Recursive Modelling Of Intentions Of Fulfilling Tax Obligations By Industrial Enterprises In Case Of Implementing A Mechanism For Promoting Their Energy Efficiency

O. MYKOLIUK[1], H. KUCHEROVA[2], V. FOSTOLOVYCH[3], N. PRYLEPA[4]

[1]Department of Management, Administration and Hotel and Restaurant Business, KHMELNYTSKYI NATIONAL UNIVERSITY, UKRAINE. E-mail: oksanamik81@gmail.com
[2]Department of Economics, CLASSIC PRIVATE UNIVERSITY, ZAPORIZHZHIA, UKRAINE. E-mail: kucherovahanna@gmail.com
[3]Department of Accounting and Taxation in the branches of the economy, VINNYTSIA NATIONAL AGRARIAN UNIVERSITY, UKRAINE. E-mail: vfostolovich@gmail.com
[4]Department of Management, Administration and Hotel and Restaurant Business, KHMELNYTSKYI NATIONAL UNIVERSITY, UKRAINE E-mail: nataprilepa@gmail.com.

ABSTRACT

The paper proves the importance of introducing incentives for energy-efficient functioning of industrial enterprises by increasing a carbon tax and its redistribution between the payer and the state. The paper aims to conduct recursive modelling of intentions of fulfilling extended tax obligations by industrial enterprises in case of implementing a mechanism for promoting their energy efficiency. Research methods are the following: synthesis and analysis; theoretical generalization; logical generalization; method of rising from the abstract to the concrete, recursive modelling, financial analysis. Results: the expediency of implementing the mechanism for promoting the energy efficiency of industrial enterprises has been justified; the tools for minimizing resistance to tax changes have been determined.

Keywords: Recursive Modelling, Energy Efficiency, Industrial Enterprise, Tax Consciousness, Tax Obligations, CO2 Tariff.

JEL classification: C53, E62, L6, Q4, P28

1. Introduction

Given the increasing exhaustion of traditional energy resources and the aggravation of global contradictions in economic development, ensuring energy security is one of the main strategic objectives. One can solve this problem, first of all, through diversifying energy resources, optimizing models of energy consumption and implementing energy-efficient technologies based on renewable energy sources. Renewable energy has, over the last decade, not only become a tool for achieving the idea of low carbon society but is increasingly arguing in favour of an economically viable alternative to fossil fuels.

All over the world, renewable energy is rapidly gaining momentum, replacing traditional and environmentally unfriendly energy sources. Renewable energy is based on the use of sun, water, wind and natural thermal energy.

The chosen pro-European vector of the state focus determines an energy-efficient development in the field of taxation in the context of global trends, which require that economic entities should immediately promote tax consciousness, social responsibility and ecologization of the tax system. In today's conditions, new parameters of ensuring an energy-efficient development of industrial enterprises are becoming increasingly relevant, taking into account non-formal and qualitative tax factors, financial indicators of growth, extending boundaries of functioning, as well as new alternatives for recovery, stability and development. Thus, the issues of promoting energy-efficient technologies are considered along with the mechanisms of ecologization of taxes at the level of taxpayers, the tax system and the state. All the participants in the interaction are united and differentiated by their intentions of fulfilling tax obligations in general and especially regarding the promotion of energy-efficient technologies. The formation of economic entities' intentions is a rather subjective and multidimensional process and, therefore, should be studied in more detail.

2. Problem definition and modeling

Such scholars as J. J. Burke and J. C. Stephens (2018) theoretically generalize and identify links between the development of renewable energy and state regulation. The authors critically evaluate energy democracy and formulate a set of possible implications for the full implementation of renewable energy in practice.

L. Chester (2010), however, studies the complexity of global markets of primary energy and analyzes the interdependence between financial markets and advanced industrial technologies. According to the researcher, energy security has managed to occupy a worthy place in the context of introducing green energy worldwide.

S. Yang Zhou and Z. Shao (2016) introduce the concept of the energy internet. They consider a new form of energy system development combined with modern information technologies and business. They believe that such a combination can help to develop innovative business and service models.

O. Egorova et al. (2016) explore the methodology of developing and implementing enterprises' strategies in research work. The authors present practical examples of enterprises' strategic goals in achieving sustainable development. This approach can be used to develop an energy-efficient strategy and build a strategic planning model.

O. Mykoliuk and V. Bobrovnyk (2019) highlight the need to develop the national economy by achieving energy security. The authors analyze the development of renewable energy sources and determine the main priorities in the national policy of Ukraine's national security, as well as the possibilities of ensuring energy security through developing renewable energy, taking into account the priorities of environmental security, improving energy efficiency and ensuring energy conservation.

M. Voynarenko et al. (2018) investigate the factors affecting energy security by using an economic and mathematical model and an oriented graph. The authors have managed to identify key indicators

for assessing energy security at industrial enterprises.

M. Asaul et al. (2019) justify the role of informatization in the system of enterprise management. The authors indicate that a key factor in the enterprise's development is its ability to perceive information space and timely response to changes in the external environment. The enterprise's energy modernization is inextricably linked to managerial processes in terms of its ability to adapt to the external environment.

M. Voynarenko and & O. Mykoliuk (2017) also deal with relevant issues of energy security in the context of European integration. The researchers analyze Ukraine's energy efficiency as a whole and compare similar indicators with those of developed countries.

In developed countries, a modern model of taxation is aimed at reforms towards achieving transparency in the context of administrative measures, monitoring tax compliance, examining tax behaviour, raising the level of tax culture and ecologization. Some aspects of taxation are developing, to varying degrees, in different countries. At the same time, social, psychological and economic issues of tax behaviour remain relevant X. Gao, H. Zheng et al. (2019), in particular in the context of tax reforms towards promoting energy efficiency and underdeveloped tax consciousness. Some scholars P. Wesseh, B. Lin, and P. Atsagli (2017) have attempted to study the features of decision-making in taxation through exploring the structure of tax consciousness, namely levels of knowledge, emotional components, behavioural predisposition (activity), by methods of conducting sociological and statistical studies, agent-oriented modelling C. Arguedas, F. Cabo, G. Martín-Herrán (2017), fuzzy modelling, reflexive control and hierarchy analysis. However, all findings prove the importance of tax behaviour and awareness, both to achieve fiscal efficiency of measures aimed at promoting energy efficiency and motivate economic entities to fulfil tax obligations in other areas.

In developed countries, a modern model of taxation is aimed at reforms (European Commission, 2014) towards achieving transparency in the context of administrative measures (EY, 2013), monitoring tax compliance, examining tax behaviour van Raaij WF (2016), raising the level of tax culture (OECD, 2015) and ecologization. Some aspects of taxation are developing, to varying degrees, in different countries. At the same time, social, psychological and economic issues of tax behaviour remain relevant Devos, Ken. (2013) Kirchler, Erich, (2014), Kucherova H. (2017). Kim, Jin-Sep (2008), Weber, TO, Fooken, J., & Herrmann, B. (2014), in particular in the context of tax reforms towards promoting energy efficiency and underdeveloped tax consciousness. Some scholars have attempted to study the features of decision-making in taxation through exploring the structure of tax consciousness, namely levels of knowledge, emotional components, behavioural predisposition (activity), by methods of conducting sociological and statistical studies Hastuti R. (2014), Abdul-Razak, A., & Adafula, CJ (2013), agent-oriented modelling Hashimzade, N., Myles, G.D., Page, F., & Rablen, M.D. (2014), fuzzy modelling Kucherova (2017), reflexive control Kucherova (2015) and hierarchy analysis Kucherova, (2019) However, all findings prove the importance of tax behaviour and awareness, both to achieve fiscal efficiency of measures aimed at promoting energy efficiency and motivate economic entities to fulfil tax obligations in other areas.

2.1. Energy efficiency at the snate level

In Ukraine, the issues of energy efficiency and energy security are addressed by the State Agency on Energy Efficiency and Energy Saving of Ukraine (State Energy Efficiency) and the Energy Efficiency and Saving Association. Some issues are covered by the Bioenergy Association of Ukraine and the Institute of Energy. Globally, energy efficiency is analyzed by IEA, Enerdata, Bloomberg, British Petroleum; use of renewable energy – by Renewable Energy Policy Network for the 21st century (REN 21).

Taking into account the prospects of renewable energy development, renewable energy sources may become significantly cheaper, and an economically justified effect may increase, which will promote the large-scale implementation of clean technologies by industrial enterprises.

2.2. Promoting the development of renewable energy

Ukraine has already introduced a powerful tool for stimulating the development of renewable energy. It is the "green" tariff for electricity produced from alternative sources, which also provides customs and tax benefits. Therefore, the Law of Ukraine "On Electricity Power Industry" establishes the green tariff to promote the production of electricity from alternative energy sources (hydropower produced only by micro, mini and small hydropower plants, except for blast furnace and coke oven gas).

Thus, the green tariff is a special tariff for the purchase of electricity produced at power facilities, including those construction-stage power plants (start-up complexes) put into operation, from alternative energy sources (hydropower produced only by micro, mini and small hydropower plants, except for blast furnace and coke oven gas).

Besides, the green tariff is set by the National Commission, which is responsible for the relevant state regulation. At the same time, it is set for each economic entity that produces electricity from alternative energy sources, by each type of alternative energy and for each entity of electricity power industry (or for each stage of construction of a power plant (start-up complex).

The allowances for observing the level of using the equipment produced in Ukraine are a fixed additional payment to the green tariff, proportional to the level of the economic entity's use of the equipment produced in Ukraine at the entity of electric power industry, in the percentage determined by this Law (see Table 1).

Table 1. Green tariff allowances according to the level of using the equipment produced in Ukraine

The number of green tariff allowances, %	The level of using the equipment produced in Ukraine, %
5	30
10	50

The allowances for observing the level of using the equipment produced in Ukraine following the entity of electricity power industry are set in monetary terms by the National Commission, which regulates the fields of energy and utilities, for each date of conversion of a fixed minimum amount of the green tariff.

2.3. Renewable energy sources in the industry

The functioning of industrial enterprises is rather energy-consuming, which leads to dependence on external sources of energy, high costs of domestic products, reduced competitiveness and sustainability of enterprises to changes in the environment. The demand for renewable energy sources has a steady upward trend due to the introduction and improvement of existing renewable energy technologies.

Given that renewable energy sources have an inexhaustible resource base and are environmentally friendly, it is necessary to implement renewable technologies in industrial enterprises, which will ensure their energy security and become the basis of further competitive potential.

In this context, the development of an energy security strategy, which underpins the principle of introducing renewable energy technologies, can serve as a promising direction for developing and reinforcing competitive positions of industrial enterprises.

Industry modernization is inextricably linked to energy-saving technologies. Given the significant increase in prices for imported energy products for many enterprises, the introduction of energy-efficient technologies is the matter of economic feasibility and enhancement of products' competitiveness. Due to modernization, enterprises simultaneously solve certain important tasks, such as increasing production efficiency, saving expensive energy resources, reducing emissions into the atmosphere, improving the safety of equipment and labour. On a nationwide basis, such steps can reinforce the overall energy balance, ensure energy security and improve the environment. It must be acknowledged that the following initiatives can ensure the competitiveness of enterprises

and create a solid basis for sustainable development: an efficient consumption of energy resources at all stages of production, the introduction of modern energy-efficient technologies, the implementation of organizational, technical and economic measures aimed at improving energy efficiency of production, as well as investments in the development of energy-saving technologies.

2.4. Mechanisms of implementing energy-efficient technologies

Taking into account the state's active promotion of renewable energy sources, the State Agency on Energy Efficiency and Energy Saving of Ukraine is currently developing a mechanism for implementing energy-efficient technologies in production, in particular through a carbon tax.

Energy-efficient production can help to solve complex energy, economic and environmental problems, as well as increase production volumes with simultaneous reduction of energy consumption and carbon emissions. The mechanism for promoting energy-efficiency at enterprises will increase the competitiveness of enterprises. Subsequently, the indicators of the country's economy will increase.

Industrial enterprises have a potential large enough to reduce energy consumption. According to the National Energy Efficiency Action Plan through 2020, energy use in this sector should be reduced by 25%. Besides, Ukraine's commitment to the Paris Climate Agreement obliges industrial enterprises to reduce their greenhouse gas emissions. The combination of these factors creates the need to introduce an incentive mechanism for government support to the industrial sector, in particular, machine-building.

Therefore, the essence of this mechanism lies in the fact that carbon taxes will be accumulated in the special fund of the state budget and will be used solely to finance energy efficiency and renewable energy measures at enterprises. It must be acknowledged that such mechanisms have long been successfully operating in European countries.

The classic response of taxpayers to raising the tax burden in the countries with low levels of tax culture implies finding ways to evade taxes. As a result, the justification of such an increase through systematic and gradual increases in carbon tariffs should also be explained in terms of determining the financial and economic capacity of industrial enterprises as one of the factors in their decision-making regarding payment volumes of taxes. The relevant international experience of promoting energy efficiency at industrial enterprises and using renewable energy sources ensures only partial reimbursement to Ukrainian enterprises (40%), paid in the form of a carbon tariff. Thus, it is necessary to use tax optimization methods to reduce the tax burden, taking into account a complex financial situation.

3. Implementation and algorithm

Preventing resistance from taxpayers to increase carbon tariffs, the authors have attempted to assess an existing financial and economic situation at industrial enterprises (see Table 2).

Table 2. The dynamics of values of financial indicators for industrial enterprises in Ukraine

Indicators	Years						
	2013	2014	2015	2016	2017	2018	norm
Current liquidity, %	140.8	134.5	140.5	137.6	133.4	130.9	min 100
Absolute liquidity, %	2.2	2.8	4.4	4.4	3.9	3	min 20
Autonomy coefficient, %	44	40.6	41.1	40.5	39.7	38.2	min 50
Return on assets, %	0.1	0.4	3	3.4	3.1	2	max
Return on working capital, %	1.2	0.4	3	3.4	3.1	2.9	max
Net margin, %	0.6	0.3	1.7	1.8	1.5	1.5	max
Return on total assets, %	3.8	1.5	3.7	4.2	3.8	3.8	max
Asset turnover	1.2	1.2	1.3	1.3	1.4	1.4	max
Working capital turnover	2.5	2.2	2.3	2.4	2.3	2.4	max
Receivables turnover	5.4	5.1	5.5	5.5	5.8	5.5	max

Table 2 shows that the indicators of current liquidity exceed the regulatory level of 100%. However, the level of the indicator's value for the studied period decreases from 140.8% to 130.9%. In this regard, the industry can provide short-term commitments more than sufficient. The indicators of absolute liquidity failed to reach the regulatory level of 20%, however, increasing from 2.2% in 2013 to 4.4% in 2016, further decreasing to 3% in 2018. Thus, money and its equivalents are not enough to ensure the current obligations of economic entities. The indicators of autonomy coefficient do not reach the regulatory level of 50% and decrease from 44% in 2013 to 38.2% in 2018 for the studied period. So, there is every reason to believe that enterprises are not financially reliable enough.

Return on assets is characterized by the profitability of 1 UAH of assets of economic entities. Its indicators rapidly increase from 0.1% in 2013 to 3.6% in 2016 and further decrease to 2% in 2018. The dynamics of return on working capital is similar since its indicators increase from 1.2% in 2013 to 3.4% in 2016 and decrease to 2.9% in 2018. The conversion of sales revenue into profit is characterized by the net margin, which increased from 0.6% in 2013 to 1.8% in 2016 and decreased to 1.5% in 2018. The ratio of operating profit to assets of economic entities characterizes return on total assets, which also increased from 3.8% in 2013 to 4.8% in 2016 and decreased to 3.8% in 2018.

The conditions of business activity in terms of asset turnover characterize their performance. Its indicators fluctuate in the range of 1.2-1.4 for the studied period. Working capital turnover shows where working capital efficiently generates the value of sold products (the difference between current assets and current liabilities). According to its indicators, the efficiency of such generation fluctuates in the range of 2.2-2.5 for the studied period. The ability of economic entities to settle accounts receivable during the studied period remains within the limits of 5.1-5.8, which is partly explained by the payment crisis in the country. Based on the assessment of the trends in the indicators, it is reasonable to increase carbon tariffs, whose value will not affect the financial and economic situation at industrial enterprises.

It is quite difficult for developing countries to reduce the fiscal impact of increases in tariffs and rate as a result of tax evasion. The authors believe it necessary to recursively model economic entities' intentions of fulfilling their tax obligations in the context of increases in carbon tariffs.

Recursive modelling implies justifying alternate occurrence of cause and effect links between factors, which allows one to justify a single trajectory of obtaining possible results without feedback.

Therefore, Y – the last dependent variable in the trajectory of motion; X – variables conditioning Y, i.e. [38]: Xa → X → Xb → Y, where X_a – a set of variables preceding X; X_b – a set of variables following X; Y – a dependent variable.

The identification of determinants of tax behaviour and their links, as well as to the rule presented in Figure 1, has made it possible to elaborate the structure of a recursive model for shaping taxpayers' intentions to fulfil tax obligations in the event of increases in carbon tariffs. The hypothetical model relies on justified structural equations, which are based on cause and effect links of endogenous variables in a rigid sequence operating without feedback.

The authors have also elaborated a scheme of cause and effect links based on expert assessment, sociological studies, their knowledge, which are expressed by a coefficient describing the connection between the volatility of the dependent variable and independent volatility through standard deviation in terms of constancy of other factors, to determine economic entities' intention of fulfilling tax obligations in the event of increases in carbon tariffs. This approach makes it possible to take into account cause and effect links between qualitative and quantitative variables and is relevant to the field of taxation as a process. Figure 2 explains the links between exogenous and endogenous variables by the coefficient $γ_{ij}$, where i – the endogenous variable index, j – the exogenous variable index. At the same time, endogenous parameters are inextricably linked by the coefficient $β_{nm}$, where n – the dependent variable index, m – the independent variable index.
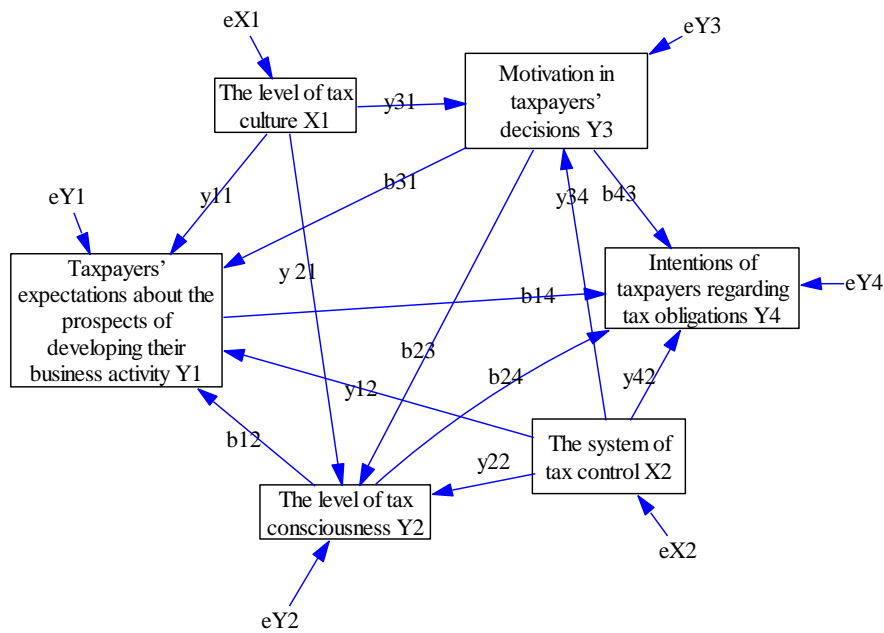
Figure. 1. The structure of a recursive model for shaping taxpayers' intentions to fulfil tax obligations

Thus, the proposed hypothetical model can be described by the following equations:

$$Y_1 = y_{11}x_1 + y_{12}x_2 + b_{31}y_3 + b_{12}y_2 + ey_1, \quad Y_2 = b_{23}y_3 + y_{21}x_1 + y_{22}x_2 + ey_2,$$

$$Y_3 = y_{31}x_1 + y_{34}x_2 + ey_3, \quad Y_4 = b_{43}y_3 + b_{14}y_1 + b_{24}y_2 + y_{42}x_1 + ey_4. \tag{1}$$

Thus, the solutions of the equations through least square method make it possible to predict taxpayers' intentions of fulfilling tax obligations in the context of increasing a carbon tax. The following assumptions have been taken into account for the practical implementation of the proposed approach:

– the motivation behind economic entities' decisions is determined by the increase in the annual tax burden (according to the World Bank). In the event of a reduction in the tax burden, the intentions of fulfilling tax obligations will increase;

– the level of tax culture and consciousness is reflected in the indicators of tax discipline, in particular through tax penalties;

– the tax control system is characterized by different types (liberal and fiscal-administrative), determined by the frequency of such control;

– economic entities' intentions of fulfilling tax obligations are formed between full (partial) taxation and tax evasion. They are determined based on the results obtained from surveying economic entities or the set expectations of economic entities about the prospects of their business activity in the percentage of persons evading questions, which suggests that they intend to deviate from tax and other norms. The indicators of the shadow economy's volumes from GDP are used, too;

– economic entities' expectations about the prospects of their business activity are determined based on the data provided by the State Statistics Service of Ukraine.

Given that the industrial sector of the economy of Ukraine forms the lion's share of GDP between 2018 and 2019, Table 3 presents the indicators of expectations of its economic entities.

Table 3. Expectations of industrial enterprises about the prospects of developing their business activity, a balance of answers, %

Quarters/ years	The financial and economic condition	Total sales of products	Investment costs on construction	Investment costs on machinery, equipment and facilities	The number of workers
3/2017	17.8	24.9	14.6	24.7	5
4/2017	12.9	26.5	8.8	22.9	4.6
1/2018	19.6	32	13.9	27.3	10.1
2/2018	20.7	28.7	14	22	6
3/2018	14.7	29.2	12.3	23.2	6.9
4/2018	15.7	28.5	12.4	23.7	6.2
1/2019	20.8	34.4	13.2	24.7	5.4
2/2019	22.9	30.2	9.2	22.6	4.4
3/2019	20	27.1	9.3	17.7	2.2

Table 3 shows certain improvements in the level of enterprises' business activity due to improved expectations about investment costs on construction, good results regarding total sales of their products and financial and economic conditions at enterprises. One can also expect an increase in the number of workers. Table 4 presents the input data for the implementation of the recursive model.

Table 4. Input data needed to calculate the recursive model for shaping taxpayers' intentions to fulfil tax obligations in the event of increasing carbon tariffs

Years	Intentions of taxpayers regarding tax obligations, Y4	Taxpayers' expectations about the prospects of developing their business activity, Y1	The level of tax consciousness, Y2	Motivation in taxpayers' decisions, %, Y3	The system of tax control, X2	The level of tax culture, X1
2015	43.1	-15	0.51	40	21663	4611007
2016	52.20	-11	0.43	35	18485	6 103433
2017	40.6	-4	0.49	32	19169	16 300557
2018	37.8	-4.4	0.50	30	18357	13 232296

The correlation matrix of the links is presented in Table. 5.

Table 5. Correlation matrix (-1<k<1)

	Y4	Y1	Y2	Y3	X2	X1
Y4	1,00					
Y1	-0.56	1.00				
Y2	-0.88	0.10	1.00			
Y3	0.43	-0.96	0.06	1.00		
X2	-0.08	-0.72	0.54	0.86	1.00	
X1	-0.65	0.96	0.26	-0.84	-0.52	1.00

Taxpayers' intentions of deviating from tax norms are described by a close indirect connection with the level of tax consciousness (-0.88), by an average connection with the level of tax culture (-0.65), as well as by their expectations in terms of their business activity (-0.56). A weak but direct link is related to motivation in taxpayers' decisions (0.43), whereas the link with the tax control system is not significant. Given the availability of statistics for only four years, it is not possible to build an adequate model.

3.1. A financial tool for promoting energy-efficient measures

It is essential to consider the use of revenues obtained from the introduction of a carbon tax. The international experience in applying financial instruments under which funds are channelled towards enterprises to promote energy efficiency, imply fundamental features regarding the conditions for government support in different countries, as well specific criteria for selecting enterprises to participate in such programmes. The need to introduce the mechanism for promoting energy efficiency at industrial enterprises and using renewable energy sources in the context of the State Agency on Energy Efficiency and Energy Saving of Ukraine is presented in Table 6.

Table 6. Justifying the need to introduce the mechanism for promoting energy efficiency at industrial enterprises and using renewable energy sources

Current status	Probable changes
Only entities with more than 500 tonnes of carbon emissions per year are accounted (only ~ 60% of entities)	The tax must be paid by everyone who consumes fossil fuels
Lack of proper control and verification of the submitted data	The tax rate should depend on the carbon content of a particular fuel
An unjustified low tax rate (0.37 UAH per 1 tonne of carbon emissions) does not promote emission reductions	The tax rate should promote the reduction of fossil fuel consumption or the switch to alternative fuels and RES
Individual sectors and entities do not pay a carbon tax at all	Tax revenues must be used for their intended purpose
Tax revenues disappear into the budget (20% – state budget, 80% – local budget)	Economic entities implementing energy efficiency and renewable energy measures may benefit from government support

According to [5; 6]

4. Conclusions

Consequently, the introduction of the mechanism for promoting energy efficiency at industrial enterprises and the use of renewable energy sources, as suggested by the international experience of using financial instruments, will help to direct state funds to enterprises to promote energy efficiency.

In Ukraine, the issue of energy efficiency is of particular importance given the threat to energy security. According to Hans-Joseph Fell, the author of the green tariff in Germany, the development of renewable energy and the introduction of energy-efficient measures in Ukraine is the only way to overcome the dependence on the import of traditional energy resources, especially natural gas and nuclear fuel.

Such a tool has several advantages since carbon taxes promote the reduction of greenhouse gas emissions and encourage investments in long-term projects. It must be acknowledged that the level of taxes is important because its size depends on the desire of investors to invest in cost-effective measures to reduce emissions. One should not hope for reduced carbon emissions with low-level taxes.

The financial analysis of industrial enterprises shows that the increase in carbon tariffs is justified. At the same time, such an increase will not affect the financial and economic situation of industrial enterprises.

Recursive modelling of industrial enterprises' intentions to fulfil their tax obligations in the event of increasing carbon tariffs has been implemented to minimize the risk of fiscal effect reduction because of tariff increases and rates due to tax evasion. The obtained results prove that the determining factor in taxpayers' intentions to fulfil their tax obligations is the level of tax consciousness and culture. Therefore, the difficult financial situation and strict tax control only partially motivate taxpayers to comply with tax rules. Thus, the increase in carbon tariff should be

carried out taking into account these factors to maintain the level of the planned fiscal effect.

References

1. BURKE, M. J., & STEPHENS, J. C. (2017). *Political power and renewable energy futures: A critical review*, Energy Research & Social Science, 35, 78-93.
2. CHESTER, L. (2009) *Conceptualising energy security and making explicit its polysemic nature*, Energy Policy, 38, 2, 887-895.
3. ZHOU, Y., YANG, S., & SHAO, Z. (2016. *Energy Internet: The business perspective*, Applied Energy, 178, 212-222.
4. EGOROVA, O., ANDRYASHINA, N., & KUZNETSOV, V. (2016). *Methodology of formation and realization of competitive strategy of machine building enterprises*, European Research Studies Journal, 19(2), 125-134.
5. MYKOLIUK, O., & BOBROVNYK, V. (2019). *Strategic Guidelines on Development of Renewable Energy Sources*, Global Journal of Environmental Science and Management, 5(SI), 61-71.
6. MYKOLIUK, O., BOBROVNYK, V., & SVISTUNOV, O. (2019). *Forming the Energy Security Strategy of Modern Industrial Enterprises*, Advances in Economics, Business and Management Research. 6th International Conference on Strategies, Models and Technologies of Economic Systems Management (SMTESM 2019), 95, 438-443.
7. VOYNARENKO, M., DYKHA, M., MYKOLIUK, O., YEMCHUK, L., & DANILKOVA, A. (2018). *Assessment of an enterprise's energy security based on multi-criteria tasks modeling*, Problems and Perspectives in Management, 16 (4), 102-116.
8. ASAUL, A., VOYNARENKO, M., DZHULII, L., YEMCHUK, L, SKOROBOHATA, L., & MYKOLIUK, O. (2019). *The latest information systems in the enterprise management and trends in their development*. The 9th International Conference Advanced computer information technologies (ACIT`2019), IEEE, Ceske Budejovice, Czech Republic, 362-365.
9. VOYNARENKO, M., & MYKOLIUK, O. (2017). *Strategic energy security outlook formation of Ukraine under European integration process*, Scientific bulletin of Polissia, 3(11), 29-37.
10. GAO, X., ZHENG, H., ZHANG, Y., & GOLSANAMI, N. (2019). *Tax Policy, Environmental Concern and Level of Emission Reduction*, Sustainability, 11, 2-17.
11. WESSEH, P., LIN, B., & ATSAGLI, P. (2017). *Carbon taxes, industrial production, welfare and the environment*, Energy, 123, 305-313.
12. ARGUEDAS C., CABO F., & MARTÍN-HERRÁN G. (2017). *Optimal Pollution Standards and Non-compliance in a Dynamic Framework*, Environ. Resour. Econ., 68, 537-567.
13. MYKOLIUK, O. (2018). *Priority trends in ensuring the energy security of Ukraine in the terms of eurointegration.* Innovative technologies and scientific solutions for industries, 1(3), 116-123.
14. MYKOLIUK, O., & PRYLEPA N. (2018). *Management of innovative development of enterprises in the context of energy security strategy*. Innovative technologies and scientific solutions for industries, 3 (5), 114-121.
15. Tax Transparency (2013). *Seizing the Initiative* Taxation Papers. Working Paper: European Commission.
16. Tax Reforms in EU Member States (2014). *Tax Policy Challenges for Economic Growth and Fiscal Sustainability*. URL: http://ec.europa.eu/economy_finance/publications/ european_economy/ 2014/pdf/ee6_en.pdf.
17. Tax Transparency: Seizing the Initiative (2013), London: Ernst&Young LLP, 49 p. URL: www.ey.com/uk.
18. OECD (2015). Building Tax Culture, Compliance and Citizenship. OECD Publishing, Paris.
19. RAAIJ W. (2016). *Tax Behavior: Compliance and Evasion*. In Understanding Consumer Financial Behavior. Palgrave Macmillan, New York. 103-111.
20. DEVOS, K. (2013). *Factors influencing individual taxpayer compliance behaviour*. Springer Science & Business Media.

21. KUCHEROVA, H. (2017). *Methods of Evaluating Taxpayers Tax Consciousness*. Transformations in Contemporary Society: Economic Aspects. Monograph. Opole: The Academy of Management and Administration in Opole.
22. KIM, J. S. (2008). Analysis of the Tax Consciousness of a Taxpayer and a Tax Agent. The Journal of the Korea Contents Association, 8(10), 142-150.
23. WEBER, T. O., FOOKEN, J., & HERRMANN, B. (2014). *Behavioural economics and taxation*. Directorate General Taxation and Customs Union, European Commission, 41.
24. HASTUTI, R. (2014). *Tax Awareness and Tax Education: A Perception of Potential Taxpayers*. International Journal of Business, Economics and Law, 5(1), 83-91.
25. ABDUL–RAZAK, A., & ADAFULA, C. J. (2013). *Evaluating taxpayers' attitude and its influence on tax compliance decisions in Tamale*, Ghana. Journal of Accounting and Taxation, *5*(3), 48-57.
26. HASHIMZADE, N., MYLES, G. D., PAGE, F., & RABLEN, M. D. (2015). *Social networks and occupational choice: The endogenous formation of attitudes and beliefs about tax compliance*. Journal of Economic Psychology, 40, 134-146.
27. KUCHEROVA, H. Y., & KOMAZOV, P. V. *Substantiation of tax consciousness model for subjects of taxation on the basis of reflexive interaction*. Středoevropský věstník pro vědu a výzkum, 3(16), 9-19.
28. KUCHEROVA, H., POKATAIEVA O., & BILSKA O. (2019). *Modelling tax consciousness evaluation in the context of economic development uncertainty.* Periodicals of Engineering and Natural Sciences.
29. KUCHEROVA H., SERHIEIEVA L., & BILSKA O. (2017). *Matrix models for assessing the taxation subjects' interaction under uncertainty of socio-economic processes*. Workshop Proceedings. CEUR-WS.org, online. 371-384.
30. KUCHEROVA, H. SERHIEIEVA, L. & BILSKA, O. (2019). *Assessment of tax subjects' interaction under uncertainty of socio-economic processes.* SHS Web of Conferences. The 8th International Conference on Monitoring, Modeling & Management of Emergent Economy.
31. HASTUTI, R. (2014). *Tax Consciousness and Tax Education: A Perception of Potential Taxpayers*. International Journal of Business, Economics and Law, 5, 1, 83-91.
32. NURLIS, I. K. (2015). *The Effect of Taxpayer Consciousness, Knowledge, Tax Penalties and Tax Authorities Services on the Tax Compliance: (Survey on the Individual Taxpayer at Jabodetabek & Bandung).* Research Journal of Finance and Accounting, 6,2, 104-112.
33. BABENKO, V., SIDOROV, V., KONIAIEVA, Y., & KYSLIUK, L. (2019). *Features in scientific and technical cooperation in the field of non-conventional renewable energy*. Global Journal of Environmental Science and Management, 5 (Special issue), 105-112.
34. KUZNETSOV, A., KAVUN, S., SMIRNOV, O., BABENKO, V., NAKISKO, O., & KUZNETSOVA, K. (2019). *Malware Correlation Monitoring in Computer Networks of Promising Smart Grids*. IEEE 6th International Conference on Energy Smart Systems, ESS 2019 – Proceedings, No. 8764228, 347-352.
35. BABENKO, V., PEREVOZOVA, I., KRAVCHENKO, M., KRUTKO, M., & BABENKO, D. (2020). *Modern processes of regional economic integration of Ukraine in the context of sustainable development*. *E3S Web Conf*., 166 (2020) 12001.
36. MUEHLBACHER, S., KIRCHLER E. & SCHWARZENBERGER H. (2011) Voluntary versus Enforced Tax Compliance: Empirical Evidence for the "Slippery Slope" Framework". European Journal of Law and Economics, 32, 89–97.
37. MUEHLBACHER S., KOGLER C.& KIRCHLER E. (2011) An Empirical Testing of the Slippery Slope Framework: The Role of Trust and Power in Explaining Tax Compliance, University of Vienna Working Paper.
38. NIEMCZYK, A. (2014) The application of path modelling in the analysis of consumer behaviour in the cultural tourism market. Economics & Sociology, 7(1), 204.