the

level of development and the effectiveness of the financial market (monetary, foreign exchange, stock) provide even the higher level of economic development of the state.



Source: IMF World Economic Outlook, October 2013.

Fig. 6. The dynamics of Gross Domestic Product per capita (current US\$) of OECD countries and Ukraine

Considering the institutional conditions of the United Kingdom industry, it should be noted that the strict competition rules ensure the dynamics of the market, as well as strong government support of the industry. In particular, different methods like as fiscal, monetary and budgetary policy are used in order to improve the infrastructure of the industry. The promotion of high-tech sector is made through innovation and investment policies, as well as subsidies to strategic industries. The UK experience in terms of institution building, the union of the tax and customs services is considered the most successful and best in Europe. The customs policy is used as a tool to protect the vulnerable national productions. The export promotion tools are the state insurance of foreign trade and preferential loans for exporters.

In the United States in 2011, President B. Obama called for the federal government to increase support for manufacturing and robotics technology. "If we want a robust growing economy, we need a robust manufacturing sector," B. Obama said, announcing the "Advanced

Manufacturing Partnership" [20]. The American federal government has usually funded half or more of American R&D. It selects the sectors most likely to add value and invests in them. American governments support sectors that can't attract private funds, especially *small and medium enterprises (SMEs)*. In May 2011 President Obama said: "Small businesses are the backbone of our economy and the cornerstones of our communities. They create two of every three new jobs in America, spur economic growth, and spark new industries across the country" [19]. In this case, in the US, the National Exports Initiative (NEI) was established in March 2010 in an attempt to help meet President Obama's target of doubling US exports over five years, with the intention of creating millions of jobs [21, p.33]. The basic obstacles to SME growth in the USA are high taxes. The Obama Administration has gone a long way to reducing the tax burdens on small businesses and has enacted a total of 17 tax-cutting measures specifically for SMEs [9, p. 17].

According to international experience, technological innovation and industrial development is one of the determinant in identification the country's place in the global economy. The innovative model of development has long been the dominant in economic policy formation of countries development in the most emerging economy. Ukraine is still trying to form an effective R&D and innovation policy, to develop effective tools to stimulate industrial development since Ukraine turned to the ways of market changes.

Despite the multi-vector orientation the experience of ASEAN, BRICS and OECD shows that the establishment of an effective economic mechanism is possible in the first place only under a common favorable institutional environment in the state, adequate taxation, development of credit system, high-quality education system, etc.

The ensuring of industry development in the country requires not only mobilization of resources for investment and targeted distribution of financial flows as much as possible, especially in the priority areas of the economy, but also overcoming the so-called government failure [22, p. 83]. A shift of emphasis on innovation, effective industrial policy, the formation of an effective infrastructure is crucial for technological advantages and new business development all over the world, especially for developing-countries.

Nevertheless, the current situation in the sphere of industrial development particularly the financial support of industry remains unsatisfactory despite the measures taken in Ukraine. Nowadays, the existing industrial development programs as well as its financial support are more declarative and do not reflect the national specificities and the realities of modern economic development. The modern Ukrainian scientists affirmed the concept of innovation neoindustrialization which can be implemented by matrix industrial policy combining both vertical and horizontal policies directed by the elimination of failures rules and suitability instead of the elimination of market failures [22, p. 82]. A. Danilenko emphasized that the need of transition from customary industry support of individual branches to management model based on the national priorities and the modern innovation

and investment projects as well as the institutions of financial support [23].

In light of the foregoing, we can define that the financial support of innovative development of Ukrainian industrial policy plays a special role for creating favorable institutional and macroeconomic conditions for **increasing the volume of investment resources** and also for **the growth of investment activity** of business entities. In this case, an important role should play the improvement of Institution of Government for institutional support of strategy and industry development policy as defined in the research of Yu. Kindzersky as follows: the developer of the rules of play and the controller of their implementation, a tool of national resources reallocation, a regulator and the owner at the same time [24, p. 52].

**Conclusions and recommendations.** The research of financing industrial development issues allowed to outline the strategy directions for improvement of the system of financing industrial development of Ukraine which are based on the preemptive usage of institutional and evolutionary tools:

creating favorable legal, economic and organizational conditions for innovation and investment in the industry by means of the organization of public-private partnerships in the priority areas of industrial development;

the support of the development of the system of direct government investment, particularly on terms of co-financing, increase the industry funding at the expense of funding source expansion notably the budget funding programs of industrial development, as well as incentives for alternative sources of financing, such as leasing, funds raised at the stock market;

the overcome of the energy-and resource-intensive industrial character by means of determination of priority directions of joint funding of energy development;

the incentives of funding for technical and technological renovation industry at the state level by means of market infrastructure formation of industrial development financial support based on development of regional institutions in promoting efficient investment. Creation of a single agency (the agency of investment promoting) which will interact with investors and governments as well as take measures in order to

support complex of innovative projects. It is necessary to consolidate the stock exchanges, to protect the rights of investment services consumers, to create the central securities depository, as well as clearing and settlement systems which ensure the minimization of risks during the execution of securities transactions;

the formation of infrastructure support system of financing industrial development by creating institutional conditions for effective functioning of innovative financial institutions and investment companies, the formation and development of the software industry private equity and venture capital, creating conditions for attracting investment from international capital markets (consolidation of stock exchanges, protection the consumer's rights of investment services, creation of a central securities depository as well as clearing and system of settlement which ensure the minimization of risks during the implementation of agreement of securities transactions).

However, the analysis of the current state of financial support of industrial development in the modern condition shows that the number of theoretical and applied issues remains unsettled. Generally, the holistic concept of financial support of industrial development under the new institutional environment of post-crisis development had not yet been formed. Ukraine needs to update the management *tools of* own funds and bank loans to achieve the investment goals, as well as the purposeful formation of the more favorable institutional environment for the lending industry. All these aspects require the further research, theoretical generalizations and methodological basis as well as specification for modern conditions of Ukrainian industry development.

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## IMPROVING THE BANK CREDIT RISK MANAGEMENT BY MEANS OF REGULATION OF ITS BRANCH CONCENTRATION

Overcoming consequences of the financial and economic crisis of 2008-2010 put on the agenda the question of forms and methods of bank risk management. As the Nobel laureate in economics Joseph Stiglitz said "Чрезмерные риски, на которые пошли банки, множество конфликтов интересов и широкие масштабы мошеннических действий – все эти уродливые явления неоднократно выходили на первое место, когда бум в конце концов оканчивался крахом, и в этом отношении нынешний кризис не является исключением"<sup>1</sup> [1, p. 189]. While lending retains the most profitable component of bank assets, credit risk remains the principal risks inherent to banking activities.

A large number of works by national and international experts is devoted to problems of bank credit risk management. Among foreign studies are noteworthy papers on methodology and practice of bank credit portfolio management (E. Morsman jr. [2]), credit risk analysis (R. Merton [3] – a structural approach; P. Artsner, F. Delbaen [4] - reduced form approach, D. Duffy [5], R. Jarrow [6] – incomplete information approach), study on the influence of sectoral loan portfolio concentration on economic capital (K. Düllmann [7]). In fact these approaches and models of credit risk assessment are of market type. Their use is fully justified in the case of acceptance of the hypothesis about the effectiveness of the stock market as an indicator of sustainability of enterprises. In modern conditions, when the stock market has lost its economic function of determining the value of companies to raise their funds, in terms of insti-

tutional and technological backwardness of the stock market the possibility of using these models is very limited.

The possibility of adapting the developed approaches to modern institutional framework are presented in the works of many Russian experts, among which should be noted A. Mishchenko and A. Chizhova [8] - single-criterion optimization of the loan portfolio on the basis of the H. Markovitz problem, M. Pomazanov [9] - methodology for the verification and optimization of the internal rating system of the bank (IRB-approach), T. Pustovalova, R. Kutuev [10] – the practical implementation of Credit-Metrics model for credit risk assessment, E. Solozhentsev [11] - transparency analysis of credit risk assessment methodologies and ratings, etc. Among Ukrainian specialists we should mention I. Annenkov [12] – consideration of institutional factors in evaluating creditworthiness of borrowers, V. Galasyuk [13] – methodological problems of evaluating the creditworthiness of borrowers, L. Primostka [14] – the study of the banking risks management process, Yu. Bugel [15] – the organization of the bank loan portfolio management, etc. However, consideration of branch characteristics of credited enterprises in credit risk assessment was not adequately reflected. This is especially true for large banks that lend to businesses in various industries. In this regard, in order to reduce the overall risk of the bank's portfolio it is particularly important to regulate branch concentration of credit risk. Methodological and applied aspects of the implementation of credit risk management practices, in particular of the diversification draw much attention in the scientific literature, but the problem of branch diversification of bank credit investments is usually considered at the conceptual, formulating level. Questions of methodical adaptation of known theoretical

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<sup>1</sup> "Excessive risks that banks have taken, many conflicts of interest and widespread fraud - all these ugly phenomena repeatedly came out on top when the boom eventually ended in a crash, and in this respect the current crisis is no exception".

approaches to the real practice of regulating branch concentration of credit risk in the bank and the relevant practical aspects of their implementation remain underdeveloped.

The objective of this article is to ground the scientific and methodical approach to credit risk management of the bank on the basis of regulating their branch concentration and developing on this basis practical recommendations to diversify its loan portfolio, taking into account branch factors.

Approaches used to optimize the bank's loan portfolio are methodically based on the analogy of securities portfolio and use for these purposes H. Markovitz problem [16]. On one hand it is justified, because either buying securities or giving money as a loan are different institutional ways of fixing the debt. The first method is used in the case of well developed stock market, the second way - in banking driven economies. Furthermore, both cases of portfolio diversification by H. Markovitz involve determining the optimal structure of investments, minimizing risk and maximizing revenue. However, in the case of securities portfolio, this model operates two main parameters - return of a security and its risk, as measured by standard deviation of return.

Return of a security is determined for representative historical period by grouping the data for previous uniform periods and calculating on this base simple average (variation) of the return.

Expected risk of a security is calculated as the standard deviation of return from its expected value. In this case it is assumed that statistics (standard deviation, variance, variation) is the measure of the relative risk of the asset in the portfolio, as a measure of the variability of the object, they reflect the level of uncertainty of the future course of events, which in fact is an expression of risk.

In the case of loans its return is determined by the interest rate, which in turn is closely related to the value of the discount rate of the Central Bank. In most cases, loans to enterprises of different branches have the same interest rate, and currently the variation of interest rate is not used as a tool of the branch risk regulation.

And as the return on loans is not a statistic, therefore, the calculation of its standard deviation in order to use it to assess the risk is unreasonable. Therefore it is necessary to use a

fundamentally different measure to assess branch risk to optimize the loan portfolio.

Assessment of the risk of lending to different branches of economy uses a variety of quantitative and qualitative indicators: the growth rate of sales revenue, level of profitability, solvency, liquidity, turnover of the bank's loans, the share of term debt in total debt on bank loans, the dynamics of overdue bank loans, loans to the estimated amount of bank reserves ratio, reserve ratio by category of credit transactions etc. All these and other indicators are used at different stages of credit risk management and are used for the analysis and evaluation of the borrowing companies, reflecting different aspects of their interaction with the bank. So the level of solvency, liquidity and dynamics of overdue bank loans are mainly used in the management of credit risk at the individual loan and characterize financial condition of the borrowing companies. Loans to estimated amount of reserves ratio, the bank reserve ratio by category of credit operations are mainly used for grounding of reserves for credit operations of the bank.

In order to use in the optimization model of the bank loans to assess the risk of economy branch lending should take measures that characterize the branch as a separate lending entity. These indicators can be output (sales revenues) and profitability of the branch. Output is an absolute indicator that characterizes the branch quantitatively. In this regard, certain parallels can be made between the amount of production in the sector and the monetary expression of offer of securities in the stock market. Profitability, as a relative measure, comprehensively characterizes the degree of efficiency of the use of material, labor, money and natural resources in the sector. And drawing a parallel with the stock market, we can say that the profitability index is similar to the return of the security.

If the output, describing the supply of the branch, depends largely on the number of external factors (resource prices, production technology, taxes and subsidies, prices of other goods, the number of sellers in the market, promising expectations of producers, seasonal changes, changes in demand for other products), the profitability reflects the efficiency of resource use and depend on a number of internal factors (prices for materials and semi-finished products,

wages, sales prices, the range and quality of products).

And to build risk indicator for branch lending it is interesting not indicators of output and profitability, but their limiting values (derivatives), which characterize the rate of change of the relevant indicators. So lending to growing industries is more preferably due to the rapid growth of financial indicators of borrowing enterprises. Investors on the stock market also prefer fast-growing companies. Consequently, the lending risk should be inversely proportional to the rate of output growth. Similarly, more attractive for lending branches with growing profitability, it means that the risk of lending is also inversely proportional to the rate of change in profitability.

However, if the derivatives are negative, that indicates that the functions of output and profitability are declining, the corresponding value of the derivative should not decrease but increase the risk of lending, therefore, in this case it is directly proportional to the absolute value of these derivatives.

In general, the risk of lending is inversely proportional to the positive value of the risk factor rate of change and is directly proportional to the absolute value of its negative rate of change.

For values of the derivative in the interval  $[0, 1]$ , despite their positive sign, the same formula for calculating the risk is used that as for negative values of derivatives as an asymptotic approximation of the risk function in this interval to zero distorts the calculated risk, bringing it closer to infinity that obviously does not make economic sense. This explains the value of 1 instead of 0 in the formula 2 for risk calculation.

For equivalent consideration for all risk factors it is necessary to evaluate output and profitability before constructing approximating curves and calculation of derivatives. Then, the corresponding graphs are positioned in the range  $[0, 1]$ .

For indicators valuation is used the following formula:

$$P_i^n = \frac{P_i - P_{\min}}{P_{\max} - P_{\min}}, \quad (1)$$

where  $P_i^n$ ,  $P_i$ ,  $P_{\min}$ ,  $P_{\max}$  – respectively normalized, current, minimum, maximum value of the index.

Thus, the general expression for the risk can be written using the following formula:

$$\sigma = \begin{cases} \frac{1}{R^n \cdot V^n}, R^n \geq 1, V^n \geq 1 \\ \frac{|R^n|}{V^n}, R^n < 1, V^n \geq 1 \\ \frac{|V^n|}{R^n}, R^n \geq 1, V^n < 1 \\ |R^n| \cdot |V^n|, R^n < 1, V^n < 1, \end{cases} \quad (2)$$

where  $R^n$ ,  $V^n$  – respectively derivatives of normalized functions of branches profitability and output.

Accordingly the problem of optimization of the bank loan portfolio based on branches diversification of credit investments can be formulated as follows.

Let  $x_i$  – share of loans to the  $i$ -th branch ( $i = \overline{1, N}$ ),  $d_i$  – profitability of loans to the  $i$ -th branch,  $D$  – expected return of the loan portfolio,  $L$  – free bank reserve (pool of money that is currently available in the bank and can be used for active operations),  $L_i$  – loan limit of  $i$ -th branch. Loan portfolio optimization problem reduces to choosing a portfolio structure ( $x_i$ ), which return is not less than the value of return  $D$  (constraint (4)), and the risk is minimal (the objective function (3)). Economic and mathematical model of the problem in this case takes the following form:

$$\sqrt{\sum_{i=1}^N x_i^2 \sigma_i^2} \rightarrow \min; \quad (3)$$

$$\sum_{i=1}^N d_i x_i \geq D; \quad (4)$$

$$x_i L \leq L_i, i = \overline{1, N}; \quad (5)$$

$$\sum_{i=1}^N x_i = 1; \quad (6)$$

$$x_i \geq 0, i = \overline{1, N}. \quad (7)$$

Expression (5) describes the condition of non-excess of the loan limit for each industry. Equation (6) means that the sum of the shares of credit investments across all branches is equal to 1, the expression (7) constrain the non-negativity of the  $x_i$  variables.

Implementation of the described tasks was carried out on the example of "General Directorate of Prominvestbank in Donetsk region".

The loan portfolio is represented by the following seven branches: mining and quarrying of energy minerals, mining and quarrying except energy, food processing, beverages and tobacco; metallurgical production and fabricated metal products; machinery and equipment manufacturing, distribution, repair of motor vehicles,

household goods and personal items; transport and communications. Initial data for the loan portfolio optimization are shown in Table 1 (the designation of economic activity at the appropriate classifier is given in parentheses in Latin). Financial indicators are in constant prices of 2010.

Table 1

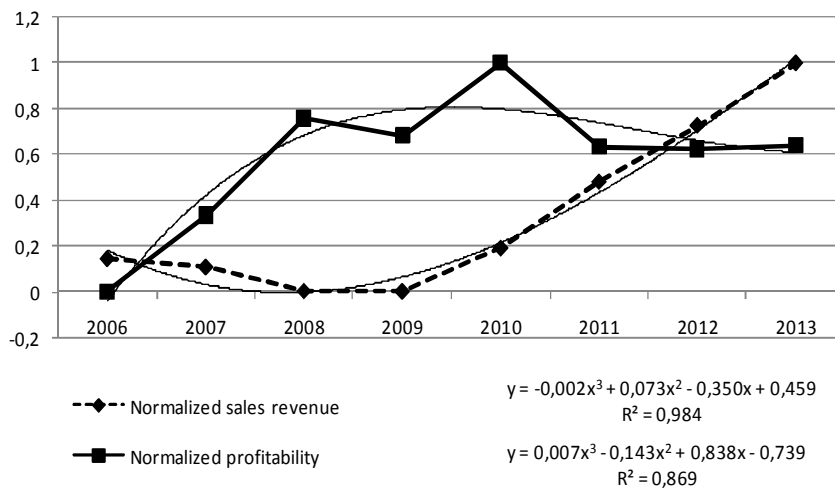
Initial data for the loan portfolio optimization

Indexes	2006	2007	2008	2009	2010	2011	2012	2013
1	2	3	4	5	6	7	8	9
<b>Mining and quarrying of energy minerals (CA)</b>								
(Financial result/ operational costs)*100, %	-2,10	-4,30	-4,50	-8,10	-6,90	-5,50	-3,23	-3,04
<i>Normalized</i>	1,00	0,63	0,60	0,00	0,20	0,43	0,81	0,84
Sales revenue, mln UAH	38149,43	25730,93	24459,93	22100,17	22419	31321,84	33878,88	37494,67
<i>Normalized</i>	1,00	0,23	0,15	0,00	0,02	0,57	0,73	0,96
Deflator	112,15	140,73	164,90	86,73	108,90	-	-	-
<b>Mining and quarrying except energy (CB)</b>								
(Financial result/ operational costs)*100, %	4,60	10,50	18,00	16,70	22,30	15,80	15,62	15,95
<i>Normalized</i>	0,00	0,33	0,76	0,68	1,00	0,63	0,62	0,64
Sales revenue, mln UAH	4131,19	3951,06	3433,02	3424,91	4360,00	5790,00	7006,00	8352,00
<i>Normalized</i>	0,14	0,11	0,00	0,00	0,19	0,48	0,73	1,00
Deflator	112,15	140,73	164,90	86,73	108,90	-	-	-
<b>Production of food products, beverages and tobacco (DA)</b>								
(Financial result/ operational costs)*100, %	1,90	1,90	0,60	1,30	1,30	2,00	2,10	2,40
<i>Normalized</i>	0,72	0,72	0,00	0,39	0,39	0,78	0,83	1,00
Sales revenue, mln UAH	15768,84	16630,85	11567,11	14358,23	16348	21438	21721	25208,67
<i>Normalized</i>	0,31	0,37	0,00	0,20	0,35	0,72	0,74	1,00
Deflator	115,03	118,55	164,90	86,73	113,90	-	-	-
<b>Metallurgical production and production of metal goods (DJ)</b>								
(Financial result/ operational costs)*100, %	6,30	7,30	6,40	3,20	0,00	0,20	1,50	1,81
<i>Normalized</i>	0,86	1,00	0,88	0,44	0,00	0,03	0,21	0,25
Sales revenue, mln UAH	120896,9	135530,3	108756,5	88068,2	121185,8	172070,0	201665,0	233060,0
<i>Normalized</i>	0,23	0,33	0,14	0,00	0,23	0,58	0,78	1,00
Deflator	115,03	118,55	164,90	86,73	113,90	-	-	-
<b>Production of machines and equipment (DK)</b>								
(Financial result/ operational costs)*100, %	2,70	3,60	1,70	1,70	4,50	6,10	5,80	5,60
<i>Normalized</i>	0,23	0,43	0,00	0,00	0,64	1,00	0,93	0,89
Sales revenue, mln UAH	26217,86	28310,56	20442,08	17622,04	19622,52	21623,00	23570,00	27761,00
<i>Normalized</i>	0,80	1,00	0,26	0,00	0,19	0,37	0,56	0,95
Deflator	115,03	118,55	164,90	86,73	113,90	-	-	-
<b>Distribution, repair of motor vehicles, household goods and personal items (G)</b>								
(Financial result/ operational costs)*100, %	13,10	15,00	10,80	7,40	9,40	9,20	8,90	9,00
<i>Normalized</i>	0,75	1,00	0,45	0,00	0,26	0,24	0,20	0,21
Sales revenue, mln UAH	248132,0	264343,0	238041,2	149472,5	25873,9	215031,0	260792,0	316077,0

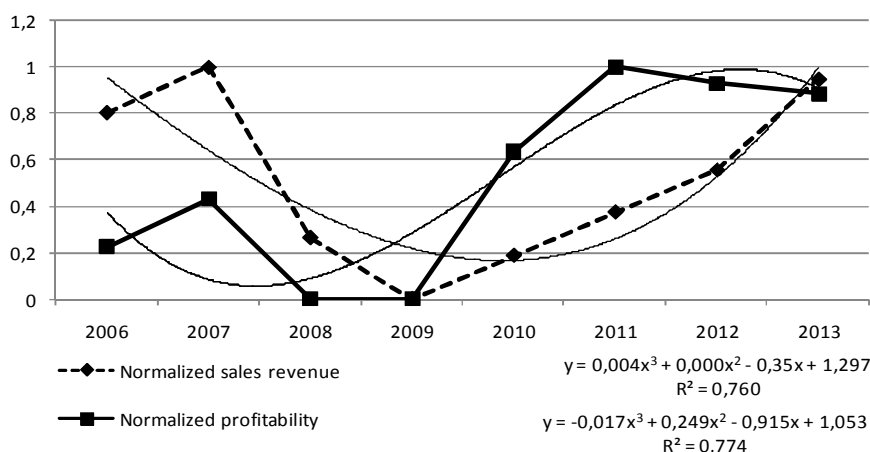
1	2	3	4	5	6	7	8	9
<i>Normalized</i>	0,77	0,82	0,73	0,43	0,00	0,65	0,81	1,00
Deflator	103,65	120,38	135,75	119,98	115,00	-	-	-
<b>Transport and communications (I)</b>								
(Financial result/ operational costs)*100, %	3,90	3,60	3,80	6,80	7,90	8,30	8,70	9,20
<i>Normalized</i>	0,05	0,00	0,04	0,57	0,77	0,84	0,91	1,00
Sales revenue, mln UAH	20932,65	21815,53	25643,68	22095,13	24502,4	27842	34405	42458
<i>Normalized</i>	0,00	0,04	0,22	0,05	0,17	0,32	0,63	1,00
Deflator	109,80	114,60	113,55	120,43	115,00	-	-	-

Using the data we plot normalized graphs of branches profitability and sales revenues. Presented graphs are well approximated by a polynomial of the third degree. Fig. 1 shows the dynamics of normalized sales revenue and profitability of branch operations using the third degree

polynomial trend line on the example mining and quarrying except energy (same directional change of indicators) and production of machines and equipment (different vector-change of indicators).



a) mining and quarrying except energy



b) production of machines and equipment

Fig. 1. Dynamics of normalized sales revenue and profitability of operation activity of Donetsk region branches

According to the obtained equations, using the known rules of differentiation, we calculate the values of the derivatives at the last point using the following formula:

$$f'(x) = n * f(x)^{n-1}, \text{ for } f(x) = x^n, \quad (8)$$

where  $f(x)$ ,  $f'(x)$  – respectively polynomial function and its derivative.

Results of calculations are shown in Table 2.

Table 2

*Branches lending risks calculations*

Branches	Derivative of normalized profitability ( $R'^n$ )	Derivative of normalized sales revenue ( $V'^n$ )	Risk ( $\sigma$ )
Mining and quarrying of energy minerals (CA)	0,320	0,159	0,051
Mining and quarrying except energy (CB)	-0,019	0,322	0,006
Production of food products, beverages and tobacco (DA)	0,091	0,150	0,014
Metallurgical production and production of metal goods (DJ)	0,517	0,340	0,176
Production of machines and equipment (DK)	-0,227	0,584	0,133
Distribution, repair of motor vehicles, household goods and personal items (G)	0,152	0,574	0,087
Transport and communications (I)	-0,174	0,532	0,092

It should be noted about setting a loan limit for branches. Limitation, along with the diversification, reservation, securitization, is a separate method of credit risk management. It is about setting maximum allowable size of loans to one or a group of related borrowers, which allows limit the risk to a certain extent.

Limits are defined as the maximum amount of the loan or loan direction and are expressed as absolute limit values (loan amount in monetary terms), and in relative terms (coefficients, indexes, norms). The base for calculating limits is determined primarily by the bank's credit policy and can be determined from the value of the bank's capital, the value of its loan portfolio, the balance-sheet and other indicators. Loan limit for borrowers of particular branch can be defined as the maximum aggregate amount of branch funds or as the average value of branch loans for a number of previous time periods.

In the presented computational experiments as a branch credit limit aggregate amount of branch funds was taken, which can be explained by the presence of this indicator in branch statistics. Loan debt may be used for this purpose. However, given that in recent years due

to the effects of the financial and economic crisis of 2008-2009, when lending to businesses has been virtually suspended, changes in loan debt does not always mean the issuance of new loans, and to a greater extent due to the repayment by enterprises of already existing debt, the use of this indicator is not always justified. In addition, the establishment of reasonable loan limit is relatively independent scientific and practical problem (see [17]) and is not included in the present study areas.

Thus, the central element of the proposed methodological approach to branch diversification of risks in the bank loan portfolio is the use of not only actual but also forecast data of the branches development. This approach is methodologically different from calculations based on actual data on the following points of view.

So in the classic H. Markovitz problem of investment portfolio diversification the data about securities return and its variations are determined for representative historical period with an implicit prerequisite that the same trends will remain in the future. These indicators are defined retrospectively and assessed statically at the time of calculation. In the proposed ap-

proach, the lending risk is associated with the branches future. Long-term lending of a stagnant branch is not justified, even if it's financial indicators are high.

Another fundamental aspect is the use is not absolute, but limit values for the calculation of risk. By this mean cyclical trends in branches development is taken in account. So for growing branch risk, determined by the derivative at the time of calculation, is positive and is proportional to the absolute value of the growth rate, for stagnant – it is negative and its absolute value is proportional to the decrease rate.

Equally important in the proposed approach is the use of the calculation of the risk of not only financial indicator of branch profitability, but also the sales revenues (output). This is justified by economic factors, as sales revenues and financial indicators are determined by factors of a different nature and institutional factors. In circumstances where there is a propensity to conceal the actual financial results and distort financial statements, statistical data on the branches profitability can be questioned. However, the "safe" industry sales revenues will grow, and the "dysfunctional" will decline.

The essential difference of the proposed approach to the bank loan portfolio diversification is the consideration of the branch loan limitations. So in the classical H. Markovitz problem it is assumed that in order to maximize their profitability or minimize the risk an investor can buy any number of securities of different companies. When lending of branches should consider their specific "bandwidth". So different branches have different loan requirements. As a rule, in the current economic conditions loans to enterprises are given for working capital, and therefore a statistically significant relationship between the branch working capital and the value of its loans can be traced.

Finally, the proposed approach implements R. Foster's principle of considering technology life cycle in branch lending (see concept of the S-shaped curve reflecting the emergence, abrupt growth and gradually achieving full maturity stage of a process or a product [18]). It is necessary for lending companies not only analyze current financial performance but technology life-cycle phase of the branch.

The calculation of the optimal loan portfolio is made on forecast data of The informational and analytical system of budgetary process support on regional level (IASBP) [19]. One of the IASBP objects is analysis of real sector of the economy enterprises, grouped by type of economic activity. The complex of mathematical models of the region's economy formed in the system is designed to predict trends in the development of real and financial sectors of the economy in the medium term. The choice of sectors for modeling economic development in the region in IASBP is performed using a methodical approach, grounded in the work [20] on the basis of the following criteria:

share of tax revenues of particular branches in the total sum of region's tax revenues (all possible types of economic activity are considered from the point of the budgeting, tax revenue of selected branches to the budget of region should be more than 90% of total tax revenue);

output (aggregate amount of sales revenue of selected industries should be almost 100% of the total sales revenue);

branch typicality (typical region's branches should be chosen for modeling).

The following economic activities are selected for Donetsk region in IASBP: production of energy minerals, mining and quarrying except energy, metallurgy and production of fabricated metal products, distribution, repair of motor vehicles, household goods and personal items, production of food, beverages and tobacco products, production of machinery and equipment, transport vehicles and equipment. The validity of the branches set is confirmed by the real data on a loan - these branches is given loans. The following are the basic data for the loan portfolio optimization. Data of 2006-2010 is actual, of 2011-2013 is forecasted. Financial indicators are used in comparable prices.

Let's accept the portfolio return of 14%. Bank's free resources for lending amounted to the beginning of the calculation period 500 mln UAH. Calculation of the optimal portfolio is made by using "Solver" spreadsheet application of MS Excel, the results are shown in Table 3.

Table 3

*The results of calculating the optimal loan portfolio*

Branches	Return ( $d_i$ ), %	Risk ( $\sigma$ )	Shares ( $x_i$ )	$x_i^2$	$\sigma_i^2$	Amount of branch loan, mln UAH	Loan limit ( $L_i$ ), mln UAH
Mining and quarrying of energy minerals (CA)	14	0,051	0,012	0,000	0,003	6,10	1552,41
Mining and quarrying except energy (CB)	14	0,006	0,806	0,650	0,000	403,20	1258,06
Production of food products, beverages and tobacco (DA)	14	0,014	0,171	0,029	0,000	85,39	961,69
Metallurgical production and production of metal goods (DJ)	14	0,176	0,001	0,000	0,031	0,51	9099,43
Production of machines and equipment (DK)	14	0,133	0,002	0,000	0,018	0,89	1586,06
Distribution, repair of motor vehicles, household goods and personal items (G)	14	0,087	0,004	0,000	0,008	2,07	7022,93
Transport and communications (I)	14	0,092	0,004	0,000	0,009	1,84	1161,78

The results of this numerical experiment show that mining and quarrying except energy is the most preferred for lending. Its share in the optimal loan portfolio will be 0,81.

On second position is the production of food, beverages and tobacco (its share is 0,17). Mining and quarrying of energy minerals in the prospective portfolio takes third place according results of computer simulation (its share is 0,012). The least preferred is the lending of metallurgical production and production of metal goods, the corresponding share in the optimal portfolio decreased to 0,001. The achieved lowest value of risk is 0,00561.

Thus, the developed procedure of the loan portfolio formation is the basis for the implementation of the proposed approach to the regulation of the branch concentration of bank credit risk. It includes analyzing of the existing loan portfolio and choosing of branches to form a new portfolio, building and analyzing time series of branch revenues and profitability, calculating of risk indicators for each branch based on the limits of sales revenues and profitability in the forecast period, loan portfolio optimization by minimizing the risk, taking into account branches loan limits with achieving the expected return.

Approbation of the proposed approach on the example of the branch "General Directorate

of Prominvestbank in Donetsk region" based on actual data for years 2006-2011 and forecast data for 2012-2013 was performed. The optimization of the loan portfolio shows the practicability of changing the loan portfolio structure, namely:

reduction of lending to mining and quarrying of energy minerals, metallurgical production, production of machines and equipment distribution, repair of motor vehicles, household goods and personal items to 447; 268; 371 and 2.377 mln UAH respectively;

increasing of lending to mining and quarrying except energy, production of food products, beverages and tobacco, transport and communication activities to 2964, 499 and 1 mln UAH respectively.

According to the analysis of the quality of the newly formed portfolio the expected reduction in the size of reserves for compensation of possible losses on loan operations of the bank in the amount of 127 to 196 mln UAH was revealed, that demonstrates the effectiveness of the proposed approach and allows recommending its perspective implementation in large Ukrainian banks. It should be noted that consideration of branches life cycles relationship in the developed model should be perspective of research in this direction.

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## REGULATION OF THE SOLID HOUSEHOLD WASTES GENERATION AND TREATMENT IN UKRAINE: GUIDELINES AND PRIORITIES

Alongside with the creation of important material objects, spiritual and cultural values development of the human society is accompanied by the generation of wastes.

Accumulated industrial and household wastes as well as their growth rates became a serious threat, causing the raise of deep concerns among population. World's waste stream amounts to 11,2 bln tons annually [1, p. 290], 1,3 bln tons of which (approximately 438 kg per capita) fall at solid household wastes (SHW)<sup>1</sup> [2, p. 11].

An important role in the generation and treatment of SHW plays industry as a whole despite the facts that SHW is a result of the final consumption of goods and industrial enterprises are usually omitted when regulation of SHW is executed. This role could be described from several points. First, industrial enterprises produce goods for consumption. If environmental

reasons were not considered at all stages of the life cycle of these products, industry would impose an excessive burden on environment in the form of wastes and an overuse of natural resources. In the second place, industry may influence the stream of SHW by creating durable or recyclable packaging that would also have positive impact on the raw resources use. Thirdly, wide-scale recycling must be done by enterprises, which, in turn, could represent a whole branch of industry. In such a way recycling industry creates jobs, builds more competitive manufacturing industries and adds significantly to a country's economy. For example, in the 27 countries of European Union (EU-27) recycling industry recorded turnover of Euro 232 bln in 2004 and Euro 319 bln in 2008 (at current prices) [3, p.12].

As it became evident from experience, amounts of SHW are in close correlation with the level of countries' economic welfare (and the level of industrial activity in some respect). "The leader" in this sphere with more than 942 kg of SHW per capita generated annually is USA [2, p. 98].

In the EU-27 annual generation of SHW is about 520 kg per capita ranging from 831 kg per capita in Denmark<sup>2</sup> to 361 kg per capita in Czech Republic<sup>3</sup> [4].

In countries which are traditionally considered to be leaders in the field of environmental protection (Sweden, Germany and Japan) each year forms 475, 570 and 461 kg of SHW per capita respectively [2, p. 97; 4]. So it is evident that the problem of waste generation in these countries is also exists.

As for Ukraine it should be noted that in spite of the comparatively low to the above

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<sup>1</sup> Hereinafter the author of the paper offers to interpret the term "solid household wastes" wastes that are mainly in a solid state (not liquid or gaseous), which originate in the vital processes of humans in residences and non-residential spaces in the form of residuals of materials, objects, wares, commodities, products, that can no longer be used as intended in the places of their accumulation and are not connected with production activity of enterprises.

This definition differs from the fixed in Ukrainian legal acts term "household wastes" by: 1) specification of the wastes state (solid); 2) inclusion all of the possible solid household wastes "producers" in it.

It differs from the worldwide known term "municipal solid wastes" in the part that excludes constructive and medical wastes as long as the latter requires special treatment due to their classes of danger. Besides municipal solid wastes belong to municipal authorities (or are collected through municipal services and programs), while solid household waste does not have such attributes.

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<sup>2</sup> Data refers to year 2009.

<sup>3</sup> Data refers to year 2009.

mentioned countries level of the economic welfare, SHW generation in it is close to the one of world leaders. Every year occurs near 12 bln tons (270 kg per capita) of SHW in Ukraine [5].

During the last 30 years leading countries of the world are undertaking active measures on diminishing of SHW volumes and weight. They also improve methods of SHW treatment due to switch from incineration and landfilling to recycling, reuse and recovery as well as development of alternative waste treatment technologies [4, 6]. In other hand, the problem of waste generation and treatment was not resolved in Ukraine. It is evident from the fact that only 3% of SHW was recycled in 2012, more than 90% – was landfilled or discarded and 4% – was incinerated [7].

At the same time Ukrainian incineration plants do not correspond to the requirements of environmental safety, 17% of landfills are overloaded, 80% of them are build without proper account of the ecological safety requirements in regard to groundwaters and air pollution. In addition about 35 thousand of unauthorized dumps appear every year [5].

All of the above mentioned enhance the risk of natural resources pollution which in turn can have negative impact on a health of country's population. Taking into account the price of life in Ukraine [8, p. 308-311] economic damage from water pollution by leachate on life and health of country's population may constitute about \$32,2 bln or about 20% of GDP of Ukraine.

Other factor of environmental and economic risks from SHW treatment in Ukraine is landfill gas. Its emissions are comparable with the emissions of methane (the main compound of a landfill gas) from coal mines. The damage from the landfill gas emissions in the air in Ukraine calculated on the basis of Tax code rates [9, article 243.1] is about 73 mln UAH annually.

As long as contained in the landfill gas methane is one of greenhouse gases, its emissions in Ukraine can result in violation of international agreements and obligations for the reduction of greenhouse gases (Kyoto protocol for example) taken by country. In turn this may de-

teriorate the relationships of the country with its foreign partners.

The situation around SHW in Ukraine depicted earlier in this paper allows to insist on the relevance and importance of the regulation of SHW generation and treatment.

In the world researches on the regulation of SHW generation and treatment are conducted by international organizations, government agencies as well as scientists. For example, staff of the USA Agency on environmental protection regularly conducts monitoring in this field, develops methods, programs and recommendations on improvement of the regulation in this sphere [10, 11, 12]. Problems of SHW treatment are among the main tasks on the agenda for the specialists of Organization of economic cooperation and development [13]. Costs and benefits, related to separate waste collection as well as further recycling and reuse of wastes are investigated by D. Aadland [14], D.K. Benjamin [15], J. Dewey [16], T.C.Kinnaman, D. Fullerton [17].

In Ukraine scientific researches on regulating the sphere of SHW treatment are also conducted. For example, at legislative level the Law of Ukraine "On wastes" [18] was enacted alongside with some other decisions and orders [19, 20], which set legislative background in this sphere and are directed on a bigger role of separate wastes collection and recycling of SHW in the country.

Problems of wastes classification by the types of danger and possibilities of separate wastes collection and wastes treatment are reflected in the works of I.Kh. Osmanov and M.V. Abramova [21], V.S. Mischenko and A.P. Vygovskaya [7, 22].

At the same time problems of the choice of measures directed on a slowdown of SHW generation and most appropriate way of SHW treatment still remain unsolved in Ukraine. Also there is no clear and consistent nationwide program within the framework of which there would be settled main directions of the SHW generation and treatment regulation as well as timelines for specific measures, authorities, obligations and penalties for violations in this sphere.

As long as Ukraine faces such wide spectrum of questions which is necessary to solve as quick as possible it would be appropriate to analyze the experience of leading countries in the field of SHW regulation.

Thus, *the objective of the study* is to develop recommendations on the improvement of the regulation of SHW treatment in Ukraine on the basis of analysis of foreign experience in this field and estimations of its positive and negative sides in respect to Ukrainian realities.

Analysis of the foreign experience would be conducted on the example of Germany. This appears to be useful to Ukraine on two reasons. First, Germany is a world leader in the sphere of the regulation of SHW generation and treatment [23] and has long history of such regulation. For example, measures on SHW regulation are undertaken in this country from 1975. Since that time the wide-scale informational programs, directed on stimulation of separate wastes collection by population, were conducted [24].

Secondly, in Germany industrial enterprises are directly engaged in the process of diminishing volumes of SHW and their further recycling. This is particularly important as long as these economic agents usually are not taken into account (or even are forgotten to be taken into account) when analyzing possible methods of solving the problem of SHW generation and treatment.

Initially in Germany substantial attention was addressed to the treatment of packaging. Government made such decision due to the fact that packaging makes up to 50% on volume and 30% on weight of the SHW generated in the country [25, p. 14].

In fact governmental regulation in this field began in 1991, when Germany established "The Ordinance on the Avoidance of Packaging Waste" (Packaging Ordinance). In accordance with this Packaging Ordinance producers and distributors of the final products<sup>1</sup> were obliged to take back from end-consumers used transport packaging free of charge and to recycle (or organize further recycling) these materials.

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<sup>1</sup> In this case and further in this paper by final product author means product that is made for sale or distribution to the end-consumer.

In 1992 and 1993 Packaging Ordinance was amended to broaden its action on all types of packing used for the transportation and storage of goods from the place of their production to the place of their final consumption. Accordingly within the framework of this Packaging Ordinance manufacturers, distributors, and retailers were required to take back and recycle these materials from consumers free of charge as well [23].

An implementation of these requirements by the state was directed on realization of "producers' responsibility" concept in the country. In turn it means that every company that places packaging at the market is obliged to take care of their reuse or recycling. The main goal of such concept is to decrease SHW volumes (packaging in particular) on landfills and in such a manner to achieve economy of natural resources and to improve quality of environment [26].

Besides these legislative limitations in regard to packaging there was implemented deposit-refund system by the state that was operated from January, 1993. In line with this system all producers and distributors had to pay to the budget (and, accordingly, to include in the price of the produced products) a certain sum depending on the type of a packaging material. Eventually part of this sum was supposed to be paid to end-consumers in the case of returning of the packaging. It was done with the aim of stimulating consumers to collect their wastes separately. After collection these materials had to be recycled. Remains of the deposited sum had to be transferred to SHW recycling enterprises to cover their costs on recycling [25, p. 13-15].

Such strict measures of regulation undertaken by the state, just as additional administrative interference in the business activity of an industry resulted in establishment in 1990 Dual System of Germany (Duales System Deutschland – DSD).

Initially DSD was founded as nonprofit organization, which had to collect, sort and recycle residuals from consumption in this country.

To date DSD is a head organization. Its functions are co-ordination of DSD programs implementation (there are 9 of them in Germa-

ny), establishing the order of recycling packaging marked with the special mark – "Green point" (Green dot). The whole activity of DSD is carried out under firm control of the government with accordance to the German legislation. As for the sorting and recycling enterprises, they are not the property of DSD but its partners. There are about 400 such partners in the field of SHW treatment in Germany [23].

Results of DSD programs are carefully documented by the DSD staff and then are examined by the state officials according to the stringent legislation in this sphere.

The participant of the DSD programs (producer of the packed goods) can mark its packaging with "Green point". This sign is a signal for an end-consumer to collect such packaging separately with the aim of its further recycling within the DSD programs instead of returning it to the producer or distributor (as requires the legislation of the country).

Packaging, made from the different types of raw materials, must be collected in different ways. Germans have to sort out packing made from metals, plastic and mixed materials (for example – such type of beverage packing as "tetrapack") and put them in the special "yellow" containers or garbage plastic bags which should be placed along the sides of a street roads (curbside recycling programs – CRP). A glass package must be gathered by the population and brought to the special containers, set in the residential area (but not near every house). The same is true for the residues made of paper and

cardboard, but containers in this case would be marked for this type of wastes.

Such way of sorting and collecting wastes as was depicted for the glass and paper is usually called bring system.

As for the kitchen scraps and garden wastes they must be composted. The rest of the throw-outs not included in the above mentioned groups must be placed in grey bins which are also removed from cities within the framework of the municipal but not DSD's curbside recycling programs. In the last case city authorities are charging population for that and further treatment of such garbage [26].

The sorted by the population SHW are additionally sorted on recycling enterprises-partners of the DSD.

Costs on collection, transporting, sorting and recycling of packaging, carried out within the framework of DSD programs, are covered with the so-called license fee paid by producers and suppliers of packed goods.

A license fee is estimated on the basis of weight and surface area of package, and also depends on the type of the materials (Table 1). This means that license fees reflect costs of sorting and recycling proportionally. If these costs drop, the license fees are reduced accordingly [23]. Thus, the DSD creates incentives for producers and distributors of packed goods to diminish their weight and volume as well as to use more environmentally safe materials while making package. As a result it may stimulate innovative activity in the sphere of package production.

Table 1

*License fee in the DSD according to materials<sup>1</sup>*

Packaging material	License fee, (Euro cents per kg)
Plastic	113,64
Other composites	84,65
Composite cartons with special acceptance and recycling guarantee	62,78
Aluminum, other metals	61,24
Tinplate	22,68
Paper, board, cardboard	16,69
Natural materials	8,26
Glass	6,16

<sup>1</sup> Licence fee valid from 01 January 2005.

In the first years of DSD existence costs of package collection and recycling within the framework of its programs were extraordinarily high – up to 2005 they were approximately 2 bln Euros a year [27]. However development of the recycling technologies and growth of the number of DSD partners resulted in the reduction of these costs which in 2010 constituted less than 1 bln Euros [27].

As for the efficiency of the DSD programs as a means of influence on the volumes of package recycling it should be noted that less than in 15 years of their action levels of recycling within the DSD exceeded the targets set in accordance with the Packaging Ordinance (Table 2) [23].

From the data presented in table 2 it is possible to conclude that from 2000 to 2003 recycled materials by weight stayed almost at the same level. However it is necessary to take into account that there were improvements of the recycling and package production technologies during this period. Packing materials could become lighter in spite of the fact that quantity of wrapped goods sold in that time did not decline.

As for the volumes of the recycled within the framework of DSD packages exceeding the mark of 100% it bears mentioning in this respect that such surplus was due to recycling of imported packages (in case of agreements between foreign producers and DSD), of untreated earlier packaging as well as other recyclable materials (not package).

Table 2

*DSD packaging recycling data*

Type of waste	Quantities passed on for recycling, mln tons				Packaging Ordinance target, %	DSD recycling target achieved in 2003
	2000	2001	2002	2003		
Glass	2,67	2,5	2,51	2,27	75	99
Paper, cardboard	1,51	1,48	1,44	1,41	70	161
Plastic	0,57	0,59	0,64	0,6	60	97
Tinplate	0,32	0,31	0,31	0,33	70	74
Aluminum	0,04	0,04	0,04	0,04	60	121
Compounds	0,38	0,37	0,38	0,3	60	128

Recycling within the framework of DSD allows preserving natural resources. In this matter it is important to point that recycling of 589 000 tons of the plastic containers in 2000 saved approximately 20 bln MJ of energy produced from natural resources. That energy in turn made it possible to provide electricity and heat during 130 days in all residences of Berlin [23].

In addition, researches and data analysis on DSD activity from the moment of its establishment till 2010 has proved, that recycling in Germany (package in particular) is more environmental friendly way of SHW treatment, than incineration with the subsequent generation of heat ("waste-to-energy") [23]. Besides as long as lesser amounts of SHW were landfilled during this period, it led to diminishing of the pressure on landfills and therefore – environmental pollution by landfill gas and leachate.

Nevertheless compared to the strategy of waste avoidance recycling seems to be not so

appealing way of SHW treatment. The main reason in this matter is that DSD programs are oriented on recycling, but not diminishing wastes or avoidance of their generation. In fact, DSD rather stimulates production and consumption of packed goods in Germany, than serves as an instrument of SHW reduction. In this respect and taking into account that this aspect of DSD contradicts German legislation, DSD is exposed to criticism from the side of environmentalists [28]. They also often claim their disapproval of DSD on the grounds that in spite of declared economy of energy and natural resources attained by virtue of SHW recycling; strategy of waste avoidance would allow to preserve more energy and natural resources as long as they won't be wasted on eventually needless things.

These lacks of the DSD is caused mainly by the absence of the environmentalists among those, who develop environmental legislation of the country and DSD programs [28].

This could be solved (at least partially) by taking into account more environmental parameters while deciding upon DSD license fee. In particular it is important to reflect the necessity of declining carbon dioxide emissions caused by package recycling [23].

In conclusion it may be noted that DSD is in the picture of "hybrid approach" to environmental regulation. That is elements of voluntarily agreements (R. Coase), market-based and command and control approaches were implemented in this instrument of the regulation of SHW treatment. In other words, under the influence of strict German legislation and the threat of employment of harsh financial measures by the state industry came to an arrangement on the most economically reasonable way of solving the problem with SHW treatment that would also hedge enterprises from the redundant control of authorities.

However in the last few years the wave of criticism arise around DSD due to the fact that originally nonprofit organization begins to make financial reasons the corner-stone of its activity. As a result of it quality and amount of packaging recycling falls, while license fee comes up. Accordingly this situation leads to the disaffection amongst enterprises-participants of the DSD as well as authorities [29].

However in spite of this fact DSD, as originally framed, appears to be such an appealing way of SHW treatment that in other EU member-countries are created similar systems of SHW treatment under the support of DSD staff and licenses on the use of the "Green point" mark are bought in Germany. That is European countries follow the German way of SHW treatment [23].

As for the possibility of the adoption the German practice on SHW treatment in Ukraine it is necessary to make several remarks.

1. By the time of creation of DSD in Germany there were held wide-scale informational programs on the stimulation of the separate wastes collection and recycling for more than 15 years. And even in spite of the reputation of Germans as extremely disciplined and responsible nation, it took 30 years to ensure that the major part of the country's population (90%) is carried out separate waste collection [24].

Ukrainians do not have a reputation of as disciplined and responsible nation as Germans do. In addition there were no informational programs on separate waste collection or stimulation of the SHW recycling similar to foreign ones in Ukraine. From this point the possibility of the separate SHW collection by the population of Ukraine remains quite low.

Due to the above mentioned it seems that increase of the volumes of the SHW recycling in Ukraine would require organization and carrying-out waste sorting by the specialized sorting enterprises or organizational unit of the SHW recycling firms in this transitional to the separate waste collection period of time. On top of that population can be stimulated to separate waste collection by the increasing of the number of scrap-yard facilities in the country as was done in the USSR.

This recommendation appears to be especially interesting considering the fact that there are already more than 1500 such scrap-yard facilities in Ukraine. Nevertheless their number is still very low compared to member-countries of EU, where more than 1,5 mln employees are involved in the recycling industry. The annual turnover of this industry reaches more than 100 bln euros in EU [3, p. 12; 7].

In any case, each of the above offered ways of organizing the separate SHW collection in Ukraine requires the investment of time and financial resources. But their exact amount has to be defined after thoroughly conducted scientific estimations.

2. By the time of DSD creation there were clear legal frameworks in the field of packaging treatment in Germany.

In Ukraine there are also legal acts on the regulation of SHW generation and treatment. The main of these documents is The Law of Ukraine "On wastes" [18].

However in spite of the positive meaning of this law as an instrument of the regulation of wastes treatment sphere there is still no definition of the term "solid household wastes". The list of wastes treatment presented there is far not complete, and the levels of development of technology, science in this field as well as foreign achievements are not reflected in it as well. The latter is subjected to the sorting as long as it is described in the law as exceptionally mechan-

ic process while such methods of sorting as hydroseparation, metal fractions grading, chemical sorting etc. are left aside. Such a narrow interpretation of sorting methods can born possibilities of levying extra fines by Ukrainian authorities on enterprises and population due to the peculiarities of institutional environment in the country.

Besides that, article 35-1 of the Law of Ukraine "On wastes" though is in accordance with the up-to-date world tendencies in the field of SHW treatment (namely priority is given to the recycling), but in fact is nothing but the declaration of intentions. This comes from the fact that there are no ratified methods of separate SHW collection in Ukraine, prescribed by this article. One of a few attempts to develop such method on a period 2011-2015 was undertaken in Simferopol, but for now was not implemented in practice [30].

On top of that there are no financial levers of influence on SHW "producers", which would stimulate them to decrease the SHW volumes or treat these wastes in the most environment-friendly way voluntarily, in the Ukrainian statutory.

Environmental tax on placing the wastes in the specialized places or objects, set in the Tax code of Ukraine [9, article 246]), can't be considered as such a lever as long as it concerns industrial wastes and their placing basically. Hence this tax has no impact on the SHW generation or a choice of SHW treatment method.

Taking this into account there are a certain "detachment" and fragmentariness of Ukrainian legislation in the sphere of SHW generation and treatment.

It is believed that regulation of the SHW generation and treatment must be carried out on the basis of some nationwide program, which would comprise economic, social and ecological aspects. There must be included development of legislation on performing activity in this field.

Such programs were implemented in Ukraine. For example, there was "A program on SHW treatment" (2004) that served as a basis for "The National strategy on SHW treatment" and project of The Law of Ukraine "On household wastes" [22, p. 23-24]. However they were valid until 2009. After that any of the planned

programs on this matter (with time horizon till 2020) were not implemented or even created.

In the acts on the main directions of development of Ukraine and its security enforcement (for example, Strategy on the national security of Ukraine, Conception of residential areas' sustainable development) environmental protection as a whole and regulation of the SHW in particular are just declared without any refinement about who, when and what suppose to do in this respect [31, sub-article 3.2.6; 32].

That is the task of development of national concept (strategies, programs) on regulation of the SHW generation and treatment on a period after 2013 is still pressing.

3. In 2012 only 3% SHW (about 1 mln tons) were recycled in Ukraine. That is extremely low compared not only to the world leading countries (Germany in particular), but even to Brazil, where the level of SHW recycling exceeds 90% in some cities [33, p. 27].

In the meantime even existing recycling enterprises of Ukraine do not work on full industrial capacity. That is due among other things to the insufficient level of provision of the recyclable materials in a country.

For example, more than 110 thousand tons of paper wastes are recycled on the Kiev (Obukhov) paper-cardboard plant annually that makes only 50% of its capacity. Approximately 70 thousand tons of paper wastes are supplied there by the specialized corporation "Ukrvtorma", whilst the rest of the paper wastes (40 thousands tons) are imported at \$70 per ton. That price exceeds the cost of domestic paper wastes. On some estimations an increase of domestic paper wastes provision would allow Kiev (Obukhov) paper-cardboard plant to gain about 0,5 mln UAH of profit alongside with the saving 4-4,5 mln UAH as a consequence of import substitution [22, p. 190].

However even in the case of the organization of paper wastes provision and sorting in Ukraine it would take development of economically grounded tariffs (or a license fee in an event of implementation of a German experience with DSD) on recycling. The latter, for example, is determined by the fact that established by the Ukrainian legislation tariffs on collection, provision and recycling of packaging for the "Ukrekomresursy" [20, article 2] do not

stimulate this and other similar firms to increase the volumes of recycling in the country. Compared to the license fee within the DSD framework (table 1) the above mentioned tariffs has to be increased for at least in a 5 times to induce recycling in Ukraine.

Beyond that, as was already noted in this paper, organizing of the SHW treatment on the DSD principles boosts their recycling only. In a meantime it may happen that waste avoidance (due to more rational use of raw materials, changes of products and packaging design), composting, incineration with the energy generation (waste-to-energy) etc. would be more suitable and appropriate ways of SHW treatment in Ukraine

That is, it seems reasonable to assess as wide as possible spectrum of solving the problem of SHW generation and treatment prior to concentrating on some particular way of SHW treatment or copying the experience of some other country (let it even be a world leader) without proper account of the institutional environment and existing ecological problems in Ukraine.

4. While implementing the regulation of SHW sphere in Ukraine the question of financing remains.

Managing the SHW sphere in the conditions of undeveloped SHW treatment infrastructure and straighten circumstances, when substantial part of population and enterprises are on a verge of survival, is extremely problematic.

At the same time on the estimations of Ministry of the regional development, construction, housing and public services it would cost for approximately 160 bln UAH to create the SHW treatment infrastructure (60 wastes-sorting plants, 30 plants on bio-mechanical processing, 30 recycling plants and many other objects) on the national level [7].

Financing the SHW treatment sphere with the environmental tax revenues is extremely scarce. This is due to low rates of such taxes in Ukraine (even after the Tax Code implementation) that does not correspond with the ecological situation in the country and rates of environmental taxes in the leading countries of the world. Besides during the time of independence of Ukraine even these revenues practically never entered budget in full partly by virtue of lack of

attention of authorities to violations in this field [34].

The situation with the environmental tax for the wastes placing is even worse: at first, there is only about 40% of the tax accrued enters budget. Secondly, the tax is oriented on the storage of industrial wastes, thus it doesn't encourage reduction of SHW. As a consequence this results in a lack of resources on the performing of SHW treatment programs. Hence these programs are funded on 23% at the best [22, p. 139, 156-161].

To provide funds for solving the SHW problem is possible by increasing the rates of environmental tax in Ukraine and (or) augmenting the number of economic instruments of SHW regulation. However these measures should be done with respect of least negative impact on SHW "producers" (for example, shutdowns of plants).

Besides fundraising for the SHW treatment in Ukraine can be carried out due to national and foreign investors, grants etc. For example it could be done within the framework of the emission trading schemes. At the same time an implementation of this suggestion requires an improvement of environmental situation in Ukraine as a result of reduction of industrial emissions in the first place (as long as industry is the largest polluter). Aside from the above mentioned it is necessary to improve economic situation in the country as well as to develop more clear and transparent legislation and to take measures on the decline of the level of corruption.

In general, to implement an economic regulation of the SHW generation and treatment in Ukraine it would take a development of a financial mechanism, comprising all aspects of this problem.

On the basis of the above mentioned, it is possible to draw some conclusions.

A problem of the regulation of SHW generation and treatment is really pressing in Ukraine. However population's mentality, economic and institutional peculiarities, undeveloped infrastructure in the field SHW treatment impedes to adopt in full extend German experience in the implementation of DSD in a short-run.

To change this situation in Ukraine it is necessary to do the forthcoming.

1. In a short-run interested environmental groups, departments of the Ministry of ecology and natural resources of Ukraine, wastes sorting and recycling enterprises, authorities in collaboration with each other should run a campaign on informing population about the necessity of diminishing the volumes of SHW and separate waste collection. As it became evident in Germany, such campaigns are essential part of the measures on regulating the SHW sphere.

2. In medium and long-run authorities with the assistance of members of environmental groups and scientists have to:

- develop the national strategy (program) of SHW treatment;

- implement (improve) Ukrainian legislation in the field of SHW treatment within the framework of this strategy, concerning separate waste collection and its recycling, ecological and sanitary requirements to the landfills and incineration plants;

- create methods and mechanisms of separate SHW collection by the local authorities as it is foreseen in the Cabinet of Ministries of Ukraine's Act "On the introduction of the collection, provision and treatment of wastes system as reusable resource" (№ 915, 26 July, 2001) and article 35-1 of the Law of Ukraine "On wastes";

- elaborate legal acts on the polluters' financial responsibility for separate wastes collection and recycling that would define amenable authorities in this field as well as their competence.

With the aim of SHW minimization and stimulation of more environment-friendly ways of SHW treatment it is necessary to use more widely economic instruments of environmental regulation (taxes, deposit-refund systems, etc.) to influence the SHW "producers" in a more flexible manner in Ukraine. Thus a preference must be given to instruments that would stimulate waste avoidance. It is due to the fact that prevention of a SHW generation "at a source" is easier and cheaper than their further treatment and storage.

However, taking into account the lack of information on the possibilities of the implementation of these instruments in Ukraine, their

study and scientific rational must be held prior the introduction of such instruments.

It is necessary to ensure that such instruments would be used not as a separate, isolated measure of regulation of the SHW treatment sphere, but along with other measures. For example, this could be done within the framework of mechanism of the financial regulation of the SHW sphere. In such case it would contribute a solution to this problem.

These directions of regulation the SHW sphere by means of economic instruments are seen as a further direction of scientific researches.

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## PROBLEMS OF INDUSTRIAL ENTERPRISES' AND PRODUCTION COMPLEXES' ECONOMICS

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### ORGANIZED SYNERGY AS AN IMPERATIVE OF INTEGRATION STRATEGIES (BASED ON THE STUDY OF RUSSIAN CHEMICAL AND PETROCHEMICAL HOLDINGS)

Ukrainian chemical industry is undergoing important institutional changes in the recent years. They are caused by active industry reformation and consolidation processes. The transition to bifurcation mechanisms in development of large chemical enterprises was catalyzed by the fall in market conjuncture and growth in commercial risks caused by global financial and economical crisis as well as deteriorating situation in the energy sector. It is obvious that in modern conditions the ability of enterprise owners to ensure a stable supply of energy and material resources at affordable prices became the main external profitability factor in the industry. Hence, the search of competitive advantage factors has shifted from the economic area into institutional and political areas.

Starting from 2010 the key events on the mergers and acquisitions (M&A) industry market are related to activities in the nitrogen and titanium sub-sectors of Ostchem Holding AG which is controlled by the Group DF holding. The forming and structural features of groups' chemical assets in Ukraine were studied in the previous article [1]. The study showed that the key motives and benefits for creating this group of companies were organizing synergy and establishing almost monopolistic control over the industry.

The large Russian chemical holdings have similar in content but wider in scale experience in using strategic synergism. Therefore, studying, systematization and analysis of their experience is a relevant scientific and practical task within the general problem of improving the enterprise management efficiency based on synergy.

The importance of studying Russian experience in the enterprise integration development is also caused by the fact that the issues of supplying Ukrainian industry (including nitric sub-sector) with energy and natural resources have mainly situational solutions. Ukrainian relations with major natural gas supplying countries are instable. But even if not taking this fact into account, it has been obvious for a while that in the long term perspective domestic producers will not independently withstand the strong pressure from the gas monopolists. Therefore, it is necessary to develop new ways of managing institutional changes in the chemical industry, form and use the full synergetic interactions potential in the framework of implementing different integration strategies. These actions will help to maintain and enhance the competitive advantages of basic enterprises.

A wide range of foreign and domestic publications on strategic synergism became a theoretical and methodological basis for the current study. The collection of papers by known Western scientists (I. Ansoff, M. Porter, R. Moss Kanter, R. Rumelt, A. Campbell, S. Ghoshal, H. Itami and others) [2] has been a basic information source in a Russian-speaking scientific community for a decade. The core of these studies lays in understanding the high synergism potential and the need for its use in the enterprises integration strategies (including M&A). The article by Campbell [3] should be also mentioned within the context of current study. The author describes the difference between two types of acquisition – integration deals and portfolio deals. He points on the growing success of deals especially when “each type of deal is justi-

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fied by a different logic and managed in a different way” (p. 22). In addition, Campbell reviews areas from where synergies may come. R. Moss Kanter also writes about the importance of finding synergism during the integration opportunities analysis in a growing economy: “A great company can become even better by learning from an acquisition's best talent” [4, p. 123].

Big attention to the essence, types, sources, assessment and ensuring of positive synergism in the integration processes is also given in the publications of Ukrainian and Russian scientists. In particular, this study is based on scientific works of S. Savchuk [5], Y. Rod and A. Savuschyk [6], O. Kyrychenko and O. Vaganova [7], M. Gluschenko [8], Y. Dejneka [9], V. Makedon [10]. Part of the studies is empirical and examines the characteristics of synergy-based integration strategies in particular industries. For example, I. Buleev and S. Bogachev [11] study the formation of integrated structures and their practical activity in the steel industry and municipal sector based on the synergetic approach. F. Dermentli [12] examines the characteristics of organizing integrated corporate structures in the tube production and offers a methods for determining the synergetic effect caused by such integration.

Similar problems are standing in front of business structures in the Ukrainian chemical industry. Hence, the main objective of the current work is to study and summarize the rich Russian experience in implementation of integration strategies in the chemical complex and analyze their synergetic basis. This is a logical step forward within the general synergy-focused research direction.

Powerful vertically and horizontally integrated companies play a dominant role in the institutional structure of Russian chemical and petrochemical industry since late 1990s. They combine upstream and downstream enterprises, logistics operators and distribution networks (currently they are SIBUR, EuroChem, Acron, PhosAgro, URALCHEM, Uralkali, SDS Azot, Bashkirian Chemistry, SANORS and others).

The Figure shows the share of the main Russian producers in the nitrogen segment of the “big” chemistry. The figure proves the role of these companies and their importance in the sectoral production structure. Moreover, the key

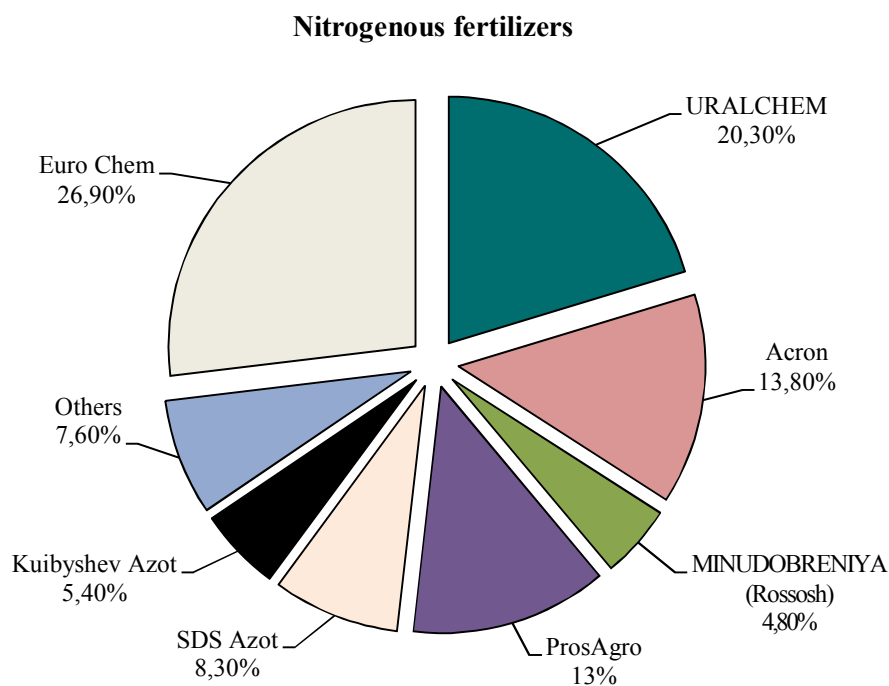
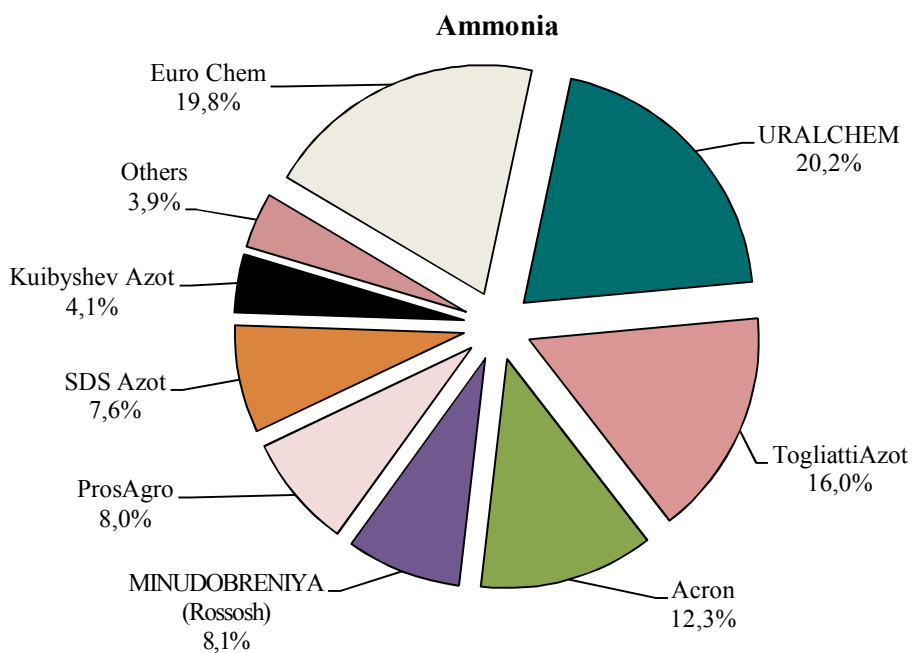
financial and economic indicators of leading chemical, petrochemical and agrochemical holdings (see Table 1) reveal the scale and efficiency of this business.

EuroChem created in 2001 includes enterprises in mining and chemical industries: Kovdorskiy GOK (Murmansk region), EuroChem – Usolskiy Potash Complex (Perm region), Phosphorit (Leningrad region), Nevinno-mysskiy Azot (Stavropol region), Novomoskovskiy Azot (Tula region), EuroChem – BMU (Krasnodar region), Kazakh EuroChem Fertilizers and Lithuanian Lifosa [14]. Following an active trade policy EuroChem created a network of distribution centers in Russia and Ukraine.

The holding also includes EuroChem – VolgaKaliy that was created to develop the Gremyachinskoe potash deposit in the Volgograd region. After commissioning the production capacities of potassium chloride at Gremyachinskiy GOK, EuroChem will become the first company in Russia and third in the world to produce the whole range of mineral fertilizers – nitrogen, phosphate and potash.

In 2012 EuroChem acquired a mineral fertilizers production asset in Antwerp (Belgium) from BASF. This asset was named EuroChem Antwerpen. The same year EuroChem bought K+S Nitrogen (currently known as EuroChem Agro distribution network) from a German manufacturer of chemical fertilizers and plant protection products called K+S Group. These agreements were signed within the EuroChem's strategic plans in expanding its presence on the global fertilizer market, including through acquisitions.

However, the main problem of chemical and petrochemical industry is its heavy dependency on raw materials and energy costs. If discussing the nitrogen segment, recently the situation became even more exacerbated. The reason behind that is liberalization of the Russian natural gas market. (Surely, the target price of \$150 / thousand cubic meters for Russian fertilizer producers seems not very high compared to sky-high natural gas prices for domestic industrial consumers. But when comparing it to the prices for main competitors – \$16-48 in the Persian Bay countries, \$32-48 in Latin America, it becomes clear that maintaining competitiveness is a relevant issue for Russian chemists).



*Figure. Production structure for the nitric subsector main products in Russia, 2012  
(data from AZOTECON PLUS Ltd., source [13, p. 23, 24])*

Hence, the manufacturers' efforts in this segment aimed at implementing the strategy of backward integration and investment in gas production assets seems reasonable. For example, in 2012 EuroChem acquired Severneft-Urengoy

natural gas producer to create a resource security foundation and develop own nitrogen business. As a result, the groups' self-sufficiency in natural gas increased to 25%.

The main performance indicators of key Russian chemical holdings  
in 2011-2012 according to International Financial Reporting Standards\*

Year	Indicator			
	Revenue	Net profit	EBITDA**	Profitability according to EBITDA
	<i>mln. rubles</i>	<i>mln. rubles</i>	<i>mln. rubles</i>	%
<b>SIBUR</b>				
2011	248660	62799	86669	35
2012	271330	60085	82291	30
Growth rate, %	109.1	95.7	94.9	-5
<b>EuroChem</b>				
2011	131298	32031	49656	38
2012	166478	32569	49168	30
Growth rate, %	126.8	101.7	99.0	-8
<b>Acron</b>				
2011	65431	20328	20856	32
2012	71112	14861	19924	28
Growth rate, %	108.7	73.1	95.5	-4
<b>PhosAgro</b>				
2011	100518	22476	35370	35
2012	105303	24510	34695	33
Growth rate, %	104.8	109.0	98.1	-2
	<i>\$ mln.</i>	<i>\$ mln.</i>	<i>\$ mln.</i>	%
<b>URALCHEM</b>				
2011	2080	445	750	36
2012	2423	665	839	35
Growth rate, %	116.5	149.4	111.9	-1
<b>Uralkali</b>				
2011	3496	1185	2068	70
2012	3950	1597	2375	71
Growth rate, %	113.0	134.8	114.8	1

\* Created by author according to the companies' integrated reports (for example, [13] and others). Original measuring units were not modified.

\*\* EBITDA is calculated by adjusting operating income with amortization of fixed and intangible assets, profit or loss from exchange rate differences, other non-cash and non-standard items.

Acron agrochemical holding includes producers of mineral fertilizers and organic synthesis products: Acron (Veliky Novgorod), Dorogobuzh (Smolensk region), Hongri Acron (China, Shandong Province), mining projects: North-Western Phosphorous Company (Murmansk region), Verkhnekamsk Potash Company (Perm region), North Atlantic Potash Inc (Canada), as well as logistics operators (Russian Acron-Trans, Andrex, Estonian AS BCT, AS DBT) and own distribution systems (Agronova, Chinese Yong Sheng Feng) [15].

The Acron group is currently implementing an ambitious fertilizers segment develop-

ment strategy aimed at building own resource base and deepening vertical integration. Several resource projects are implemented simultaneously: phosphate (GOK Oleniy Ruchey at Murmansk region) and potash (Talitsky GOK at Perm region and the development of potash deposits in Canada). Holdings management also considers hedging risks associated with providing natural gas by acquiring gas assets.

In addition to obtaining resource independence, Acron is working on processing of ammonia, apatite concentrate and potassium chloride surpluses into products with high added value. In other words, the holding is looking for

synergy in direct integration projects. The Acrons acquiring efforts aimed at Polish Azoty Tarnow chemical company in 2012 must be assessed from this point of view. Although the deal was scaled down (Acron acquired only 13.78% in Azoty Tarnow), now the holding is the second largest shareholder of the Polish company. Its production capacities are considered by Acron as a bridgehead for developing activities in the European Union.

PhosAgro holding is a vertically integrated structure with a full production cycle of phosphate fertilizers (54% of Russia's production output in 2012). Recently, the company is implementing a strategy of increasing capitalization and improving overall efficiency by consolidating shareholdings of major enterprises. At the moment, it includes nearly 96% of the main apatite and nepheline concentrate producer called Apatit (Murmansk region), PhosAgro-Cherepovets (established as a result of merge between Ammophos and Cherepovetsky Azot at Vologda region), Balakovo Mineral Fertilisers (Saratov region), Metachem, Agro-Cherepovets, PhosAgro-Trans (transportation), Phos-Agro-Region (storage and distribution), NIUIF (science and engineering) [16].

In October 2007 the Russian chemical market got a new player – URALCHEM. Currently it unites such large Russian mineral fertilizers production enterprises as Mineral Fertilizer Plant of Kirovo-Chepetsk Chemical Works (Kirov region), Azot Branch of URALCHEM (Berezniki, Perm region), Minudobrenia (Perm), Voskresensk Mineral Fertilizers (Moscow region). The Group also owns a small stake in TogliattiAzot. In addition, the holding includes Cypriot “daughter” called UralChem Freight Limited, transport and logistics operators (URALCHEM-TRANS, Latvian SIA Riga Fertilizer Terminal), a number of trading companies (TD URALCHEM, Brazilian UralChem Trading Do Brasil Ltda, Latvian SIA UralChem Trading) [17].

During 2008-2012 URALCHEM actively signed deals in merging and consolidation of agrochemical assets. For example, 100% share of Azot was consolidated in 2008. In 2010 Azot was reorganized in form of a merge with URALCHEM. In 2011 URALCHEM increased its effective shareholding in MFP KCCW and VMF to 100%. In 2012 the holding purchased 43.5% stake in Minudobrenia and acquired the

sole control of that enterprise. Such consistent policy is aimed at implementing synergetic effects connected to the optimization of internal cash flows management, administrative costs reduction and increase in investments attractiveness.

The consolidation (or rather monopolization) of Russian potash industry occurred in 2011: the two competitors Uralkali and Sylvinit united (they are both located in the Perm region and were part of a single industrial complex in Soviet times). Thus, one of the most powerful potash companies was formed (its share on the global potash fertilizers market is about 20%). It implements a vertically integrated business model and controls the entire logistic chain from potassium ore production to potassium chloride supply [18]. Uralkali managers evaluated the synergetic effect of merge with Sylvinit at the rate of \$300 mln. Such numbers supposed to be reached through restructuring production, administrative and logistic processes, optimizing staff and service functions. Another significant consequence of the merge for manufacturers was the removal of internal competition and increase in products prices.

In fact, the described process was a raider scheme that allowed eliminating a successful competitor. The ultimate goal of the scheme was a significant increase in capitalization of the united company and its speculative resale.

In 2013 Uralkali's top managers tried to takeover Belaruskali (its market value is about \$30 bln.) with the help of other raider tools. But this attempt was foiled by the Belarusian government structures.

Bashkirian Chemistry was established in 2005 to coordinate the activities and development of few chemical and petrochemical enterprises. Currently the group is a leader in soda ash, PVC and cable compound production. It controls Bereznikovsky Sodovy Zavod (Berezniki, Perm region) and Bashkirian Soda Company (Sterlitamak, Republic of Bashkortostan) which was formed in spring 2013 through the reorganization of Kaustik and merging it with Soda. It also owns Transneftekhim logistic company (Moscow) [19]. The declared motives behind the merge among others included optimizing product deliveries between holdings enterprises, consolidation of financial resources for developing Karanskoe deposit and getting a higher credit rating. Preparing the asset for an

initial public offering (IPO) or sale to a strategic investor could also be a strategic goal.

From the other hand, the results of Gazproms integration in the chemical and petrochemical business are ambiguous. Gazprom is a Russian gas monopolist that long time ago crossed the primary processing and export borders of energy carriers.

Rise in prices for oil and gas, increase in profits and the desire for wide production diversification towards the products with high added value resulted in the rapid development of petrochemical holding SIBUR [20]. Since 1998 it was owned by Gazprom and controlled through affiliates. In 2011 Sibur Limited became the owner of 100% shares in SIBUR. The ultimate beneficiaries of Sibur Limited are the NOVATEKs shareholders and SIBURs top managers. (By the way, the latter is the largest deal in the history of Russian chemical industry).

Currently SIBUR manufactures products on 27 industrial platforms and implements a business model that focuses on the integrated work of two main directions – fuel and petrochemical. In this case (except commodity sales) fuel and raw materials are sent to the petrochemical unit for further processing. The built production chains are based on high dependence of chemistry and petrochemistry on raw materials and energy costs. They provide great synergetic effects from such integration.

In 2012 SIBURs earned 271.3 billion rubles (increase of 9.1% compared to 2011), including 46.6% revenue share from sales of petrochemical products.

The holding is implementing strategy of monetizing hydrocarbon materials into deeper processing products due to progressive deterioration in sale conditions of commodities. Therefore, over time the proportion of SIBURs resource direction will decrease in favor of petrochemical direction.

The latter consists of three segments: basic polymers (total production capacity of the group by the end of 2012 – 475.0 thousand tons/year), synthetic rubbers (622.0 thousand tons/year), plastics and organic synthesis products (975.4 thousand tons / year).

In the basic polymers segment SIBUR is represented with Tomskneftekhim, NPP Neftekhimiya (a joint venture established by SIBUR and Moscow Oil Refinery) and Tobolsk-Polymer. Also the company is implementing

major building projects: polypropylene production complex in Tobolsk (Tyumen Region) and, in partnership with SolVin, a PVC complex in Kstovo (Nizhny Novgorod region).

In the plastics and organic synthesis products segment SIBUR produces styrene, polystyrene, polymer compounds, ethylbenzene, alcohols, ethylene glycol, polyethylene terephthalate, geosynthetic materials and caustics. Production assets of this segment are represented with Sibur-Neftekhim, SIBUR-Kstovo, Sibur-Khimprom, Polyef, Sibur-PETF, Plastic, SIBUR GEOSINT, BIAXPLEN.

In the synthetic rubbers segment the group covers the entire technological production chain of this type of product including the individual hydrocarbons separation, monomers and polymers production.

The manufacture is concentrated at Voronezhskintezkauchuk, Togliattikauchuk, Togliattisintez, Krasnoyarsk Synthetic Rubbers Plant and the joint (with China Petroleum and Chemical Corporation) Sibur-Sinopec Rubber Holding Company Limited. Since 2012 SIBUR implements an international constructing project in India. The aim is to build a new complex for producing butyl rubber with capacity of 100 thousand tons/year in conjunction with the Indian Reliance Industries Limited.

Thus, paying a big attention to synergy in general and its use in organization of SIBURs integration policy in particular is a key element of holdings sustainable production and strong financial performance. However, from a scientific and practical point of view it is also interesting to analyze the opposite examples (e.g. de-investment with a goal to eliminate negative synergy) from holdings history.

In mid-2000s the company made a new step in the diversification strategy and decided to establish a subsidiary agrochemical holding. The idea was to utilize Gazproms control over the natural gas market in order to expand in the production of nitrogen fertilizers. At that time such a move seemed completely logical and able to create the ground for new integration processes. The prospects for continuing this agrochemical chain in the context of Russian agribusiness consolidation around large industrial structures were seen clearly. This direction allowed to strengthen the development prospects of internal market and to stably supply domestic farmers with fertilizers at affordable prices.

In 2006 the mineral fertilizers producing assets of Gazprom and SIBUR were consolidated into one subsidiary structure named SIBUR Fertilizers in order to optimize the management structure. This company was a major shareholder in Kemerovo Azot and Kemerovo Orton. It also controlled different stakes in Minudobrenia (Perm), Cherepovetsky Azot, MINUDOBRENIYA (Rossosh).

The strategic task of SIBUR Fertilizers was to expand agrochemical assets. This was primarily achieved through the purchase of controlling stakes in major fertilizer producers. Therefore, in subsequent years, a number of manufacturers became acquisition targets for the new structure.

But now it is obvious that SIBUR Fertilizers failed to become the consolidation center of agrochemical assets for Gazprom. Hence, sale of SIBURs assets in the mineral fertilizers business at the end of 2011 seemed justified. The following assets were sold: Minudobrenia (Perm) to URALCHEM, Kemerovo Azot and Angarsk Nitrogen Fertilizer Plant (Irkutsk region) to Siberian Business Union.

The latter is a new player on the Russian agrochemical market. The synergy that occurs when chemical assets (primarily, the ammonium nitrate production) are integrated with the coal and agricultural enterprises of Siberian Business Union is the main reason for such purchase.

Another subsidiary of SIBUR called SIBUR Russian Tyres repeated SIBUR Fertilizers fate. Originally this company was established to centralize sales of its tire companies. But eventually it pursued an active consolidation policy of production assets (Amtel-Vredestein Russian-Dutch tire holding, Nizhnekamskshina, a joint venture project with Pirelli and Rostekhnologii State Corporation, etc.) However, in late 2011 SIBUR Russian Tyres (the leading Russian tire plants – Yaroslavl Tire Plant, Omskshina, Cordiant-Vostok, VOLTYRE-PROM) has been sold to the company's top management and renamed into CORDIANT.

It can be concluded that the sale of non-core assets which reduced the overall effectiveness of the holding by new SIBUR owners was a preparation for the IPO and a way to obtain financial resources for paying the SIBURs purchase debt.

When talking about the overall configuration of the Russian chemical market, it should be

noted that a lot of “independent” chemical companies (besides evolving holdings) which were controlled by management or regional administrations worked in the industry in the late 1990s. However, the activity of large companies in absorbing independent competitors on this market significantly increased in the last pre-crisis years. One of its important directions was the fight for the agrochemical sector assets. During 2004-2008 this sector showed the growth and profitability that were not less than in metallurgy or oil industry. It was considered as one of the most attractive sectors in terms of private capital investments.

During crisis period the integration processes have stalled due to a general fall in the chemical business profitability and negative tendencies on the capital markets. A number of major M&A deals also remained unsealed because of that. But a new redistribution “wave” came on the chemical market during post-crisis years (especially in 2011). The consolidation processes of Russian chemical assets revived due to their cheapening and the desire of key industry players to take advantage of favorable economic and financial situation for completing or reformatting their business empires. New capital entered the industry; new players appeared (the MINUDOBRENIYA (Rossosh) deal).

It can be expected that trends of existing holdings diversification, “independent” assets acquisitions and further consolidation of the industry will become stronger in the nearest perspective. The sequence of events associated with the raider attack on TogliattiAzot in 2011 shows that the fight for influence in the chemical sector has become tougher and the pressure techniques now include tools that break the synergetic interactions.

It is also important to note that Russian capital is predominantly the financial basis of these numerous transactions on the merge-acquisition market. The interest of European investors in the Russian chemistry exists (for example, the activities of a large Norwegian company Yara International ASA) but the role of foreign capital is still secondary (due to some limitations of foreign investment into strategic enterprises and other reasons).

Thus, studying and generalizing the Russian implementation experience of integration strategies in the chemical complex and analyz-

ing their synergetic basis allow making the following conclusions.

The desire to preserve and strengthen the businesses competitiveness in the unstable market environment is the main reason for companies' active behavior on the M&A market. As a result, the largest vertically integrated chemical holdings are formed. They seek and retrieve the well-known synergism benefits that are related with the optimization and unification of business processes, the production and distribution policy coordination, the technology and personnel competence transfer, the neutralization of acute fluctuations in the energy and chemical products markets, the competition reduction in domestic markets and strengthening the competitive position on world markets, the resources accumulation, the investment centralization, the management and reporting standardization, the optimization of financial flows based on internal price and tax regulations, the cost reduction for signing and executing commercial contracts.

At the same time, the creation and management of such large integrated structures carries certain risks associated with the revaluation of positive synergies and increased direct reorganization costs. The latter includes the costs on acquiring shares, firing personnel, optimizing production and logistic activities, restructuring the information and management systems. However, the possible negative synergies that are more difficult to estimate can have the same importance for the overall efficiency of the integration process. This negative synergies may include management deterioration of the combined structure (and increase in administrative costs on discussion, coordination and control as a consequence), low compatibility of infrastructure and supporting activity, reduced income due to the difference in quality of assurance and service systems, conflicts in corporate cultures, etc.

Most of the industry key players implement a vertically integrated business model which allows controlling the entire added value creation process and ensures stability, flexibility and profitability of entire business.

The initial chaotic assets gathering process was gradually replaced with focused construction of complete interrelated business segment chains (own resource base, efficient processing capacities, logistics and distribution networks). This is the main trend in the current industrial M&A market. Now, when assessing

the effectiveness of future M&A deals, the strategic advantage is given to the assets that successfully complement existing assets and can increase the integrated structure value due to synergetic effect.

Main organizational and management efforts as well as the investment capital are spend on support and deepening of the unique resource advantages which create the foundation for Russian holdings competitiveness. The issues of productive assets modernization and innovative development are not a priority. They are mostly postponed to post-bifurcation industry development times.

Current trend aimed at the industry consolidation should remain in the nearest perspective. Russian nonintegrated chemical enterprises as well as post-Soviet assets (primarily, assets of Ukrainian and Belarusian companies) will become targets for acquisition strategies.

In these conditions, the development strategy of key Ukrainian chemical companies should be directed at forming similar strong national integrated structures to withstand the global industry giants. This process is already underway. But unfortunately the modern scenarios of receiving synergism benefits in Ukrainian chemical industry are based on increasing profitability of separate private business structures and do not take into account the state interest.

The key players of Russian chemical market actively started implementing strategic plans in expanding their presence on international markets. This includes acquisition of foreign production, transportation and distribution assets. The main synergy sources in this process are joining the advanced production and technological experience (including energy efficiency experience), the business culture development, expanding range and geography of sales, the logistics optimization, overcoming trade barriers, stepping towards promising sales markets and coming closer to end-customers.

Finally, it is worth noting that the management of leading Russian holdings understands the essence of synergy, its main sources and declares the successful use of internal and external synergy elements in the corporate management.

Thus, the orientation on the search and implementation of different long-term synergetic effects is clearly traced in the integration

strategies of Russian chemical and petrochemical holdings. This effects form a solid ground for their sustainable competitive advantages on both domestic and global markets.

Prospects for further research in this direction are associated with the development of methodical approaches to analyzing the effectiveness of integration strategies. This will allow quantitatively evaluating the synergetic effects in the activities of Ukrainian and Russian chemical holdings and reveal the extent of implementing synergism potential.

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## MANAGEMENT OF PRODUCTIVE CAPITAL OF COGNAC INDUSTRY ENTERPRISES OF UKRAINE

The current economic situation in Ukraine is marked by uncertainty and inconsistency, which is why arise scientific discussions on advanced concepts of economic development of domestic enterprises. Even under conditions of sufficient elaboration of theoretical and methodological approaches to the assessment of development of enterprises and forecasting future trends of the external and internal environment, scientific problems of justification of the concepts of enterprise management in the aspect of its growth strategy are actual. The methodological basis of modern management concepts should be formed taking into account accumulated practical experience in strategic management.

At the present stage of development of the methodology of the financial analysis the capitalization of the enterprise is the indicator of economic efficiency of its activity. The lack of a single approach to the management of the process of capitalization of enterprises complicates the justification of effective administrative decisions concerning the growth of its cost and increase its capitalization. For these reasons, particularly relevant are the works of scientists, aimed at solution of the problems of development and implementation of specific mechanisms to control the process of capitalization of the enterprise. The above mentioned implicitly indicates the timeliness and the scientific importance of the chosen theme for research.

The effectiveness of the enterprise activity in any industry is largely determined by its capital value and dynamics which determine the size of an enterprise and stability of its operations. Therefore, an important characteristic of an enterprise quality management system is its capital.

Kirsanova T. and Koljada I. solve the problem of effective management of an enterprise capital by determining the optimal capital structure, which refers to a ratio of equity and debt that maximizes the market value [1, p. 61].

However, these researchers hold positions of importance of preserving and enhancing equity.

Some problems of managing enterprise capital structure, namely the optimization of capital structure, described in the writings of many other researchers:

Korzh R. worked out the capital structure of companies in the current economic conditions based on systematic guidelines static and dynamic theories of capital structure optimization [2];

Chyzh N. compared to previous scholars, narrowing a range of analyzed companies, highlights the problems of forming the optimal structure of its own enterprise capital [3];

Piletska S. for the grant of recommendations in relation to the construction of equity structure proves feasibility of controlling the structure of equity and debt businesses on a definition of subordinated capital by providing opportunities to use additional capital as a part of its own and a bill of credit, a bond is as a part of a debt [4];

Shevchenko N. offers to determine the optimal capital structures of stock companies by minimizing debt values guards and increase the values of their own, and proves that effective methods of optimizing the capital structure is to use a loan and lease issuance of preferred shares [5];

Obuschak T. focuses on the optimization of the equity and debt capital on a multi-objective basis, but emphasizes the need to ensure the lowest possible cost of capital components [6];

Shpak N. and Rudnytska A. support the partaking of new capitals at the obligatory condition of development of the system of indexes of the status and use of enterprise capital, and they emphasize that there is an optimal capital structure, which will help to minimize the weighted average cost of capital and at the same time support the credit reputation of an enterprise [7];

Semenov G. and Peleshko A. offered an approach to determine the optimal capital structure according to method of the combined effect of maximizing the return on equity growth and the level of financial stability that, in their opinion, enables rapid and optimal capital structure, and predict the maximum increase in return on equity and financial viability in the future [8]. The results of research done by Semenov G. and Korol S. a set of criteria for return on equity and the level of financial stability criterion is added to minimize the level of financial risk on the basis of which the stages of optimization capital structure have been determined [9];

Perederiyenko N. and Lespuh A. solve the problem of optimizing the capital structure and conclude that the structure of equity and loan capital «не є сталою, може змінюватись у відповідь на зміну умов виробництва і реалізації, але в кожний момент менеджери повинні мати чітке уявлення про цільову структуру і всі фінансові рішення підпорядковувати завданню досягнення такої структури капіталу»<sup>1</sup> [10, p. 184]. It is very important to consider the comments of these authors concerning the variability index of the target capital structure dynamics, that is why it is necessary to identify the factors of index changes to ground its periodic adjustment;

Grinkevich S., Saldan P. and Melnichenko I. consider approaches to determine the nature of capital structure and optimal capital structure and focus their research on the grounding for the choice of financial development strategy based on the model of the structure of its capital. Because of different economic conditions different industries in the economy of various countries agree with the conclusion of these scholars about the impossibility to find a single approach to determine the optimal ratio of capital items, which proves the necessity of deploying other areas of study of conditions for companies' capitalization we consider one of the most original search conditions is formation of capital and industrial – enterprises separately formation of productive capital [11].

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<sup>1</sup> «is not constant, can change in response to changing conditions of production and sales, but managers should always be clear about the target structure and all financial solutions to subordinate the task of achieving such a capital structure»

The problem of managing its capital structure is observed in the works of national scientists-classical Afanasiev A. [12], Balitska V. [13] and Blanc I. [14]. But they are focused on the invention of the optimal ratio of equity and debt capital. However, according to the obtained results of during research, it is the financial capital is not a significant factor in the capitalization of the companies of some branches of economy, which is why there is the need to analyze the contribution of other types of capital.

Management of capital structure is in the focus of researches of leading foreign scientists. Kehinde James Sunday, PhD of Lagos State University Ojo (Nigeria), by examining the characteristics of Small and Medium Scale Enterprises (SMEs), concluded, that it was capital management ensures continuous operation of the enterprise in the market, its growth and solvency [15, p. 271].

Romano C. A., Tanewski G. A. and Smyrnios K. X. invented the relationship between firm size and the importance of managing its capital, namely: managing capital is a significant factor in the growth of the effectiveness of large and medium-sized enterprises than of small ones [16].

Baral J. K. as a result of constructing regression models found that the size, growth rate and earnings of the enterprise are significant determinants of its capital structure [17].

Khrawish H. A. and Khraiweh A. H. A. focused attention on the invention of impact the ratio of short-term and long-term debt in the capital structure on its profitability [18].

Given a large number of scientific papers on managing capital structure it is possible to make a remark that the formation of an effective mechanism for managing the capitalization of industrial enterprises should be based on consideration of mandatory industry-specific requirements for raw materials, technologies, machines of all logistics and personnel, especially the specialization, a process of manufacturing and production technology. Semenov A., Plaksiuk A. and Jaroszevska O. support the positions which deal with the formation of aggregate enterprise capital and argue that «this issue requires only an individual approach. It is impossible to determine a single optimal approach of capital ratio of structural elements for different compa-

nies or one company for the entire period of its operation» [19, p. 140].

The optimal capital structure of the enterprise is usually achieved through the attainment of the chosen optimization criterion. Researchers usually choose one out of the three criteria of optimizing the capital structure of the enterprise [9, p. 140]:

1. value of the enterprise as a whole;
2. maximum share price of the company;
3. optimal ratio of return on equity and financial viability.

Thus, it is evident that much of the attention of researchers focused on studying the impact of the management financial capital of enterprise on its economic efficient. But at the same time the question arises: is it sufficient to choose one of the above criteria and how to en-

sure a more rational choice of optimality criterion by defining the specific features of the investigated companies. Also need to determine whether enough only solution to the problem of optimization of capital structure.

The purpose of this article is to determine the impact of capital structure on the company capitalization rate of the enterprise of the full-cycle production of cognac in Ukraine and to evaluate the possible directions of improving the management of their own productive capital. Some results of the research were represented in the article [20].

Table 1 shows the amount of capital involved in the production process of Odessa Cognac Factory, and some financial indicators of its activity.

Table 1

*The volume of capital and results of operation at Odessa Cognac Factory \**

Years	Non-current assets (f.1, line 080), ths UAH	Long-term liabilities (f.1, line 480), ths UAH	Share of non-current assets	The share of long-term commitments	Net Profit, ths UAH	EBITDA, ths UAH	EVA, ths UAH
2004	136,047	28334	0,83	0,17	1302	20732	
2005	129,587	30667	0,80	0,20	6173	28862	17056,38
2006	152,769	83548	0,65	0,35	490	23962	13819,04
2007	122620	34539	0,78	0,22	2256	26996,6	13357,02
2008	122,978	106,171	0,54	0,46	2126	34164	7322,479
2009	112,602	35185	0,76	0,24	2024	26306	4943,463
2010	103,259	0	1	0	2215	20585	8608,442
2011	96465	362,513	0,21	0,79	1476	25133	13844,3
2012	93425	362,443	0,20	0,80	6489	28939	13316,97

\* Composed and calculated by the author according to the Financial Statements of Odessa Cognac Factory «Shustov».

EBITDA - Earnings Before Interest, Taxes, Depreciation and Amortization.

EVA - Economic Value Added.

Velnamy T. and Aloy Niresh J., Professors from Sri Lanka, on the basis of correlation analysis revealed relationships between a capital structure and profitability - namely, between the ratio of borrowed and equity and return on equity [21].

As it can be seen from the data given in table 1, there is a chaotic dynamics of the financial results of operating capital in Odessa Cognac Factory and the tendency of development of indicators EBITDA and EVA is not clear. For

this situation, there is an assumption that it is the result of unstable capital structure.

The lack of stable tendency to attract long-term bank loans can be attributed to two factors:

1. Odessa Cognac Factory uses bank loans to purchase foreign cognac required for blending. But determining the required amount of loan capital, should take into account in an agreement between the plant and the Bank on especially favorable credit conditions at 10% per annum.

2. Fall of credit used in 2008 to zero in 2010, after which the revival of lending is seen, due to the overall situation in the banking sector of Ukraine, when banks stopped lending altogether individuals and businesses due to the financial crisis, but in 2011 they restored it.

To justify recommendations for the management of its capital structure, the relationship between the financial capital operating results (EBITDA and EVA) and the share of long-term liabilities of Odessa Cognac Factory was invented. However, the relationship between EBITDA and the share of long-term debt in the capital structure of the enterprise is very weak (coefficient of determination 0,1826), and as far as the rate of EVA is concerned such a relationship is absent (coefficient of determination is almost zero – 0,0588).

In this respect, the relationship between EVA and the share of long-term liabilities at Odessa Cognac Factory was checked; as a result, it was found that the dependence with lag 2 (coefficient of determination 0,4677) is a bit bigger, but still there is no reason to argue that at the studied enterprise the financial results are determined by the structure of capital involved. To test this assumption we checked the dependence of net income on the capital structure of the plant and it has found that the relationship between the net profit of the plant and the percentage of a long-term debt (even lags) are virtually absent. According to the results of finding the relationships between the key financial indicators of enterprise performance and the share of long-term liabilities a final conclusion can be made: the structure of the capital involved is not the determining factor for predicting capitalization of Odessa Cognac Factory. So it is possible to formulate the following hypothesis: factory capitalization is determined by its productive capital. In other words: for the capitalization of Odessa Cognac Factory «Shustov» it is necessary to focus on the management of formation and utilization of productive capital, which is based on grapes planting.

Areas of land occupied by grape bushes in Odessa Cognac Factory during 2000-2012 years can be described as unsteady.

Climatic features and characteristics of the soil near the town Feodosiia led to the fact that to produce cognac of Odessa Cognac Factory «Shustov» such sorts of grapes as Rkatsiteli, Silvaner, Aliquot, Sukholimansky White, Char-

donnay, Riesling, Sauvignon Blanc, Pinot Blanc are grown.

As can be seen from the data given in table 2, the acidity of grapes and its sugariness, the range of values is determined by the variety and actual values – by weather conditions and sunlight access to vines, the company keeps these factors constant by controlling the density of vines planting. The dynamics of areas of a particular grape variety depends on weather conditions and pests, namely: 1. due to a very cold winter (below 30° C) vineyards can die out, which took place in 2010; 2. Feodosiia soil isn't resistant to the main pest of grapes - phylloxera.

The main characteristics of the varieties of white grapes that are grown for the production of cognac of TM «Shustov» are as follows:

acidity (over 6-6,5 g / l), which determines the taste and after taste of the finished drink - cognac;

sugar content (usually more than 20 %), which determines the potential amount of cognac spirit. Sugar content of grapes and cognac spirit are proportionally dependent parameters, that's why white grapes with high sugar content index are used to produce large amounts of alcohol.

Gross harvest of grapes for making cognac of TM «Shustov» for the same period can also be characterized as an uncertain size, which firstly depends on the area of vineyards, and secondly, competent preparation of vines when cutting vines after harvest in the fall. Even if there is a close connection between indicators of vineyard area and total grape harvest (coefficient of determination is very high -  $R^2 = 0,9237$ ), it can be argued that the analyzed parameters are random variables.

Peculiarities of cognac production mean pressing of harvested grapes rather than pressing of each type separately, the white grape varieties are interchangeable, and therefore we can forecast the potentially optimized distribution of a land area under vineyards of any particular type. Based on the importance of the sugar content of grapes for the volume of spirit production, it is reasonable to carry out further calculations, based on getting the maximum amount of harvested sugar.

Index of gross yield of sugar from the grape harvest of Odessa Cognac Factory (Table 2) is characterized by an accident. It does not reflect the dynamics of the fluctuations in the

overall yield rate of 1 ha (figure for all grades). It is obvious that a constant yield of 1 hectare at the factory reaches at the expense of proper

pruning of grapes in autumn and adjusting the density of planted vines (at a distance of 2,5 - 3 m between them).

Table 2

*Yield of sugar from 1 hectares, fi / ha*

Years	Chardonnay	Riesling	Rkatsiteli	Silvaner	Aliquot	Suholymansky White	Sauvignon Blanc	Pinot B lanc
2000	14	16,9	19,4	16,3	23,8	20,5	8,7	12,0
2001	16	17,4	20,4	15,9	23,9	20,8	10,3	11,0
2002	14	18,0	20,8	16,7	22,6	21,0	10,0	12,8
2003	15	16,8	21,4	17,4	24,5	20,9	10,1	11,7
2004	16	16,8	19,9	17,5	22,6	19,4	10,6	12,1
2005	15	15,9	20,7	16,6	24,3	20,8	9,4	11,8
2006	15	17,4	21,5	17,1	23,4	20,3	8,9	11,4
2007	15	17,2	21,0	17,4	23,1	18,9	10,4	11,6
2008	15	17,1	20,6	17,1	24,9	20,1	9,5	12,4
2009	16	17,1	19,7	17,1	25,9	19,8	9,0	11,4
2010	15	17,8	20,5	17,2	25,3	19,6	9,7	11,1
2011	16	17,8	20,6	17,7	22,5	21,2	9,0	12,3
2012	15	18,4	21,7	17,3	23,2	19,5	10,0	12,1

During the research by the following laws were revealed:

First, the dynamics of the gross harvest almost follows the dynamics of the total vineyard area. For this reason, reaching the planned gross crop values determine the importance of managing the total area of vineyards.

Secondly, 2010 was characterized by a sharp reduction in the total area of vineyards due to their freezing after winter. In the same year there was a significant decrease in grape harvest.

Thirdly, even in periods 2000-2003 and 2005-2008 when the vineyard area was almost constant, fluctuations in gross harvest of grapes were observed, which confirms the fact that the harvest of grapes is also determined by weather

conditions, such as special features of the summer months, when berries ripen.

The distribution of vineyards by types of grapes in Odessa Cognac Factory has historically background.

It's possible to increase the volume of harvested sugar by redistribution of areas between different grape varieties. For this purpose, we recommend to use such mathematical tool of calculation as «efficient portfolio theory» [22-25].

While solving the problem, the structure of vineyards used for Odessa Cognac Factory was determined (Table 3, Fig. 1).

Changes that will occur in the structure of the distribution area between grape varieties are reproduced in Fig. 2.

Table 3

*Structure of planted grapes of Odessa Cognac Factory*

Chardonnay	Riesling	Rkatsiteli	Silvaner	Aliquot	Suholymansky White	Sauvignon Blanc	Pinot B lanc
for the minimum risk portfolio (in Fig. 1 - the lowest point)							
0,188	0,122	0,076	0,000	0,133	0,099	0,126	0,256
to maximize the value of gross yield of sugar from all areas of vineyards without limitation of risk (in Fig. 1 - This is an extreme point of the upper area, which corresponds to only one sort -Aliquot № 6)							
0	0	0	0	1	0	0	0
for the distribution of areas between grape varieties that is currently present at the factory (in Fig. 3 - a yellow dot is inside the area)							
0,171	0,165	0,157	0,144	0,123	0,114	0,080	0,048
to ensure maximum efficiency in existing (actual) risk levels (average volume of sugar yield from 1 ha)							
0,128	0,155	0,122	0,140	0,156	0,202	0,030	0,067

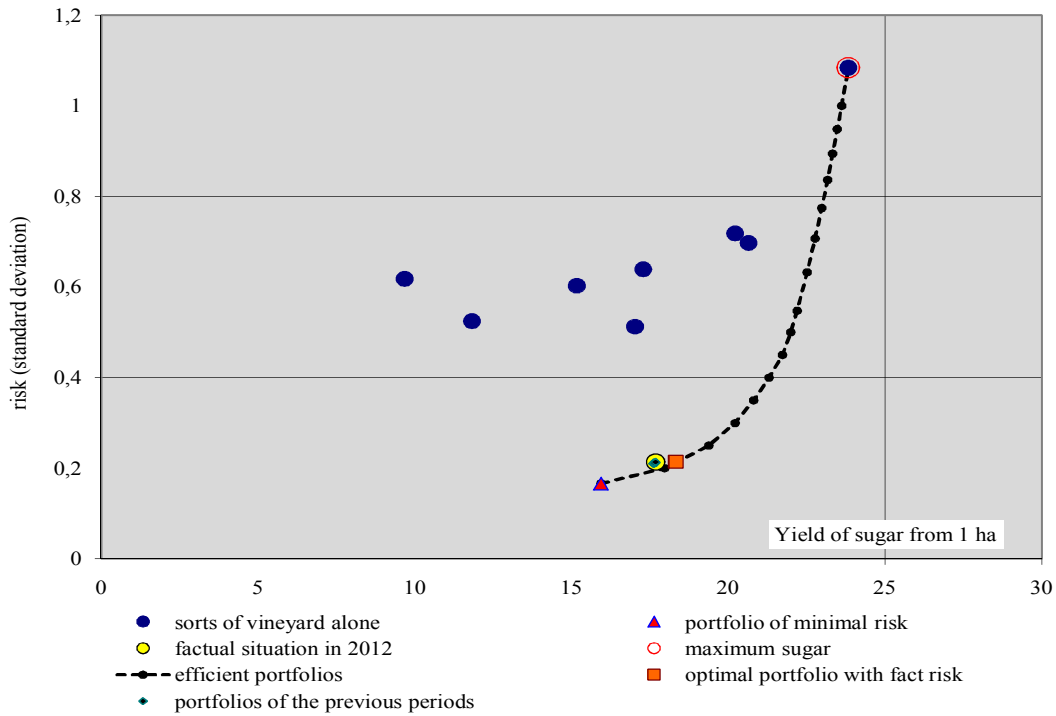


Fig. 1. Portfolios of distribution of areas between grape types

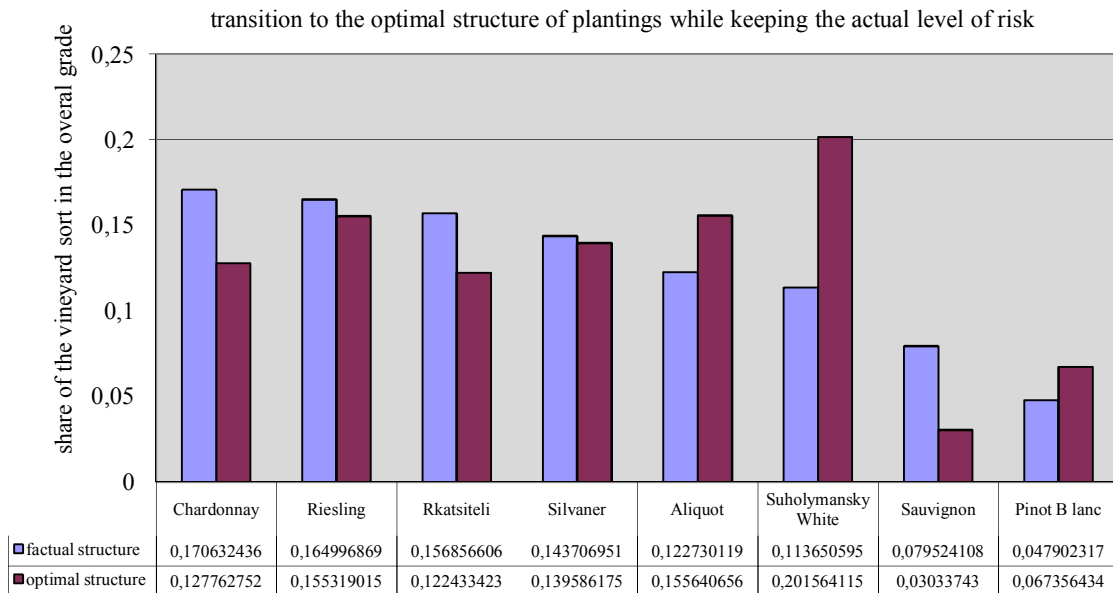


Fig. 2. Changes in distribution of areas between the grape types under the actual level of risk

If you agree to the increase in risk, you can get any of the points of the right lower limit (shown by the dotted line in Fig. 1). Each higher point is reached by the corresponding changes in the structure of the distribution area. The dynamics of these changes is shown in Fig. 3.

However, EBITDA would increase from 33,903 thousand UAH to 43,330 thousand UAH, by 27,8 % (Fig. 4). The growth of EBITDA can be interpreted as the increase in capitalization of the factory under research.

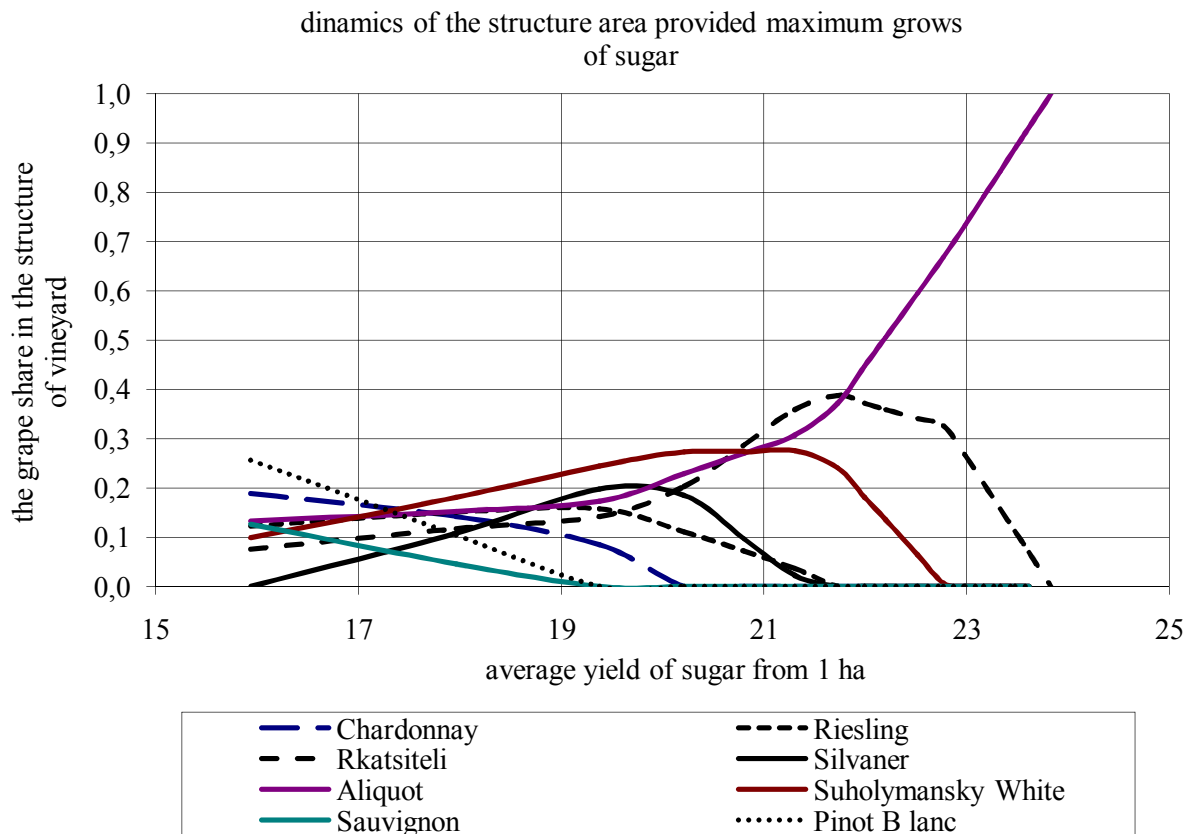


Fig. 3. Dynamics of structure of vineyard areas with the increase in maximum average volume of sugar yield from 1 ha

According to the calculations, it was determined that under optimal distribution of the structure of planted grapes to the produce of cognac alcohol at Odessa Cognac Factory «Shustov», the average volume of sugar harvested from the grape can be increased by 3,7 %. Thus, the redistribution of land between the grape varieties is the initial condition to improve operational performance through the better use of the available production capacity. But it should be noted that it will be observed in 4 years (lag = 4 while assessing the impact of gross volume of sugar from the harvested grapes on EBITDA). The plant management should accept recommendations on the optimal alloca-

tion of land area between the grape varieties while planning future business strategies to produce maximum yield of grapes.

Thus, by results of research, the impact of productive capital in the financial performance of the enterprise capitalization was found and the structure of productive capital was optimized. This article validates a new approach to the increase in the capitalization of an enterprise of a complete cycle of cognac production through organizational and economic transformations of the production capital as a resource base for the future capitalization when the industry characteristics and peculiarities of the production process are taken into account.

Further research is seen to be appropriate towards the invention of the influence of other factors on the enterprise capitalization. Necessary to determine how the value of the enterprise is influenced by such factors as the size of the enterprise, operating expenses, the composition of assets and its liabilities, growth in sales, business risk, debt service capacity, stability in cash flow and others.

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## DIAGNOSING ECONOMIC SECURITY OF AN INDUSTRIAL ENTERPRISE

Economic crises, as a rule, have negative effect on the potential of industrial enterprises: investments are reduced, fixed assets wear out, scientific-and-technological stock dwindles, the most qualified staff leaves, etc. These crises can be caused by both external and internal factors, the influence of which may become evident with a very long lag. In fact, the problems of holding economic security arise for every enterprise not only in times of crisis, but also when working in a steady economic environment. However, the anticrisis tasks to be solved vary significantly. Unfortunately, in practice, the executive board of a company begins thinking about the problems with the economic security only on the verge of bankruptcy when the company is «unable to settle with creditors» [1].

In the times of crisis, the most dangerous threat to the development of an enterprise is the destruction of its potential (industrial, technological, scientific-and-technical as well as staff), as the main factor of company viability. In this case, the ability to restore the enterprise potential using its own funds (depreciation and profits), as well as external borrowings is not provided. Both of these sources in a crisis situation are blocked.

At present, a large proportion of the national enterprises, working in an unstable economic environment, are unprofitable (Table 1), facing a deep decline in production and being in a critical condition.

Table 1

*Part of the loss-making enterprises by industry, % [2]*

Economic activities	2010	2011	2012	2013 (January-September)
Total	42,7	36,5	37,0	41,0
Industry	43,0	39,2	39,3	43,6
Construction	46,1	41,2	41,1	45,6
Wholesale and retail trade, repair of motor vehicles and motorcycles	39,7	35,4	36,0	35,4
Transportation, storage, postal and courier activities	47,2	38,6	39,9	46,9
Temporary facilities and catering services	43,6	40,7	42,6	44,9
Information and telecommunications	43,1	40,9	38,6	43,6
Financial and insurance activities	43,2	42,8	41,8	43,1
Real estate	51,2	46,9	45,7	48,5
Professional, scientific and technical activities	44,0	38,7	39,4	39,7
Education	37,1	33,0	32,9	35,9
Health care and social assistance	41,1	40,5	38,8	23,4
Arts, sports, entertainment and recreation	50,7	45,9	47,5	62,8

Thus, the task of the internal self-assessment and forecasting of their condition in terms of economic security, protection from the negative effects of internal and external origin which affect the capacity of the company, estab-

lishing a system of safety indicator monitoring, justification of threshold values and taking managerial decisions aimed at countering threats is of current interest for industrial enterprises.

Considerable attention is paid by the national and foreign scientists to the problem of determining the probability of bankruptcy. Development of methodology and criteria for predicting bankruptcy was carried out by such leading scholars as E. Altman [3], W. Beaver [4], G. Sprinheyt [5], R. Wood, J. Taffler [6], R. Sayfullin, G. Kadykov [7], A. Tereshchenko [8], who have been developing discriminant models for evaluating the probability of bankruptcy.

These authors considered the possibility of building an adequate model of estimating the probability of bankruptcy of enterprises on the basis of the financial statements. Despite the fairly large number of publications [9, 10] about the management of financial resources of enterprises and about addressing issues of production and sales financing, current realities require more thorough investigation of non-financial factors impact on the economic security of the enterprise.

An important contribution to the solution of problems of crisis management was done by Ukrainian scientists A. Gradova [10], A. Chernyavsky [11], S. Shershneva [12] and others. However, foreign and national methods have certain shortcomings, and especially the inability to be used in the pre-crisis conditions. Moreover, in these works it is not considered that the various stages of the economic crisis are very different and need to have different anti-crisis management decisions. The relevance of this study is determined by the absence of the assessment which allows to determine the stage of the economic crisis and can be the basis for the development of anti-crisis strategy

The objective of the study is to develop the model of economic security's diagnostics, based on the analysis of not only financial but also other components of entities, the rationale of crisis management algorithm based on types of economic crisis.

Economic security of enterprise is defined as the state of the economic system that enables to keep resistance to external and internal threats, confront the factors of disorganization by using available potential. The system of economic security has traditionally included the following components: financial (effective use of financial resources), political and legal (compliance with applicable laws), intellectual and

personnel (effective human resource management, preservation and development of staff), technical and technological (compatibility of the equipment and technologies with modern world analogues upon the condition of optimization of resource costs), informational (effective information and analytical support of economic activity), environmental (compliance with applicable environmental standards), powerful (physical security of employees). The general scheme of the factors of economic security of industrial enterprises is shown in Fig. 1.

For analytical assessment of each component, we should identify possible threats and evaluate the probability and consequences of their occurrence. Gist of the study lies in carrying out such calculations, which, even in case of being incompletely adequate, would make it possible to obtain sufficiently reliable results you can rely on when choosing a commercial alternative [13]. Moreover, it should be emphasized that the mechanism for creating economic security should be based on internal system characteristics of the company, i.e. the socio-economic system itself should include «built-in» mechanisms to prevent internal and external threats, depending on the actual state of the economic system.

In the relation to the specifics of the company, the state of the economic security can be characterized as:

a) normal – indicators of economic security are within the threshold values, and the degree of usage of the available potential is close to technical standards;

b) pre-crisis – limit value of at least one of the indicators of economic security is exceeded, and the other indicators are close to the limit values, and the technical and technological capabilities to improve the conditions and results of production by taking precautionary measures are not lost;

c) crisis – limit values of most major indicators of economic security are exceeded, the signs of irreversible decline in production appear and a partial loss of capacity due to the depletion of technical resources occurs;

d) critical – all the boundaries separating normal and crisis state of production development are violated and the loss of part of the potential becomes imminent.

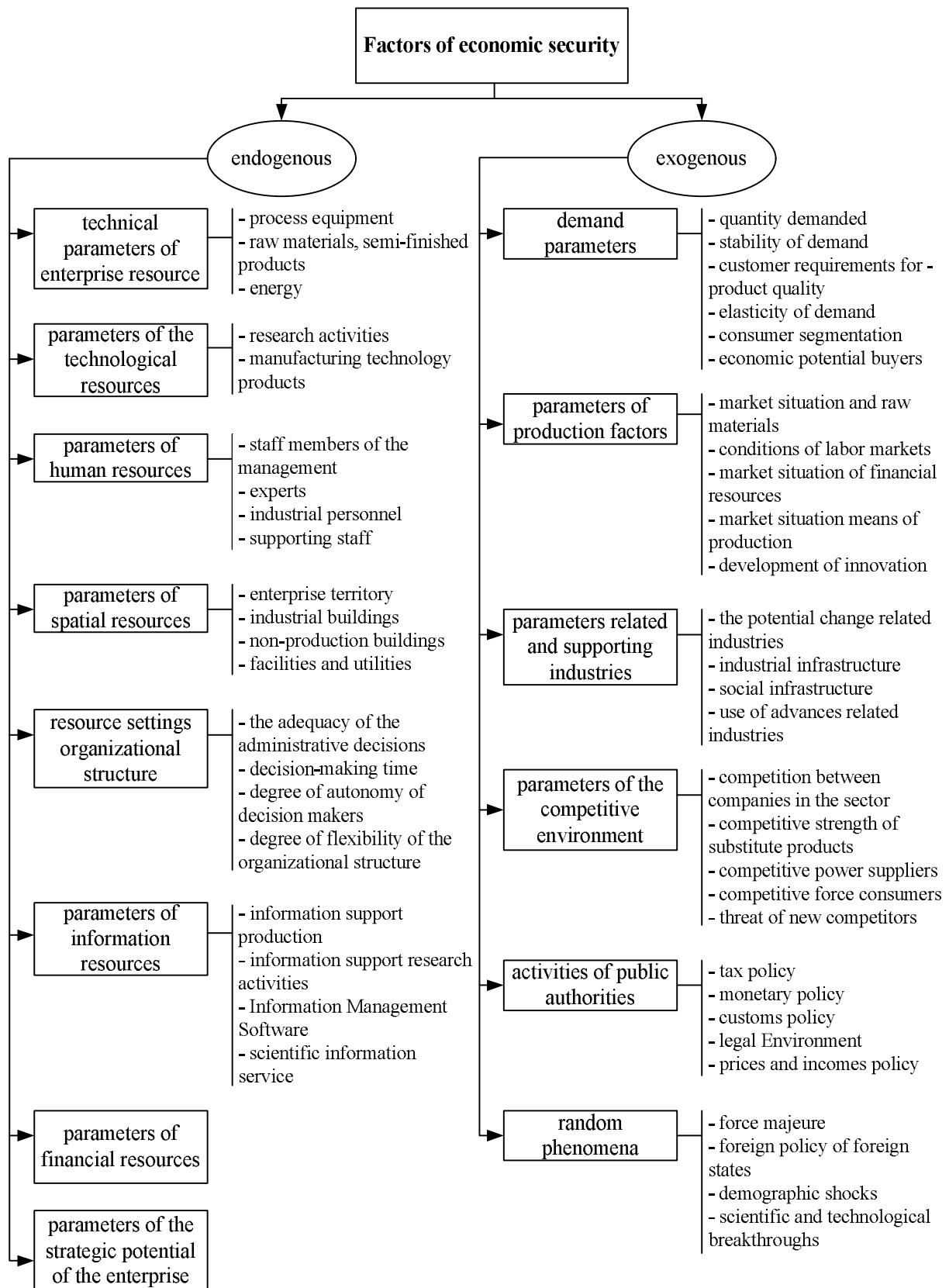


Fig. 1. Factors to ensure the economic security of industrial enterprises

During sustainable functioning, the company focuses on maintaining the normal rhythm of production and marketing, on the preventing physical and financial damage, on blocking up unauthorized access to official information, on the countering unfair competition and criminal manifestations.

Timely detection of adverse trends and prediction of bankruptcy are very important for national companies. However, there are no effective techniques which enable to make a reliable prediction of failure during the latent crisis. Various techniques for predicting bankruptcy which are used in domestic practice actually predict various types of crises [14]. Therefore, the assessments obtained by means of these techniques can often vary greatly and none of them can claim to be universal.

The choice of specific techniques should obviously be dictated by the peculiarities of the industry in which the company operates. Moreover, even the techniques themselves can and should be adapted as industry-specific.

There are two basic approaches to diagnosing bankruptcy. The first approach is based on financial data and includes the calculation of the coefficients: the Altman, Taffler discriminant models and others. The second one involves data analysis of bankrupt companies and their comparison with the company being studied.

The first approach has a rigorous mathematical justification, but enterprises that are in difficulty, in every way delay the publication of their reports, it common for companies in crisis to seek the whitewash of their activities. Furthermore, some financial indicators may testify the insolvency, while the other ones can notify stability or even a slight improvement. In such circumstances it is difficult to draw a conclusion about the real state of economic security.

The second approach is based on a comparison of signs of bankrupt companies with the characteristics similar to the analyzed company. But the problem is the lack of appropriate database in Ukraine.

Apart from the described above «quantitative» approaches to the prediction of bankruptcy, we can distinguish «qualitative» approach, which involves the analysis of some individual characteristics of the company in crisis, for example, excessive use of short-term borrowings

as a source of financing long-term investments, a chronic shortage of current assets, adverse changes in the stock of orders, loss of key administrative staff, unscheduled stoppages or failures of production, conflicts in the company, etc. If a company has such characteristics, it is concluded that its economic security is at risk.

Thus, the choice of specific methods of analysis of economic security depends on the particular industry and the level company development. Moreover, even the methods themselves may be adjusted taking into account the specificity of the company under analysis.

Methodology of estimation of economic security level should include a large number of procedures that should be combined into several successive stages:

- 1) determination of the components of economic security;
- 2) selection of specific indicators to measure the level of economic security;
- 3) selection of a basis for comparison ;
- 4) determining the direction and dividing specific indicators into groups of raising and lowering economic security;
- 5) calculation of the values of general indicators in selected groups;
- 6) calculation of the values of economic security indicator;
- 7) determination of the degree of economic security;
- 8) determination of the dynamics of economic security and the nature of company development;
- 9) factor analysis of economic security and determination of prospects of an industrial enterprise development.

To build a model of analyzing economic security and detecting latent crisis, method of fuzzy sets can be used, which enables to introduce the linguistic variable, and to specify the relation of quantitative values of each factor with its qualitative linguistic description by the membership functions. Membership function is a quantitative measure of information uncertainty towards the analyzed parameters, the value of which is described in linguistically fuzzy form (e.g., «a very strong threat to economic security» - 5 points, «strong» - 4 «moderate» - 3, «weak» - 2, «very weak» - 1).

Information base for the analysis of economic security with the purpose of detecting the latent crisis is the accounting control and internal reporting. As the parameters can vary significantly for the characteristics of the economic security of enterprises in various industries, and even within the same industry, it is appropriate to evaluate indicators on the basis of dynamics of their bias over a certain period. For this purpose an index method is used, that is, each analyzed indicator is an index of changing of a certain indicator of activity or sustainability of the company; this is the ratio of the values of this index for the beginning and the end of the period. To assess the indices, the scale of values for each specific company is developed.

The linguistic variable is determined, depending on the degree of deviation of the actual figure of the index of economic security, proposed for a particular company. By each criterion of economic security the signal is assigned a numerical value about the threat of crisis ( $C_i, i=1 \dots n$ , where  $n$  - number of indicators selected for analysis).

Further we introduce two intermediary indicators:

$C$  – an integral indicator of the true signal conditions:  $C = C + I$ ;

$S$  – an integral component of the total force of signals about the loss of economic security:  $S = S + C_i$ .

To calculate the magnitude of the risk of a crisis for each group of indicators or for the whole enterprise, magnitude indicator of signal of economic security loss is used ( $M$ ):

$$M = \frac{C}{n} 100\%, \quad (1)$$

where  $n$  – number of analyzed parameters for the group or for the whole company.

Magnitude of the economic security threat signals characterizes the crisis coverage and gives an idea of the number of areas affected by the crisis, that is, those areas where the loss of economic security is possible in the near future.

The intensity of the threat of losing economic security is suggested to calculate by the formula:

$$I = \frac{S}{n \cdot r} 100\%, \quad (2)$$

where  $I$  – intensity of signal of economic security loss;

$r$  – dimension of scale of the signal values ( $r = 5$ ).

The intensity of signals of economic security loss characterizes the depth of the crisis and gives an idea of the economic security of the industrial enterprise.

The size and intensity of threats to the economic security is estimated using the scale provided in Table 2.

Table 2

Linguistic evaluation scale and intensity of the threat of economic security

The numerical value of the index	Linguistic evaluation indicator	Forecast
< 10 %	extremely low	potential crisis
10 – 20 %	low	
20 – 40 %	average	latent crisis
40 – 70 %	high	
70 – 100 %	extremely high	

Values of above 40 % suggests the presence of latent crisis in the company and the loss of economic security. When the indicator values are less than 40 % the chance of having a crisis is low, the state is characterized as a potential crisis, which may be followed by the possible development of a latent crisis.

Assessment of the level of economic security must be made from the perspective of

several components which characterize the availability and the results of using the individual elements of the economic potential of the company. Within each component of the overall level of economic security, we should highlight the elements which characterize the effectiveness of using certain types of company resources. Here is an example of indicators characterizing the financial, technical and technological components.

The financial component of economic security is assessed on the basis of these indicators:

equity ratio - reflects the level of financial stability;

cost ratio per one hryvnia sales - characterizes the efficiency of the production and management resources of the company;

return on sales - sales effectiveness;

absolute liquidity ratio - describes the solvency of the company.

Manufacturing component of economic security may be considered through the following indicators:

labour results - characterizes the efficiency of labor costs;

capital results - characterizes the efficiency of working capital;

assets ratio - describes the efficiency of fixed assets;

wear rate - reflects the state of the fixed assets of the enterprise;

the coefficient of the real property value - enables to estimate the total value of the company potential.

Similarly, we can estimate the other components of economic security.

Further we calculate generalizing indicators for each selected group; these indicators reflect the «strength» and «weakness» of the company from the perspective of economic security. Generalizing indicator values are calculated by formulas depending on the direction of the influence of the indicator on the economic security:

for increasing indices

$$K_{eb}^{\uparrow} = \frac{\sum_{i=1}^n \left( \frac{a_i^{\Pi} - a_{\min}}{a_{\min}} + \frac{a_{\max} - a_i^H}{a_{\max}} \right)}{n}, \quad (3)$$

where  $a_i^{\Pi}$ ,  $a_i^H$  – the actual values of the partial indicators included in the group of indicators which increase the level of economic security ( $i = 1, 2, \dots, n$ );

$n$  – number of partial indicators in this group;

$a_{\min}$  – the minimum threshold value for a positive indicator;

$a_{\max}$  – maximum threshold value for negative indicator;

for decreasing indices

$$K_{eb}^{\downarrow} = \frac{\sum_{j=1}^m \left( \frac{a_{\min} - a_j^{\Pi}}{a_{\min}} + \frac{a_j^H - a_{\max}}{a_{\max}} \right)}{m}, \quad (4)$$

where  $a_j^{\Pi}$ ,  $a_j^H$  – the actual values of the partial indicators which lower the level of economic security ( $j = 1, 2, \dots, m$ );

$m$  – number of partial indicators rates in the group.

In fact, the values of general indicators reflect the relative level of deviation of the values of selected parameters of theselected standards. Furthermore, the implementation of standardization enables to lay the indicators which are heterogeneous in economic nature for comparable form and combine them in generalizing terms.

Indicator of economic security ( $I_{eb}$ ) should reflect the capabilities of the enterprise to maintain and improve the level of economic security, so it is calculated as the ratio of values of generalizing indicators:

$$I_{eb} = \frac{K_{eb}^{\uparrow}}{K_{eb}^{\downarrow}}. \quad (5)$$

In general, the value  $I_{eb}$  characterizes the state of the enterprise in terms of economic security at a given time, and therefore reflects the efficiency of using the economic potential of the company. Scale of assessment of economic security level and existence of crisis in the company is presented in Table 3.

Thus, the proposed method of determining the level of economic security of industrial enterprise is aimed at detecting the latent stage of the economic crisis.

Depending on the state of economic security and the type of crisis, specific set of anti-crisis measures is used. The general algorithm of maintaining economic security of the industrial enterprise, taking into account the stage of a crisis process and the difference strategic decisions and tactical measures at different stages of the crisis is presented in Fig. 2. The proposed algorithm consists of the following blocks: the block of recognizing the stages of the crisis process, the block of selecting the anti-crisis strategy

Characteristic values of the level of economic security

Value of the indicator of economic security	Characteristics of the level of economic security	Type of crisis
$I_{eb} > 1,25$	Security margin of the company	Potential crisis
$1 < I_{eb} < 1,25$	Sufficient level of enterprise security	
$I_{eb} = 1$	Equilibrium raising and lowering factors (stability)	Incipient crisis
$0,75 < I_{eb} < 1$	Allowable reduction in company security level	Developing crisis
$0,5 < I_{eb} < 0,75$	Maximum permissible reduction of security	
$0,25 < I_{eb} < 0,5$	Critical reduction of enterprise security	Progressive crisis
$0 < I_{eb} < 0,25$	Catastrophic reduction of enterprise security	

in accordance with the stage of the crisis, the block of developing corresponding anti-crisis measures and the block of evaluating the applied strategy.

Measures of meeting the incipient crisis are similar to the activities of eliminating the potential crisis, that is the main emphasis should be directed towards the elimination of unfavorable factors, due to which a threat to economic security emerged. Developing crisis also carries a risk of transition into a heavy crisis. In this regard, the anti-crisis measures should concern the deeper foundations of economic security. Measures to eliminate the progressive crisis suggest a thorough review of enterprise strategy, as well as its mission and goals.

The enormity of crisis, i.e. the scope: the number of components of the crisis-ridden economic security, - is of great importance during the development of anti-crisis measures.

From the perspective of an enterprise strategy for a potential crisis a slight adjustment of company development course as well as eliminating the factors that influenced the emergence of adverse trends is enough, i.e. the anti-crisis measures are more tactical in nature. In case of the developing crisis it is necessary to develop measures to adjust development strategies, e.i. the measures aimed at normalizing the elements of economic security; there are strategic changes.

During the severe progressive crisis it is required to have the full use of the economic potential of the company, reviewing the company strategy, its mission, goals and objectives.

After choosing the appropriate anti-crisis strategy, the development of tactical measures to overcome the crisis should be started. Positive effect can be achieved only by using a tho-

roughly elaborated system of anti-crisis measures, presented in the form of a strategic project with its subsequent introduction in a strategic plan. Such plan is developed taking into account the characteristic features of the enterprise and the state of its economic security. Anti-crisis measures are formulated in form of specific tasks that are necessary at the moment. The main principles that should be followed while developing the anti-crisis measures are: feasibility, time and rationality limitations, the cost of solution should not exceed the resultant effect of their conducting.

Thus, the paper solves important scientific and practical tasks for the formation of the methodological approach for the level of economic security diagnosing. The main conclusions and recommendations are the following:

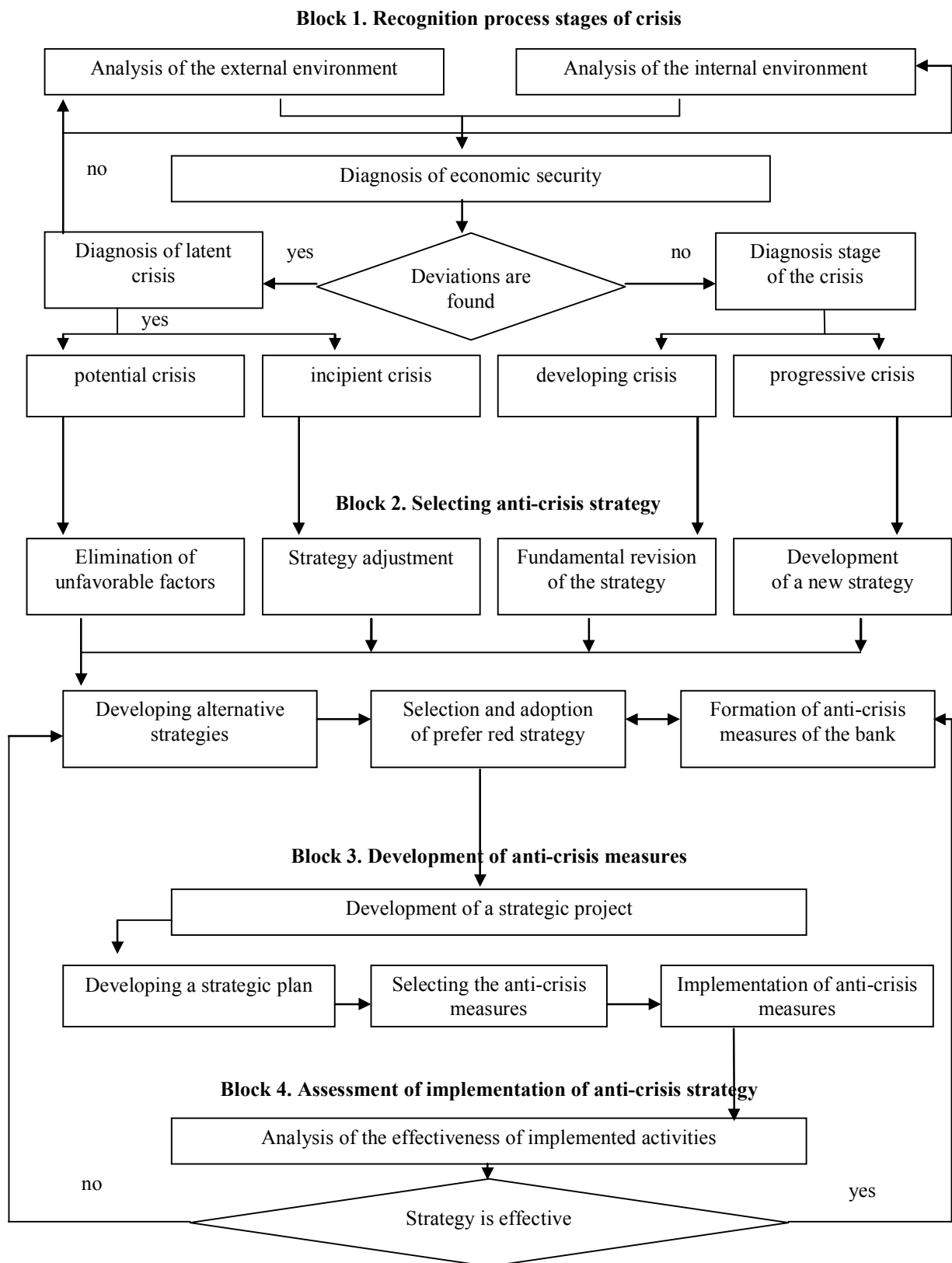
the key components of economic security of the industrial enterprise have been identified;

the classification of economic security states in accordance with the type of economic crisis has been proposed;

mathematical apparatus of assessing the level of economic security, which is based on the use of fuzzy set theory has been developed;

the algorithm of the anti-crisis management strategy selection, depending on the depth of the crisis and identifying the elements of economic security, has been proposed.

Management practices show that in a dynamic and uncertain environment an important role in the ensuring economic security and competitiveness of industrial enterprises is given to the effectiveness of anti-crisis management. The cyclical nature of the economy forces businesses to adapt to the changes in the internal and external environments in order to maintain economic security. But for the problem of



*Fig. 2. The control algorithm of economic security*

determining the economic security indicators of business enterprises, i.e. the index of economic security, there is still no universal solution. And the formation of economic-mathematical apparatus for making the scale of economic security indices for industrial enterprises is the subject to the author's further research.

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## АНОТАЦІЇ

**Вишневецький В.П., Чекіна В.Д.** *Стратегічні напрями податкової політики України у сфері регулювання розвитку промисловості.* – С. 17.

Розглянуто досвід податкового стимулювання економіки країн, що успішно розвиваються (Китаю, Індії, Бразилії, Південної Африки, Російської Федерації, Казахстану, Білорусі). Обґрунтовано пропозиції щодо стратегічних напрямків податкової політики України у сфері регулювання розвитку промисловості.

*Ключові слова:* податкова політика, податкове стимулювання, країни, що розвиваються, стратегічні напрями, промисловість, неоіндустріалізація.

**Гаркушенко О.М.** *Регулювання утворення та поведіння із твердими побутовими відходами: орієнтири та пріоритети.* – С. 107.

У зв'язку зі складною ситуацією з накопиченням твердих побутових відходів в Україні за одночасної відсутності достатнього рівня правової врегульованості цього питання проаналізовано досвід світового лідера у сфері регулювання утворення та поведіння із цим видом відходів – Германії – як можливого орієнтира для вирішення проблеми накопичення та поведіння з даними відходами в Україні. На підставі проведеного аналізу, а також особливостей України (економічний, екологічний стан, правове поле, інституційні умови) розроблено рекомендації щодо напрямів регулювання сфери твердих побутових відходів в Україні.

*Ключові слова:* тверді побутові відходи, забруднення, регулювання, екологічні податки, економічні інструменти екологічного регулювання, утворення відходів, поведіння з відходами, довкілля.

**Гурнак О.В.** *Оподаткування та економічне зростання: еволюційний підхід.* – С. 66.

Подано результати емпіричних досліджень впливу рівня оподаткування на економічне зростання. Показано, що характер досліджуваного зв'язку відрізняється для різних податкових популяцій і субпопуляцій. Зокрема, в країнах західноєвропейської податкової субпопуляції відсутній значущий зв'язок між рівнем оподаткування та варіаціями реального економічного зростання, а для східноєвропейської субпопуляції, що включає також Україну, збільшення реального податкового коефіцієнта призводить до зниження реального економічного зростання.

*Ключові слова:* економічне зростання, податковий коефіцієнт, тіньова економіка, податкова популяція, еволюційна економіка.

**Касьянова Н.В., Касьянов А.В.** *Діагностика економічної безпеки промислового підприємства.* – С. 136.

Запропоновано модель діагностики кризи промислового підприємства, яка базується на аналізі всіх складових економічної безпеки та дозволяє оцінити глибину кризи підприємства. Для оцінки інтенсивності сигналів про втрату економічної безпеки пропонується використовувати теорію нечітких множин. Запропоновано алгоритм формування антикризової стратегії підприємства залежно від виду кризи.

*Ключові слова:* криза, економічна безпека підприємства, антикризова стратегія, нечітка логіка.

**Кравченко О.О.** *Забезпечення фінансової стійкості залізничного транспорту України.* – С. 74.

Статтю присвячено дослідженню фінансового стану залізничного транспорту України та можливості застосування існуючих підходів (показників фінансового стану) до аналізу ефективності управління фінансами галузі. Запропоновано систему обмежень для підтримки фінансової стійкості функціонування залізничного транспорту України у короткостроковій та довгостроковій перспективі.

*Ключові слова:* залізничний транспорт, фінансовий стан, фінансова стійкість, система обмежень.

**Мазур Ю.О.** *Оцінка інвестиційно-інноваційного розвитку економіки України: еволюційний підхід.* – С. 44.

Проведено аналіз залежності інвестиційно-інноваційного розвитку промисловості від ефективно-податкової політики в розвинених країнах і країнах БРІКС. Обґрунтовано доцільність дослідження податкового стимулювання інвестиційно-інноваційного розвитку промислових підприємств з позицій еволюційного підходу з урахуванням закономірностей зміни правил і норм поведінки господарюючих суб'єктів у просторі та часі на довгострокових інтервалах часу. Удосконалено еволюційну агентно-орієнтовану модель інвестиційно-інноваційного розвитку економіки для опису інерційного сценарію діяльності промислових підприємств України.

*Ключові слова:* інвестиційно-інноваційний розвиток, податкове стимулювання, еволюційна економіка, моделі оподаткування.

**Майбуров І.А., Леонтєва Ю.В.** *Реалізація концепції податкових витрат у Російській Федерації: методологія оцінки ефектів і ефективності.* – С. 5.

Актуалізується необхідність розробки методології оцінки податкових витрат і ефективності податкових пільг для реалізації завдання їх обліку й оптимізації. Розмежовуються базова і нормативна структури податків. Пропонується алгоритм оцінки податкових витрат, а також спосіб оцінки податкових витрат з аналізованої пільги за період. Формулюються початкові вимоги до оцінки ефективності податкових пільг. Аргументується необхідність використання як інтегрального показника бюджетної ефективності податкової пільги.

*Ключові слова:* податкові витрати, базова структура, нормативна структура, фіскальний ефект, соціальний ефект, економічний ефект, бюджетний ефект, ефективність пільги.

**Матюшин О.В., Шкаєва Т.І.** *Удосконалення управління кредитними ризиками банку на основі регулювання їх галузевої концентрації.* – С. 98.

Подано науково-методичний підхід до регулювання галузевої концентрації кредитних ризиків банків, що ґрунтується на аналізі динаміки та прогнозуванні розвитку галузей економіки, які відрізняються домінуючими продуктами та технологіями їх виробництва. Його основу становить ідея, згідно з якою найменш ризиковими визнаються кредити підприємствам галузей, що перебувають у стадії зростання.

*Ключові слова:* кредитний ризик, банк, галузева концентрація, галузь, кредити, динаміка розвитку

**Могилова А.Ю.** *Управління виробничим капіталом підприємств коньячної галузі України.* – С. 127.

Доведено, що для забезпечення капіталізації підприємства коньячної галузі України варто зосередити увагу на управлінні процесом формування та використання виробничого капіталу. Обґрунтовано новий підхід до оцінки капіталізації підприємства повного циклу виробництва коньяку через організаційно-економічні трансформації виробничого капіталу як ресурсної основи майбутньої капіталізації.

*Ключові слова:* виробничий капітал, підприємство, виноробна галузь, коньяк, повний цикл виробництва, виноградарство, EBITDA, EVA.

**Половян О.В., Казакова М.Г.** *Основні напрями формування державної стратегії сталого регіонального розвитку в Україні: реалії та перспективи.* – С. 32.

Проаналізовано вплив антропогенного навантаження на довкілля в Україні. За допомогою кластерного аналізу проведено групування областей України за рівнем економіко-екологічного стану. Для загальної оцінки економіко-екологічної ситуації по регіонах України здійснено рейтинговий аналіз. Проаналізовано стратегії ре-

гіонального розвитку ЄС і України. Запропоновано напрями забезпечення сталого розвитку регіонів України.

*Ключові слова:* антропогенне навантаження, сталий розвиток, холізм, стратегія регіонального розвитку.

**Соколовська О.В., Соколовський Д.Б.** *Моделювання видатків бюджету Донецької області.* – С. 56.

Розглянуто науково обґрунтовану пропозицію методів і моделей прогнозування видатків місцевих бюджетів. Серед інших обрано дві найбільш адекватні моделі багатовимірної регресії: адитивну та мультиплікативну. Порівняння результатів показало, що обидві моделі досить точно і приблизно однаково апроксимують вихідні дані. За їх допомоги здійснено прогноз бюджетних видатків на середньострокову перспективу для Донецької області.

*Ключові слова:* місцеві бюджети, видатки, моделювання, прогнозування, багатовимірні регресія.

**Шевцова Г.З.** *Організована синергія як імператив інтеграційних стратегій (на прикладі російських хімічних та нафтохімічних холдингів).* – С. 118.

Досліджено досвід формування потужних холдингових компаній у хімічній та нафтохімічній промисловості Росії та останні тенденції на галузевому ринку злиття – поглинання. Обґрунтовано, що імперативом сучасних інтеграційних стратегій галузевих бізнес-структур є організація і реалізація різних видів синергії з метою формування міцної основи їх конкурентних переваг на внутрішніх і світових ринках.

*Ключові слова:* організована синергія, синергетичний ефект, інтеграційна стратегія, холдинг, злиття й поглинання, хімічна та нафтохімічна промисловість.

**Шемякіна Н.В., Гориненко Г.С.** *Удосконалення практики фінансового забезпечення промислового розвитку.* – С. 84.

Проаналізовано механізм фінансового забезпечення промислового розвитку, а також структуру капітальних інвестицій. Наведено динаміку валових капітальних інвестицій у промисловості та обсягів ВВП. Розглянуто різні фінансові ресурси для забезпечення розвитку промислових підприємств. Наведено зарубіжний досвід практики фінансового забезпечення промислового розвитку. Обґрунтовано основні напрями активізації механізму фінансово-кредитного забезпечення технічного розвитку промисловості України.

*Ключові слова:* фінансове забезпечення, інвестиції, економічний розвиток, промисловість, аналіз інноваційної діяльності.

## АННОТАЦИИ

**Вишневецкий В.П., Чекина В.Д.** *Стратегические направления налоговой политики Украины в сфере регулирования развития промышленности.* – С. 17.

Рассмотрен опыт налогового стимулирования экономики успешно развивающихся стран (Китая, Индии, Бразилии, Южной Африки, Российской Федерации, Казахстана, Беларуси). Обоснованы предложения по стратегическим направлениям налоговой политики Украины в сфере регулирования развития промышленности.

*Ключевые слова:* налоговая политика, налоговое стимулирование, развивающиеся страны, стратегические направления, промышленность, неоиндустриализация.

**Гаркушенко О.Н.** *Регулирование образования и обращения с твердыми бытовыми отходами в Украине: ориентиры и приоритеты.* – С. 107.

В связи со сложной ситуацией с накоплением твердых бытовых отходов в Украине при одновременном отсутствии достаточного уровня правовой урегулированности этого вопроса проанализирован опыт мирового лидера в сфере регулирования образования и обращения с этим видом отходов – Германии – как возможного ориентира для решения проблемы накопления и обращения с данными отходами в Украине. На основании проведенного анализа, а также особенностей Украины (экономическое, экологическое положение, правовое поле, институциональные условия) разработаны рекомендации по направлениям регулирования сферы твердых бытовых отходов в стране.

*Ключевые слова:* твердые бытовые отходы, загрязнение, регулирование, экологические налоги, экономические инструменты экологического регулирования, образование отходов, обращение с отходами, окружающая природная среда.

**Гурнак А.В.** *Налогообложение и экономический рост: эволюционный подход.* – С. 66.

Представлены результаты эмпирических исследований влияния уровня налогообложения на экономический рост. Показано, что характер исследуемой связи отличается для различных налоговых популяций и субпопуляций. В частности, в странах западноевропейской налоговой субпопуляции значимая связь между уровнем налогообложения и вариациями реального экономического роста отсутствует, а для восточноевропейской субпопуляции, включающей и Украину, увеличение реального налогового коэффициента приводит к снижению реального экономического роста.

*Ключевые слова:* экономический рост, налоговый коэффициент, теневая экономика, налоговая популяция, эволюционная экономика.

**Касьянова Н.В., Касьянов А.В.** *Диагностика экономической безопасности промышленного предприятия.* – С. 136.

Предложена модель диагностики кризиса промышленного предприятия, основанная на анализе всех составляющих экономической безопасности, которая позволяет оценить глубину кризиса предприятия. Для оценки интенсивности сигналов о потере экономической безопасности предлагается использовать теорию нечетких множеств. Предложен алгоритм формирования антикризисной стратегии предприятия в зависимости от вида кризиса.

*Ключевые слова:* кризис, экономическая безопасность предприятия, антикризисная стратегия, нечеткая логика.

**Кравченко О.А.** *Обеспечение финансовой устойчивости железнодорожного транспорта Украины.* – С. 74.

Статья посвящена исследованию финансового состояния железнодорожного транспорта Украины и возможности применения существующих подходов (показателей финансового состояния) к анализу эффективности управления финансами отрасли. Предложена система ограничений для поддержки финансовой устойчивости функционирования железнодорожного транспорта Украины в краткосрочной и долгосрочной перспективе.

*Ключевые слова:* железнодорожный транспорт, финансовое состояние, финансовая устойчивость, система ограничений.

**Мазур Ю.А.** *Оценка инвестиционно-инновационного развития экономики Украины: эволюционный подход.* – С. 44.

Проведен анализ зависимости инвестиционно-инновационного развития промышленности от эффективной налоговой политики в развитых странах и странах БРИКС. Обоснована целесообразность исследования налогового стимулирования инвестиционно-инновационного развития промышленных предприятий с позиций эволюционного подхода с учетом закономерностей изменения правил и норм поведения хозяйствующих субъектов в пространстве и времени на долгосрочных интервалах времени. Усовершенствована эволюционная агентно-ориентированная модель инвестиционно-инновационного развития экономики для описания инерционного сценария деятельности промышленных предприятий Украины.

*Ключевые слова:* инвестиционно-инновационное развитие, налоговое стимулирование, эволюционная экономика, модели налогообложения.

**Майбуров И.А., Леонтьева Ю.В.** *Реализация концепции налоговых расходов в Российской Федерации: методология оценки эффектов и эффективности.* – С. 5.

Актуализируется необходимость разработки методологии оценки налоговых расходов и эффективности налоговых льгот для реализации

задачи их учета и оптимизации. Разграничиваются базовая и нормативная структуры налогов. Предлагается алгоритм оценки налоговых расходов, а также способ оценки налоговых расходов по анализируемой льготе за период. Формулируются исходные требования к оценке эффективности налоговых льгот. Аргументируется необходимость использования в качестве интегрального показателя бюджетную эффективность налоговой льготы.

*Ключевые слова:* налоговые расходы, базовая структура, нормативная структура, фискальный эффект, социальный эффект, экономический эффект, бюджетный эффект, эффективность льготы.

**Матюшин А.В., Шкаева Т.И.** *Совершенствование управления кредитными рисками банка на основе регулирования их отраслевой концентрации.* – С. 98.

Представлен научно-методический подход к регулированию отраслевой концентрации кредитных рисков банков, основанный на анализе динамики и прогнозирования развития отраслей экономики, которые отличаются доминирующими продуктами и технологиями их производства. Его основу составляет идея, согласно которой наименее рискованными признаются кредиты предприятиям отраслей, находящихся в стадии роста.

*Ключевые слова:* кредитный риск, банк, отраслевая концентрация, отрасль, кредиты, динамика развития.

**Могилова А.Ю.** *Управление производственным капиталом предприятий коньячной отрасли Украины.* – С. 127.

Доказано, что для обеспечения капитализации предприятия коньячной отрасли Украины следует сосредоточить внимание на управлении процессом формирования и использования производственного капитала. Обоснован новый подход к оценке капитализации предприятия полного цикла производства коньяка через организационно-экономические трансформации производственного капитала как ресурсной основы будущей капитализации.

*Ключевые слова:* производственный капитал, предприятие, винодельческая отрасль, коньяк, полный цикл производства, виноградарство, EBITDA, EVA.

**Половян А.В., Казакова М.Г.** *Основные направления формирования государственной стратегии устойчивого регионального развития в Украине: реалии и перспективы.* – С. 32.

Приведены результаты анализа влияния антропогенной нагрузки на окружающую среду в Украине. С помощью кластерного анализа проведена группировка областей Украины по уровню экономико-экологического состояния. Для общей оценки экономико-экологической ситуации по регионам Украины осуществлен рейтинговый анализ. Проведен анализ стратегий регионального развития ЕС и Украины. Предложе-

ны направления обеспечения устойчивого развития регионов Украины.

*Ключевые слова:* антропогенная нагрузка, устойчивое развитие, холизм, стратегия регионального развития.

**Соколовская Е.В., Соколовский Д.Б.** *Моделирование расходов бюджета Донецкой области.* – С. 56.

Рассмотрено научно обоснованное предложение методов и моделей прогнозирования расходов местных бюджетов. Среди прочих выбраны две наиболее адекватные модели многомерной регрессии: аддитивная и мультипликативная. Сопоставление результатов показало, что обе модели достаточно точно и примерно одинаково аппроксимируют выходные данные. С их помощью осуществлен прогноз бюджетных расходов на среднесрочную перспективу для Донецкой области.

*Ключевые слова:* местные бюджеты, расходы, моделирование, прогнозирование, многомерная регрессия.

**Шевцова А.З.** *Организованная синергия как императив интеграционных стратегий (на примере российских химических и нефтехимических холдингов).* – С. 118.

Исследован опыт формирования мощных холдинговых компаний в химической и нефтехимической промышленности России и последние тенденции на отраслевом рынке слияния – поглощения. Обосновано, что императивом современных интеграционных стратегий отраслевых бизнес-структур является организация и реализация разных видов синергии с целью формирования устойчивой основы их конкурентных преимуществ на внутренних и мировых рынках.

*Ключевые слова:* организованная синергия, синергетический эффект, интеграционная стратегия, холдинг, слияния и поглощения, химическая и нефтехимическая промышленность.

**Шемякина Н.В., Гориненко А.С.** *Совершенствование практики финансового обеспечения промышленного развития.* – С. 84.

Проанализирован механизм финансового обеспечения промышленного развития, а также структура капитальных инвестиций. Приведена динамика валовых капитальных инвестиций в промышленности и объемов ВВП. Рассмотрены различные финансовые ресурсы для обеспечения развития промышленных предприятий. Приведен зарубежный опыт практики финансового обеспечения промышленного развития. Обоснованы основные направления активизации механизма финансово-кредитного обеспечения промышленного развития Украины.

*Ключевые слова:* финансовое обеспечение, инвестиции, экономическое развитие, промышленность, анализ инновационной деятельности.

## ABSTRACT

**Garkushenko O.M.** *Regulation of the solid household wastes generation and treatment in Ukraine: guidelines and priorities.* – P. 107.

Accumulation of solid household wastes and rates of their growth in the world as a whole and in Ukraine – in particular caused the raise of concerns among population. One of the reasons of this situation is that solid household wastes represent the irrational use of scarce natural resources. In addition to this wastes accumulation on landfills or their incineration causes pollution, which may result in the increase of morbidity rate.

In the developed countries of the world measures on the regulation of solid household wastes generation and treatment are undertaken for about 30 years. Due to this new approaches of wastes treatment were developed as well as new types of packaging – one of the main compounds of the solid household wastes in the modern world.

In the meantime recycling and reuse of scrap are the most preferred ways of waste treatment in leading countries of the world. That allows to use same materials for several times without extraction of raw materials as well as it saves space on landfills. Pollution of air and groundwaters is decreasing in turn.

But in Ukraine the situation with regulation of solid household wastes is quite opposite. There are a lot of overloaded landfills and dumps. Most part of that landfills as well as incineration plants does not correspond to the ecological safety requirements.

Ukrainian legislation on the wastes treatment is far from perfect.

Taking into account all of the preceding it was assumed that to improve situation in Ukraine it would be useful to analyze the experience of leading countries in the field of the regulation of wastes generation and treatment.

As long as Germany is a world leader in this field and industrial enterprises are directly engaged in the process of diminishing volumes of solid household wastes and their further recycling there this country appears to be a good example for that matter.

On the ground of the presented in the paper German experience of the regulation of solid household wastes treatment as well as account of economic, institutional, environmental and some other peculiarities of Ukraine recommendations on the improvement of regulation of solid household wastes generation and treatment was offered.

*Keywords:* solid household wastes, pollution, regulation, environmental taxes, economic instruments of environmental regulation, wastes generation, wastes treatment, environment.

**Gurnak O.V.** *Taxation and economic growth: an evolutionary approach.* – P. 66.

Taxes play an extremely important role in assuring of the activities of the state, financing the production of public goods and income redistribution. At the same time, neither theoretical work, nor the facts can give the definite answer concerning the character and significance of the impact of taxes on the economic growth. The reason for such discrepancies in the obtained results can be ignorance of the existence of different tax populations and subpopulations. They are defined as groups of countries, which formed similar formal and informal tax institutions during the long socio-economic evolution. In the paper the results of an empirical test of this hypothesis are given.

Methodology of the study was based on the construction of the procedure of stepwise selection and analysis of statistically adequate econometric models as for undivided sample of 117 countries, so as for different tax populations and subpopulations. In constructed models, economic growth was viewed as the dependent variable, and the tax ratio and the size of the shadow economy were considered as independent variables.

These results confirm the investigated hypothesis. Wherein, for the mixed tax populations' countries, including subpopulations of Muslim countries, as well as a subpopulation of post-colonial countries of the European tax population, an increase in the effective tax rate contributes to real economic growth. In the tax subpopulation of Western European countries, the significant interrelation between the level of taxation and variations in real economic growth is absent. For Eastern European tax subpopulation including Ukraine, the increase in the real tax ratio leads to a fall in the real economic growth. This happens because of a clear priority of social spending and inadequate government funding programs for economic growth, and low efficiency of state institutions.

*Keywords:* economic growth, tax ratio, shadow economy, tax population, evolutionary economics.

**Kasyanova N.V., Kasyanov A.V.** *Diagnosing economic security of an industrial enterprise.* – P. 136.

In the article it is shown, that the basic methodological approaches to the analysis of the probability of bankruptcy industry, have different imperfections. The necessity of appraisal of the crisis on the basis of weak signals and early prediction of potential crisis, led to the creation of the model diagnosis of the industrial enterprises' crisis, which is based on an analysis of all components of economic securi-

ty, and allows us to estimate the depth of the crisis the company.

Assessment of the level of economic security is done from the perspective of the several components that characterize the presence of the crisis at the enterprise and the use of certain elements of the economic potential of the enterprise. To estimate the signal intensity of the loss of economic security, it is proposed to use the theory of fuzzy sets. The mechanism of calculating the integral indicator of the economic security level, which reflects the efficiency of the economic potential of the company was given. Also, it should be noted, that the method of analysis of economic security may be subject to adjustment in the context of the analyzed enterprise specifics and characteristics of the industry.

The paper addresses important scientific and practical tasks for the formation of the methodological approach for the level of economic security diagnosing. The main practical recommendations for the use of given research is to use the algorithm of choice strategy of crisis management now, depending on the depth of the crisis and identifying elements of economic security for its respective recess.

*Keywords:* crisis, economic security, anti-crisis strategy, fuzzy logic.

**Kravchenko O.O.** *Ensuring of financial sustainability of railway transport in Ukraine. – P. 74.*

The article shows the important role of railway transport in the Ukrainian economy. Difficulties in the process of reforming the industry and the economic crisis in Ukraine determine deterioration in the financial condition of the railway transport. This reflects negatively on the ability to carry cargo and passengers with the necessary quality and speed. Therefore the aim of the article is to study the features of the financial condition of railway transport of Ukraine and the formation of the system of constraints to maintain its financial stability in unsteady conditions of the institutional environment.

The article stipulates that used indicators describing the financial condition of the enterprises do not consider the particular characteristics of the plant and the financial and economic activities of a particular object, which leads to incorrect test results. Investigated the financial condition of the railway transport of Ukraine.

It is shown that in order to prevent further accumulation of negative trends in operating and financial sector there is an objective need for the formation of severe restrictions managing its financial assets to improve their effectiveness in the short and long term.

The article suggested and justified system of constraints, which includes 1) a primary funding operations, and 2) the volume balance of positive and

negative cash flows, and 3) synchronization generating operational, financial and investment cash flow, and 4) maintaining an optimum balance of funds as reserves to ensure financial sustainability 5) providing liquidity cash flow.

Implementation of the proposed system of constraints will contribute to a) improve the operational management of cash flows from a position of balance of income and expenditure of funds, and b) increase the liquidity of the balance of the industry, and c) increase the investment attractiveness of the railway transport of Ukraine, and d) the release of funds from the operational turnover for capital investment in the development of the industry.

Improving the management of the financial condition and financial sustainability of railway transport should also include 1) reduction in line with the current regulatory framework, and 2) the development of methodology for assessing the financial condition of the provisions and financial stability, and 3) implementation of the necessary changes in the organization of financial work of railway transport; 4) the full implementation of the system of financial planning, and 5) development of monitoring operational and financial performance.

*Keywords:* railway transport, financial condition, financial sustainability, system of constraints.

**Matyushin O.V., Shkaeva T.I.** *Improving the bank credit risk management by means of regulation of its branch concentration. – P. 98.*

The article presents a scientific and methodical approach to the regulation of the industry concentration of credit risk of banks, based on the analysis and prediction of the dynamics of development of branches with different dominant products and technologies for their production. It is based on the idea that the loans to branches that are at the stage of growth and show a steady positive dynamics of output and profitability of operations are considered to be the least risky. Existing approaches and models of credit risk assessment are the market ones. Their use is fully justified in the case of acceptance of the hypothesis about the effectiveness of the stock market as an indicator of sustainability of enterprises. In modern conditions, when the stock market has lost its economic function of determining the value of companies to raise their funds, in terms of institutional and technological backwardness of the stock market the possibility of using these models are very limited. The objective of this article is to ground the scientific and methodical approach to credit risk management of the bank on the basis of regulating their branch concentration and developing on this basis practical recommendations to diversify its loan portfolio, taking into account branch factors. the developed procedure of the loan portfolio formation is the basis for

the implementation of the proposed approach to the regulation of the branch concentration of bank credit risk. It includes analyzing of the existing loan portfolio and choosing of branches to form a new portfolio, building and analyzing time series of branch revenues and profitability, calculating of risk indicators for each branch based on the limits of sales revenues and profitability in the forecast period, loan portfolio optimization by minimizing the risk, taking into account branches loan limits with achieving the expected return. The economic and mathematic model of credit portfolio formation taking into consideration a branch factor is worked out. Recommendations on bank credit risks branch concentration regulation improving is offered.

*Keywords:* credit risk, the bank, branch concentration, industry, loans, the dynamics of development

**Mayburov I.A., Leontyeva Yu.V.** *Implementation of the concept of tax expenditures in the Russian Federation: the evaluation methodology of effects and efficiency.* – P. 5.

The subject actualized in the article is the need to develop an evaluation methodology of the tax expenditures efficiency as well as tax incentives efficiency for the purpose of tax accounting and optimization. The basic structure of taxes and the normative structure of taxes are distinguished in the article. The basic structure of taxes did not originally contain any advantages for certain activities or groups of taxpayers, representing some ideal theoretical tax construction. As a normative structure of Russian income authors consider taxation in various degrees (different rates applied) of different types of income, and the taxation of one part of the total income according to the model Schantz-Haig-Simons. The authors propose an algorithm for tax expenditures estimating. A method of tax expenditures estimation according to the analyzed tax incentive for the estimated period is proposed. The initial requirements for assessing the tax incentives efficiency are formulated. It is proposed to distinguish between four types of effects (fiscal, social, economic, budget, and ecological) and the same types of efficiency.

The ways to calculate these types of efficiency are suggested. *Fiscal efficiency* of tax incentive is the ratio of the fiscal effect of the provision of incentives received in the period  $t$ , when a real effect from the action of the incentives appears to the tax expenditures in the same period  $t$ . *Social efficiency of the tax incentive* is the ratio of the social impact of the provision of incentives received in the period  $t$ , when the real effect of the action of this incentive appears to the amount of tax expenditures over the same period  $t$ . *The economic efficiency of the tax incentives* is the ratio the economic effect from the provision of incen-

tives received in the period  $t$ , when the real effect of the action of this incentive appears to the sum of tax expenditures of the same period  $t$ . The need for using the budget efficiency of the tax incentives as an integral index is proved. *Budgetary effect* of tax incentives may be represented as the sum of the fiscal, social and economic effects

*Keywords:* tax expenditures, the basic structure of tax, the normative structure of tax, the fiscal effect, the social effect, the economic effect, the budget effect, tax incentives efficiency.

**Mazur J.O.** *Evaluation of investment and innovative development of Ukrainian economy:evolutional approach.* – P. 44.

Considered that industrial development in Ukraine depends on effective tax regulation. It manifests itself in the creation of conditions for sustainable economic growth based on investment and innovation, and the tax system that convenient for taxpayers. However, in modern conditions Ukraine occupies one of the last positions by GDP per capita PPP. There are reduced total investments in the economy, the share of the costs of implementing the scientific and technological work in the total GDP etc.

Evolutionary economics as scientific approach in the modern economic thought is considered for investigative of socio-economic processes and phenomena and based on long-term changes and changes in the behavior of agents, who take certain decisions. Such decisions don't always lead to an increase in public (or private) welfare. The need to consider the patterns of change of rules and norms of the individual's behavior in space and time in terms of their evolutionary development is identified. This methodology may be useful from the standpoint of research tools of tax policy to stimulate investment and innovation activities of industrial enterprises in Ukraine. However, the use of the evolutionary approach for the analysis of tax instruments in the promotion of investment and innovation has not received sufficient development.

For evaluation of investment and innovative development of the industry is proposed to investigate the socio-economic system, which consists of the components of the innovation economy, that interacting through causal relationships: government (tax and budget sectors), economic agents and households. Innovation generated from knowledge. Knowledge as innovation is transmitted to innovative enterprises. Since not all knowledge can be transformed into innovation, then there is their forgetfulness. All agents are equal bearers of knowledge, and all kinds of knowledge are equivalent.

The result of functioning of components of the innovation economy is a quantitative assessment of

factors of economic growth that determine its rate in terms of agents' behavior change in the socio-economic environment. Evolutionary characteristics of agents' behavior are selection, variability, heredity. They have an impact on the each component's behavior in the socio-economic environment. Thus the economy is growing (or evolves) in a fast changing environment.

Proposed approach is used for evaluation of investment and innovative development of economy in the real socio-economic conditions in Ukraine. Substantiated, that public income is not enough for financing of spheres of production and human capital. Therefore, there is development of national economy with low rate. It eliminates the possibility of using of modern innovative technologies actually.

The directions of tax policy to stimulate of investment and innovative development of Ukrainian economy are proposed.

*Keywords:* investment & innovative development, tax stimulation, evolutionary economics, tax models.

**Mohylova A.Yu.** *Management of productive capital of cognac industry enterprises of Ukraine.* – P. 127.

Substantiated that the structure of capital involved is the determining factor for predicting capitalization Odessa Cognac Factory. For this reason, to ensure capitalization of the enterprise of cognac industry in Ukraine should focus on the management of development and utilization of productive capital, which is based on planting grapes. In the article the new approach to assessing capitalization of enterprise complete cycle of cognac through organizational and economic transformation of the production capital as a resource base for future capitalization.

Focusing on the importance of the sugar content of grapes figure for the volume of alcohol, all calculations are carried out for reasons of ensuring the most collected large amounts of sugar. On this basis concluded that the possible optimization potential distribution area of land under vine particular brand. Given the optimal allocation structure planting grapes for the production of cognac alcohol at Odessa Cognac Factory «Shustov» medium duty sugar harvest grapes can be increased by 3,7%. However, EBITDA increased by 27,8%. Growth of EBITDA ratio can be interpreted as increased capitalization of the test plant. Thus, the redistribution of land area between the grape varieties are output by improving operational performance through better use of the available productive capacity.

*Keywords:* production capital, enterprise, wine industry, cognac, a full cycle of production, vineyards, EBITDA, EVA.

**Polovyan O.V., Kazakova M.G.** *Main directions of forming State strategy of sustainable regional development in Ukraine: realities and perspectives.* – P. 32.

Currently, Ukraine is facing the strategic task of economic modernization on the basis of sustainable development. One of the most popular methods of state regulation of sustainable development is a strategic planning system that balances economic, environmental and social goals of long-term community development. At the same time there is still no single approach to the definition, creation and development of an integrated strategy for sustainable development based on a holistic vision. The issue of sustainable development is especially important for Ukraine because of the high level of technogenic burden on its environment. The purpose of this research is to identify key principles, directions and features of a strategy for sustainable development of the regions of Ukraine. In the paper the influence of anthropogenic impact on the environment in Ukraine is analyzed. Using cluster analysis, the grouping of regions of Ukraine is made in terms of economic and environmental conditions. The rating analysis is carried out for the overall assessment of the economic and ecological situation in the regions of Ukraine. Research of regional development strategies of EU and Ukraine is conducted. According to its results Ukraine has no state strategy based on a holistic approach to solving the environmental problems of economic development. Existing documents highlight some aspects of sustainable development, but they are not complex. In its turn the analysis of the strategy "Europe 2020" confirms its holistic platform, complexity and focus on the coordination of social, economic and environmental objectives of society development. The authors of the paper suggest a number of directions for ensuring sustainable regional development in Ukraine. The practical implementation of the proposed recommendations will promote a process of changing qualitative characteristics of socio-economic systems within environmental constraints to provide opportunities to meet the needs of future generations.

*Keywords:* anthropogenic impact, sustainable development, holism, strategy of regional development

**Sokolovska O.V., Sokolovskyi D.B.** *Modeling of budget spending of Donetsk region.* – P. 56.

In current Ukrainian forecasting practice budget expenditures are often planned according to achieved results, taking into account the inflation rate. But this principle does not allow defining medium- and long term trends, which provides evidence of lack of adequate forecasting of local budget expenditures. Now the scientifically-based approach to

forecast local budget expenditures is required; the latest is impossible without using of mathematical and economic models.

Given paper is aimed to develop scientifically based methods and models in order to forecast local budget expenditures and to make a medium-term forecast of local budget expenditures for Donetsk region. In order to choose an appropriate forecasting model, based on existing theoretical issues, we distinguished three classes of forecasting models: microsimulation models, component-based-models, regional-level models. This analysis allowed us to determine the forecasting technique which is the mixed variant of deterministic and econometric models. It based on using of correlatable factors, which influence directly on benchmark parameter – budget expenditures. Such technique provides the medium-term forecasting of budget expenditures in Donetsk region for 2014-2016. Input model data includes official statistical data for all considering indexes and also for benchmark parameter, covering period 2006-2013, by half-year.

After preliminary estimates we've chosen two forecasting models of multivariate regression type: additive and multiplicative (logarithmic) models. Modeling results showed that ratio between budget expenditures in Donetsk region and Ukraine's GDP is sufficiently stable, it changes continuously according to political and economical government decisions; the saccadic changes can be naturally explained by hypothesis of external pulse effects (as it was in the second half of 2008). The chosen models allowed us to make a medium-term forecast of local budget expenditures of Donetsk region.

Results of forecasting, as well as analytical conclusions can be useful for budget management in Donetsk region. Developed mathematical economic models can be used to forecast spending of local budgets of Ukraine.

*Keywords:* local budgets, expenditures, modeling, forecasting, multivariate regression.

**Shemiakina N.V., Gorinenko A.S.** *Improving the practice of financial support of industrial development.* – P. 84.

The article analyzes the financial and credit support of industrial development. The paper analyses the current state of investment activity in Ukraine and the development issues in the investments of industry. It analyzes problems connected with forming the investment policy and a number of measures aimed at improving the situation. In the context of the global financial crisis as well as political instability and economic deficiencies of Ukrainian governance, the investment climate in Ukraine in 2008-2009 was significantly degenerated. The article analyzes the structure of capital investment, and shows

the dynamics of gross capital investment in industry, and the GDP. It's proposed possible ways of using and improving methods of optimizing the structure of financial sources of investment in the main headband. The article analyzes the current state of innovation activities in the Ukrainian industry in recent years. The article analyzes the trends and structure of the investment in the innovation products and processes. The paper reviews a variety of financial resources of technical development on industrial enterprises. As well as article analyzes the financial results of Ukrainian companies and revealed their negative trend. The article analyzes the net profit of industrial enterprises. The paper is determined that banks should be the main financial centers of industrial development in the modern condition. It's determined that alternative funding mechanisms of the technical development in the industry has not been sufficiently developed. The paper is considered the international experience of financial support of industrial development. It's determined that an achievement of economic stability and renewal of industrial production requires an active investment policy and justified long-term strategic direction. It should be aimed at the creation, capacity and efficiency of scientific and technical potential of industry according to national requirements. The research of financing industrial development issues allowed outlining the potential directions for improvement of the system of financing industrial development in the medium term.

*Keywords:* financial support, investment, economic development, industry, analysis of innovation.

**Shevtsova G.Z.** *Organized synergy as an imperative of integration strategies (based on the study of Russian chemical and petrochemical holdings).* – P. 118.

The paper studies the formation of powerful holdings in the Russian chemical and petrochemical industry as well as the latest tendencies on the merges – acquisitions industry market. The industry is being reformed and consolidated; the monopoly structures are created. Strategic synergism plays an important role in these processes. The relevance of this study is high because similar processes are currently undergoing in the Ukrainian chemical industry.

The main objective of the current work is to study and summarize the rich Russian experience in implementation of integration strategies in the chemical complex and analyze their synergetic basis.

The conducted research proved that the imperative of modern integration strategies in the chemical industry business structures is organizing and implementing different kinds of synergies with the goal of creating a sustainable basis for their competitive advantages in both domestic and global markets.

As a result, the large vertically integrated chemical holdings that seek and retrieve the well-known benefits of synergism are formed.

It is explored that currently the main trend of M&A industry market is a focused construction of full chains of interrelated business segments. This includes own raw materials base, efficient processing capacities, logistics and distribution networks.

It is shown that the acquisition of foreign production assets, transportation and distribution systems and receiving synergetic advantages associated with that is one of the modern tools for advancing on international markets.

Synergy-based integration strategies should be considered as a mechanism for creating strong national integrated structures with aim to withstand the global industry giants. The current trend aimed at consolidating the Russian chemical industry should be preserved in the nearest perspective. The Ukrainian chemical assets are still a target for acquisition strategies of Russian holdings.

*Keywords:* organized synergy, synergetic effect, integration strategy, holding, M&A, chemical and petrochemical industry.

**Vishnevskiy V.P., Chekina V.D.** *Strategic directions of tax policy of Ukraine in the sphere of industrial development regulation. – P. 17.*

It was determined that tax policy of Ukraine strategically remains in the state of uncertainty. We need the clear definition and consistent observance of long-term priorities of social and economic development in a whole and the taxation in particular, that maintain stability of business operations and are of key importance for investment decisions making.

The global financial and economic crisis of 2008-2009 has demonstrated that the EU is going through the hard times nowadays and obviously loses the global economic competition to the South. The directive toward the economic integration with EU

goes against the Ukrainian economic interests at least in point of development prospects of industry which as it is shown firstly is a generally accepted generator of economic innovations and secondly is still the leading sector of the national economy that supports close cooperation ties with countries of the Custom Union (CU).

Ukraine relates to the post-Soviet countries with incomes that are below average. In this connection, it is necessary to solve the problems, which are typical for developing countries and to find new growth opportunities related to including of value generation in global chains focused on the South, which is on the upswing in a present historical period. That is why at the present time, it makes sense to develop the tax system with caution to the developing countries, which also use the achievements of modern economic theory. In this connection, the experience of the tax incentives in successful developing countries (China, India, Brazil, South Africa, the Russian Federation, Kazakhstan and Belarus) was reviewed.

The proposals for the strategic directions of tax policy of Ukraine in the sphere of regulation of the industry were grounded. The main directions of tax policy for mid-term (5-7 years) should be the creation of favorable conditions for innovative development by means of provision of efficient tax incentives for scientific, research and innovative activity. The strategic direction of tax policy for long-term perspective (10-15 years) should be the creation of favorable conditions for the sustainable development of the country and neoindustrialization by means of shifting from income taxation to levying of resource usage and gradual transition to the principles of "green" tax reform.

*Keywords:* tax policy, tax incentives, developing countries, strategic directions, industry, neoindustrialization.

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