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Article

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Concept of Environmental Taxes as EU's Own Resource and CGE Modelling of its Effects on Slovakia[1]

*Viliam PÁLENÍK – Tomáš MIKLOŠOVIČ**

Abstract

EU's own resources create the base of the European budget revenues. Traditional resources of the European budget are decreasing. The current status of own resources is both inconvenient and confusing. A new concept of environmental taxes can serve as a new EU´s own resource. This concept would lead to more transparent financing of the EU budget and better environmental protection. In combination with an application of the principle of the fiscal neutrality, which consists in a collateral reduction of certain direct taxes, the tax could accelerate economic growth. The concept of the EU´s own resources reform through an introduction of the environmental tax in the amount of 1% of GDP, accompanied by parallel decreasing of the tax burden by the same amount has been proposed. Calculations of macroeconomic effects have been executed with help of the computable general equilibrium model with the focus on Slovakia.

Keywords: *environmental tax, CGE model, EU's own resource, change of tax rates*

JEL Classification: C68, H23

Introduction

This study continues in previous work of the authors that has described a concept of the EU's own resources reform through the introduction of the environmental tax in the amount of 1% of GDP with a parallel decreasing of the tax burden by the same amount (Páleník and Miklošovič, 2015). Calculations of macroeconomic effects were carried out according to the computable general equilibrium model (CGE model) with the focus on Slovakia only. The authors used the static CGE model for one country with a social matrix for Slovakia and

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constructed five scenarios. Possible results for the EU as well as other Member States would be technically calculated but would require consistent the Social accounting matrices (SAM) and those are unfortunately not available for the authors at the moment. The authors disaggregated the foreign counties into two categories within the model. First one consists of the EU countries and second one represents the rest of the world. This disaggregation was useful when constructing other two alternative scenarios. Individual parts of the study were focused on a description of the applied CGE model, a definition of the modelled scenarios, the final discussion on achieved results and a conclusion (Páleník and Miklošovič, 2016). Another related study was focused on calculating the impact of the new environmental tax on tax rates (Luptáčik and Luptáčik, 2016).

The paper has five main parts. First we introduce a concept and definition of new environmental tax as the new own resource of European Union. In the second part we focus on CGE model methodology which was used on calculations. Third we introduce the simulations which could cover the possibly range of behaviour after introduce the new environmental tax. After that we focus on results of the simulations. Last part is the discussion and summary.

1. The Concept and Definition of the New Environmental Tax

The authors propose to analyse in a greater detail a concept of a new type of the environmental tax that would have the following characteristics. Taxation of energy consumption and CO_2 emissions: the aim of the new tax is to combine environmental protection with recovery in the economic growth. It will tax products according to how much energy is consumed and CO_2 emitted in the production process, irrespective of whether whole process or only a part of it takes place within or out of the EU. Different tax rates shall be established for several dozen product types. These tax rates will be determined on the basis of an input--output analysis for the entire production process of a sample product. End use of goods and services in the European market will be taxed. Exported goods and services will not be taxed. In accordance with the principle of fiscal neutrality, costly or administratively demanding environmental protection requirements will be abolished and/or taxes on labour will be reduced. Within a macro-economic framework such as CGE, the effects most likely will be:

- Cutting costs will make the companies more competitive in both domestic and foreign markets; this development will also result in enhancing opportunities for growth in the domestic production and, consequently, employment and GDP.
- European companies will be able to compete fairly with non-European competitors, with the principle of a level playing field applicable for all, so there will be no incompatibility with World Trade Organization (WTO) rules.

• The introduction of environmental levies will make environmentally unfriendly products relatively more expensive and environmentally friendly ones relatively cheaper, which will improve consumer's behaviour with regard to environmental protection.

• Budget neutrality means no increase in absolute prices of European products.

• Introduction of the tax will probably push up absolute prices of imported goods, meaning that importers will pay a significant part of the own resources.

• Improved growth and higher employment levels will more than offset increase in the prices of the imported products caused by the environmental tax.

• The extra economic growth will generate additional tax revenues, which will help to make the tax acceptable to the Member States.

• Simultaneous reduction in costs for business: We also suggest abolishing or reducing taxes, charges and other costs of business in the EU, in order to support business. It is also advised that the Commission would compile a quantified list that sets out a volume of funding sufficient to compensate for loss of the revenue once the new tax has been introduced, so that fiscal neutrality is achieved – for example, excise duty on mineral oils, carbon credits and reduced social security and tax burdens on labour. When it comes to reducing the costs for producers, key sectors of the European market that are heavily regulated could be targeted, putting these producers at a disadvantage in comparison with their worldwide competitors. Studies (Egenhofer et al., 2013) suggest, for example, that reducing the price of energy in the steel industry would have a strong impact on production.

The magnitude of these impacts, however, needs to be assessed as it depends on many macro-economic feedback effects. The new environmental tax is to be applied in all the EU Member States and thus throughout the EU, with the following parameters:

a) 60 to 100 groups of products subjected to different rates of the environmental tax;

b) a number of product groups according to availability of data and differences in energy consumption and CO_2 emissions;

c) taxation of the end use of goods and services in the European market (household and government consumption and investment: C + G + I);

d) no taxation of goods and services exported from the EU;

e) taxation of the end use of goods and services on the European market to be the same, irrespective of origin (imported goods and services for end use taxed in the same manner as domestic products; those imported for intermediate consumption taxed indirectly as a part of the domestic goods and services for end use);

f) tax bands for individual product groups in dependence on energy consumption and levels of CO_2 throughout the entire production process;

g) uniform rates being the same for all Member States;

h) rates for products will be calculated on the basis of the input-output analysis so a total revenue from this tax matches current Member State payments into EU's own resources (i.e., to bring in between 0.3% and 1.0% of gross national income).

2. CGE Model Methodology

Relations among individual variables in all computable general equilibrium models are calibrated on database of so-called benchmark balance (from the year of data collection, social accounting matrix). Calibration process generates ratio and sub-parameters depending on exogenously defined elasticity of some behaviour, so the model could duplicate input data. The majority of the CGE models are comparatively static. The CGE models benefit from the assumption *ceteris paribus* and can model the impacts of exogenous shocks and sudden changes of economic policies.

Macroeconomic theory of balance forms a basis of the models of the computable general equilibrium and was presented by a French economist León Walras in 1874. His theory was further elaborated, mathematically defined and numerically described by Arrow and Debreu (1954). The computable general equilibrium model is a numerical result of this theory.

The structure of the used CGE model comes from (Dervis, De Melo and Robinson, 1982). The structure of a program code comes from the model USDA (Robinson, Kilkenny and Hanson, 1990). The basis of the static part of the model comes from authors McDonald, Robinson and Thierfelder (2005). The entry database for the model is SAM for Slovakia and year 2010 created by the authors. The model contains 92 endogenous variables which are subsequently calculated in 92 linear and non-linear equations.

We constructed a market balance assuming a rational behaviour of all the subjects. In this situation, a total supply would equal to a total demand.

The first formulas create a budget limitation of households that maximized their efficiency while using only their income. There has been no profit of firms in the economy since any positive results would create a potential for establishing a new company and a market would not be ideally competitive. CGE model is a macroeconomic model so it is not necessary to use real values of goods but only relative prices.

We opted for the index of consumer prices as a numeraire. All other prices were compared relatively to the numeraire. That means that all the results represent real values.

Foreign entities were for a purpose of the environmental tax simulation divided into two groups. The first group represents the European Union and the second group represents the rest of the world. All relations among domestic and foreign institutions were subsequently transformed into these two groups of foreign elements. One of the main assumptions is that there is no labour movement between domestic and foreign countries. Thus, we chose the aggregation of production commodities and production activities. It means that Slovakia is represented by one production sector producing just one commodity (product).

The applied CGE model was created in Institute of Economic Research of Slovak Academy of Sciences (IER SAS) and is being recursive dynamic. The concept recursive dynamic mean that result of one iteration is the enter to the next iteration. However, only its static feature was used for each simulation (all exogenous shocks were applied at the same time).[2]

We used the principle of nested functions while modelling the production in order to copy the real situation which reflects specific features of the economy better.[3] General production can be divided into two parts. The first part represents the demand for work and capital while the other represents the demand for consumption of inputs. The advantage of using nested production functions is that each nested function can have different elasticity of substitution for the demand (due to the function describing added value (L – Labour, K – Capital)) and for the function that models the intermediate consumption demand.

Prices of domestic products used at home (or in a domestic country) are defined as *PQD* and their price is always the same regardless the consumer. The domestic demand is divided into the intermediate consumption demand *QINTD* and the final demand. The final demand splits into the demand of a household *QCD*, the demand of the government *QGD*, the demand of enterprises *QENTD*, investments *QINVD* and changes in the stock dstockconst (dstockconst is exogenous variable in this situation). The value of the domestic demand (costs of acquisition) is *PQD*QQ*, where *QQ* is the composite commodity. Export is marked as QE_W and a price for particular exported goods is $PE_W = PWE_W * ER_W$. An export price is PWE_W and an exchange rate for a foreign country is ER_W. The difference in the price of exported goods and the price of domestic products used inland is formed by export taxes TE_W depending on the group of a foreign country.

Domestic producers form a commodity supply and receive a common price *PXC* for each commodity unit. Overall domestic commodity production is marked

[2] Used model consist from 92 endogenous variables and equations in the each iteration.

[3] The principle of nested functions consists of dividing the production process into more parts (for instance value added and intermediate consumption). Next each of these parts divides to other parts (for instance value added divide to labour and capital).

as *QXC*. A domestic price of import PM_W is applied to commodity import QM_W and is influenced by a global price PWM_W, exchange rate ER_W and tax rate of imported goods TM_W.

All commodities which are consumed within a domestic market are influenced by various production taxes, value added tax, sales tax, other taxes and product subventions. The domestic production is evaluated by an average output price PX that is formed by aggregated inputs on one unit of the output. The necessary primary inputs for the production FD_f are included already into consideration within the average price WF_f.

The domestic demand for fixed assets consists of a demand of the fixed capital *QINVD* and changes in the stock dstocconst. This particular change is defined as an exogenous variable in the model and remains constant. Domestic savings consists of household savings, corporate savings and savings of the government. Abroad savings $CAPWOR_W$ balance the overall external account.

Foreign income is constituted by expenses of the domestic economy that consists of the imported production and the use of production factors. Income of the domestic economy, including exported commodities and net transfers from abroad to particular institutions, basically represents foreign expenses. The exchange rates (different for both categories of foreign countries) step into all the international transactions (for example between a foreign country and the government).

The price of supply for the composite commodity *PQS* is defined as a weighted average price of commodities produced and consumed by the domestic market *PDD* and the domestic price of the imported commodities *PM*.

The price of an imported commodity is composed of a worldwide price PWM_W and an exchange rate ER_W with additionally applied income tax TM_W. Weights of prices are calculated through first order conditions for the optimal solution.

Average prices do not include sales tax yet *TS* in order to get an overall consumer price of the composite commodity *PQD*. A production price of commodities *PXC* is defined in the same way. This price consists of weighted average prices of commodities from domestic producers sold on the domestic market and exported abroad PE_W.

A price of export is calculated from the world price of export PWE_W and an exchange rate ER_W adjusted by tax additionally imposed on the exported commodities TE_W.

An average price for one unit of the output obtained from an activity *PX* is defined as the weighted average of domestic producers' prices whose weights are constant. Those prices are divided after paying production taxes *TX* into paid an aggregated value added price *PVA* and an aggregated price of the intermediate inputs *PINT*. The aggregated value added price includes prices paid for primary

production inputs. Overall payments for the intermediate inputs against one unit of aggregated intermediate inputs are defined as a weighed sum of prices of inputs into the production *PQD*.

For more information on the applied computable general equilibrium model see Páleník and Miklošovič (2016).

We used also more exogenous variables that entered mainly into the constant elasticity of substitution (CES) function. Definition and calibration of other variables in the CES function is important for a result of the simulation while an incorrect setup of exogenous parameters can lead to deviated results. Right calibrations of the exogenous variables are crucial for behavioural modelling of particular subjects in the market because those variables enter various behavioural equations. There are only few works focusing on the exogenous variables for production sectors in Slovakia (Lichner and Miklošovič, 2011; Lichner, 2013). These research papers cannot be, however, compared to specific econometric studies[4] that have dealt with calibration of the above mentioned variables in different countries and various sectors. Due to this lack of relevant studies we have used the GTAP[5] database to determine various exogenous variables. The import of services and products is defined through the CES function.

Values of elasticity of substitution σ_A between the domestic production and the import were used according to a study by Hertel et al. (2004) who had estimated the elasticity of substitution through the econometric model. Values of elasticity of transformation are stated in the Table 1. Since there are no values of elasticity of transformation σ_T in the GTAP,[6] we opted for defining this value based on NZIER (2011). It states values of elasticity of transformation in the range between from –1.46 to –20. We set the value on –2 since we had assumed a strong interconnection between the foreign trade and European partners.

We divide the production in the model into two levels. The first one simulates a generated final output with the help of the added value and the intermediate consumption using the CES production function. The elasticity of substitution σ_X is used as the first parameter between the added value and the intermediate consumption. This parameter is crucial for formula which calculates the final output in the model.

Individual values of the elasticity of substitution between the added value and the intermediate consumption were placed equal to 2 according to the model by McDonald, Robinson and Thierfelder (2005). We have modelled the added value

[4] Main reason of only so few works with specific methodology is that longer time series without a gap are missing.

[5] Global Trade Analysis Project – organisation of researchers dealing with quantitative methods.

[6] A database represents a global model, where the elasticity of substitution in imports means the elasticity of transformation in exports.

in the second level of the production through CES production function as well, when particular production factors are inputs into the function. Values of elasticity of substitution σ_{VA} come from GTAP database, in particular from the study of Jomini et al. (1991). There is an international overview of studies that assessed this parameter for production sectors using data for multiple countries.

The income elasticity of demand is used to calculate Stone Geary utility of a household function of the parameter in the model of household demand for a consumption of commodity. This parameter represents a marginal utility from an additional consumption, while an inevitable consumption is already saturated. Values of income elasticity come from Reimer and Hertel study (2004). They state an income elasticity of demand for 10 types of products and 87 countries. Particular values of elasticity of substitution are set up according to a classification of product types according to the sectors. We used the Fisher parameter to define a subsistence minimum of households and set it up to the value of –1.05 according to McDolnald, Robinson and Thierfelder (2005).

T a b l e 1

Values of Individual Elasticities Used in the Model

	σ_A	σ_T	σ_X	σ_{VA}	Income elasticity of demand
Value	2	–2	2	1.12	0.81

Source: Authors.

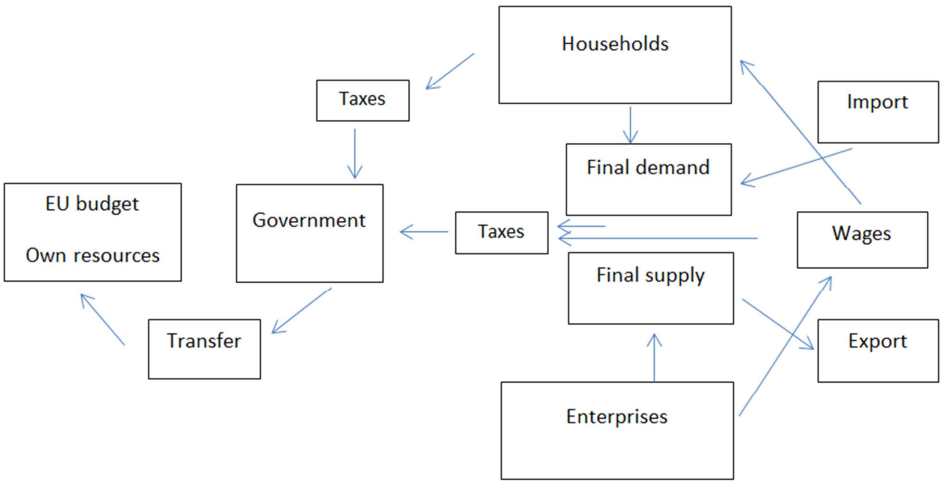
3. Scenarios

We have created three base scenarios while modelling the inputs of introducing the environmental tax in Europe. Moreover, we have constructed other two auxiliary scenarios, where we are modelling the inputs of introducing the environmental tax in Slovakia. The first base scenario (B) presents an economic balance of Slovakia based on data from the social accounting matrix for 2010. Calculations of macroeconomic effects were made with the focus on Slovakia only.

Results of all other scenarios were compared with this fundamental scenario and thereby were able to determine clear effects of incorporating exogenous shocks into the model. A simple scheme of economy functions for the fundamental scenario can be seen below in the Picture 1. There are main institutional sectors of the economy like households, enterprises, government and foreign entities. A household and enterprise meet in the market through their final demand or the final supply which should achieve a balance after saturating their demand. Different subjects pay taxes that form the income of the government. The government sends transfer payments into the EU budget that finally constitutes own resources of the EU.

Picture 1

The Scheme of Economy Functions, the Baseline (B) Scenario



Source: Authors.

The first auxiliary scenario represents the introduction of the environmental tax in Slovakia (not in the EU) in the amount of 1% of the gross domestic product (EUR 659 million in 2010, which was approximately 103% of the gross domestic income in 2010[7]). Transfers to the EU budget were decreased by the same amount, but on the other hand, the tax burden of the final consumption was increased by this volume. The government compensated smaller transfers to the EU budget by decreasing an income tax burden for households. The amount is the same in both cases. The introduction of the environmental tax is fiscally neutral. The households are the most profitable subjects because their labour taxes paid to the government has decreased. Taxes for enterprises have remained unchanged, but the household disposable income has gone up. That means that gross salary for labour force stays unchanged, but net salary has been increased. The simple scheme of the introduction of the environmental tax in Slovakia with the case of most benefits for the households is depicted in the Picture 2. Let us label this auxiliary scenario the alternative auxiliary scenario H + SR.

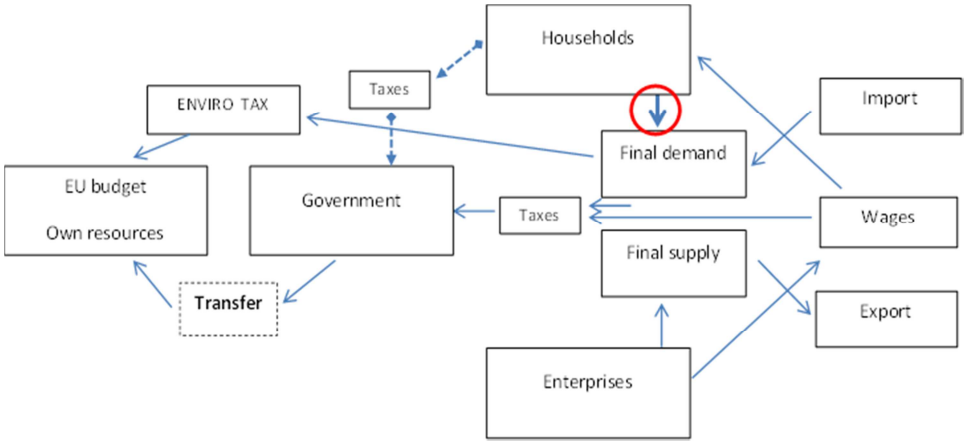
The second scenario, the scenario H + EU, represents a simplified reaction of the EU economy to similar exogenous shocks introduced in the EU. In auxiliary scenario H + SR, we expect an impact on the disposable income of the households, the change in products prices and services in Slovakia due to increased domestic demand as well as increase of the tax burden of the final consumption.

[7] The total revenue of the European budget in 2010 was 105% of gross national income (GNI) of EU.

Prices of the goods imported from the EU are expected to grow by the same amount as in the scenario H + SR. The introduction of the environmental tax in the EU thus shows that the households are indeed the most profiting subjects, not only in Slovakia, but in the whole EU.

Picture 2

The Scheme of Economy Functions, the Alternative Scenario H + EU*



Note: * Rectangle TRANSFER in this picture represents government´s cancelled payment to the EU budget.

Source: Authors.

The second auxiliary scenario represents the introduction of the environmental tax in the amount of 1% of the gross domestic product. Transfers to the EU budget were decreased by the same amount, as in base scenario 1 and auxiliary scenario 1. The government compensated smaller transfers to the EU budget by decreasing the income tax burden for enterprises in the amount of 1% of GDP. In the end, the introduction of the environmental tax is fiscally neutral. In this case, the enterprises are the most profitable subjects because their expenses (labour cost) decrease by EUR 659 million. That means that the gross salary for labour force decreases, but net salary remains unchanged. The same happens with the household disposable income which remains unchanged. The tax burden of the final consumption increases. The enterprises become more competitive due to expenses decreasing and are able to increase their production. This scenario is to be called the alternative auxiliary scenario E + SR.

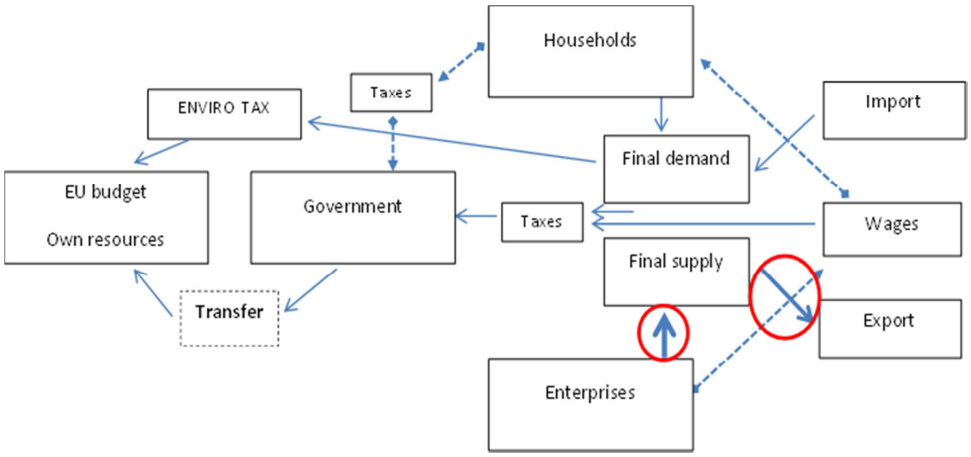
The third base scenario features a simplified reaction of the EU economy to a flat introduction of exogenous shocks in the whole EU. We expect impacts mainly on product and service price changes in Slovakia due to the growth of the foreign demand as well as of the increased tax burden of the final consumption.

With the alternative scenario E + EU, we expect the change of the import prices from the EU by the same percentage level that has occurred in Slovakia in the scenario E + SR. In the end, we can simply present this scenario as the introduction of the environmental tax in the EU, when it represents the biggest benefit for both Slovak and EU enterprises. The simple scheme of the introduction of the environmental tax in all European countries with the most benefits for the enterprises is depicted in the Picture 3.

The difference between scenario E + EU and the auxiliary scenario E + SR is that the simultaneous introduction of the environmental tax and decreasing of the labour tax would take place not only in Slovakia, but in the rest of the EU so it would enter the category of own resources. Slovak producers would lose a better competitive position and would have to share the benefit of decreased salary expenses with all the EU producers.

P i c t u r e 3

The Scheme of Economy Functions, the Alternative Base Scenario E + EU



Source: Authors.

T a b l e 2

The Main Economic Shocks Used in Alternative Scenarios

	H + SR	**H + EU**	**E + SR**	**E + EU**
Transfer from the government to the EU budget	Cancelled	Cancelled	Cancelled	Cancelled
Environmental tax	Established	Established	Established	Established
Labour tax	Decreased	Decreased	Decreased	Decreased
Gross salary	Unchanged	Unchanged	Decreased	Decreased
Net salary	Increased	Increased	Unchanged	Unchanged
Consumer price in Slovakia	Decreased	Decreased	Decreased	Decreased
Import price from the EU	Unchanged	Decreased	Unchanged	Decreased

Source: Authors.

4. Results of Scenarios

We have described three main scenarios in the previous part. The results of these three simulations are in absolute values (Table 3), thus represent absolute changes against the base scenario (Table 4) and relative changes in percentage points (Table 5).

We can conclude that all the alternatives would positively influence the Slovak economy. The results from auxiliary scenarios one (H + SR) and two (E + SR) are not included in the tables. As it can be seen in the Picture 4, the influence of the scenarios E + EU is significantly higher than in case of the scenarios H + EU. A more detailed analysis of individual scenarios reveals additional specific information.

T a b l e 3

Results: Simulated Main Scenarios of Introducing the Carbon Tax in the Slovak Economy, Absolute Real Values, mil. EUR, Number of People

	B	H + EU	E + EU
Gross Domestic Product	65 897	66 774	68 323
Consumption of a household	37 142	38 278	38 905
Export to the EU	44 804	45 476	46 302
Export to the ROW	8 155	8 277	8 427
Import from the EU	39 966	40 741	40 942
Import from the ROW	13 290	13 574	13 564
Netto export EU	4 838	4 735	5 360
Netto export ROW	–5 136	–5 296	–5 137
Intermediate consumption	101 126	103 075	103 627
Domestic production	164 622	167 442	169 408
Employment (quantity of people)	2 316 255	2 354 927	2 457 059

Source: Authors.

T a b l e 4

Results: Simulated Main Scenarios of Introducing the Carbon Tax in the Slovak Economy, Absolute Real Changes Against the Scenario B, mil. EUR, Number of People

	H + EU	E + EU
Gross Domestic Product	877	2 426
Consumption of a household	1 136	1 764
Export to the EU	672	1 498
Export to the ROW	122	273
Import from the EU	776	976
Import from the ROW	283	274
Netto export EU	–104	522
Netto export ROW	–161	–1
Intermediate consumption	1 949	2 501
Domestic production	2 820	4 786
Employment (quantity of people)	38 671	140 804

Source: Authors.

Let us have a closer look at the scenario H + EU. It affects tax changes in Slovakia and all the European countries. In this scenario, the households would be a sole recipient of the profit from the decreased tax burden since the gross salary would remain unchanged in the applied CGE shock. The net salary would rise after taxation, income and consumption of the household as well. Domestic demand would increase and GDP too. The introduction of the environmental tax would negatively affect the final domestic demand which would be reflected in a rise of the price level and decrease a real economic growth. Based on results of the CGE simulation, there would be a positive influence of decreased labour tax over a negative impact of the environmental tax introduction with the GDP growth by 1.3% and household consumption raised by 3.1%. On top of that, there are more secondary effects that lead to this result in the CGE model. For example, primary growth of the household demand will result in secondary growth of the demand for labour. This leads to increased employment (by 1.7%), GDP growth and improvement of households' standard of living when measured by their income (by 3.1%).

T a b l e 5

Results: Simulated Main Scenarios of Introducing the Carbon Tax in the Slovak Economy, Relative Changes Against the Scenario B in %

	H + EU	**E + EU**
Gross Domestic Product	1.3	3.7
Consumption of a household	3.1	4.7
Export to the EU	1.5	3.3
Export to the ROW	1.5	3.3
Import from the EU	1.9	2.4
Import from the ROW	2.1	2.1
Netto export EU	–2.1	10.8
Netto export ROW	3.1	0.0
Intermediate consumption	1.9	2.5
Domestic production	1.7	2.9
Employment	1.7	6.1

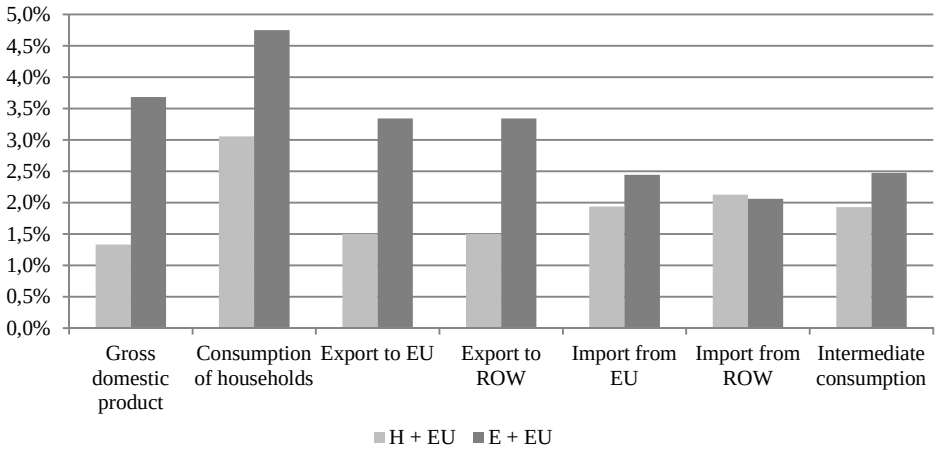
Source: Authors.

While analysing the scenario E + EU we have to look at the simultaneous introduction of the environmental tax and decreasing of labour tax. At the same time, a gross salary level is decreased by enterprises which leaves the household disposable income unchanged. The results in the Table 5 and the Picture 4 show a positive influence of the scenario E + EU. Additional growth of GDP is 3.7% and the household consumption is 4.7%. A negative effect of the environmental tax on the economy comes in a form of rising consumer price level. Reduction of gross salary expenses is reflected in the area of production prices that will improve the competitiveness of European producers in both domestic and foreign market. This will subsequently result in the growth of the net export (by 10.8%),

production, demand for labour, higher employment (by 6.1%[8]) as well as salaries growth. Finally, the household disposable income will go up as well. In comparison with the scenario H + EU, positive effects in the CGE simulation results would strongly prevail over negative ones.

P i c t u r e 4

Results of Modelled Simulations, Relative Changes Against the Baseline Scenario



Source: Authors.

5. Discussion

The discussion aims to interpret the results of both main simulated alternative scenarios against the base scenario. The applied model is static, aggregated and considers one representative producer, a household and the government. Only foreign segment is disaggregated into the rest of the EU and the rest of the world. Despite this, similarly to all other CGE models, this applied model is quite complex to interpret, with various feedbacks that make the results not very explicit.

The scenarios H + EU and E + EU were designed to quantify two opposite cases (most benefits for either households or enterprises) that would present limits for market forces, but we could consider them a space for collective negotiations as well. The scenario H + EU represents a case of very strong unions which do not allow the enterprises to lower salary expenses when the tax burden is decreased. The scenario E + EU presents a situation when companies take a maximal advantage of decreasing their gross salary expenses and unions are not able to prevent a drop of the gross salary. It is clear enough that the first situation, the

[8] The model assumed fix wages in the scenarios. In the reality, employment rate does not rise at this volume but the wages would rise.

scenario H + EU, is advantageous for employees and the second situation, scenario E + EU benefit the enterprises. The CGE simulation results showed that the scenario E + EU is in accordance with expectations and is advantageous for the enterprises. But on top of that, it is beneficial for households as well, even more than the scenario H + EU. The household incomes grow by 3.1% in the scenario H + EU, but in the scenario E + EU by 4.7%. The trend is even more obvious in the area of employment. It rises by 1.7% in the scenario H + EU, but in the scenario E + EU by as much as 6.1%. There is no such a situation applicable in reality but we generate arguments for a public discussion and collective negotiations about recipients of the labour tax decrease. We can get closer to the real situation by a specific change in the CGE model construction.

The scenarios H + EU and E + EU could be considered as the introduction of EU's own resources. Differences when compared to the H + EU and E + EU scenarios are quite small and correspond with economic intuition. Commodity desegregation would be necessary in future studies with different rates of the environmental taxes for particular groups of products and services. To bring the own resources reform into reality it would be valuable to simulate effects not only for the EU as a unit, but for individual Member States as well. Simulations like this are technically possible but require consistent SAM matrices and those are unfortunately not available at the moment to the authors.

Summary and Conclusions

This study continues in the previous work of the authors that has described the concept of EU's own resources reform through the introduction of the environmental tax in the amount of 1% of the GDP with a parallel tax burden decrease by the same amount. Calculations of macroeconomic effects were executed with the help of the CGE model with the focus on Slovakia.

The CGE model of the Institute of Economic Research SAS has been modified and applied in this study. Entry database for the model is the social accounting matrix for 2010 created by the authors. We constructed a market balance assuming rational behaviour of all the subjects. In this situation, a total supply would equal to a total demand.

Other formulas create a budget limitation of the households which maximized their effectiveness while using only their income. There was no profit since any positive results would create a potential for establishing a new company and a market would not be ideally competitive. Foreign countries were for the purpose of the environmental tax simulation divided into two groups. The first group represents the European Union and the second group represents the rest of

the world. All relations among domestic institutions and foreign countries were subsequently transformed to comply with this division.

No labour movement between the domestic and foreign labour market was one of the main conditions. Then we chose the aggregation of production commodities and production activities. It means that Slovakia is represented by one production sector producing just one commodity (product). Despite the CGE model created in IER SAS being recursive dynamic, only its static feature was used for each simulation (all exogenous shocks were applied at the same time).

We created three main scenarios and two auxiliary scenarios while modelling inputs of introducing the environmental tax in Slovakia. The first one, a base scenario (B), presents economic balance of Slovakia based on data from a social accounting matrix for 2010.

The first auxiliary (H + SR) scenario represents the introduction of the environmental tax in Slovakia in the amount of 1% of GDP. Transfers to the EU budget were decreased by the same amount, but on the other hand, the tax burden of the final consumption was increased by this volume. The government compensated smaller transfers to the EU budget by decreasing income tax burden for households in the amount of 1% of GDP. Expenses (gross salary) for the enterprises stay unchanged, but the net salary and household disposable income goes up.

The second main scenario (H + EU) represents a simplified reaction of the EU economy to similar exogenous shocks introduced in the whole EU. Prices of imported goods from the EU are expected to grow by the same amount as in the first auxiliary scenario. Finally, this scenario shows the introduction of the environmental tax in the EU and subjects that profit the most are households not only in Slovakia, but in the whole EU.

The second auxiliary scenario (E + SR) represents the introduction of the environmental tax in the amount of 1% of GDP. The transfers to the EU budget were decreased by the same amount. The government compensated smaller transfers to the EU budget by decreasing an income tax burden for the enterprises by 1% of GDP. The most profitable subjects in this scenario are the enterprises because their expenses decrease, but the net salary for labour force stays unchanged. The tax burden of the final consumption increases. The enterprises become more competitive due to expenses decrease and are able to increase their production.

The last main scenario (E + EU) features a simplified reaction of the EU economy to a flat introduction of exogenous shocks in the whole EU. With the alternative scenario E + EU, we expect the change of import prices from the EU by the same percentage level that occurred in Slovakia in the scenario E + SR. We can conclude that all the alternatives would positively influence the economy. The influence of the scenario E + EU is significantly higher than the scenario H + EU.

The scenario H + EU affects tax changes in Slovakia and all the European countries. The households would be a sole recipient of the profit from decreased tax burden since the gross salary would remain unchanged in the used CGE shock. Based on results of the CGE simulation, there would be a positive influence of decreased labour tax over a negative impact of introducing the environmental tax with the GDP growth by 1.3% and household consumption raised by 3.1%. This also leads to the increased employment (by 1.7%), GDP growth and improvement of households' standard of living when measured by their income.

While analysing the scenario E + EU we have to look at the simultaneous introduction of the environmental tax and decreasing of labour tax. At the same time, a gross salary level is decreased by the enterprises resulting in unchanged net salaries and household disposable income. The additional growth of GDP is 3.7% and consumption of household rises by 4.7%. In comparison with the scenario H + EU, positive effects in results of the CGE simulation would strongly prevail over negative ones. Reduction of salary expenses is reflected in the area of production prices that will improve the competitiveness of European producers in both domestic and foreign market. This will subsequently result in the growth of net export (by 10.8%), production, demand for labour, higher employment (by 6.1%) as well as salaries growth. Finally, household disposable income will go up as well.

The scenarios H + EU and E + EU could be considered to be the introduction of EU's own resources. Differences between the H + EU and E + EU scenarios are quite small and correspond with economic intuition. Commodity desegregation would be necessary to count through the CGE model in future studies with different rates of the environmental taxes for particular groups of products and services. We could benefit from the already mentioned study which calculated those tax rates through the input-output model. To bring the own resources reform into reality; it would be valuable to simulate effects not only for the EU as a unit, but for the individual Member States.

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