ФІНАНСИ. БАНКІВСЬКА СПРАВА

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ON THE PROBLEM OF TAX SYSTEM OPTIMIZATION IN UKRAINE

Urgency of the research. *The process of tax system reforming is aimed at its optimization – on the one hand, by ensuring the maximization of tax revenues to the budget, and on the other hand – by minimizing the tax evasion.*

Target setting. *Optimization of the Ukrainian tax system needs to be realized by constructing the Dupuit-Laffer surface for two taxes in order to determine their rates, which will provide the largest amount of tax revenues to the budget.*

Actual scientific researches and issues analysis. *The methods for state tax system optimization are laid by such scholars as R. Bird, L. Kaplow, J. Slemrod and others. Ideas for optimizing the tax system, both in developed countries and in developing ones, in particular in Ukraine, have not lost their importance today.*

Uninvestigated parts of general matters defining. *The academic economists have not yet sufficiently investigated the problems of optimizing the tax system through the construction of the Dupuit-Laffer surface and finding the optimal level of tax rates, providing the maximal tax revenues to the budget.*

The research objective. *It is necessary to investigate the "Dupuit-Laffer effect" for direct national taxes by constructing the Dupuit-Laffer surface in order to optimize tax rates and maximize government tax revenue.*

The statement of basic materials. *The Dupuit-Laffer surface modeling is implemented and the optimal tax rates of the investigated taxes, which ensure the maximization of government tax revenue, are determined. It is substantiated that the effective rate of 18% of the corporate profit tax is on 2% lower than the optimal one, and the rate of 19.5% of the personal income tax is 2.5% lower than the optimal one.*

Conclusions. *It is proved that one of the effective ways of optimizing the tax system in Ukraine is to model the Dupuit-Laffer surface for direct national taxes. Statistically significant results of modeling allowed to obtain optimal rates for the studied direct taxes, the application of which will ensure the maximum possible government tax revenue.*

Keywords: *direct tax; curve; surface; effect; maximization; optimization; government tax revenue.*

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ДО ПРОБЛЕМИ ОПТИМІЗАЦІЇ ПОДАТКОВОЇ СИСТЕМИ УКРАЇНИ

Актуальність теми дослідження. *Процес реформування податкової системи має на меті її оптимізацію – з однієї сторони забезпечення максимізації податкових надходжень до бюджету, а з іншої – мінімізацію ухиляння від сплати податків.*

Постановка проблеми. *Оптимізацію податкової системи України необхідно реалізувати шляхом побудови поверхні Дюпюї-Лаффера для двох податків з метою визначення їх ставок, що забезпечать найбільший обсяг податкових надходжень.*

Аналіз останніх досліджень і публікацій. *Методологію оптимізації податкової системи держави закладено такими вченими, як Р. Берд, Л. Каплов, Дж. Слемрод та ін. Ідеї щодо оптимізації податкової системи як у розвинених державах, так і в країнах, що розвиваються, зокрема в Україні, не втратили своєї важливості і сьогодні.*

Виділення недосліджених частин загальної проблеми. *Вченими-економістами ще недостатньо опрацьовані проблеми оптимізації податкової системи через побудову поверхні Дюпюї-Лаффера і знаходження оптимального рівня податкових ставок, за яких податкові надходження до бюджету будуть максимальними.*

Постановка завдання. *Необхідно дослідити «ефект Дюпюї-Лаффера» для прямих загальнодержавних податків шляхом побудови поверхні Дюпюї-Лаффера з метою оптимізації податкових ставок і максимізації податкового доходу держави.*

Виклад основного матеріалу. *Реалізовано моделювання поверхні Дюпюї-Лаффера та визначено оптимальні податкові ставки досліджуваних податків, які забезпечують максимізацію податкового доходу держави. Обґрунтовано, що діюча ставка 18% податку на прибуток підприємства на 2% нижча оптимальної, а ставка 19,5% податку на доходи фізичних осіб на 2,5% нижча оптимальної.*

Висновки. *Доведено, що одним із дієвих шляхів оптимізації податкової системи України є моделювання поверхні Дюпюї-Лаффера для прямих загальнодержавних податків. Статистично значущі результати моделювання дали змогу одержати оптимальні ставки досліджуваних прямих податків, застосування яких забезпечить максимально можливий податковий дохід держави.*

Ключові слова*: прямий податок; крива; поверхня; ефект; максимізація; оптимізація; податковий дохід держави.*

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Urgency of the research. In modern conditions of state tax policy reformation the problem of the correlation between the tax burden on the economy and the volume of tax revenues to the budget, which is the basis for optimizing the tax system at the macro level, becomes the matter of topical interest. At the same time there is a conflict of interests – on the one hand, the Government seeks to maximize the tax revenues of the state, and on the one hand – taxpayers aim at minimizing the tax expenditures. However, in the conditions of a developed civil democratic society and a high level of economic literacy of the population, the antagonistic interests of the subjects of taxation are smoothed over because of the public interest priority. Instead, in the context of the social and economic trans-

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formations taking place in Ukraine, such a conflict is complicated and deepened by tax evasion, off-shore schemes, high level of shadow economy, tolerance for corruption and its strengthening, etc.

Target setting. To ensure the tax policy effectiveness, it is necessary to optimize the tax system of Ukraine by determining the optimal tax rates based on the results of the economic and mathematical modeling of the Dupuit-Laffer surface, which will maximize tax revenues to the budget.

Actual scientific researches and issues analysis. The basic methodological principles for optimizing the state tax system are laid down by such scholars as R. Bird [1], L. Kaplow [2], J. Slemrod [3] and others. Ideas for optimizing the tax system in developed countries (for example, the US tax reform from the end of 2017 to the beginning of 2018) and in developing countries, in particular in Ukraine, have not lost their significance today.

Uninvestigated parts of general matters defining. The economists have not yet sufficiently worked out the problems of optimizing the tax system, taking into account the "Dupuit-Laffer effect" [4; 5] for the two taxes, which is manifested mathematically through the construction of the Dupuit-Laffer surface and finding the optimal level of tax rates, under which the tax revenues to the budget will be maximal. Although the methodical apparatus of the Dupuit-Laffer surface is used in the scientific publications of O. Yastremskyi [6], in order to analyze the behavior of competitive enterprises and the branch depending on changes of such 2 taxes as the value added tax and the payroll tax; F. Donder and J. Hidricks [7] for the maximization of tax revenues from the tax rate increase due to government revenue targeting; F. Busato, B. Chiarini and G. Rey [8] to assess the level of tax evasion as a result of tax rate increase. The optimization of the Ukrainian tax system by constructing the Dupuit-Laffer surface is being implemented in this article for the first time on the national economy level. The results will reflect the level of readiness of taxpayers and the Government to compromise public interest and also to determine how effective the existing tax rates are.

The research objective. The main objective of the research is to study the "Dupuit-Laffer effect" for the direct state budgeting taxes – corporate income tax and personal income tax – by constructing Dupuit-Laffer curves and surfaces, which will allow obtaining optimal tax rates and maximizing the tax return of the state (tax revenues to the budget)..

The statement of basic materials. The optimization of the Ukrainian tax system is possible under the following conditions: firstly, the methodological support of the optimization process must be based on real (official) statistical data available in the public domain; secondly, the study should cover a significant time lag, not less than 10 years; and thirdly, the specification of the model of tax revenues to the budget should reflect real dynamics.

To realize the task of the Ukrainian tax system optimization in the field of direct taxation, at first it is necessary to form the initial data for the period of 2004-2016 (Tab. 1).

Table 1

Financial results of direct taxation in Ukraine

Years	Corporate income tax		Personal income tax	
	Rate, %	Revenues to the budget, UAH million	Rate, %	Revenues to the budget, UAH million
2004	30.0	16 162	13.0	13 213
2005	25.0	23 464	13.0	17 325
2006	25.0	26 172	13.0	22 791
2007	25.0	34 407	15.0	34 782
2008	25.0	47 857	15.0	45 896
2009	25.0	33 048	15.0	44 485
2010	25.0	40 359	15.0	51 029
2011	23.0	55 097	18.0	60 225
2012	21.0	55 793	18.0	68 092
2013	19.0	54 994	18.0	72 151
2014	18.0	40 201	19.5	75 203
2015	18.0	39 053	19.5	99 983
2016	18.0	60 223	19.5	138 782

Source: formed according to the data provided by [9]

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As it is seen from Tab. 1, the "Dupuit-Laffer effect", aimed at increasing the tax revenues as a result of a significant tax rates reduction and vice versa, available in relation to the taxation of corporate profit, as the reduction of the rate by 12% between 2004 and 2016 led to the increase in the government tax revenue in 3.7 times, but it is clear that other factors also influenced these dynamics. As for the personal income tax, the explicit indicated effect is not observed, which needs further analysis.

At the next stage of the study it is necessary to determine the form of the relationship between the tax rate and the amount of tax payments to construct the government tax revenue curves and to construct the target function of maximizing the government tax revenue. The following quadratic equation is the easiest:

$$GTR_i = \alpha\tau_i - \beta\tau_i^2 \underset{\tau_i}{\rightarrow} max, \quad (1)$$

where GTR_i – means tax revenues to the budget from the *i*-th tax;

τ_i – means the interest rate of the *i*-th tax, where $\tau_i \in [0; 100]$;

α, β are the parameters of the equation;

$\underset{\tau_i}{\rightarrow} max$ – means that the maximization of the target function of the government tax revenue is carried out by changing the tax rate and finding its optimal level – τ_{opt}.

The Dupuit-Laffer curve can be constructed on the basis of formula (1) only as a local case when there is a point of absolute maximum of this function. Therefore, it is advisable to consider other models. Thus, the target power function, proposed for the formalization of the Dupuit-Laffer curve in [10], is as follows:

$$GTR_i = \lambda\tau_i^{\alpha}(1 - \tau_i)^{\beta} \underset{\tau_i}{\rightarrow} max, \quad (2)$$

where λ is the proportionality coefficient;

α is the tax progression coefficient;

β is the coefficient of taxpayers susceptibility to the tax rate change (or the economic activity decline coefficient) [10, p. 164].

According to S. Londar [11], the closer correspondence with the statistical data (higher determination coefficients) has a model in the form of power and exponential dependence, the target function of which looks like:

$$GTR_i = \lambda\, \tau_i^{\alpha}\, e^{-\tau_i\beta} \underset{\tau_i}{\rightarrow} max, \quad (3)$$

where e is the basis of the natural logarithm, $e \approx 2.71828$ [11, p. 128].

Thus, using the formulas (1-3) given above, which formalize the connection between the tax rate and tax revenues to the budget, let us solve three optimization tasks concerning the maximization of the target functions of the government tax revenue from direct taxation. To do this, we will process official statistic data (see Tab. 1), having completed all the necessary mathematical transformations and statistical processing of data. As a result of modeling, we find the parameters of the equations (1-3), the determination coefficient, and the observed value of Fisher's F-criterion (compared with the critical 4.84 for proving or refuting of the stochastic connection validity). We also maximize the target functions and find the optimal tax rates (Tab. 2).

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Table 2

The results of modeling the government tax revenue curves from direct taxation and the solution of optimization tasks

Indicator	Quadratic model:		Power model:		Power-exponential model:	
	corporate income tax	personal income tax	corporate income tax	personal income tax	corporate income tax	personal income tax
λ	-	-	$2.41 \cdot 10^{14}$	$1.72 \cdot 10^{19}$	$7.9 \cdot 10^{-7}$	$1.12 \cdot 10^{-9}$
α	2238.2	4421.5	8.86	13.52	12.52	15.48
β	-22.57	-44.07	36.02	49.59	0.63	0.71
R^2	0.308	0.521	0.679	0.896	0.683	0.897
F-criterion	4.9 > 4.84	11.95 > 4.84	10.55 > 4.84	43.08 > 4.84	10.79 > 4.84	43.38 > 4.84
T_{opt}, %	49.6 ≈ 50	50.2 ≈ 50	19.7 ≈ 20	21.4 ≈ 21	19.85 ≈ 20	21.7 ≈ 22
GTR_{max}, UAH mln	55 479	110 894	50 251	99 779	50 713	100 776

***Source*:** calculations made by the author according to the data given in [9]

As can be seen from the Tab. 2, the worst statistical estimates have the quadratic models, whereby the theoretical government tax revenue is the highest, but in order to achieve this, it is necessary to substantially increase the tax rates – up to 50%, which means the overwhelming tax pressure, totally unacceptable for the national economy of Ukraine, since, according to the "Dupuit-Laffer effect", it will force taxpayers to stop their business activity or to avoid tax payments as much as possible by reducing the tax base, that is, concealing profits, paying envelope wages and so on.

An important result of the conducted optimization of the Ukrainian tax system based on the modeling of the Dupuit-Laffer curves under the power-exponential model (determination coefficient R^2 and the observed F-criterion value are not essential but still they are higher compared to the power model) are the received optimal tax rates – 20% for the corporate income tax and 22% tax for the personal income tax. Thus theoretically the maximum possible aggregate government tax revenue makes 150 492 million UAH, the total volume of which is 462 thousand UAH higher in the case of power-exponential model, compared with the power one. Consequently, for modeling the Dupuit-Laffer surface, we take as basis the power-exponential curves of the national direct taxes graphically represented on Fig. 2.

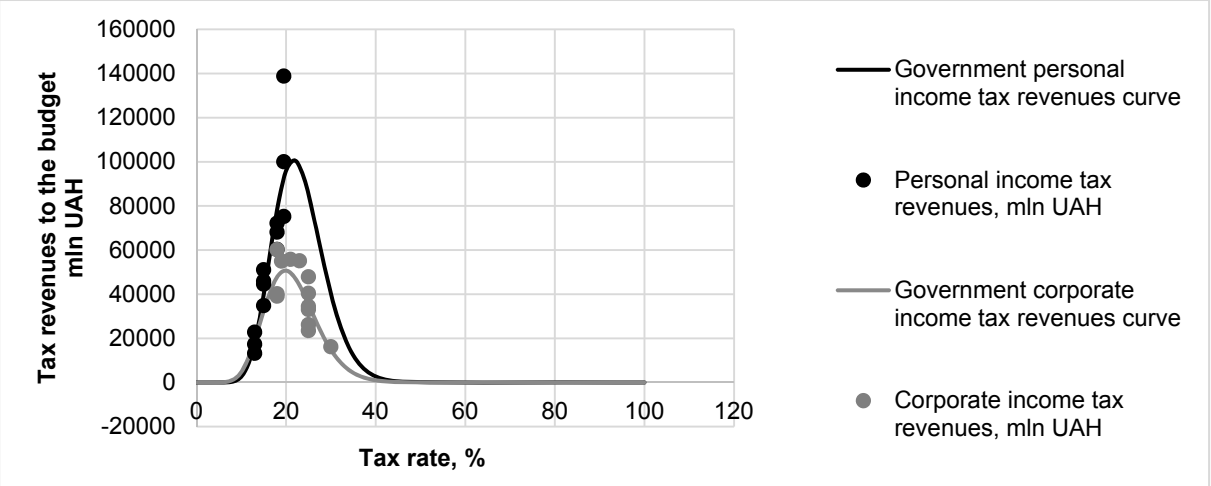

Fig. 1. Dupuit-Laffer Curves of Direct Taxes (2004-2016)
Source: calculations made by the author according to the data given in [9]

The final results of the conducted optimization of the tax system of Ukraine are shown in Fig. 2.

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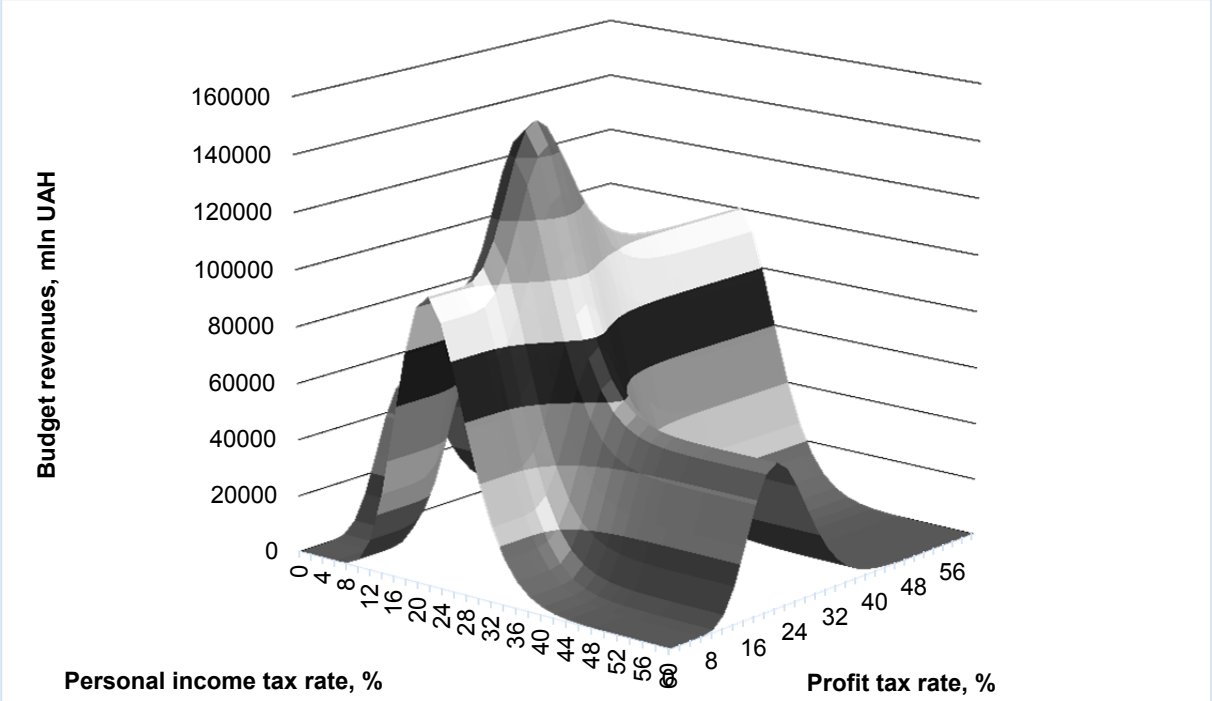

Fig. 2. The Dupuit-Laffer surface, reflecting the maximization of tax revenues from optimal rates of direct taxes

Source: calculations made by the author according to the data given in [9]

Conclusions. Thus, the results of the conducted optimization allow us to form the background for reaching compromise between the Government and the taxpayers in order to ensure public interest in the form of insignificant increase of tax rates of national direct taxes – 2% corporate income tax increase, and 2.5 % personal income tax increase. The prospects for further author's research are the optimization of indirect taxation and the general level of tax burden on the national economy.

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