

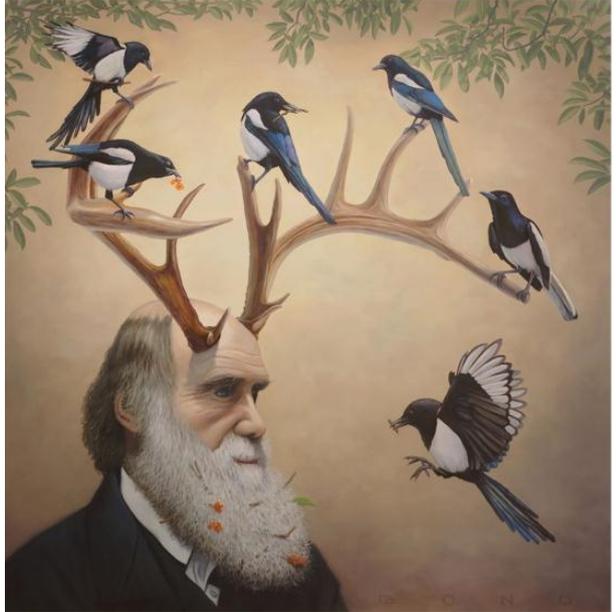
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Analysis of the economic efficiency criteria and equity while determining the taxes

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Abstract

The aim of the study is to investigate the criteria of economic efficiency and equity while determining the optimal amount of taxes comparative qualitative research methods. The authors show that while determining the rational level of the tax burden, it is necessary to determine and describe in terms of quantity the totality of factor connections and parameters of equity and efficiency, taking into account the specific conditions of taxation of the specific country. In conclusion, using the offered approach with the application of alternative optimization method, allowing to establish a taxation scheme accepted by the majority of the population.

Keywords: Tax, Burden, Equity, Efficiency, Optimization.

Análisis de los criterios de eficiencia económica y equidad a la vez que se determinan los impuestos

Resumen

El objetivo del estudio es investigar los criterios de eficiencia económica y equidad a la vez que se determina la cantidad óptima de

impuestos en los métodos de investigación cualitativos comparativos. Los autores muestran que, al determinar el nivel racional de la carga tributaria, es necesario determinar y describir en términos de cantidad la totalidad de las conexiones de factores y los parámetros de equidad y eficiencia, teniendo en cuenta las condiciones específicas de tributación del país específico. En conclusión, utilizando el enfoque ofrecido con la aplicación del método de optimización alternativo, que permite establecer un esquema de impuestos aceptado por la mayoría de la población.

Palabras clave: Impuestos, Carga, Equidad, Eficiencia, Optimización.

1. INTRODUCTION

On the modern stage, the importance of a stable tax system is obvious, as well as of creation and application of efficient methods of tax regulation and control. Imperfection and instability of the taxation system do not allow the state to perform its functions efficiently. In conditions of the market economy, any state uses widely tax policy as a certain regulator of influence on the negative market phenomena. However, none of the directions of the tax policy optimization study, taking into account its equity and efficiency, has not to lead to the creation of the completed method of optimal tax burden amount selection.

2. LITERATURE REVIEW

There are lots of different approaches to the optimal design of a tax system, yet the patterns to follow usually have much in common.

The standard theory of optimal taxation posits that a tax system should be chosen to maximize a social welfare function subject to a set of constraints (MANKIW, WEINZIERL & YAGAN, 2009). Legal structures also trying to find the optimal concept of tax system, however typically they trying to cover only several specific areas, e.g. to prioritize knowledge expenditure, including by using tax incentives and other financial instruments to promote greater private R&D investments and to remove tax obstacles, improving the business environment, particularly for SMEs, and supporting entrepreneurship.

International experts have an opinion, that ongoing substantial transformation of business models placed pressure on the basic concepts underlying the existing international tax rules, which were created almost a centenary ago. Some researchers came to an opinion that in all existing literature on optimal taxation contains assumptions to implement complex tax schemes, which is not necessarily the case for many developing countries (KANBUR, PAUKKERI, PIRTTILÄ, & TUOMALA, 2017).

The large part of the researchers deals mostly with the specific tax, not trying to cover the whole tax system, e.g. income tax (together with progressive taxation). Another problem is the fairness of the tax system. Tax system being fair is not only a matter of redistribution herein arise different issues - fairness of procedure, fairness with respect to legitimate expectations, and fairness in treating similar people similarly. Also, it should be noted, that many researchers tried to study the optimal taxation, however much of such works are abstract

and mathematical (MIRRLEES, ADAM, BESLEY & BLUNDELL, 2011). Sometimes the area of the research could be very narrow as well as have clear behavioral aspects e.g. Optimal Taxation of Wealth when bequests motivated by the joy of giving (BRUNNER & PECH, 2012).

On the contrary, in the article Use of the tax prism method when forming tax part of the budget authors offered a conception of the tax prism, allowing evaluating and predicting consequences of changes of separate tax on budget revenues as well as the cumulative impact (LEONTYEV & VEROVSKA, 2017). Even though models in optimal tax theory typically posit that the tax system should maximize a social welfare function subject to a government budget constraint, taking into account that individuals respond to taxes and transfers, because social welfare is larger when resources are more equally distributed, but redistributive taxes and transfers can negatively affect incentives to work, save, and earn income in the first place. This creates the classical trade-off between equity and efficiency which is at the core of the optimal income tax problem (DIAMOND & SAEZ, 2011).

Multi-criteria analysis is a tool, that already had been applied to the taxation problems, e.g. in one specific area - the taxation of agricultural land (SIROKY, KRAJCOVA & HAKALOVA, 2016). The researchers also study a very complicated topic - incomparability between state and business desires by finding a compromise point (MALAFEYEV, ABRAMYAN & SHULGA, 2019), yet such models usually left as academic research without practical integration into real

economic systems. Some researchers trying to apply modern technologies as a competitive tool for a multi-criteria assessment. Blockchain' algorithms could help to make a taxation system much more transparent and reliable, as well as enhance interactions between social, economic and political agents (POKROVSKAIA, 2017), which would definitely lead to overall much more fair tax system.

3. RESULTS AND DISCUSSIONS

The state has benefited from the increase in incomes at the expense of taxes. This will allow increasing state charges without serious consequences to stimulate the growth of the economy creating new job positions. At the same time, this should not ruin a tax-payer. A tax-payer gets to profit from the minimum tax rate. Introduction of certain taxes and fixation of their amounts is difficult multifactor objective. The attempts to achieve necessary and mutually acceptable solutions by the method of trial and error leads to significant expenses and does not bring necessary result. The losses connected with errors are too large.

The goal of operations research is preliminary quantitative reasoning of optimal solutions. Sometimes (rather seldom) as a result of the study it is possible to indicate only one strictly optimal solution, and more often – to single out the area of almost equal optimal (reasonable) solutions, within which the final choice can be made (VENTTSEL, 2001). Every state creates its own system of legislative

acts, commonly regulating tax system and tax collection. There are a lot of requirements to tax systems that as a result form two incompatible principles – economic efficiency and fairness. Choice of the most acceptable structure of taxes suggests that if one of the requirements is taken as an optimization criterion than others should be taken into account in a form of limitation.

If EEC is given only taking into account state necessity, then the consequences of such a solution are poorly forecasted. For this purpose, it is useful to develop the method that would allow rationally and reasonably to choose EEC, which will maintain at the required level economic policy of the state and comfort taxation for individuals and legal persons. At the present time, the parameters corresponding to the abbreviation EEC taken in this paper, are set by the discretionary decision. Such choice of EEC from the experience of previous years is universal in its own way, however, it does not allow to set very accurately EEC value that is really necessary for a particular period.

Such assigning of EEC as any other analogous operation is a complex psychophysiological process of judgment. To study such a process, we carried out special tests during which the respondents determined the subjective probability of event occurrence. The tests have shown the following results: under the true probability of event occurrence, the ordinary unprepared respondents could be almost 20 times wrong in assigning of subjective probability. And the specially prepared group had values of subjective probability a few times lower

than that of unprepared ones. However, the absolute value of the mistake remained rather high (KAHNEMAN & TVERSKY, 1979).

Persons assigning values of certain parameters with the definitely lower limit of the latter, overstate the values, subconsciously introducing the assurance coefficients. However, in practice, there are also opposite cases (their number is significantly lower), when some factors are evaluated incorrectly and reduced parameter values are assigned. Consequently, the assigning of EEC from the experience is not optimal and accurate, since mistake values can reach significant values. This complicates the assigning of this important parameter. In the majority of cases, at first the taxes are set and then the evaluation of their influence on equity and efficiency takes place. Therefore, a perspective objective is to develop the method for EEC determination, taking into account its impact on taxpayers and maximal compliance with economic terms of the accounting period.

4. CONCEPT OF THE OPTIMAL TAXATION

The typical feature of optimal taxes assessment in the system equity-efficiency is the constant search of compromise solutions providing execution of numerous discrepant requirements. Essentially, this is the main principle of system optimization. Here we should specify the term optimally. From Latin, Optimus means the best. But, when calling some solution optimal, it is often implied that in certain conditions it corresponds to its purpose. Therefore, solving the

objective of EEC selection, one should formulate clearly the conditions where the system equity-efficiency will work.

Besides, it is necessary to ascertain if only one solution of the given objective is allowed or the options are possible. As was mentioned above, for the solution of the stated objective it is reasonable to use methods of mathematical programming (operations research). In the opinion of Saaty, one of the remarkable specialists in the study of the operation: “Research of the operations is an art to give bad answers on the practical questions, to which other methods give even worse answers” (SAATY & VARGAS, 1994: 10). As researches have shown, direct use of only necessary signs in the objective of EEC search does not give necessary results.

First of all, the system of equations, followed by the necessary signs, is solvable only in the simplest cases. It is often easier to grope for an extremum of the objective function than to solve such an equation system. Moreover, the indicated way does not guarantee to find out of solution in all cases. Even if the created system of equations is solved, the finding out of absolute extremum of the objective function requires the whole system of checks which is more difficult when the function has more arguments. Secondly, in the series of practical cases, the objective function $f(x)$ cannot be differentiated, since the elements $x = \{x_1, x_2 \dots x_m\}$ often are constantly changing, and discrete values.

All these circumstances lead to the situation when the use of classical methods of mathematical analysis or variation calculation when solving the problem of EEC search, turns out to be ineffective. At the same time, initially stated the objective of extremum finding comes to such secondary objectives which turn out to be not easier but rather more difficult than the initial one.

Therefore, in our case, it is more reasonable to use a method of alternative optimization. It is based on the selection of the best taxation scheme from the series of options calculated beforehand with systematically changing elements. Such an approach gives the opportunity to get graphic dependences, characterizing different taxes from the optimized element (EEC). Let us consider the use of an alternative method of optimization as applied to the objective of EEC selection in the system equity-efficiency. Further, it is necessary to study the whole system of connections of taxes with every element of this system.

4.1. Determination of EEC in the system equity – efficiency using the system of relative single indicators

Before realising alternative optimization, it is necessary to specify numerical values of relative single indexes that characterize fairness and efficiency of tax policy for the appropriate state in each case and period. It is necessary to specify numerical values of relative single indexes according to a single scheme:

$$K_{ij} = P_{ij} / P_{i,hl}; K_{ij} = P_{i,hl} / P_{ij} \quad (1)$$

$$i = 1, N; \quad j = 1, M,$$

Where

K_{ij} – relative designation of relative single index;

P_{ij} – value of single index of researched characteristic (equity or efficiency);

$P_{i, bl}$ – value of single index taken as basic (possible) level;

i – Name of the estimated characteristic;

j – no. of variant;

N – The number of relative single indexes;

M – The number of researched variants.

As $P_{i, bl}$ assumed quality indexes for the appropriate taxation variant that could be considered the best or value $P_{i, bl}$ can be determined according to other special considerations.

As values of relative single indexes $P_{i, bl}$ it is possible also to assume critical values of quality indexes of researched variants of the system. In all cases, under the determination of the values of relative single indicators from the formulae (1), such formula is chosen that corresponds to the improvement of indices system quality while the

increase of single indicator. Let us assume that requirements of the equity and efficiency of tax policy contradict each other. Relative single indexes – equity $K_{eq\ j}$ and efficiency $K_{ef\ j}$ – are formed so that their values in the range of values less than 1 show not allowed quality values (their characteristics), but allowed values of index K_{ij} is equal to 1 or exceed 1.

4.2. Forming of combined diagram

Let us illustrate the use of alternative optimization method on the example of conditional situation, parameters of which are modeled in the table 1.

Table 1: Characteristics of parameters used during the calculations of relative single indicators

No. of alternati ve, j	1	2	3	4	5	6	7	8	9	10
EEC	20	40	60	80	100	120	140	160	180	200
$P_{eq\ j}$	10	200	300	400	500	600	700	800	900	100
	0									0
$P_{eq, basic}$ level	300									
$K_{eq\ j}$	0,33	0,6	1,0	1,3	1,6	2,0	2,3	2,6	3,0	3,3
		7	0	3	7	0	3	7	0	3
$P_{ef\ j}$	44	40	36	34	30	25	20	13	7	4
$P_{ef, basic}$ level	20									
$K_{ef\ j}$	2,20	2,0	1,8	1,7	1,5	1,2	1,0	0,6	0,3	0,2
		0	0	0	0	5	0	5	5	0

Source: created by authors

Using the values of relative single indicators, calculated by formulae of the kind (1), according to the data of table 1, we can make dependency diagrams of these indices on EEC in a form of a combined diagram (figure 1).

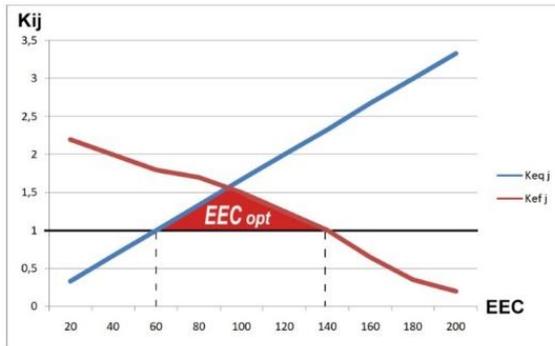


Figure 1: Combined diagram of dependencies of relative single indicators on EEC (Source: created by authors)

Let us analyze such a combined diagram. Variants with $EEC = 20$ and $EEC = 40$ are not acceptable since they are corresponded by inappropriate values of a relative single indicator of the equity Keq_j . A relative single indicator of efficiency Kef_j for EEC equal 20 and 40 is in the zone of acceptable values, however, it significantly exceeds basic values, i.e., it is unreasonably overstated. The variant with $EEC = 60$ is acceptable by both indices but still overstated by almost 2 times by the efficiency criterion. In a similar way we analyze other variants, reject inappropriate ones and determine the area of allowed values of EEC_{opt} , within which we can choose appropriate values of EEC . Consideration of this diagram confirms the groundlessness of assigning

of EEC only from the point of view of necessary efficiency provision, without revision of the taxation characteristics, determining the equity criterion.

One should remember that if the found optimal variant corresponds to the rather overstated value of some relative single indicator than this speaks about the redundancy of characteristics which determine it. If such excess is not reasonable and necessary, then one should take measures on the decrease of its values and after that to evaluate fully the accuracy of EEC choice. In the considered variants of financial situation imitation, the area EEC lies within the limits from 60 to 140 standard units. This case is chosen as an example. When calculating real situations, the area of acceptable EEC can differ by sizes and location, from the case given in figure 1.

The offered method of variant optimization can be used to compare different schemes of taxation or to carry out the plan for the state development and creation of state-owned enterprises or additional workplaces. The objective considered here is nonlinear and, consequently, as we saw, can have numerous solutions. The physical and logical analysis contributes to the obtaining of the only solution. It allows us to choose the most conveniently implemented solution from the set of formally right solutions and reject others.

The most difficult is the situation when after removing all unacceptable solutions, there are not any acceptable solutions left. This means that the chosen characteristics and restriction set by them do not

allow to evaluate EEC. The evaluation of compatibility of requirement should be carried out on the preliminary stage. If this does not lead to the purpose, then we have the incompatibility of the objective requirement. In such a situation to solve our problem by the method of alternative optimization, it is reasonable to use an optimized method of consequent concessions. Description of this method can be found in works (EHRGOTT, 2005). According to the method of consequent concessions to find out optimal compromise solutions after the relative single indicators are formulated, it is necessary to carry out their ranking in descending order of priority.

After this is done, we determine the maximum of the relative single indicator with the highest priority. Next, the concession by the first criterion is assigned, then we determine the concession by the criterion with second priority in the range of concession of the previous criterion. In our case, we consider only two criteria of equity and efficiency. With a complete solution to this problem, it is necessary to consider their connections with efficiency and equity. In the last case, the concessions are assigned in case of necessity right up to the last criterion. The role of the ranking priority of relative single indicators and concession size is large. Let us specify this on example. Let us assume that while considering our optimization model. The relative single indicators of equity and efficiency turned out to be incompatible (figure 2).

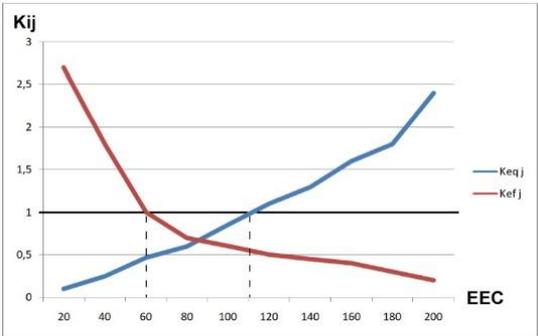


Figure 2: Example of incompatibility of relative single indicators (Source: created by authors).

They lack the area of compatibility in the zone of acceptable values of relative indices from 1 and higher. Then, if the priority under the ranking is given to K_{efj} , then the values of EEC should be taken as 60, and if K_{eqj} , then – 150. However, it is possible in the case of equal priority of indices to do the concessions for both and choose the appropriate solution. It is reasonable to carry out ranking by expert methods or, what is more preferable, using probabilistic approach. During the ranking, one should take into account the stability of the indices, i.e., and size of their change in respect to EEC.

After obtaining of the most appropriate EEC value, in case of unavoidable compatibility, there should be given practical recommendations on application of these or those taxes and/or taking of specific measures for the adaptation of the budget to new conditions. Carrying out the suggested EEC optimization, one should take into account that the requirement of economic neutrality or minimization of

the excess tax burden is most convenient to represent in quantitative form. In connection with this, designing the changes in the tax system, it makes sense to choose a variant which generates the least excess burden.

Practical implementation of the variants depends on what types of direct or indirect taxes can be collected using the means which are at government disposal. From the one hand, acceptability of variants is determined by the ability to accumulate all the necessary sum of tax return, and from another hand, by the correspondence to the equity principles. The higher tax returns are, the larger tax burden is, with all else being equal. Equity requirements, if they suppose the achievement of total equality, can also enter into a conflict with the tendency to decrease the excess burden.

If be guided firstly by the equity considerations and apply taxation actively for the purposes of reallocation, then allocation expenses turn out to be very significant. The key role is played by discouraging influence of taxes on the labor efforts, which stipulates the efficiency losses, connected with the replacement of labor with leisure, and also on the economic activity, i.e, utilization of resources. Tax structure, optimal from the point of view of the efficiency, meeting all the limits which are characterized as ability of the state to collect taxes, as well as specific requirements to the reallocation, is called Pareto efficient tax structure. A search of these very zones is the content of tax optimization objectives. A situation where tax returns are fully allocated among the population in a form of payments,

reducing economic inequality, correspond to the progressive taxation most of all. With all conditions being equal, the quicker average norm of taxation grows, the larger income equalization is provided.

5. CONCLUSIONS

Combination of equity and efficiency of the tax policy is a serious problem which still does not have a final solution that complicated state regulation of the economy. One can state the fact in taxation sphere there is a place for choice between two competing goals of equity and efficiency. The situation is aggravated by the absence of generally accepted efficiency criteria (although this criterion is subdued to a simpler scheme of mathematical description and causes fewer disputes of specialists (and equity)). To solve the problem of equity and efficiency of tax policy, it is necessary to determine and describe quantitatively all connections of the equity and efficiency with taxes, applied in particular country. Then, using the offered approach with the application of alternative optimization method, to create the system of taxation optimal parameters determination, allowing to establish taxation scheme accepted by the majority of the population, and suggest it to the government for realization.

REFERENCES

- BRUNNER, J., & PECH, S. 2012. "Optimal Taxation of Wealth Transfers When Bequests Are Motivated by Joy of Giving". **The B.E. Journal of Economic Analysis & Policy**. Vol. 12, N° 1. Italy.
- DIAMOND, P., & SAEZ, E. 2011. "The Case for a Progressive Tax: From Basic Research to Policy Recommendations". **Journal of Economic Perspectives**. Vol. 25, N° 4: 165–190. USA.
- EHRGOTT, M. 2005. **Multicriteria Optimization**. Second edition, Springer. P. 328. Germany.
- KAHNEMAN, D., & TVERSKY, A. 1979. "Prospect Theory: An Analysis of Decision under Risk". **Econometrica**. Vol. 47, N° 2: 263-291. USA.
- KANBUR, R., PAUKKERI, T., PIRTTILÄ, J., & TUOMALA, M. 2017. "Optimal taxation and public provision for poverty reduction". **International Tax and Public Finance**. Vol. 25, N° 1: 64-98. Germany.
- LEONTYEV, A., & VEROVSKA, L. 2017. "Use of the tax prism method when forming tax part of the budget". **Economics and Culture**. Vol. 14, N° 1: 128-135. Poland.
- MALAFEYEV, O., ABRAMYAN, E., & SHULGA, A., 2019. **Dynamic model of firm's competitive interaction on the market with taxation**. arXiv preprint arXiv:1905.06364. USA.
- MANKIW, N., WEINZIERL, M., & YAGAN, D. 2009. "Optimal taxation in theory and practice". **Journal of Economic Perspectives**. Vol. 23, N° 4: 147-174. USA.
- MIRRLEES, J., ADAM, S., BESLEY, T., & BLUNDELL, R. 2011. **Tax by Design: The Mirrlees Review**. Oxford University Press. P. 548. UK.
- POKROVSKAIA, N. 2017. **Tax, financial and social regulatory mechanisms within the knowledge-driven economy. Block chain algorithms and fog computing for the efficient regulation**. In 2017 XX IEEE International Conference on Soft Computing and Measurements (SCM). IEEE. pp. 709-712. USA.

SAATY, T., & VARGAS, L. 1994. **Decision Making in Economic, Social and Technological Environments**. RWS. Italy.

SIROKY, J., KRAJCOVA, J., & HAKALOVA, J. 2016. "The taxation of agricultural land with the use of multi-criteria analysis". **Agricultural Economics**. Vol. 62, N^o 5: 197-204. USA.

VENTTSEL, E. 2001. **Operations research**. High School. P. 208. USA.



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