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Modeling of the Excise Taxation Influence on Components of Human Potential

Abstract: *The purpose of the research is analysis of a model of influence of excise tax rate increase for tobacco products in Ukraine on financial indices of state funds, prevalence of tobacco smoking, and indices of society health. Due to the results of research, the author determined the opportunities of the excise tax for tobacco smoking prevalence regulation in Ukraine. The dynamics of changes of specific and ad valorem rates of the excise tax and the dynamics of its contribution to the revenues of the State Budget of Ukraine were analyzed. The author estimated the changes of tobacco smoking prevalence in Ukraine on the basis of an adapted imitation model under conditions of increase of excise tax rates to the level of rates of the European Union countries. The research shows the excise tax is an effective financial regulator of tobacco smoking prevalence in Ukraine and it influences a population health condition. Increase of the excise tax rates causes reduction of amounts of tobacco product consumption and decrease of the share of smoking adults. Gradual increase of the Ukrainian rates to the level of the EU before 2018*

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may allow pulling from 1.0 to 1.9 million of people through premature death. Aside from a positive social effect of health enhancement, increase of the share of excise tax within a structure of a retail price of tobacco products will positively influence the growth of tax incomings to the State Budget. Consequently, under the Ukrainian contemporary economic environment the excise tax is an effective financial regulator of tobacco smoking prevalence.

Introduction

The research of different aspects of the concept of "human potential" done by the authors of the article enabled to make a general conclusion that the human potential is a source which is inherent to a human as an actor of economic relationships and is formed on the basis of important components such as health, intellectual opportunities to gain and to generate new knowledge, to create technologies and to form professional skills, freedom of economic choice enabling performance of creative work aimed at development of a society and attaining a beneficial social and economic result. The mentioned author's conclusion is coherent with the understanding of the sense of human potential development by specialists of the UNO, who consider it as a process of provision of humans with a more wide range of ways of enhancement of their existence. Such a choice is fundamentally uninterrupted and continuous and it changes in time as a result of transformation of cumulated quantitative changes into new quality. The main interrelated aspects of human potential development comprise of possibility to get through long and healthy life, attaining knowledge, which is important for formation of the basics of own existence, and also access to economic resources needed for the provision of an appropriate life quality. In terms of absence of at least one of these components, the possibility of existence and development of a human significantly decreases. Since tobacco smoking is one of the factors of the health deterioration leading to the retardation of human potential development, there is a need to research the influence of increase of tobacco product excise tax rate on the public health in Ukraine

The official authorities of Ukraine claims that the share of smokers in the Ukrainian population amounts up to the third of adults (30%). According to the unofficial estimations, approximately a half of the population of Ukraine smokes. Within the last years, a tendency of rapid prevalence of smoking among teenagers, young people, and women has been observed. The mentioned facts are a reason for the conclusion about the vital necessity of reduction of a tobacco product consumption level in Ukraine.

Taxation is one of the most efficient instruments of regulation of the tobacco smoking level. Some researches indicate that the increase of a price

for tobacco products by 70% may prevent the forth of the world smoking-related fatal cases. Moreover, the increase of tobacco tax rates directly benefits to the state in the form of the increase of tax revenues, which in turn may be used for the tobacco smoking combat and the support of important state medical and sanitary and social programs.

The purpose of the research is the modeling analysis of the influence of increase of tobacco product excise tax rate on financial indices of the state funds, the prevalence of tobacco smoking, and indices of the public health in Ukraine. Tasks of the research consist of the estimation of change of tobacco smoking prevalence in Ukraine on the basis of an adjusted imitation model in terms of the increase of excise tax rates to the level of rates of the European Union members and of the detection of excise tax opportunities regarding the regulation of tobacco smoking prevalence in Ukraine and its influence on the population health state.

In the process of research the author used general scientific and special scientific methods. In particular, historical method was used to analyze the process of formation of the excise taxation system of Ukraine. Statistical method was applied to analyze the shares of excise tax within the structure of tax revenues of the Consolidated Budget of Ukraine and the dynamics of specific and ad valorem rates of the excise tax and the price for tobacco products. The method of least squares was used to determine an interrelation between an average retail price for tobacco products and a share of smokers in the world population. Modeling was applied to analyze the influence of the excise tax rate dynamics on the level of human potential development, namely on the decrease of prevalence of tobacco smoking in Ukraine.

The results of research show that the increase of excise tax rates stipulates the reduction of amounts of the tobacco product consumption and the reduction of the share of smoking adults. The gradual increase of these rates in Ukraine to the level of the EU before 2018 may enable to prevent from 1.0 to 1.9 million of people from premature death, to reduce the prevalence of smoking among inhabitants aged 15 and older from 25.5% to 24.1% of the population, to decrease the amount of smokers aged 15 and older from 9.4 million to 8.9 million of people.

The increase of excise tax share within the structure of the retail price for tobacco products positively influences the increase of tax revenues of the State Budget. The amount of excise taxation revenues to the Budget may fluctuate from 53.9 billion of grivnas to 59.9 billion of grivnas and the amount of revenues of AVT payment may fluctuate from 12.2 billion of grivnas to 13.3 billion of grivnas.

Consequently, in terms of Ukrainian contemporary economic environment the excise tax may be an effective financial regulator of the tobacco smoking prevalence.

Analysis of the interrelation between excise tax rates for tabaco products and level of human potential development in Ukraine and in the world

The span of a healthy period of life is the most important index determining general duration of population life. According to the International reports ((United Nations Development Programme, 2000; Roca, 2013), since the moment Ukraine attained its independence, the quantity of quality adjusted life years has started to fall significantly. In 1990 this index accounted for 71 years in Ukraine and was close to the index in the highly-developed countries. In 1995 the quantity of quality adjusted life years decreased by more than 3 years. Before 2011 Ukraine has failed to reach the indices of 1990: in 2011 duration of life in Ukraine accounts for 68.5 years. As can be seen in Figure 1, this index for Ukraine is lower than the analogical one for the countries with medium indices of a human potential development level (70.7 years) and, of course, than the analogical one for the countries with high indices of a human potential development level (75.8 years) and for the countries with extra high indices of a human potential development level (80.9 years).

According to The European Health Report of World Health Organization Regional Office for Europe (World Health Organization Regional Office for Europe. 2005), tobacco smoking is a significant factor influencing span of a healthy period of life. The general quantity of deaths in Ukraine caused by tobacco smoking approximately accounted for 100,000, constituting 13% of the total mortality. Tobacco smoking causes death due to cardiovascular diseases (47%), respiratory diseases (19%), lung cancer (16%), and other diseases (9%). Approximately 70% of fatal cases caused by tobacco smoking were observed in the age group 35-69.

Figure 1. Dynamics of span of a healthy period of life in Ukraine compared with the dynamic of average index in the groups of countries with an extra high, high, medium, and low level of human potential development during 1990–2011 (years of life)
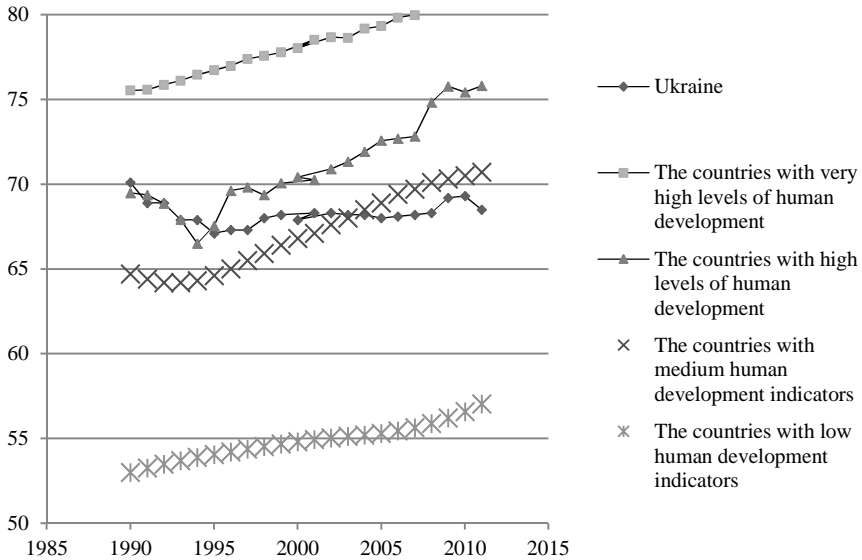
Source: United Nations (2014).

The statistics states that the share of smokers in the population of Ukraine constitutes approximately a third of adults (30%). According to unofficial estimations, in Ukraine approximately a half of the population smokes. Within the last years, a tendency of rapid expansion of smoking among teenagers, young people, and women has been observed. The mentioned facts are a reason for the conclusion about the vital necessity of reduction of a tobacco product consumption level of the Ukrainian population.

The world practice shows that taxation is one of the most efficient instruments of tobacco smoking level regulation. The reports of the World Health Organization contain data of researches, which indicate that the increase of a price of tobacco products by 70% may prevent a forth of the world smoking-related fatal cases (Lopez *et al.*, 2006). Simultaneously, the increase of tobacco tax rates directly benefits to a state in a form of the increase of tax incomings, which in turn may be used for fighting tobacco smoking and support of important state medical and sanitary and social programs.

Within centuries taxes for tobacco products have been used as regulators of tobacco smoking by the governments of all the countries in the world. The experts (World Health Organization, 2008) claim that taxes for tobacco products, in comparison with other types of taxes, are easily perceived by all inhabitants, even by a poor stratum of population, since the majority understands that smoking is harmful for health. Notwithstanding the warnings of tobacco industry actors, the increase of tobacco product taxes does not generally result in reduction of tax incomings within the structure of state budget revenues (Jha & Chaloupka, 2000, p. 242). The known general consistency claims that the increase of tax rates for tobacco products by 10% provides the reduction of tobacco consumption by 4% in the countries with a high income level and approximately by 8% in the countries with a low and medium level of income. Simultaneously, the tobacco tax incomings approximately increase by 7% (Jha & Chaloupka, 2000, p. 419).

The increase of tax rates dramatically influences reduction of a cigarette consumption amount in the countries with a low and medium level of incomes (Jha & Chaloupka, 1999), but does not conduce to the decrease of tax incomings to the state budget. For instance, in South Africa each next increase of cigarette excise tax rates by 10% enables the growing of cigarette excise tax incomings by 6%. During 1994–2001 the total excise tax incomings have been increased twice as much (van Walbeek, 2002).

Analysis of the world practice of tobacco product taxation showed that in Ukraine as well as in the majority of other countries the share of excise tax within the structure of the price for tobacco products is sufficiently considerable. For instance, in 2012 it accounted for 50%, which was close to the indices of Romania, Georgia, Poland, and other countries of the world, which were similar in the level of social and economic development, and was higher than the analogical indices of some high-developed countries (Japan, the USA, and Singapore).

Simultaneously, the average retail price for tobacco products in Ukraine is among the lowest prices and the share of smokers is one of the highest in the world: in 2012 the average retail price for a pack of cigarettes of the most popular brand according to the purchasing power parity (PPP) accounted for 1.75 dollars of the USA and the share of smokers accounted for 30%. In Belarus the value of tobacco products accounted for 2.36$, in Russian Federation – 1.85$, in Poland – 5.85$, in Slovakia – 4.82$.

As can be seen in Figure 2, there is a general interrelation between the average retail price for tobacco products and the share of smokers, calculated on the basis of the statistics of 2012 for 14 countries (World Health Organization, 2014). Obviously, there is a consistency, which may be presented as a linear line, according to the international experience: y = -1,548x +

35.31. In other words, if the price for tobacco products increases by 1 USA dollar according to the PPP, the share of smokers in average decreases by 1.5%. Consequently, the price is a significant regulator of a number of smokers.

Figure 2. Interrelation between the average retail price for tobacco products and the share of smokers[1]
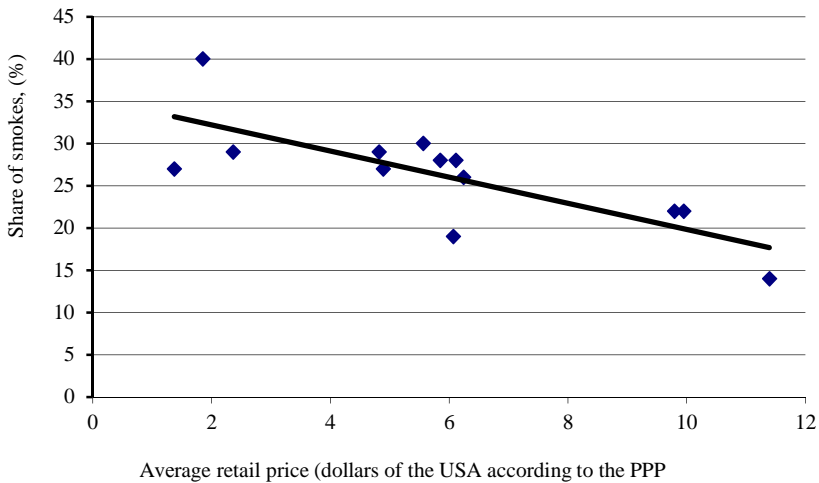

Source: World Health Organization (2014).

Simultaneously, there is a need to note that according to the data of the WHO smokers insufficiently react to price changes in terms of relatively low prices. Such a situation has been recently observed in Ukraine (Ross *et al.*, 2009).

Since 2008, simultaneously with the significant increase of the excise tax rates, the price for tobacco products in Ukraine has become to extremely increase (Figure 3). Notwithstanding this process, the temp of its rise has remained to be lower than the temp of the inflation, and the consumer price index for tobacco products during years has continued to be at a level of the consumer price index of essential goods and services. As a result, during these years the price elasticity of demand for tobacco products has remained approximately at the same level, i.e. has accounted for -0.1.

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[1] Built by the author on the basis of the 2012 data for 14 countries of the world.
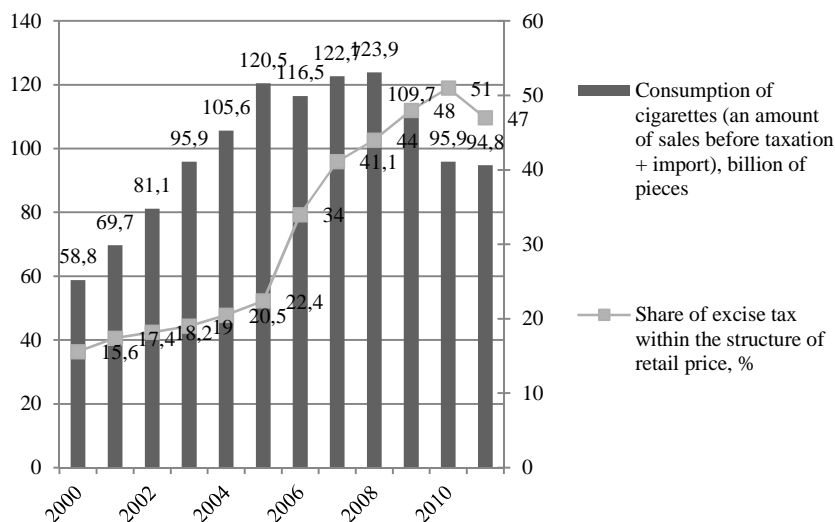
Figure 3. Dynamics of the average retail price for cigarettes with a filter and without a filter per pack (20 pieces) during 2000–2014
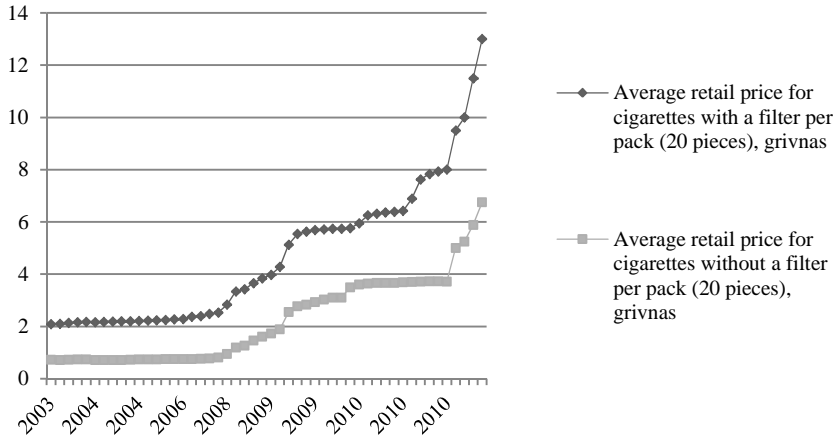
Source: The State Statistics Agency of Ukraine (2013c).

Consequently, nowadays the average retail price for tobacco products in Ukraine does not perform a function of destimulation of the tobacco product consumption in a way the price operates in economies of other countries: this price enables experienced smokers as well as teenagers, youth, and even children to continue smoking without significant expenses for a personal budget. The amounts of tobacco product consumption (Figure 4) have extremely increased from 2000 to 2008, achieving the maximum (+211%). This is an affirmation of the assertion mentioned above. The biggest amount of tobacco product consumption was observed in 2007 and 2008, when the population annually consumed in average 123.5 billion of cigarettes or 6.2 billion of packs (in other words, consumption constituted 13.5 packs per person, taking into account even children).

Figure 4. Consumption of cigarettes and the share of excise tax within the structure of retail price for tobacco products in Ukraine during 2000–2011
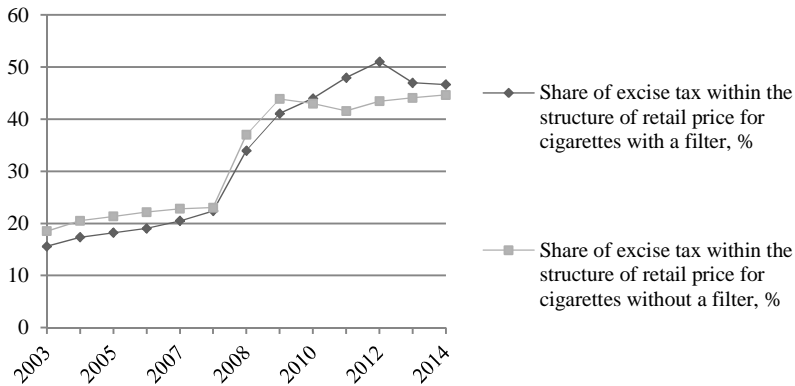

Source: The State Statistics Agency of Ukraine (2013a); The State Statistics Agency of Ukraine (2013c).

This process took place, because the relatively low, compared to other countries, retail prices for tobacco products in Ukraine before 2009 were caused by sufficiently low prices of producers. The significant increase of the share of excise tax within the structure of average retail price for cigarettes with a filter and without a filter during 2008–2009 (Figure 5) has caused appreciable change of the retail price for tobacco products and has overcome the tendency of their consumption.

Taking into consideration that the process of increase of the prices of tobacco products will continue due to implementation of the articles of the Tax Code of Ukraine, which contemplate the increase of excise taxes, there is a need to understand in what way these measures may influence the sector of state funds and health of the society. To understand the future processes there is a need to do retrospective analysis of processes, which has taken place in the Ukrainian economy.

Figure 5. Dynamics of changes of the share of excise tax within the structure of retail price for cigarettes with a filter and without a filter during 2003–2014

Source: The State Statistics Agency of Ukraine (2013c).

The history of transformation of the process of tobacco product taxation in Ukraine may be conventionally divided into five periods:

1. 1993–1995. There was an decrease of excise tax rates in order to encourage production. During 1993–1995 there has been an ad valorem system of taxation (expressed as a percentage of a sale price). In 1993 there was a 70% unified rate. In 1995 it declined and state authorities have begun to use it for cigarettes without a filter (10%) and with a filter (40%). As a result of such excise policy the share of excise taxes within tax incomings of the State Budget and the retail prices for cigarettes decreased;

2. 1996–1999. There was the increase of the excise tax rates in order to increase the revenues of the State Budget. During 1996–1999 the taxation policy has changed. The excise tax was expressed as a fixed sum per particular amount of cigarettes. In 1996 the rate constituted 2 ECU per 1000 cigarettes with a filter and 0.5 ECU per 1000 cigarettes without a filter. The rates have annually increased and in December 1998 reached 2.5 ECU for both cigarettes with a filter and without a filter. In November 1999 the excise tax rates were determined in the national currency: 10 grivnas per 1000 cigarettes with a filter and 7 grivnas per 1000 cigarettes without a filter. Actually, there was decrease of the excise tax rate, because at that moment 2.5 ECU were equal to 12 grivnas. The main consequence of the four-year period of the excise tax rate increase is increase of the prices for cigarettes and significant increase of the revenues of the State budget;

3. the end of 1999–2007. There was stabilization of the excise tax rates. Since the end of 1999 there has been stabilization of the excise tax rates accomplished by their further insignificant increase. This increase mainly was less than a level of inflation. Also, this period was characterized by entering into force of retirement insurance fees expressed as 5% of a wholesale price in July 1999. Since the 1st of January 2004 the retirement insurance fees were cancelled;

4. the beginning of 2008 – the end of 2010. There was increase of the specific and ad valorem rates of excise tax. From the beginning of 2008 the specific and ad valorem rates of excise tax have increased twice as much. Since September 2008 the rates have increased more than twice as much. In July 2009 the next 1.5 times increase of specific excise tax for tobacco products occurred. There was the insignificant 25% increase of the ad valorem rate. Since July 2010 only the specific rates of tax for cigarettes with a filter have increased by 30%. Other excise tax rates have remained the same.

5. 2011–2014. There was a significant increase of the specific excise tax rates and the simultaneous decrease (from 25% to 12%) of the ad valorem excise tax rate in 2013.

The dynamics of change of the excise tax rates for tobacco products is presented in Figure 6 and Figure 7.

Figure 6. Dynamics of the excise tax rate (the specific one) for cigarettes with a filter and without a filter during 2000–2015[2]
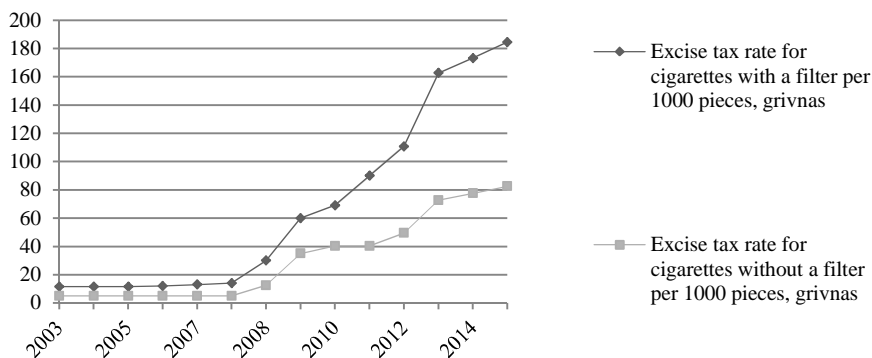
Source: On Amendments to the Tax Code of Ukraine (2012).

[2] Prognosticated figures of the excise tax rates during 2014-2015.

Figure 7. Dynamics of the excise tax rate (the ad valorem one) for cigarettes with a filter and without a filter during 2000–2015[3]
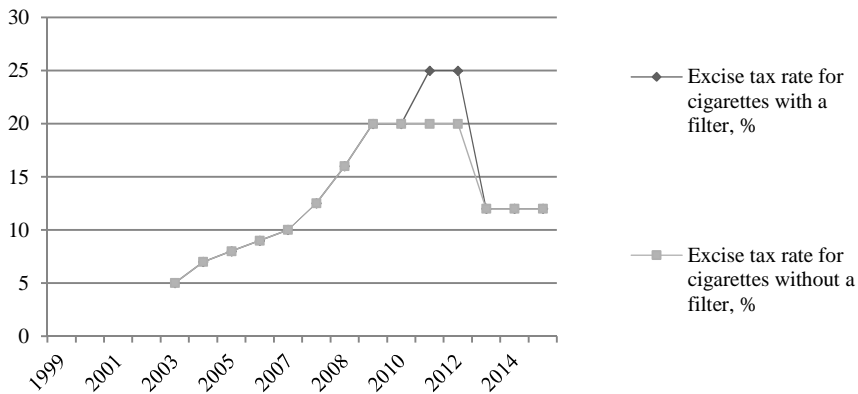

Source: On Amendments to the Tax Code of Ukraine (2012).

Although there was an increase of the excise tax rates for tobacco products in Ukraine, experts suggest (The Ministry of Health of Ukraine, 2009) that they still remain relatively low and, consequently, may be increased due to annual increase by a quantity, which does not exceed the level of inflation. In our opinion, such tax policy may facilitate, firstly, the decrease of tobacco smoking prevalence and, secondly, the increase of the share of excise taxes for tobacco products within tax incomings of the State Budget. Such consequences were already received in other countries (Denisova & Kuznetsova, 2011).

Tax incomings are the main component of formation of the revenues of the State and the Consolidated Budgets. Their share within the structure of the revenues of the Budgets during the last years has constituted approximately 80%. The share of excise tax for tobacco products within the tax incomings to the Consolidated Budget has remained low and accounted for from 2000 to 2008. It did not exceed 3.31% in 2001 and in 2008 it decreased to 1.5% (Figure 8). As a result of the increase of excise tax rates, since 2009 the share of excise tax incomings has begun to increase. Simultaneously, the increase of excise tax caused the increase of retail prices, the decrease of consumption, and, as can be seen in Figure 8, the declining of production of tobacco goods.

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[3] Prognosticated figures of the excise tax rates during 2014–2015.

Figure 8. Cigarette production and the share of excise tax for tobacco products in the tax revenues to the Consolidated Budget of Ukraine during 2000–2011
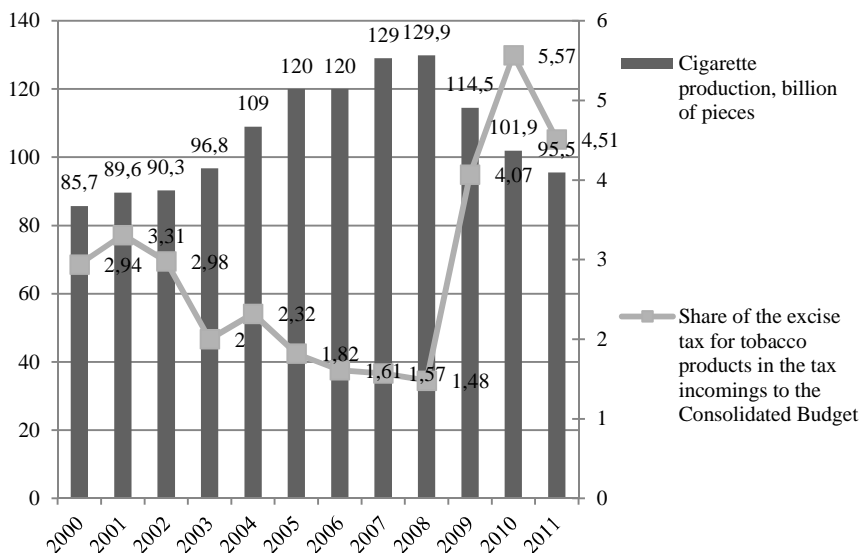
Source: The Ministry of Finance of Ukraine (2012).

Theoretic description of the model of influence of dynamics of the excise tax rate for tobacco products on the level of human potential development

The modeling of impact of a change in cigarette excise taxes on public health was carried out by numerous scientists (see Ahmad, 2005; Levy *et al.*, 2000; van Walbeek, 2010; Willmers, 2013). Ahmad (2005) offers a dynamic computer simulation model, which estimates the cumulative health and economic outcomes of changes in smoking status for the entire population of California over 75 years under several excise tax rate conditions. Levy *et al.* (2000) develop a simulation model in order to predict the effects of taxes on the smoking rate and smoking-attributable deaths, comparing the results of modeling to smoking prevalence measures from the US National Health Interview Survey between 1993 and 2003. Since the results of modeling of mentioned authors are close to the official statistics of the USA health protection authorities, the mathematical modeling is suggested to be an effective and proper instrument of assessment of the influence of a change in cigarette excise taxes on public health of

a certain country. Taking this into consideration, it is worth developing a simulation model adjusted to the fiscal and health conditions of Ukraine.

In the process of research the model of Willmers (2013) was adjusted to the conditions of Ukraine in order to quantitatively estimate the influence of excise tax on the tobacco smoking prevalence in Ukraine. It is suggested that the market of cigarettes consists of the only one price segment. Such suggestion in practice means that the calculations listed below may be used by tax systems of other countries, where there is an inconsiderable gap between prices for cigarettes of different brands.

There is a need to adapt the model (Willmers, 2013) in order to quantitatively estimate the influence of excise tax on the tobacco smoking prevalence in Ukraine. The authors suggest that the market of cigarettes consists of the only one price segment. Such suggestion in practice means that the calculations listed below may be used by tax systems of other countries, where there is an inconsiderable gap between prices for cigarettes of different brands.

The proposed model describes an economic process of movement from the primary equilibrium (1) by further change of the excise tax rate, of an average amount of cigarette price, of an amount of general consumption, and of distribution of a cigarette market to a new equilibrium in a short-term period (2) and in a long-term period (3). The model contemplates an increase of a number of variables in the process of movement between the two balanced states: the index 1 concerns parameters of the primary equilibrium; the indices 2 and 3 are parameters of the short-term and long-term equilibrium. It is suggested that one-time changes of the excise tax occur during a year, and this influence is short-term, namely, changes of the excise tax rate and the prices of cigarettes do not cause increase of amounts of illegal trade. To estimate the long-term prospects (3), the model takes into consideration the influence of inflation and an increase of a population income level.

A retail price (P) consists of three components: (1) an excise tax (ET), (2) a universal tax for sales (a value-added tax in Ukraine (VAT)), and (3) an industrial price (IP). An industrial price is a universal category providing income. It is formed by members of a particular market, i.e. original producers, importers, logistic companies, wholesale and retail sellers. The formula is:

$$P_1 = IP_1 + ET_1 + VAT_1 \qquad (1)$$

An excise tax burden (ET_1 / P_1) conventionally is known. A contribution to a price P_1 of a value-added tax VAT_1 at a rate τ constitutes $\tau(IP_1 + ET_1)$. As a result:

$$P_1 = IP_1 + ET_1 + \tau(IP_1 + ET_1) = (IP_1 + ET_1)(1 + \tau) \tag{2}$$

An industrial price:

$$IP_1 = P_1 / (1 + \tau) - ET_1 \tag{3}$$

Let a primary amount of cigarette consumption constitute Q_1. Consequently:

– a general amount of consumer expenses: $P_1 \times Q_1$;
– a general amount of incomings from an excise tax: $ET_1 \times Q_1$;
– general income of an industry of production and distribution of cigarettes: $IP_1 \times Q_1$.

Whether an excise tax (ET) is fixed in the form of added value for a unit of product, it is determined independently of an industrial price (IP). Whether an excise tax is an ad valorem one, the tax is charged as a percentage of an industrial price (IP).

In this case the estimated ad valorem tax rate is ET_1 / IP_1.

The authors suggest that the excise tax rate increased by a quantity ψ. Consequently, a contribution of the new quantity of tax to a price is calculated as:

$$ET_2 = ET_1(1 + \psi) \tag{4}$$

In the case of an ad valorem type of excise tax, the percentage increases from ET_1 / IP_1 to $(ET_1 / IP_1) \times (1 + \psi)$.

In some countries an industrial price (IP) is controlled by tobacco companies. Usually they used obtained information on increase of an excise tax to change an industrial price (IP) by λ% and, at the same time, to change an excise tax:

$$IP_2 = IP_1 \times (1 + \lambda) \tag{5}$$

Whether an excise tax is fixed as an added value for a unit of product, a new retail price (P_2) is calculated as:

$$P_2 = \left[IP_1 \times (1+\lambda) + ET_1 \times (1+\psi)\right] \times (1+\tau) \qquad (6)$$

Whether an excise tax is an ad valorem one, a new retail price (P_2) is calculated as:

$$P_2 = IP_1(1+\lambda) \times \left[1 + (ET_1 / IP_1) \times (1+\psi)\right] \times (1+\tau) \qquad (7)$$

In this case, price elasticity for a new price P_2:

$$\varepsilon_P = \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{P_1 + P_2}{Q_1 + Q_2} \qquad (8)$$

As a result, the authors determine Q_2 on the basis of the known ε_p (a quantity ε_p is calculated due to empirical statistical data of further cases of excise tax change):

$$Q_2 = Q_1 \left[1 + \varepsilon_p \left(\frac{P_2 - P_1}{P_1 + P_2}\right)\right] \Big/ \left[1 - \varepsilon_p \left(\frac{P_2 - P_1}{P_1 + P_2}\right)\right] \qquad (9)$$

In a long-term period, an increase of population income influences consumption of tobacco products (income changes in accordance with an inflation temp). The calculations show that the influence of this factor may be taken into account by an index α, which is empirically calculated. Consequently:

$$Q_3 = Q_1(1+\alpha)\left[1 + \varepsilon_p \left(\frac{P_2 - P_1}{P_1 + P_2}\right)\right] \Big/ \left[1 - \varepsilon_p \left(\frac{P_2 - P_1}{P_1 + P_2}\right)\right] \qquad (10)$$

In the process of α estimation on the basis of the statistical data, the authors determined that the influence of population income increase on tobacco smoking is significantly lower than the influence of an average salary.

Using the known Q_3, the authors calculate a general amount of consumer expanses $P_3 \times Q_3$, $P_3 = P_2 \times (1+\alpha)$ and, if there is a need, a general amount of tax incomings, a general revenue of tobacco industry, the pace of increase of an average retail price, of consumption amount, of a general

amount of consumer expanses, of general revenues, of profit of a tobacco industry, and of a general amount of profit tax.

From the standpoint of social influence of the determined new excise tax rate, there is a need to estimate: 1) the prevalence and intensiveness of smoking under new conditions; 2) the number of potentially saved lives due to giving up smoking by a share of inhabitants.

A general reduction of cigarette consumption Q is achieved by: 1) decrease of a share of smokers (i.e. decrease of smoking prevalence); 2) decrease of an average number of smoked cigarettes (i.e. decrease of smoking intensiveness).

Whether the share of decrease of cigarette consumption conventionally is a quantity ρ (%) and the primary smoking prevalence is SP_1, a new quantity of smoking prevalence SP_3 is calculated as:

$$SP_3 = SP_1 \left[1 + \frac{Q_3 - Q_1}{Q_1 + Q_3 / 2} \right] \rho \tag{11}$$

To assess a number of lives which were prevented from death caused by tobacco smoking due to the increase of excise tax, it is required to use:
− a prognosticated number of adults (N_f);
− primary smoking prevalence (SP_1);
− a share of inhabitants, death of which would have been prevented if they had given up smoking (γ).

According to medical research, the factor of smoking duration influences a human more considerably than the number of cigarettes smoked daily. The mortality is determined on the basis of smoking prevalence and slightly depends on the smoking intensiveness. Consequently, a number of saved lives is calculated as:

$$SL = N_F \left(SP_1 - SP_3 \right) \gamma \tag{14}$$

Modeling of influence of dynamics of the excise tax rates on a human potential development level

It is required to do calculations according to such primary parameters of the model:
1. *A pace of increase of the excise taxes for tobacco products.* Let's suppose that before 2018 the specific excise tax rates for tobacco products will increase to a rate level of the European Union, i.e. to 64 euro per

1000 cigarettes. The ad valorem excise tax rate will be stable, i.e. at a level of 12%. Annual pace of the increase of specific excise tax under such conditions will account for 34.55% and the specific excise tax will increase to 716.5 grivnas per 1000 pieces before 2018, compared to 162.5 grivnas per 1000 pieces in 2013.

2. *An average retail price for the most popular brand of cigarettes.* The share of cigarettes of the middle and economical class within the structure of consumption of Ukrainians constitutes approximately 90% (Imperial Tobacco Group, 2014). The most popular brand is the cigarettes of TM "Pryluky" smoked by approximately 9% of smokers (World Health Organization, 2010). In 2013 the fixed average retail price for the cigarettes of TM "Pryluky" constituted 8.6 grivnas per pack (20 pieces).

3. *An amount of tobacco product consumption.* Estimation of the amount of tobacco product consumption in Ukraine on the basis of official statistics is a bit complicated, because the statistics data on their sale concern less than a half of the respective market. To assess the consumption, there is a need to use the estimation of so-called legal sale (production + import – export). However, the legal sale can significantly differ from the actual cigarette consumption. It can be less than the real consumption (in situations, where there is a high level of smuggling into a country, as it has been in Ukraine during 1999–2000) and the legal sale can be more than the real consumption (in situations, where there is a high level of smuggling out of a country, as it has been in Ukraine since 2003). In 2013 the consumption according to the "legal sale" accounted for 89.2 billion cigarettes or 4.5 packs of cigarettes. Simultaneously, there is a need to emphasize that the estimation of smoking prevalence (11) does not require the value of primary amount of consumption, since the formulas (9) or (10) show the relationship between Q_1, Q_2 and Q_3.

4. *A share of the excise tax in an average retail price.* It is calculated on the basis of average retail prices for cigarettes with a filter and the excise tax rates in 2013. The share of excise tax in the average retail price for cigarettes in 2013 accounted for 47% or 3.66 grivnas in monetary terms.

5. *A value-added tax rate.* According to the prognosticated figures, it will be fixed at a level of 17% since 2015.

6. *A number of adults aged 15 and older.* This figure accounted for 38.752 million of people in 2013, according to the data of the State Statistics Service (The State Statistics Agency of Ukraine, 2013b). According to

the forecasts (Libanova, 2006, p. 119), in 2018 the number of adults aged 15 and older will constitute 36.791 million of people.

7. *A number of smoking adults (aged 15 and older).* According to the data of GATS, a number of smoking adults constituted 30% in 2013 (11.62 million of Ukrainians) (World Health Organization, 2010). These data is also confirmed by the results of research of the WHO (the World Health Organization(World Health Organization, 2013).

8. *A percentage of change of a real price of producers as a reaction for the change of excise tax rates.* A rule of thumb states that the percentage of change of a real price of producers (as a reaction for the change of excise tax rates) constitutes approximately 5%.

9. *Elasticity of price consumption.* Price elasticity means sensitivity of cigarette consumption to price change. Although tobacco causes considerable addiction, as can be seen in Figure 2, the cigarette consumption really reduces in response to the price change. For instance, the price elasticity -0.1 means that the increase of prices by 1% reduces the tobacco consumption by 0.1%. The empirical research shows that the price elasticity in the developed countries constitutes approximately -0.4. At the same time, the range of price elasticity in the developing countries constitutes from -0.4 to -0.8 (Barber & Ahsan, 2009). To calculate the model for Ukraine, the author used the price elasticity -0.2. As it was mentioned above, this fact is related to the relatively low average retail price for tobacco products during 2011–2013.

10. *A number of people avoiding premature death caused by diseases related to tobacco smoking.* To estimate a number of such people, the author used the 0.35 share of the total number of persons giving up smoking. This choice of share is grounded in the previous results of scientists (Barber & Ahsan, 2009), however the author of the model TETSiM van Walbeek (2010) states that the share of people saved among who gave up smoking can be approximately 50% (Willmers, 2013).

The results of calculations of the model are given in Table 1.

Table 1. Estimation of influence of the excise tax rate increase on the prevalence of tobacco smoking in Ukraine

Figures	Basic level (2013)	Euroscript (2018)	
		Price elasticity -0,1	Price elasticity -0,2
Financial figures			
Incomes of the budget received due to the excise tax for cigarettes, billion of grivnas	18.6	59.93	53.88
Incomes of the budget received due to the VAT for cigarettes, billion of grivnas	6.9	13.28	12.15
Incomes of the tobacco industry and the retail trade, billion of grivnas	15.06	17.6	16.1
Characteristic of the price for tobacco products			
Retail price, grivnas per pack	8.6	22.4	
Share of the excise tax within the structure of retail price, %	47	66.24	
Share of taxes within the structure of retail price, %	64	80.75	
Reaction of the population for change of tax policy			
Prevalence of smoking among inhabitants aged 15 and older, %	30	25.5	24.1
Number of smokers aged 15 and older, million of persons	11.63	9.38	8.86
Number of saved lives, million of persons	-	1.03	1.93

Source: own calculations.

Conclusions

The increase of excise tax rates stipulates the reduction of tobacco product consumption amounts and the reduction of share of smoking adults. The gradual increase of these rates in Ukraine to the level of the EU before 2018 may enable to save 1.0 to 1.9 million of people from premature death.

Although there is a positive social effect of health enhancement, the increase of share of excise tax within the structure of retail price of tobacco products will positively affect the increase of tax incomings to the State Budget. Consequently, the excise tax is an effective financial regulator of

the tobacco smoking prevalence under the Ukrainian modern economic conditions.

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