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OPTIMIZATION OF CORPORATE PROFIT TAXATION IN THE CONTEXT OF STIMULATING THEIR INVESTMENT ACTIVITY: THE CASE OF UKRAINE

The article describes various methods of tax optimization in the implementation of corporate tax management of a business entity, in particular mechanisms for reducing the tax base, using tax breaks, and a special tax regime, changing the place of registration of taxpayers.
The methodology of economic and mathematical modelling was used to optimize the tax burden of a business entity by balancing between the part of corporate income tax (investment tax credit), that an enterprise should use for investing, and the part paid to the budget.
The developed economic-mathematical model of determining the proportion of «investment tax credit» entity has two objective functions – maximum value of the entity's profit and maximum of the accrued taxes sum. The offered economic-mathematical model will allow to define effective strategies of management of enterprise's profit and demonstrate advantages of preferential taxation for activation of investment activity of the enterprise.
JEL: C02; H25; H32; G30

In the conditions of an unstable external economic environment, the issue of finding mechanisms for optimizing tax burden is becoming increasingly pressing for business entities. The level of the tax burden in Ukraine indicates that business entities should give a significant portion of their profit to the state.

The tax burden "washes away" a large share of working capital of an enterprise, thereby reducing its financial stability and paying capacity, depriving it of the financial resources necessary for extended reproduction.

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Issue of the tax burden optimization for the taxpayers was deeply researched by Arthur Laffer already in the 1970s of the twentieth century. According to the scientist's conclusion, the negative impact of the tax burden on the investment activity of business entities causes a decrease in the state tax revenues in the future, as the state's attempts to maximize the tax rate lead to an increase in taxpayers' resistance and ultimately the amount of tax revenues of the state are decreasing (Blankart, 2000).

In modern financial science, the taxation research line and in particular, the economic content of the tax burden have been actively developing. Here are some definitions of this notion.

Sokolovska A. (2006) equates the concept of tax load and tax burden and defines it as an influence of taxation on the economic system as a whole and on the taxpayers; as a combination of economic constraints that arise as a result of tax payments and transfer of the free funds to the budget, instead of other possible ways of their use by the business entities.

According to the authors (Reed & Rogers, 2006), the tax burden is the fraction of resources spent on payment of the taxes on the personal income of economic entities.

US economist Joseph Stiglitz (1998) provides an excellent definition of the tax burden in his work «Public Sector Economy» and argues that the term «tax burden» is used by scientists and experts to identify the number of individuals who actually carry a tax burden regardless of the circle of taxpayers, who are defined by law. Thus, the aim of the tax burden research is to determine the actual «tax burden-bearer» and tax liability.

The term "tax incidence" is widely used in English literature. In the paper, authored by G. Metcalf & D. Fullerton (2002), tax incidence is defined as an analysis of the taxation role in the distribution of wealth in the economic system and the search for a tax burden bearer.

This research begins with the analysis of taxes transferring process, when the payer, who is legally obliged to pay a specific tax, does not necessarily pay it and is, in fact, not a taxpayer.

Modern financial science also distinguishes between the notions of «tax limit» and "tax burden".

The boundary of economic entities taxation is a fixed upper limit of economic entities and individuals' tax deductions that enable the implementation of the fiscal policy of the state and stimulation of innovative, scientific, technical, investment and production activities in all spheres of the state economy.

The upper limit of tax deductions could not be the same for different states with first-rate organization of financial systems. Such a limit is connected with differences and peculiarities of the historical socio-economic development of the state. Scientists and experts agree that the level of upper limit deductions to the budgets is relatively higher in unitary states with smaller territory than in the states with a federal system, that are territorially larger and more differentiated by the level of socio-cultural development (Malyshkin, 2015).

The tax burden, unlike the tax limit, is characteristic of the general functioning of the tax system in the state, which shows how the level of tax rates and the amount of tax payments influence the financial status of the taxpayers or the economic system as a whole and provides a quantitative assessment of this impact (the size of tax payments, their share in GDP or the income of taxpayers) (Sokolovska, 2006).

Above mentioned differentiation of tax limit and tax burden consider these concepts at the macro level. At the micro-level, if to regard business entities as taxpayers, these concepts can be seen as identical, since they reflect the deduction of the entrepreneur's income share to the state budget.

The level of tax burden at the macro level, as indicated by (Tsymbaliuk, Vyshnevska, 2012), reflects the features of the state tax policy, as it allows to quantify the overall impact of the taxation system on the tax payments sources.

The main drawback of the tax burden level definition, according to the assessment of taxation systems experts in the EU countries, is that it does not allow calculating the level of taxation and burden on individual sectors of the economy and groups of taxpayers in a realistic way.

Bench N. (2008) defines the tax burden as a generalized economic category that designates the tax system sphere of influence and the totality of the effects of its impact on the economy, production factors and concrete payers.

In order to study the functioning of an entity with regard to various strategies for optimizing tax burden, the economic-mathematical modelling is used.

The application of economic-mathematical modelling for improving tax management is determined by the fact that this method allows us to analyze the behaviour of a business entity in relation to different management strategies and choose the best among them.

An economic-mathematical model means a concentrated expression of the most important economic interactions of the studied objects (processes) in the form of mathematical functions, inequalities and equations (Vitlinskyi, 2003).

The application of economic and mathematical modelling to the study of corporate tax management tasks varies considerably at macroeconomic (regional) and microeconomic levels.

Taking into account that the procedure for tax charges and tax payment is clearly stated in the documents, most researches devote their studies to the dynamics of tax charges and tax payment at the macroeconomic level.

In this case, econometric methods and models are usually used to research the correlation between different economic variables of the tax system.

According to V. Vitlinskyi et al. (2001), in order to predict tax revenue, it is necessary to look at the retrospective data on the return of taxes plans for the previous periods and the degree of their performance.

Within this approach, a set of models for predicting and planning tax revenues, taking into account tax risk, are built with the help of ARIMA and ARIMAS models (seasonal components are taken into consideration) (Tereshchenko, 2000).

Possibility of forecasting the volumes of tax revenues, taking into account the risk of under-execution of planned revenues, is the advantage of these models. The disadvantage of this approach is that the built models simply describe the dynamics of tax revenues without taking into account the underlying factors that predetermine the development of the tax system.

The research (Semerak, 2007) highlights the impact of taxation on an enterprise using the social welfare function and builds a model of the enterprise tax strategy choice using the "fuzzy logic" approach.

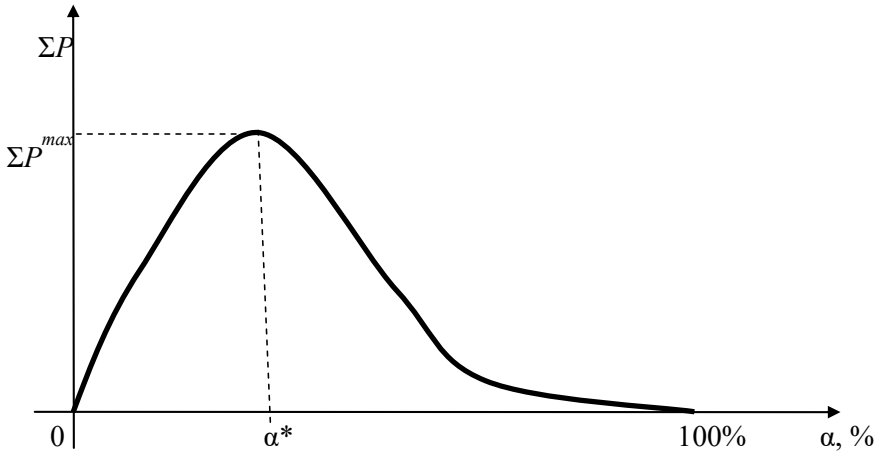
The organization of tax management is characterized by the interaction of the enterprise and the state. On the one hand, the authorities organize the tax process and determine the tax rates; on the other hand, the company accepts the rules of conduct when paying taxes and while assessing the corresponding amounts of taxes.

In this case, the tax rate affects the amount of taxes paid: when the tax rate increases to a certain level α *, the amount of tax accruals and paid taxes ΣP (the amount of budget revenues) increases, while further growth of the tax rate leads to a reduction in the amount of collected taxes due to the fact that it will be unprofitable for the company to carry out a legal activity (to make its activities "shadow") (Savchenko, 1999).

To determine the optimal size of the tax rate, various mechanisms are used, in particular the methodology of econometric modelling and the study of the relationship between economic variables. Laffer Curve describes this dependence (see Figure 1).

Figure 1

Dependence between the amount of the tax rate and the amount of budget revenues



At the microeconomic level, special attention is paid to the problems of choosing a tax system or alternatives to managing tax burdens; optimization of tax load management; assessment and analysis of the impact economic indicators make on the tax burden of an enterprise; estimating tax deductions; modelling the functioning of enterprises taking into account tax processes (Yastrebova, 2009).

One of the approaches to optimizing corporate tax management is the method of determining the break-even point, which allows for accurate estimation of critical volumes of production, taking into account the tax factor for the organization of break-even activity (Serdiuk, 2007).

In order to study the mechanism of the relationship between a taxpayer and the controlling bodies, it is also possible to use game techniques used in the analysis of conflict situations (Proskura, 2007). In this case, the search and analysis of effective taxpayer and tax inspector behaviour strategies are conducted. The impact of motivation and different accounting metrics used to evaluate CEO and chief executive officers performance for annual bonuses affect the level of corporate tax planning effectiveness is investigated by Phillips J. D. (2003); Powers, K., Robinson, J. R. & Stomberg, B. (2016).

When implementing corporate tax management, various methods of tax optimization are used at the microeconomic level, in particular, distinguishing between legal and illegal methods of reduction of tax liabilities, special methods of optimization (replacement of relations, distribution of relations, delayed tax payments, reduction of the legal tax unit, the offshore practice), the application of tax privileges and exemptions, etc. (Bryzhalin, 2000).

In practice, there is often a problem of establishing a line between tax optimization and tax evasion. Hanwen Chen, Daoguang Yang, Xinmin Zhang & Nan Zhou (2020) studied the role of internal control in tax avoidance by evaluating the efficacy of the COSO framework in tax risk management in China. Often tax evasion is associated with a low culture of the taxpayers. However, the main reason for tax evasion is the excess of the non-payment benefits compared to public goods that taxpayers receive from the state for paying taxes and fees. Even punishment for such illegal acts does not deter payers, since the size of the penalties is rather low compared to the tax evasion gain.

Tax evasion is manifested in shadow activities, concealment or substitution of the taxation object, non-submission of tax returns, implementation of false transactions, and the accounting violations of tax law.

Clear determination of the paying taxes procedure by economic entities is a peculiarity of modelling that represents the functioning of the tax sphere, namely, on the basis of primary documents and tax rates, the amount of taxes that they have to pay to the budget is determined. In case when the value of gross profit is shown, the calculation of the amount of the enterprise's profit tax is automatically carried out. On the basis of data on the total amount of accrued wages and rewards for the work performed (services rendered), the amount of the single social contribution (payroll tax) and personal income tax (wage arrears) are accrued. The basis for the calculation of value-added tax are the primary documents on the means of production flow, etc.

When implementing corporate tax management, different methods of tax optimization can be applied. In this case, the methods of optimizing the tax burden are mainly mechanisms of reducing the tax base, the use of tax breaks, the use of a special tax regime, and taxpayer's place of registration change (see Table 1).

Table 1

Classification of tax optimization methods

Method	Meaning of the method
Methods of optimizing the tax burden without changing the structure of the taxes that should be paid	
The tax base reduction	Manipulation with prices, cost manipulation, change in the form and conditions of contractual relations, the formation of an appropriate accounting policy
Tax rate reduction	Organization of separate record of supplies that use different rates, creating conditions for the use of lower rates
Use of reduced payments and tax liabiliies	Using tax incentives provided by the legislation, change of activity for obtaining tax privileges
Changing the order and terms of taxes payment	Contract terms change, creating and using reserves, delaying payment of taxes
Methods of optimizing the tax burden by changing the structure of the taxes that should be paid	
Reduced list of taxes paid	Changing organizational and legal form, changing the status of a legal person or individual
Use of special tax regime	Simplified taxation system (fixed agricultural tax, single tax for small businesses of legal entities and individuals)
Changing the taxpayer's place of registration	Registration in an offshore foreign jurisdiction, registration in a free (special) economic zone within the country

Source: Compiled by the authors on the basis of Bukina, 2007 and Semenov, 2004.

To optimize the tax burden, business entities can use different strategies. One such strategy may be the balancing between the part of the corporate income tax (investment tax credit) that an enterprise should use for investing (acquisition of fixed assets, intangible assets, corporate rights and securities, upgrading of production), and the part of the corporate income that the enterprises should pay to the budget.

When choosing a method of tax optimization for the subjects of economic activity, it is necessary to conduct a detailed analysis of consequences that appear as a result of using a specific mechanism of tax policy and their impact on the dynamics of the enterprise.

An important consequence of the business entity tax policy (application of a particular method of optimizing the tax burden) is the formation of the tax history of the enterprise (in analogy to «credit history»), which, from the point of view of tax authorities, will determine the tendency of the entrepreneurial activity subject to illegal evasion (partial payment) of taxes and, as a result, will give rise to a detailed examination of its activities.

In today's economic environment, corporate income tax is one of the main taxes paid by entities, since it is the profit that is the main purpose of any business entity. Revenue is a source of enterprise asset updates and a source of investment in different projects, in particular, innovation projects. Unlike other direct taxes, this tax is paid by all legal entities, so the use of regulatory instruments in this direction will involve more entities. In addition

to income tax, businesses also pay value-added tax and excise taxes (indirect taxes), but the amounts of these taxes are almost completely transferred to the end consumer of the enterprise's products, so there is no direct tax pressure on the entity. For other compulsory payments, such as the payments to Social Security Fund, which accrue to the payroll, benefits for these payments are social and do not stimulate investment of enterprises.

How different ways of taxing capital income affect firms' investment and financial policies over their life cycle is researched by Andrés Erosa & Beatriz González (2019). Bishnu, M., Ghate, C. & Gopalakrishnan, P. (2016) studied why countries with different tax arrangements exhibit the same growth rate. The role of corporate tax planning in industry competition is examined by Armstrong C. S., Glaeser S. & Kepler J. D. (2019).

To optimize the tax burden, business entities can use different strategies. One such strategy may be the balancing between the share of the corporate income tax (so-called investment tax credit) that an enterprise should use for investing (acquisition of fixed assets, intangible assets, corporate rights and securities, modernization and upgrading of production), and the share that is paid to the budget.

Thus, a tax investment loan is one of the most widespread and most effective tools for stimulating investment and innovation activity. Most often, a tax investment loan is granted to business entities in the form of an income tax-deferred payment for a specified period in order to accumulate its investment capital for the implementation of innovative programs. The shortfall of the income in the budget is further compensated by expanding the tax base: increasing the income of taxpayers as a result of which the amount of income tax also increases (Peresada, Maiorova, 2002).

S. Mochernyi (2005) notes that ITC (investment tax credit) is a temporary deferred income tax payment used in order to increase the financial resources of an entity for the implementation of innovative projects. In essence, an investment tax credit is actually similar to the preferential tax on corporate profits.

The tax investment credit is so common due to the fact that it is profitable both for the state and for economic entities. The advantages of this tool for the state are (Matishchak, 2014):

1) increase in the competitiveness of the country's economy that is achieved through the introduction of new technologies, in particular, those that are aimed at saving the energy, through the upgrading of production capacities, which promotes employment, environmental protection and raises the standard of living in general;
2) increase in the production and sales volume through the growth of enterprises economic efficiency, which ensures the increase of tax revenues to the state budget due to increased turnover and profits of taxpayers;
3) increase of the wages level as a result of the demand for skilled labour, which will ensure the growth of taxes from the incomes of citizens.

From the entrepreneurial structures point of view, the thing that is important when using an investment tax credit is that it supports a positive investment environment and stimulates the financial and economic activity efficiency increase of business entities, since only enterprises that implement investment and innovation projects can apply for a tax credit.

The use of an investment tax credit has several advantages over the use of bank loans. Bank lending is carried out on the conditions of repayment and interest is fairly high, so the implementation of especially innovative investment projects at the expense of bank loans is complicated. Bank loan presupposes the availability of highly liquid mortgages, unlike investment tax credit, which does not take working capital or other highly liquid assets from the company's turnover (Maiorova, 2015).

In fact, the investment tax credit involves the investment resource potential of the company in the form of a profit (part of the profit, which should be directed to the budget as a tax on profit). Therefore, an investment tax credit stimulates entrepreneurs to increase their profitability level and investment activity.

In world practice, tax deductions are actively used to promote investment and innovation activities of the enterprises. Developed countries widely make use of investment tax credits to implement Research and Advanced Development.

The United States is the establisher and modern leader in the Research and Advanced Development in the corporate sector (one-third of the world's capacity). The country applies research tax credit and the so-called alternative incremental credit with a graduated rate that grows with increasing R&D expenditures (Nikiforov et al., 2009). In the United States, the value of an investment tax credit ranges from 6 to 10% of investment in equipment.

France is ranked the first among the OECD countries in terms of spending on research activities. Investment tax credit (pump-priming credit) charges 30% of research expenditures of up to 100 million euros and 5% of over 100 million euros.

Companies that were the first to apply for such a discount can get a credit of 50% during the first year and 40% during the second year (Avihdor, 2011). In 2000, England also introduced 150% R&D write-off expenses for small and medium-sized businesses and 125% for large enterprises (Nikiforov et al., 2009).

A similar mechanism of R&D tax incentives is also used in Spain: companies are allowed to deduct 100% of their R&D for the prime costs and they can get a loan of 30% of R&D costs, and if the sum of these costs exceeds average costs over the past two years, they can get 50% of the excess (Avihdor, 2011).

According to Hungarian legislation, tax incentives for innovation could be made by reducing taxes on company profits or through a tax credit. Such benefits can be obtained by any taxpayer who invests in innovative projects of over 100 million forints. Thus, the company can reduce its income tax by as much as 80% (Moldovan, 2013).

It should also be noted that, in many countries, favourable tax treatment depends on the size of the enterprise, in particular in Canada, Italy, Japan, the Netherlands and Denmark, small and medium-sized innovation enterprises receive more tax incentives (OECD, 2009).

In particular, in Japan, an enterprise has the right to deduct 7% volume of investments in equipment which is used for carrying out scientific research on the creation of new materials and electronic equipment from the income tax.

In general, the calculation of the tax investment credit base varies in different countries and depends on the objectives of such lending. In some countries (Japan, Denmark) a certain amount of investment in basic research is reimbursed and only these costs are taken into account while calculating the base. Often, this current base also includes other current R&D expenses.

In a number of countries (Canada, Spain, Korea, France, Italy) these costs or the cost of the main capital depreciation are added to the investment value of the main assets belonging to the R&D sector. In the Netherlands, a tax credit is granted on the basis of worker's wage involved in the implementation of R&D.

The tax policy of Ukraine is characterized by the fact that a fairly significant part of the profit of the national economy is deduced from the business entities in the form of a profit tax. Thus, the effective tax rate on income for most types of economic activity exceeds the nominal tax rate.

The corporate profit tax in Ukraine has become exclusively a fiscal instrument. Its regulatory potential is practically not used, and in today's economic conditions, this tool plays an important role in tax competition.

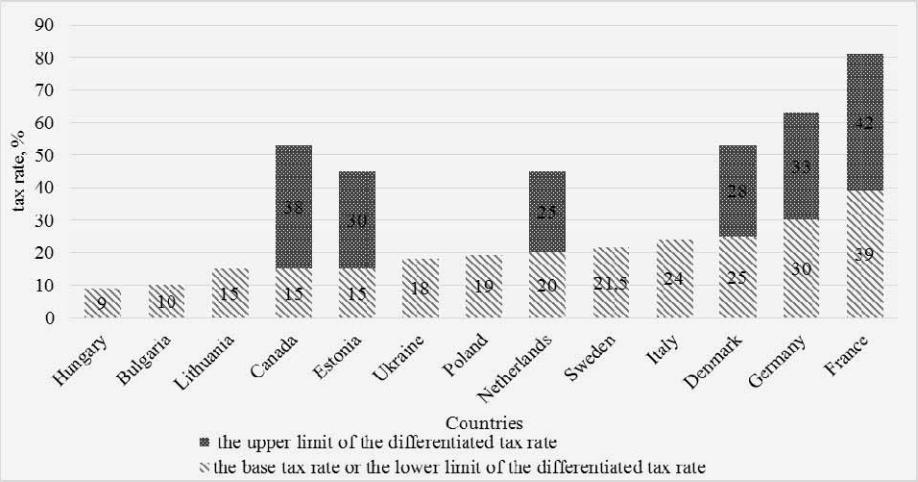
Thus, the nominal rate of corporate profit tax in Ukraine was 25% (valid until January 1, 2011), in comparison with similar rates in European countries at that time it was low; however, it created significant tax pressure on domestic enterprises. At that time, in the 2000s, global capital market trends showed a steady decline in corporation tax rates.

So, if in the early 2000s average income tax rate was 30-40% in the EU countries, then in the late 2000s its average level was within the range of 20-30%. (OECD, 2009) According to the world fiscal trends in Ukraine, with the adoption of the Tax Code, the profit tax rate is gradually decreasing. In particular, from April 1, 2011, the tax rate on income was 23%, from January 1, 2012 – 21%, from January 1, 2013 – 19%, from January 2014 and until 2019 – 18%. Business tax rates in different countries for comparison are shown in Figure 2.

As the chart shows, highly developed countries in the world (Germany, the Netherlands, Denmark, France, Canada) mainly use differentiated rates to tax corporate profits. The differentiation depends mainly on the size of the company turnover and the features of profit-sharing – reinvestment or consumption. Mid-tier countries have mainly a basic rate of income tax and an extensive system of rates for special-type operations. Low-income tax rates are observed in Bulgaria and Hungary – 10% and 9% respectively. The income tax rate in Ukraine is low compared to other countries. The basic corporate income tax rate in Ukraine is generally low compared to developed countries. However, the tax pressure on corporate profits due to the widespread use of tax benefits abroad is lower than in Ukraine. Business conditions, the mechanism of tax administration and the features of calculating the tax base are more complicated in Ukraine.

Figure 2

Enterprise (corporate tax) income tax rates in countries around the world



Source: Compiled by the authors on the basis of the source The World Bank, (2019).

The corporate income taxpayers in Ukraine are the legal entities listed in Table 2.

Table 2

Income taxpayers in Ukraine

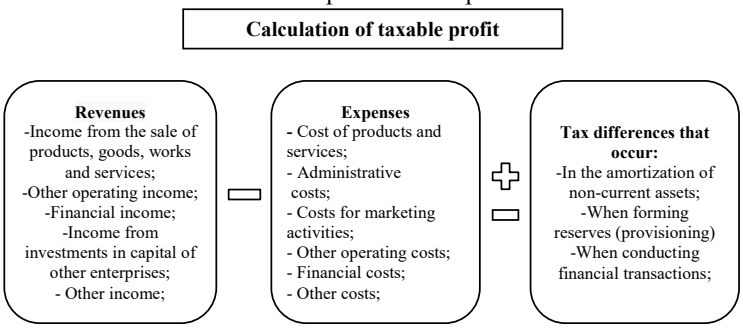
Residents	Non-residents
• business entities – legal entities that carry on business both in Ukraine and abroad, except: 1) public institutions; 2) public associations, political parties, religious, non-profit organizations, pension funds, charity founds, members of governing bodies, other related persons, as well as among employees of such organizations; 3) entities that apply a simplified system of taxation, accounting and reporting. • National Bank of Ukraine • managers of real estate operations funds	• permanent representative offices of non-residents who receive income with a source of origin from Ukraine or perform agency (representative) and other functions in relation to such non-residents or their founders • legal entities formed in any legal form and receiving income originating from Ukraine, except for institutions and organizations having diplomatic privileges or function with immunity under international treaties of Ukraine

Source: Compiled by the authors on the basis of the source Tax code of Ukraine (2010).

The object of taxation of this tax is taxable profit. That is calculated as shown on Figure 3.

Figure 3

Calculation of taxable profit of enterprises in Ukraine



Source: Compiled by the authors on the basis of the source Tax code of Ukraine. (2010).

To determine the amount of income tax, the object of taxation (taxable income) is multiplied by the tax rate.

In Ukraine, small and medium-sized businesses are taxed under a simplified system, paying a single tax. The operating conditions for taxation of small and medium-sized businesses are shown in Table 3.

Table 3

Single taxpayer groups in Ukraine

Single taxpayer groups	Tax rate
The first group is individuals-entrepreneur who do not hire labour force hired labour. They can only carry out retail sales of goods in the markets and/or carry out business activities for providing household services to the population. The entrepreneur's income does not exceed UAH 300,000 during the calendar year.	Tax rate – up to 10 percent of the subsistence level. The subsistence level is reviewed periodically. According to the state budget, in 2020 the subsistence minimum for one person per month is: from January 1, 2020 – UAH 2027, from July 1 – UAH 2118, since December 1 – UAH 2189.
The second group – individuals-entrepreneurs providing services and/or sale of goods, activities in the field of restaurant business. They operate without hired employees or the number of persons who are with them in employment, at the same time does not exceed 10 people, and their income does not exceed UAH 1,500,000 during the calendar year.	Tax rate – up to 20 percent of the minimum wage. The minimum wage is revised periodically. The minimum wage in Ukraine since January 1, 2020, is 4723 UAH per month or 28.31 UAH per hour.
The third group – entrepreneurs who operate without hired employees or the number of persons who are with them in employment are not limited and legal entities-entities of any legal form, in which the amount of income does not exceed UAH 5,000,000 during the calendar year.	The single tax rate is set as a percentage of the revenue received: 3% for VAT payers); 5% of VAT revenue for non-payers). VAT is 20%.
The fourth group – agricultural producers, whose share of agricultural production is equal to or exceeds 75% in the previous tax (reporting) year	The tax base is the monetary valuation of one hectare of agricultural land.

Source: Compiled by the authors on the basis of source Tax code of Ukraine. (2010).

We consider it is necessary to increase their annual income for small and medium-sized businesses. These volumes are critically small in today's business environment and macroeconomic conditions, in particular processes of inflation.

In general, the main tax incentives widely used in the United States, Canada, the United Kingdom and the European Union include:

1) The application of accelerated depreciation while maintaining full life and high depreciation rates in the early years. Depreciation payments in different countries have a different role in the investment processes of the enterprise: in some countries, they are the main source of investment, in others – they compensate for the renewal of individual fixed assets. Also interesting is the experience of using depreciation as an indirect tax incentive to stimulate investment in less developed economics regions or as an additional incentive for the development of priority industries. A rather specific tool that is used in developed countries is the depreciation charge for the acquisition of intellectual property. In Ukraine, the accelerated depreciation method can be applied to one of sixteen groups of fixed assets – machinery and equipment.

2) Direct reduction of profit, to which we aply tax by the full amount or by a limited fixed amount, or by the share of the expenses of the corporation's income, which are directed to the statutory investment goals and the implementation of research and development activities (tax investment credit described above).

In addition, the Code provided temporary taxation (before 2020) exemption for the certain types of economic activity. In particular, this has applied to the aircraft industry and the income of enterprises derived from the economic activity connected with gas (methane), coal deposits or electricity (Tax code of Ukraine, 2010).

3) Exemption from income tax on contributions to investment and reserve funds of companies, as well as income from the placement on the financial market of such assets.

4) Full or partial exemption from taxation of profits of new enterprises for a certain period on the criterion of priority development of the industry, support or development of the region, small or medium-sized businesses. In Ukraine, the legislation provides for tax breaks (zero-income tax payment) to small business entities whose annual income for the last annual reporting period does not exceed UAH 3 million and the amount of salary (income) accrued for each month each of the employees is not less than two minimum wages and in which the average number of employees is less than 50 (less than 20 for active enterprises that meet the rest of the requirements). Such criteria are very difficult to meet, as a new company with this amount of annual income is usually unable to pay each employee the salary required. Therefore, the opportunity to obtain such tax benefits is limited.

5) The possibility to choose between taxation of income received at the level of the business entity or taxation of derived capital. In Ukraine, there is a practice of double taxation of this income: first, the profit is taxed before it is distributed among the shareholders by the corporate income tax, then the dividends are taxed on the personal income tax.

6) Deferral and deferral of tax payment, which allows to increase sources of investment resources.

7) The proportion of corporations' gross expenditures as a proportion of representation expenses, a portion of employee social security expenses, and a portion of the cost of additional staff education.

These measures, under the favourable conditions of economic activity, and the existence of clear legally defined rules should gradually transform the profit tax into a regulatory-stimulating instrument for the development of production in Ukraine. However, the realities of economic life in Ukraine, in the particular shadow economy and corruption schemes, cast doubt on the effectiveness of such transformations.

One of the main relative indicators that calculate, when examining the effectiveness of the operation of certain taxes, or the tax system as a whole, is the tax burden. We calculate the non-income tax burden in two ways:

- As the ratio of corporate income tax revenues in the budget revenues to corporate profits as a direct tax base;
- As the ratio of revenues from the corporate income tax in the budget to the revenue from the sale of products as the main source of tax payment (Table 4).

Important indicators of the regulatory impact of corporate income tax are their investment activity. The table also shows data on capital investments made by Ukrainian enterprises.

Table 4

Tax burden on corporate income tax and investment activity enterprises in Ukraine

Years	Income tax burden,%	Tax burden on GRP,%	Total capital investment, UAH mln	Capital investments made at the expense of own funds of enterprises and organizations, UAH mln	Share of capital investments made from own funds of enterprise and organizations in the total capital investment structure,%
2011	21.42	1.37	241286.0	147569.6	0.61
2012	22.17	1.31	273256.0	171176.6	0.63
2013	25.58	1.33	249873.4	165786.7	0.66
2014	17.10	0.96	219419.9	154629.5	0.70
2015	8.97	0.67	273116.4	184351.3	0.67
2016	12.27	0.87	359216.1	248769.4	0.69
2017	11.28	0.87	448461.5	310061.7	0.69
2018	14.48	1.05	578726.4	409585.5	0.71

Source: compiled and calculated by the authors on the basis of the data of the State Statistics Service of Ukraine (2019).

At present, the capital source of enterprises and organizations is the main source of capital investment sources, the share of which in the overall structure over the last years has been steadily about 70% and shows a growing trend – in 2018 it was 71% and has increased by 10% in comparison with 2011. Thus, the opportunity to increase investment activity is

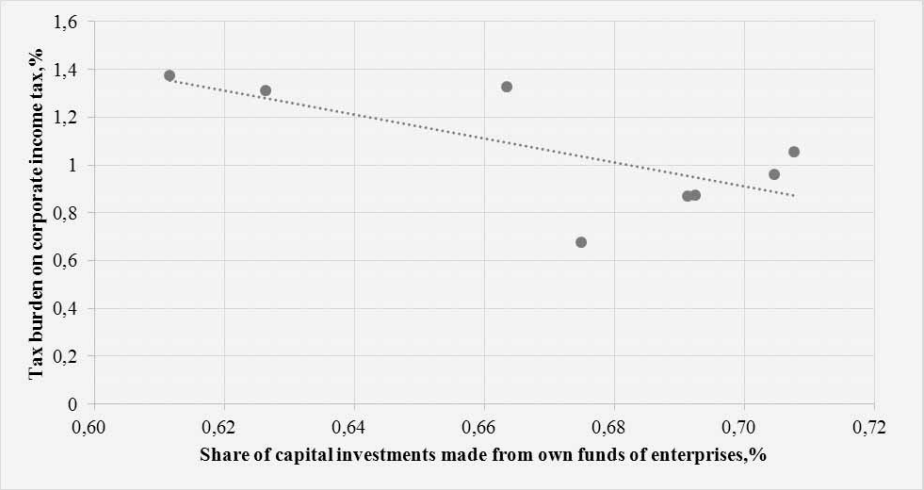
determined primarily by the financial condition of the enterprise, and to improve it requires appropriate government policy.

Correlation analysis of the tax burden on corporate income tax and the share of capital investments made at the expense of the own funds of enterprises showed that there is an inverse relationship – the correlation coefficient is -0.697 (Figure 4). This indicates that reducing the tax burden on enterprises leads to an increase in the share of capital investments made at the expense of the economic entities' own funds.

Thus, the state should focus on this interconnection and provide tax incentives aimed at intensifying investment processes in enterprises. There should also be tight control on the targeted use of these benefits with a well-developed system of penalties for violations.

Figure 4

The relationship between the tax burden on corporate income tax and the share of capital investment made from own funds of enterprises during 2011-2018



Source: Formed by the authors according to the data of the Ministry of Finance of Ukraine (2019) and the State Statistics Service of Ukraine (2019).

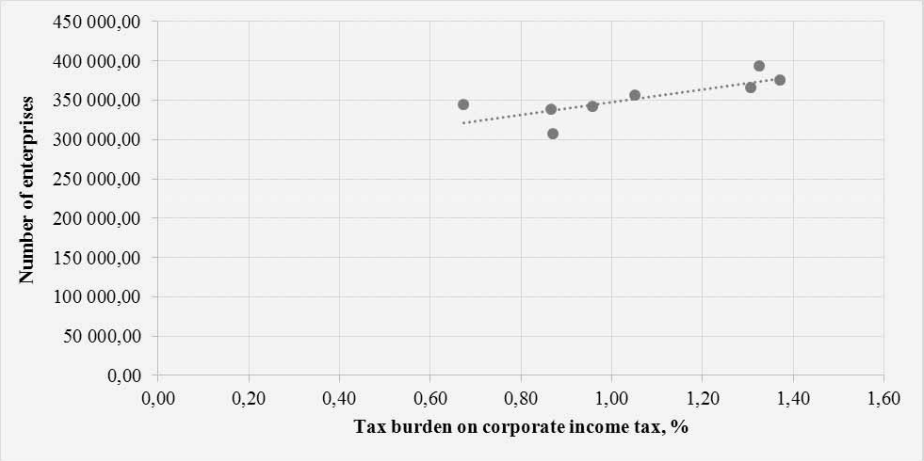
The above information on the incentives for corporate income tax benefits and the results of correlation analysis make it possible to conclude that the income tax is not used as a tool to stimulate investment activity of enterprises.

To study the impact of the tax burden on business activity, we conducted a correlation analysis of the tax burden and the number of enterprises. The results of the analysis showed that there is a close direct relationship between these values (R2 = +0,782) (Figure 5). Therefore, reducing the tax pressure on the activity of enterprises does not lead to an increase in their number, but rather to a decrease, which indicates the ineffectiveness of the application of tax benefits. In the opposite situation – increasing the tax burden leads to an

increase in the number of enterprises – we can talk about the problem of bogus enterprises mentioned above.

Figure 5

The impact of corporate income the tax burden on the number of enterprises in Ukraine during 2011-2018



Source: Formed by the authors according to the data of the Ministry of Finance of Ukraine (2019) and the State Statistics Service of Ukraine (2019).

The results of the study confirm the inefficient use of the regulatory potential of corporate income tax in Ukraine.

In our opinion, in order to shade economic processes in business and improve the efficiency of the corporate income tax system, it is first of all necessary to achieve stability in the tax field, in particular, to significantly reduce the frequency of changes in tax legislation. In addition, the taxation of enterprises should focus on incentives, rather than social benefits, with criteria that are adequate to domestic realities, and ensure transparency of their provision and efficiency of use.

At present, modernization of the main production assets of Ukrainian business entities demands particular attention, taking into account the task of increasing the energy preservation, introducing energy-saving technologies, reducing the product energy consumption and increasing its competitiveness in conditions of integration into the world economic space.

In this case, it is advisable to suggest a strategy for the modernization of domestic business entities through the partial utilization of the company investment income tax. Using this strategy, the profit before tax should be divided into two parts:

1) profit that is taxed under the general scheme and is used for different purposes: financing company's logistic development, financing own working capital growth,

formation of financial reserve, repayment of long-term and medium-term bank loans, implementation of social development and personnel encouragement, payment of dividends to the owners of the enterprise, etc.;

2) profit taxed under the preferential scheme that is used for the development of company's logistics (investments).

It is worth noting that in developed countries, the share of tax investment credit in covering the cost of investment and innovation activities is 10-30%, and the rest of it (70-90%) are own and borrowed funds of business entities. In this case, the profit taxed under the preferential scheme and the investment tax credit lead to an additional increase in profit for the entity's profit during a certain period. To study the growth of profits at the expense of an investment tax credit, it is expedient to use a distributed-lag model:

$$\Delta P_t = f\left(ITC_t, ITC_{t-1}, ..., ITC_{t-\tau}, \varepsilon\right) \quad (1)$$

Where ΔP_t denotes enterprise's profit increase for the period of time *t*; ITC_t denotes amount of the investment tax credit for a certain period of time *t*; $ITC_{t-1}...,ITC_{t-\tau}$ stand for lag variables that characterize the amount of the delayed investment tax credit in 1time τ period, accordingly; τ is the maximum period of the delay (maximum length of the lag), ε denotes the random value, that characterizes an impact of non-essential, random factors, computational errors and measurements, etc.

If there is a linear dependence between the growth of the entity's profit and the amount of the investment tax credit, then the model (1) could be written as:

$$\Delta P_t = \alpha + a_0 ITC_t + a_1 ITC_{t-1} + ... + a_\tau ITC_{t-\tau} + \varepsilon, \quad (2)$$

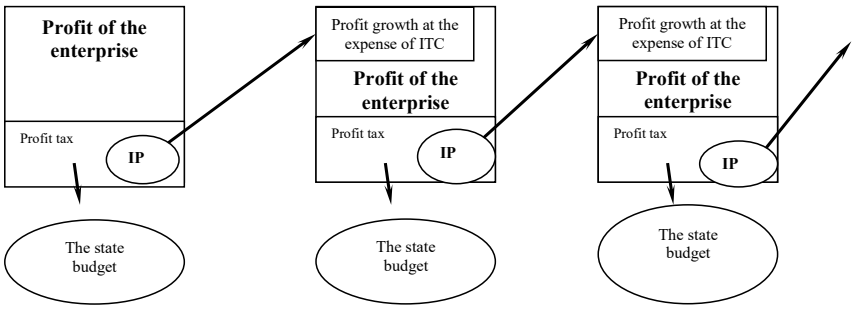
where α is initial (zero) profit level, a_0 denotes regression coefficient that describes

ITC (investment tax credit) influence on the profit increase for the current period of time, *a1* denotes regression coefficient, which describes ITC influence on the profit increase with a delay in one period of time, etc. Dependence (1) describes the case where the impact of investments on the entity's profit generation is not limited to the current period of time, but is felt for several periods which is common for the functioning of economic entities. It is worth noting that we choose a finite profit growth distributed-lag model due to the fact that after the maximum delay period τ the cost of the equipment repair (renovated or bought at the ITC expense) will exceed the amount of profit received from the investment tax credit.

The mechanism for the formation and use of the entity's profit, in this case, is shown in Figure 6.

Figure 6

Dynamics of the entity's profit generation



Source: Built by the authors.

In order to determine the fraction of the "investment tax credit" in the overall profit of a business entity, it is expedient to apply a methodology of economic-mathematical modelling, which will allow identifying effective strategies for managing the profit of the entity.

In this case, each of the participants, both enterprise and the state pursue their own diametrically opposite objectives: the business entity is interested in paying the minimum amount of taxes, which will ensure maximum profit or increase in profits, while the state wants to collect the maximum amount of taxes from business entities.

So, the economic-mathematical model of determining the "investment tax credit fraction of the entity" will have two objective functions: maximum value of the entity's profit and maximum of the accrued taxes sum.

Let t be the index of the time period ($t = \overline{1,T}$), X_{1t} the value of the business entity's profit which is taxed under the general scheme, and X_{2t} the amount of profit taxed under the preferential scheme, respectively.

The value of the investment tax credit can be calculated with the formula:

$$ITC_t = ITR \cdot X_{2t}. \quad (3)$$

Profit before the taxation of an entity *(X)* will then be equal to the sum of the profit taxed under the general and preferential schemes:

$$X_t = X_{1t} + X_{2t},\ t = \overline{1,T}. \quad (4)$$

The criterion of efficiency at the level of the entity involves maximizing the profit that is remaining at its disposal and has the following form:

$$F_1(X_{1t}, X_{2t}) = \sum_{t=1}^{T}((1-ITR)_t \cdot X_{1t} + X_{2t}) \to \max, \quad (5)$$

where ITR_t denotes income tax rate during the time period t.

The first summand of the target function (5) characterizes the entity's amount of net profit, and the second summand characterizes the value of the investment tax credit.

At the same time, the state seeks to maximize tax revenues:

$$F_2(ITR, S) = \sum_{t=1}^{T}(ITR_t \cdot X_{1t} + p \cdot S(k) \cdot ITR_t \cdot X_{2t}) \to \max, \quad (6)$$

where p denotes the probability of exposing an offence (for example, misuse of an investment tax credit for working assets funding); $S(k)$ denotes the amount of fine, which is given as a percentage in relation to the amount of the accrued tax liability for a given number k of committed offences for a certain time period.

According to the Tax Code (Податковий кодекс України) the amount of fine can take a value of 25, 50 and 75 %, so the function $S(k)$ is written as:

$$S(k) = \begin{cases} 1{,}25, & \text{if k = 1, it means that the offence is commited} \\ & \text{the first time during the last 1095 days;} \\ 1{,}50, & \text{if k = 2, it means that the offence is commited} \\ & \text{the second time during the last 1095 days;} \\ 1{,}75, & \text{if k = 3, it means that the offence is commited} \\ & \text{the third time during the last 1095 days.} \end{cases} \quad (7)$$

Unlike in function (5), the amount of fine for the misuse of the investment tax credit and the rate of corporate profit tax act as the managed variables in the target function (6).

The following restrictions could be imposed on the functioning of the corporate tax management system:

1. The total increase in the amount of tax revenue from profit (due to the growth of the tax base), which is taxed under the general scheme, should be no less than the amount of the company's foregone profit (the value of the investment tax credit):

$$\sum_{t=1}^{T} ITR_t \cdot \Delta X_{1t} \geq \sum_{t=1}^{T} ITR_t \cdot X_{2t}, \quad t = \overline{1,T}, \quad (8)$$

where ΔX_{1t} denotes profit growth which is taxed according to the general scheme.

This restriction specifies that the state "gives money" to an entity to finance key assets, so that the state compensates for the shortfall in the amount of corporate profit tax during the future periods of time at the expense of an increase in profit and investment tax credit.

2. Share of the investment tax credit of a business entity in relation to the total amount of investments must be within the limits $\left[I_t^{min}, I_t^{max}\right]$:

$$I_t^{min} \le \frac{X_{2t}}{I_t} \le I_t^{max}, \quad t = \overline{1,T}, \tag{9}$$

where I_t^{min}, I_t^{max} are lower and upper values of the business entity's investment tax credit share in relation to the total investment.

The value of the investment *It* for the time period *t* can be calculated using this formula:

$$I_t = V_t \cdot X_t + K_t + A_t, \quad t = \overline{1,T}, \tag{10}$$

where V_t is a coefficient of using the entity's profit that is allocated for the funding of fixed assets (profit share for investment); K_t is a volume of credit funds directed at the investment; A_t denotes depreciation charges of the entity.

3. The value of an unknown variable should be integral:

$$X_{1t} \ge 0;\ X_{2t} \ge 0;\ t = \overline{1,T}. \tag{11}$$

Thus, the economic-mathematical model of determining the proportion of investment tax credit of a business entity problem can be defined as:

it is necessary to find the following values of X_{1t} and X_{2t} profit, which is taxed under the general and preferential schemes that give the optimal value to the objective functions:

$$F_1\left(X_{1t}, X_{2t}\right) = \sum_{t=1}^{T}\left((1 - ITR)_t \cdot X_{1t} + X_{2t}\right) \to \max, \tag{12}$$

$$F_2\left(ITR_t, S\right) = \sum_{t=1}^{T}\left(ITR_t \cdot X_{1t} + p \cdot S(k) \cdot ITR_t \cdot X_{2t}\right) \to \max, \tag{13}$$

and satisfy the constraint:

$$\sum_{t=1}^{T} ITR_t \cdot \Delta X_{1t} \ge \sum_{t=1}^{T} ITR_t \cdot X_{2t}, \quad t = \overline{1,T}, \tag{14}$$

$$I_t^{min} \le \frac{X_{2t}}{I_t} \le I_t^{max}, \quad t = \overline{1,T}, \tag{15}$$

$$X_{1t} \ge 0;\ X_{2t} \ge 0;\ t = \overline{1,T}. \tag{16}$$

The economic-mathematical model (12) – (16) of determining the investment tax credit share of a business entity problem is a two-criterion problem of nonlinear programming.

In order to solve the problem (12) – (16) we could combine different criteria of objective functions into one (multi-objective optimization problem solving) such as: sequential concessions method, weighted sum of separate functions method, relative value deviations of each target function from its maximum value minimizing method, etc. (Nakonechnyi, Savina, 2003).

The method of sequential concessions consists in ranking the target functions in descending order according to their importance and sequentially solving a problem with one target function while assigning a concession to deviate the values of other (more important) target functions from its optimal value.

The disadvantage of this method is the necessity to determine a concession value, on which the optimal solution depends, and the fact that there is no single way to solve this problem.

In this case, the optimal solution depends on the subjective considerations of the person who solves the problem and/or decides.

The constructed problem model of determining the investment tax credit share of a business entity is solved using the financial and tax returns data of the construction industry entity (Limited Liability Company Galbud).

Data on the amount of taxes paid, depreciation charges, profits, and credit debt, etc. (Galbud Limited Liability Company, 2018) serves as an input for calculating the profits that are taxed under the general and preferential schemes, and the tax investment credit (see Table 5).

Table 5

The key figures of the Galbud Limited Liability Company activity

Index	2008	2009	2010*	2011	2012	2013	2014	2015	2016	2017
Profit of the enterprise, ths. UAH	479.9	110.7	129.8	188.8	123.8	104.8	111.2	167.4	236.5	198.8
Corporate income tax, ths. UAH	119.97	27.68	31.15	43.41	26.00	19.91	20.03	30.13	42.6	32.8
Annual depreciation amount, ths. UAH	53.2	48.9	39.5	44.2	57.1	39.3	41.4	48.5	57.0	51.4
Credits, ths. UAH	84.0	40.0	50.0	60.0	70.0	50.0	60.0	55.0	74.0	70.0
Investments, ths. UAH	473.1	144.3	167.4	217.5	213.7	152.2	153.6	196.4	283.3	253.0
ITC share lower limit value	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ITC share upper limit value	0.3	0.2	0.3	0.25	0.3	0.25	0.2	0.3	0.3	0.26
Profit share for investments	0.7	0.5	0.6	0.6	0.7	0.6	0.5	0.6	0.7	0.6

** since 2010 entity is registered as a "small business" enterprise*
Source: Compiled by the authors on the basis of financial and tax reports of the enterprise Galbud Limited Liability Company (2018).

Such indicators as the amount of fine, the probability of exposing the misuse of the investment tax credit, as well as the investment tax credit share lower and upper limit

values of the business entity in relation to the total investment sum may be considered as a type of managerial influence on the tax system of economic entities.

Having solved the problem of determining entrepreneurship investment tax credit share, we obtained the optimal values of the profit, which is taxed under the general and preferential schemes, as well as calculated investment tax credit share in the total amount of the enterprise's profit (see Table 6).

Table 6

Indicators of the Galbud Limited Liability Company tax burden optimization

Indexes	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
The amount of profit, taxed under the general scheme *(X1t),* thousand UAH.	432.6	96.3	79.6	134.4	59.7	66.7	72.9	107.1	155.9	132.6
The amount of profit, taxed under the preferential scheme *(X2t),* thousand UAH.	47.3	14.4	50.2	54.4	64.1	38.1	38.3	60.3	80.7	66.2
Share of profits taxed under preferential scheme, %	9.86	13.03	38.69	28.80	51.79	36.32	34.42	36.03	34.10	33.31
The value of investment tax credit *(ITCt),* thousand UAH	11.8	3.6	12.1	12.5	13.5	7.2	6.9	10.9	14.5	11.9

Source: Elaborated by the authors.

As a result of applying the considered approach to the tax burden management of the enterprise, the profit share of the entrepreneurship, which is taxed under the preferential scheme, varies within the limits of 10-13% under the general scheme of the average economic entity taxation and 28-52% for a small economic entity.

When the company became a subject of small business, the share of ITC increased. This is due to a decrease in total profit, a decrease in income, the need for investments, etc.

The results of the study confirm the inefficient use of the regulatory potential of corporate income tax in Ukraine.

In our opinion, in order to shade economic processes in business and improve the efficiency of the corporate income tax system, first of all, it is necessary to achieve stability in the tax field, in particular, to significantly reduce the frequency of changes in tax legislation. In addition, the taxation of enterprises should focus on incentives, rather than social benefits, with criteria that are adequate to domestic realities, and ensure transparency of their provision and efficiency of use.

As can be seen from the model, as long as the analyzed company did not belong to the category of "small business entity" (small business entities include entities with an annual turnover of less than 10 million euros), its need for a tax investment loan was significantly less. This indicates that large enterprises are more financially secure. Consequently, they have greater internal potential for large-scale investment and innovation projects. However, most of such enterprises are willing to invest their own funds in these investment projects subject to state support, for example, in the form of, for example, tax benefits.

Thus, the application of economic-mathematical modelling to assessing a tax burden and determining the proportion and value of investment tax credit for economic entities will help to develop optimal management strategies for balancing the amount of profit that is taxed under the general and preferential schemes in order to maximize the amount of profit and encourage investment into the upgrade of the production.

The presented model and analysis of the activity and taxation of Ukrainian enterprises demonstrate the need for the application of income tax incentives, and such benefits, while clearly regulating their intended use, promote the modernization and expansion of business entities. These actions, as a result, could increase tax revenues to the budget. Thus, it is possible to achieve a positive effect at both micro and macro levels.

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