Szent István University

Doctoral School for Management and Business Administration
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Theses of Doctoral (PhD) Dissertation

The Prospects and Obstacles
of a Green Tax Reform in Hungary

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„Ember vigyázz, figyeld meg jól világod:
ez volt a múlt, emez a vad jelen,-
hordozd szivedben. Éld e rossz világot
és mindig tudd, hogy mit kell tenned érte,
hogy más legyen."

(Radnóti M.)[1]

1. INTRODUCTION

1.1 The Significance of the Topic

In my dissertation I discuss the problem of environmental tax reform whose timeliness is justified by the efforts in the prevention or containment of the more and more apparent threat of climate change.

The permanent and significant change in the climate of the Earth might take place both at the local and at the global level. The changes may include the average temperature, the average precipitation or the prevailing winds. Climate change can be the consequence of natural processes (e.g. the tectonic movement of continental plates), external impacts to the planet (e.g. changes in the intensity of solar radiation) or even human activity (e.g. production of greenhouse gases).

Various effects of climate change have been manifested both on the living organisms and on human life. For example the leaves of the trees come our earlier, migratory birds start their seasonal journeys and nestle earlier than before, and a lot of plant and animal species expand their habitats to the North and to the upper regions of hills. Algae, plankton and fish are to be found in a greater abundance in the Northern parts of the oceans than before. The level of acidity in the oceans is rising due to the carbon-dioxide absorbed, which has an effect on sensitive corals and other species of coral-reefs. The productivity of the forests increased at some places temporarily, but new causative agents and other foreign species emerged from the South. It is to be expected that dangerous tropical diseases gather ground as well as devastating effects of heat waves and starvation caused by droughts resulting death of millions. The whole ecosystem of the Earth has become more vulnerable. Moreover, the above processes are likely to continue in the future even if air pollution could be cut down to zero level tomorrow.

One of the most crucial environmental problems of our age is air pollution whose effects are to be considered not only in the close circle of the emission sources, but also at remote places. The researchers all around the world are more and more interested in the problem of climate change; however the fact that we meet its consequences in more and more fields of life is just one of the motivations besides emerging business opportunities.

The topic is even more timely because the reduction of greenhouse gas (such as CO_2) emission is – beyond the aims of healthy environment and the prevention of natural disasters – our international obligation. The examination of the introduction of a CO_2 tax is a current issue as – among other things – the European Commission recommends the introduction of a standardized CO_2 tax for all the member states of the EU, which raises another possible question of dispute between the member states.

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[1] Radnóti M. (1944): Nem bírta hát In: Radnóti Mikós összes versei és versfordításai, Szépirodalmi Könyvkiadó, Budapest, 1994. 206. p.

1.2 Research Questions and Objectives

I defined the following research questions and objectives relating the topic:

I. The objectives relating the scientific literature of the topic and the tasks towards their realization are the following:

1st Review, critical analysis and drawing the international context of the present state of the Hungarian environmental regulatory system. My next task is to sketch the system of the regulatory tools and the evaluation of their effects. I analyse the possibilities of managing environment pollution as negative externalities through the example of public goods, their effects and I point out the necessity of the intervention of the state.

2nd Examination of the effects of climate change on several fields of economy and the international obligations of Hungary undertaken in the Kyoto Protocol.

3rd Collection of international experiences of the application and effects of the environmental tax reform after the overview of its theoretical background.

4th Recognition of the results of international surveys relating the acceptance of environmental awareness and environmental taxes.

II. The objectives and tasks relating my own research project are the following:

1st Examination of the types and volume of the domestic environmental taxes and the volume and tendencies of the income tax revenues using the available databases; comparison with the international data.

2nd Examination of the correlation between the levy of environmental taxes as social revenues and other economic features, rate of employment, employers' and employees' tax burdens.

3rd Overview of the international adaptation and experiences of the environmental tax reform. Examine the possibilities, dangers and effects of the implementation of an environmental tax reform in Hungary.

4th Modelling the mode of action of a domestic CO_2 tax as part of an environmental tax reform. Determining the scope of state revenues stemming from the introduction of the CO_2 tax and the analysis of the possible ways of utilizing those revenues and their effects. Performing impact analyses in order to assess how would the introduction of the eco-tax influence the income of different income groups and what positive external effects the tax reform would have.

5th The assessment of the level of the environmental awareness of the society. The analysis of the results of the questionnaire survey carried out among the Hungarian population over the age of 10; discussion of conclusions.

However the examination of the practice, the administrational burdens and legal background of the measures to be implemented in the frame of the tax reform exceeds the scope of this dissertation. I do not analyse the different effects of the CO_2 tax on different branches of economy due to the lack of precise information on the gradient of the individual net marginal utility curve. I also dispense with the determination of the range of products on which the CO_2 tax could be levied.

Through my analyses I make an attempt to point out that environment protection is not only the duty of authorities and environmental movements, but we are all responsible for our environment, habitat and only common endeavours can bring improvement and succeed in protecting the condition of our wonderful planet.

I formulated my hypotheses concerning the above mentioned research objectives, which also vitally determined the range of professional literature used in the dissertation. My hypotheses that had been also significantly influenced by my personal experiences and the opinion of my professional acquaintances were the following:

- In the rank of European countries regarding environmental awareness Hungary belongs to the more aware countries.

- The introduction of a Hungarian green tax reform has to face the rejection of the population since the Hungarian population is dismissive to taxes and has no confidence in state action.

- Green tax reform has a double dividend besides the improvement in the quality of the environment.

- The responsiveness of the Hungarian population to environmental issues is high according to the personal experiences of everyday life. Women, urban inhabitants, people with higher qualification and those married with children are more responsive to environment protection. Consumer goods produced with environment friendly technology would only be purchased by people with higher income. The decisive majority of the respondents would not support the introduction of a new tax. Those who are not openly dismissive to it, support the introduction of the tax combined with a compensational system for companies.

- The environmental responsiveness of the youth population is high, and it increases with age. In my opinion those with interest in arts and humanities, girls and urban inhabitants are more responsive to environment protection. The role of environmental education at school is remarkable.

By processing the professional literature I thrived to unravel what research and information is already available in this topic. I framed my hypotheses (whose the detailed description is to be read in chapter 'Material and Methodology') on the basis of those findings, and I determined the methods that are appropriate for the verification or disconfirmation of the hypotheses.

2. MATERIAL AND METHODS

2.1 Preliminary Hypotheses

On the basis of the lessons of the researches processed in the professional literature I form the following hypotheses relating the research questions:

1. Hypothesis (H_1):
   In the rank of European countries regarding environmental awareness Hungary belongs to the more aware countries

2. Hypothesis (H_2):
   The introduction of a Hungarian green tax reform has to face the rejection of the population since the Hungarian population is dismissive to taxes and has no confidence in state action

3. Hypothesis (H_3):
   Green tax reform has a double dividend materializing in the growing rate of employment besides the improvement in the quality of the environment.

4. Hypothesis (H_4):[2]
   The level of the environmental awareness of the adult population is high, and correlates with gender, demographic parameters, school qualification, marital status and the level of income.

5. Hypothesis (H_5):
   The level of the environmental awareness of the adolescent population is high, and correlates with gender, age, fields of interest, the existence of siblings, demographic parameters, the amount of time spent outdoors, the knowledge about the consequences of climate change and the type of school

2.2 Data and Databases Used in the Research

2.2.1   Secondary (Ecoscopic) Data

Databases utilized in the research are the following:

- Homepage of the Ministry of Finance for the collection of the data on budgetary deficit between 1998 and 2010;

- The database of the National Tax and Customs Administration (NTCA/NAV) for the collection of the data on contributions, environmental product fees and emission charges between 1998 and 2010 and the data on the personal income tax and social security contribution revenues in 2008 and 2009;

- The database of the Hungarian Central Statistical Office (HSCO/KSH) for the collection of data on employment rate, GDP, the number of unemployed persons

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[2] Hypotheses H_4 and H_5 seems unusually detailed, which might raise doubts in preliminary wording. However these presumptions came from the experiences of the author and her environment. The questionnaire survey aimed at verifying or falsifying these hypotheses, and the questions put to the respondents were compiled accordingly.

(1998–2010), the number of employed persons (1992–2010), greenhouse gas emission (2005–2008), the distribution of tax revenues in international comparison and the regional distribution of the population and the GDP in 2008;

- The database of the EUROSTAT for the collection of the data on environmental tax revenues, income tax and the tax wedge of the European countries in 2004 and in 2009, and the data on CO_2 emission (1996–2007) and greenhouse gas emission (1990–2009) in Europe.

2.2.2 Primary (Demoscopic) Data

I compiled two different questionnaires and made them available on the internet. The completion of the questionnaires began in December 2010 and ended in June 2011. The response was anonym and voluntary. I processed the results of the questionnaires with mathematical-statistical methods using SPSS and Microsoft Excel software. The survey intended to cover the whole territory of the country. The collection of data was prompted by calls by e-mail. The decisive majority of the questionnaires were filled online. In order to avoid the exclusion of those without internet access, a meagre proportion of the respondents filled printed questionnaires. The distribution of the questionnaires happened stochastically, using chains of acquaintances. The analysis of the samples can not be considered representative.

The Questionnaire Designed for the Hungarian Adult Population (over the Age of 18)

The questionnaire aimed to detect the traits of environmental awareness of the Hungarian population, the opinions regarding environmental taxes and the introduction of a CO_2 tax. The electronic questionnaire is available at the following web page: http://tinyurl.com/korny19tol

Among the respondents of the adult population all fields of occupation were represented beyond administration and higher education. There were respondents from all the counties of Hungary except Tolna. The distribution of the 516 respondents is the following: 39,1% male, 60,9% female; 5,6% aged between 19 and 23, 39,5% aged between 24 and 30, 33,1% aged between 31 and 40, 9,9% aged between 41 and 50, 9,5% aged between 51 and 60, 2,4% over 61. The distribution of the school qualification of the respondents is the following: 1,9% elementary school, 18,2% secondary school, 60,1% university or college degree, 6,8% certificate of the National Qualification Registry (OKJ), 6,2% postgraduate training, 6,8% doctoral degree. 48,4% live in the capital, 33,7% live in urban areas and 17,9 live in rural towns.

The questions of the questionnaire were closed, except one open question. In the case of the closed questions the respondents either had to choose from multiple choice answers or had to indicate on a five-point Likert-scale to what extent they agree with a given statement. During the process of the answers I worked with both metric and non-metric scaling.

The Questionnaire Designed for the Hungarian Population between the Age 10 and 18

The questionnaire survey aimed to detect the environmental awareness and the environmental activity of the Hungarian Population between the age 10 and 18. The distribution of the survey for the youth was promoted by the principals and teachers of randomly selected schools by letting the students answer the questionnaires on school-time lessons. The electronic questionnaire is available at the following web page: http://tinyurl.com/korny10-18.

The majority of the respondents live in Cegléd, Tápiószentmárton, Dabas and in the neighbourhood of Budapest, however questionnaires were returned from all the counties except from Baranya, Komárom-Esztergom, Nógrád, Somogy, Tolna and Vas. The distribution by sex, age and residence of the 434 respondents is the following: male 47%, female 53%; aged 10–14: 57,8%, aged 15–16: 28,3%, aged 17–18: 13,9%. 24,7% of the respondents live in the capital, 21% in urban towns and 54,3 in rural towns.

The questions of the questionnaire were closed, where the respondents either had to choose from multiple choice answers or had to indicate on a five-point Likert-scale to what extent they agree with a given statement. During the process of the answers I worked with both metric and non-metric scaling.

2.3 Statistical Methodology at Processing the Questionnaires

In order to manifest the existing correlations among the different factors and to determine the form and strength of these relations I performed correlation and then regression analysis. Besides descriptive statistics I also applied multiple variable methods, principally explanatory models and data reduction models. In the course of the exploration of correspondence among the variables the usage of linear regression analysis and analysis of variance (ANOVA) were the most peculiar. In the case of analysis of variance I performed post-hoc tests to monitor among which groups of the explaining variables can be substantive, statistically verifiable significant differences detected. The tests applied in this phase of the research were the following: Tukey Test, LSD Test and Scheffé Test.

In the case of the analysis of two nominal or ordinal variables I applied the analysis of contingency tables.

From the data reduction methods I chose principal component analysis and cluster analysis. Levene test was also applied to verify the fulfilment of homoscedasticity. Thriving to adherence to methodological correctness in the analysis I performed all the examinations considering restrictive criteria. I determined a 5-percent significance level as the validation criteria of the models in the statistical examinations.

The modelling methods applied in the course of the examination are summarized in Figure 1:

| | | Independent variables | |
		Non-metric	Metric
Dependent variables	Non-metric	Analysis of contingency tables	
	Metric	Analysis of variance	Correlation and regression analysis

Figure 1
The Summary of the Methods of Structural Analysis Used
Source: Sajtos–Mitev 2007. 204. p.

Most of the statistical examinations of the research were performed with SPSS software. The management of the data, the calculations of the descriptive statistics and the construction of figures were carried out with the Excel spreadsheet application of the MS Office software suite.

2.4 Analysis of the Implementation of a CO_2 Tax with Simulation Model

The exogenous variables of the model are those independent variables that cannot be deduced from the model; therefore their values have to be determined from outside the model:
- The level of the CO_2 tax (EUR/t);
- Currency exchange rate (HUF/EUR);
- The amount of the personal income tax revenue (HUF), the consolidated tax base (HUF) and its due taxes (HUF);
- The amount of the social security contribution revenues (HUF) and the contribution rates applied (%);
- The amount of greenhouse gas emission (t).

The endogenous variables of the model are those that are determined by using the model:
- The amount of obtainable CO_2 tax revenues (HUF);
- The decrease of the average rate of personal income tax (%);
- The decrease of the rate of social security contributions (%).

The variables of the model are commutable; for example if we assign what percentage point reduction we wish to achieve in the personal income tax rate of the consolidated income tax base, and what burdens on living labour we aim, we get the amount of greenhouse gas emission that is necessary to realize that objective; or assuming a constant level of emission what tax and contribution base expansion is indispensable to cover the necessary expenses.

In the case of the conversion of CO_2 revenues to reduce the personal income tax rate potential personal income tax rate reduction can be calculated by the rearrangement of the equation quoted below:

$$\frac{PIT(Tb;T\%)}{CO_2T(CO_2E;ET;P)} = \frac{\frac{PIT}{Tb}}{PIT\%} \tag{1}$$

where,
PIT: Personal Income Tax revenue
Tb: Tax base
T%:   Tax rate
CO_2T: CO_2 Tax revenue
CO_2E: Greenhouse gas emission in CO_2 Equivalents
ET: Environmental Tax
P: exchange rate (Price)
PIT %:   reduction of the average rate of Personal Income Tax

In the case of the conversion of CO_2 revenues to reduce the rate of the social security contribution, the potential social security contribution rate reduction can be calculated by the rearrangement of the equation quoted below:

$$\frac{SC(Cb; C\%)}{CO_2 T(CO_2 E; ET; P)} = \frac{C\%}{SC\%} \qquad (2)$$

where,

SC: Social security Contributions

SC%:   rate of the reduction of social Security Contributions

Cb: Contribution base

C%= S_eC% + S_rC%: aggregated Contribution rate

S_eC%: Employee's Social security Contributions

S_rC%: Employer's Social security Contributions

In the course of the model calculations I analysed three basic situations for 2008 and for 2009 assuming constant emission levels depending on the fact whether the CO_2 tax is levied on households (A), corporations (B) or all polluters (C). Then in the process of a scenario analysis I examined the effect of the potential utilization of the emerging revenues depending on the fact whether the revenues from the introduction of the CO_2 tax are spent on the reduction of personal income tax rates (a), social security contribution rates (b) or the subsidy of energy rationalization programs (c).

3. RESULTS

3.1. RESULTS OF SECONDARY RESEARCH

3.1.1 Analysis of Individual Tax Revenues in International Comparison and their Effect on Employment in Hungary

Observations from the Analysis of Environmental Tax Revenues

From the presentment of the *environmental tax revenues per capita* it can be laid down that from the 27 member states of the European Union Hungary is the at the 21st place according to the 2009 data, and only 4 of the 10 new states joining the European Union at the same day as Hungary lag behind Hungary regarding environmental tax revenues per capita. Slovenia, Cyprus and Malta have environmental tax revenue per capita indices above the EU-15 level.

Examining the *environmental tax revenues in their percentage ratio within the aggregate tax and contribution revenues* it can be ascertained that in Hungary environmental tax revenues constituted 6,64% of the total tax and contribution revenues, which puts Hungary at place 17 in the EU-27 ranking. The scale of environmental tax revenues within the aggregate tax and contribution revenues in the average of the EU-15 countries is 6,81%, while in the average of the 10 countries joining in 2004 is 8,01% and in the average of the 2 countries joining in 2007 is 8,74%. Each of the three average indices is higher than the Hungarian data. Looking at the tendencies of the ratio of the environmental tax revenues only the cases of 9 out of the 28 examined countries denote an increasing trend. These countries are: the Netherlands, Ireland, Sweden, United Kingdom, Czech Republic, Estonia, Malta, Slovenia and Bulgaria.

The ratio of the *environmental tax revenues in the percentage of the GDP* declined in most of the member states between 2004 and 2009. In the average of the EU-15 countries the environmental tax revenues constituted 2,63% of the GDP in 2009, while the same average of the 10 countries joining the EU in 2004 was 2,65%. So the ratio of the environmental tax revenues in the percentage of the GDP is higher compared to economic productivity in the newly joined countries. This is not true for the countries joining in 2007, where the ratio of the environmental tax revenues in the percentage of the GDP is 1,96%.

Observations from the Analysis of Personal Income Tax and Property Tax Revenues

Examining the *state revenues from income taxes* it is apparent that the average tax revenues of the new member states joining the EU in 2004 within the total tax revenues (45,3%) is lower than the same average of the "old member states" of the EU (50,94%) in 2009. Consequently, it is not typical of the newly joined member states to apply a stricter taxation on incomes. The ratio of the income tax revenues in Hungary (49,9%) is above the average of the 10 new member states. The ratio of the income tax revenues increased in most of the examined countries except Germany, Sweden, Malta, Poland and Bulgaria.

Examining the income and property taxes in the percentage of the GDP it is allegeable that income taxes total up to 13,75% of the GDP in the average of the EU-15 countries, while in the later joined 10 member states the income taxes add up to 7,84% of the GDP. This ratio is even worse in the two states that joined the EU in 2007 (5,55%). In Hungary the income taxes came out at 7,9% of the GDP in 2010; it is less than in 2004 and is approximately equal to the average of the member states joining the EU together with Hungary.

Observations from the Analysis of the Burdens on Living Labour

The labour cost index (LCI) measures the tax burdens of wages according to the description of EUROSTAT in the case of lower income brackets. In most of the examined countries the burdens of living labour had decreased by 2010 compared to 2004. The average rate of the tax burden in the EU-15 countries calculated from the data of accuracy of one decimal place is 37,23%, while the average burden of living labour in the new member states is 33,75%. The tax burden of living labour in Hungary is 43,6%, which means that in spite of the decreasing trend it exceeds not only the average of the new member states, but also that of the EU-15 countries. The average tax burden in Romania and Bulgaria is 38,5%. Among the EU-27 countries there are only three member states where the rate of the tax burden on living labour exceeded that of Hungary in 2010: Germany, France and Belgium.

Observation from the Analysis of the Correspondence between the rate of Employment and the Contribution Burdens

It is statistically verifiable that the burdens on living labour have an effect on the trends of employment. Practical data show that labour demand is more flexible than labour supply. As a consequence the taxes on living labour generate a higher rate of unemployment in those countries, where in the case of inflexible labour market the greater part of tax burden falls on labour supply and not on labour demand. In order to achieve the minimal deadweight loss the excessive taxation through employers' contributions is not effective. The sources from the environmental tax revenues are worth spending on the reduction of employers' contribution burdens and not on the reduction of employees' contributions.

Observations from the Analysis of Correspondence between Environmental Taxes and Some Other Economic Indicators

From the examination of the linear relation between the variables it is apparent that the environmental fee variable shows a significant correlation with the GDP and the number of unemployed. The strongest correlation can be manifested between environmental fees and the GDP, as the 0,899 correlation coefficient shows. There is a strong positive correspondence, which means if the GDP increases, the extent of the fees also increases. The correlation between the environmental fees and the number of unemployed persons is moderately tense, 0,68, which means if the number unemployed persons increases, the extent of the revenues from environmental fees also increases and vice versa. The casual relation between the variables is not unambiguous, but the existing correlation makes the environmental taxes appropriate to play the role of regulator.

3.1.2 Systematization of Environmental Taxes, Fees and Contributions in the Hungarian Regulations

By studying the legal regulations between 1988 and 2011 I reviewed the circle of taxes, fees and contributions that can be associated with environment protection. I arranged the regulating measures according to the grouping system accepted by EUROSTAT. I collected the year of publication of the regulations, the operative rate of applied measures as of October 2011, and in the case of environmental product fee as of January 2012, where these sums pour into, and what the objectives of the regulations are. I concluded that even though the regulating measures regulate the protection of all the natural resources, their scale has no dissuasive power in all the cases.

3.1.3 Presentation of the International Realization of the Environmental Tax Reform, Setting up the Environmental Awareness Matrix of the European Countries

From the examination of the realization of the environmental tax reforms in the European countries I had to come to the conclusion that the ecological tax reform is applied in all the Northern and Western countries of Europe in a limited scope and scale, but not in the Latin European countries. The tax rates are low, and degressive in the scale of energy intensity, partly because environmental taxes are mostly energy taxes. The other reason is the fact that the revenue neutrality of the tax reform only materializes on the level of the whole economy, therefore the different branches of economy are affected differently due to labour and energy intensity.

The more developed the environmental policy of a country is, the more probable it is to implement an environmental tax reform. Its permeation depends on the questions, to what extent can the resistance of the economy and the households against a tax reform that makes energy more expensive be broken down, what exemptions and compensations can be offered for the stakeholders and also what progress can be achieved in the international harmonization of the reform.

Taking the tendencies of the average emission levels of the CO_2 emission per person in the European countries for the period 1996–2007 the countries can be grouped the following way:

1st The emission level of the first group is above the EU-27 level and the trend of the emission is increasing (*environment damaging countries*);

2nd The emission level of the second group is above the EU-27 level and the trend of the emission is decreasing (*countries thriving to meet the undertaken obligations of the Kyoto protocol*);

3rd The emission level of the third group is below the EU-27 level and the trend of the emission is increasing (*countries with aggressive environmental attitudes*);

4th The emission level of the fourth group is below the EU-27 level and the trend of the emission is decreasing (*environmentally aware countries*).

3.1.4 The Distribution of the Hungarian CO_2 Emission, the Mode of Action of the CO_2 Tax and the Modelling of its Introduction

I assembled together the facilities which fall under the effect of the National Allocation Plan for the second trading period (2008–2012) specified in Appendix 10 of the 13/2008. (I. 30.) government decree. 11.993.122 tons of emittable CO_2 quotas were allocated for the facilities operating in the regulated branches of economy in Hungary. I prepared a map that displays the *distribution of the CO2 emission potential of the country* provided all the facilities with quotas would completely exploit their emission quotas.

I formed five groups from the Hungarian counties on the basis of the potential amount of emittable CO_2. In two Northern countries (Borsod-Abaúj-Zemplén, Heves) there is a massive potential of CO_2 emission, and its environment and health damaging effect is the most powerful here, independently from the fact that environment pollution is not a localizable problem. The ranking of the first five counties does not significantly change if we calculate with emission potential per 1000 people or per million forints of the GDP.

Henceforward I examined the mode of action of the CO_2 tax. As a consequence of the introduction of a hypothetical CO_2 tax, both the tax burden of individuals and the total costs of the corporations would increase. If the corporations transmit the rising costs into the price the level of production would decrease due to the decline of the consumption, which would reduce the available sources of the government through the setback in corporate income tax and value added tax revenues, and would hold back economic growth. On the positive side of the introduction of the new tax the improvement of the environmental quality and the regulation of external costs can be mentioned.

In case of a CO_2 tax combined with a compensational mechanism in the personal income tax the tax burdens for individuals would remain the same only at the level of the whole society, since the students, the pensioners, the unemployed and the intensive polluters would not benefit from the positive and compensatory effect of the compensation. For the corporations due to the rising total costs the advance in prices would result in declining production which is the same process as in the introduction of the tax without a compensational mechanism.

In case of a CO_2 tax combined with a compensational mechanism in the social security contributions the total costs would only remain constant at the national level, since the costs would decline in the labour intensive branches of the economy, and would increase in the branches with a higher level of CO_2 emission. The extent of pollution and the amount of compensation splits in the case of individuals. The structure of incomes – independently from being low, middle or high – would get better in all cases, if the level of pollution is reduced. As a consequence of the correlation between the rate of employment and the contribution burdens the rate of employment would increase, which would lead to growing production and consumption, owing to which increasing corporate income tax and value added tax revenues, moreover economic growth are to be expected besides the improvement in the environmental quality.

From the simulation modelling calculations it can be determined that the extent of the available CO_2 tax revenues calculating with the given parameters (the emission level in 2008 and in 2009; 10 EUR/t tax level; average currency exchange rates for 2008 and 2009) *in the case of a tax introduced exclusively for households is 34,8 billion forints, in the case of a tax introduced exclusively for the branches of the national economy is 166,8 billion forints and in the case of a tax introduced for all CO_2 emitters is 201,6 billion forints.*

Utilizing these revenue sources a part of the personal income tax revenues from the consolidated income tax base or a part of the social security contributions paid in 2008 and 2009 can be redeemed, which allows the reduction of tax or contribution rates. In the case of the third possible way of utilization the whole amount of the CO_2 revenues can be spent on technological development and energy rationalizing projects (Chart 1).

Chart 1 Summary of Modelling Results

Year	Taxpayer		Increase in PIT rates (% point)	Increase in SSC rates (% point)	Financial sources of technological development and E-rationalizing projects (billion HUF)
			a)	b)	c)
2008	In case of a CO_2 tax levied only on households	(A)	0,4	0,5	34,8
	In case of a CO_2 tax levied only on corporations	(B)	1,92	2,42	166,8
	In case of a CO_2 tax levied both on households and corporations	(C)	2,33	2,92	201,6
2009	In case of a CO_2 tax levied only on households	(A)	0,46	0,55	38,2
	In case of a CO_2 tax levied only on corporations	(B)	2,09	2,50	173,8
	In case of a CO_2 tax levied both on households and corporations	(C)	2,55	3,05	212,1

Source: own calculations

I performed calculations to determine what amount would the reduction of the personal income tax and the social security contribution rate mean for the individual taxpayers and employers. I prognosticated the conformation of personal income tax and social security contribution revenues for 2020 by using calculations of moving averages. I identified the *minimum level of CO_2 emission* under which the CO_2 tax revenue would not result in a perceptible personal income tax rate cut counting with 2008 figures. In the case of households under the volume of 172.530 t, in the case of corporations under the volume of 185.000 t and for the national economy less than 1.600.000 t of yearly CO_2 emission the tax exchange would have no significant effect.

3.2. THE RESULTS OF THE PRIMARY RESEARCH

3.2.1 Examination of Environmental Awareness in the Adult Population

Environmental Awareness Index

The first step was the preparation of a so called aggregated environmental awareness index from the following components: the self-evaluation of the environmental sensitivity of the respondents, the scale of concern for environmental problems and the degree of preference of environmentally friendly products. The higher the value of the aggregated environmental awareness index is, the more favourable it is for the environment.

According to the values of the descriptive statistics of the environmental awareness index of the examined population the average environmental awareness index of the 516 respondents varies between 1,31 and 5 on a 1-to-5 rating scale, and the individual responses significantly differ from the average value of 4,03, with a standard deviation of 0,76.

Statistical analysis revealed that *there is a correlation between the environmental awareness index and the following variables:*

- *gender* (the self-concept of women regarding environmental awareness is more positive than that of men);
- *age* (environmental awareness increases with age, but falls back over the age of 61, however it cannot be taken as a relevant conclusion due to the low number of cases, since only 12 persons from the 516 respondents belong to this age group);
- *marital status* (singles are less aware environmentally than the married and those living in cohabitation or a permanent relationship);
- *the number of children* (the respondents' sensitivity to the quality of the environment increases with the number of children);
- *regional location* (the ranking by regions of the environmental awareness index is the following in descending order: Northern Hungary region, Pest county, Central Transdanubia region, Southern Great Plain region, Northern Great Plain region, Budapest, Southern Transdanubia region, Western Transdanubia region; the environmental awareness index of those living in the Northern Hungarian region and the Western Transdanubian region differs significantly).

There is no statistically demonstrable correlation between the level of environmental awareness and the nature of settlement, income and school qualification.

Environmental Load Index

The second step was the creation of the so called environmental load index by conjugating the answers of the respondents for the following questions: consumers' habits regarding the purchase of food, furniture, electrical devices, consumers' expectations regarding wrapping, recycling habits, frequency of car usage. The higher the value of the environmental load index is, the less favourable it is for the environment. According to the values of the descriptive statistics *the average environmental load index* of the 516 respondents is *2,73*.

By means of explaining models I examined which factors may correlate with the environmental load index. *In the case of the environmental load index the effect of the following variables can be taken as statistically verified*:

- *gender* (the environmental load index of men (2,86 on the average) is higher than that of women (2,65 on the average));
- *school qualification* (the higher someone's qualification is, the greater load he or she means on the environment);
- *nature of settlement* (urban inhabitants mean a heavier load on the environment than those living in rural towns, while the environment load index of the capital is the lowest, which can be explained by public transport and the establishment of selective waste collecting points);
- *income conditions* (under a monthly income of 150.000 HUF the average of the environment load index is 2,7, between 150.000 and 200.000 HUF it declines, but above the monthly average income of 200.000 HUF the environment load index is increasing).

There is no statistically demonstrable correlation between the level of the environmental load index and age, marital status, number of children and regional location.

Three clusters can be distinguished *regarding the environmental awareness index*:

1st The first cluster is made up of those with a medium environmental awareness index – mostly single men under the age of 40 without children living typically in Budapest and Pest county (145 persons).

2nd The second cluster is made up of those with a high environmental awareness index – exclusively women mostly under the age of 30, single with one child, typically living in Budapest, however the latter can be the inference of the fact that the percentage of the respondents from Budapest was high (230 persons).

3rd The third cluster is made up of those with the highest degree of environment awareness – mostly over the age of 30, almost only women living in permanent relationships, raising more than one children and typically living in the Great Plain (141 persons).

Three significantly clusters can be distinguished *regarding the environmental load index* as well:

1st The first cluster is made of those with a medium environmental load index –a mixed-sex group with female majority and with a lower level of qualification compared to the other two groups living not in Budapest or Pest county (119 persons).

2nd The second cluster is made up of those with a low environmental load index – exclusively women with a higher level of school qualification mainly living in the capital with middle income (232 persons).

3rd The third cluster is made up of those with a high level of environmental load index – exclusively men with higher school qualification from Budapest and Pest county with high income (165 persons).

The Examination of Price Sensitivity

Examining the price sensitivity of the respondents I found that 16% answered that he or she would be ready to pay more for a product prepared with environmentally friendly technologies in all cases, which means the price sensitivity of the 16% of the respondents is lower than their environment awareness. 6% of the respondents chose not to buy any products prepared with environmentally friendly technologies if it is more expensive than the equivalent product prepared

with ordinary technologies, so 6% of the respondents are sorely price sensitive. More than three-quarters of the respondents (77,3%) were only willing to pay more for an environmentally friendly product if their financial situation made it possible. So it can be concluded that the respondents are firmly price sensitive. 0,7% of the respondents gave the answer other.

There is a statistically verifiable correlation *between the willingness to pay extra for environmentally friendly products and gender* ($\chi^2 = 11{,}320$; df = 1; p = 0,001). It can be stated that men are less willing to pay extra than women. (Figure 2)

Figure 2
Price Sensitivity by Gender
Source: SPSS output

There is a statistically verifiable correlation between the willingness to pay extra for the products manufactured with environmentally friendly technologies and the income level according to the result of the analysis of contingency tables. On the basis of the standardized residuals it can be determined that those in low income brackets (under the monthly net income of 250.000 HUF) are willing to pay extra if their financial circumstances make it possible, while those in high income brackets (over the monthly net income of 450.000 HUF) are clearly willing to pay extra.

The analysis of contingency tables showed no statistically verifiable correlation between price sensitivity and other variables (age, school qualification, marital status, number of children and the nature of settlement).

Evaluation of the Effectivity of Environmental Taxes

For the question to what extent the respondents agree with the statement that the introduction of the environmental taxes may improve the quality of the environment 472 of the 516 persons committed themselves to any of the answers in the following distribution shown in Figure 3.

Accordingly it can be stated unambiguously that 62,3% think to a greater or lesser extent that the quality of the environment would improve thanks to the introduction of environmental taxes. 37,7% of the respondents believe it would not. However, it cannot be neglected that most of the respondents answered they expect only small improvement in the quality of the environment.
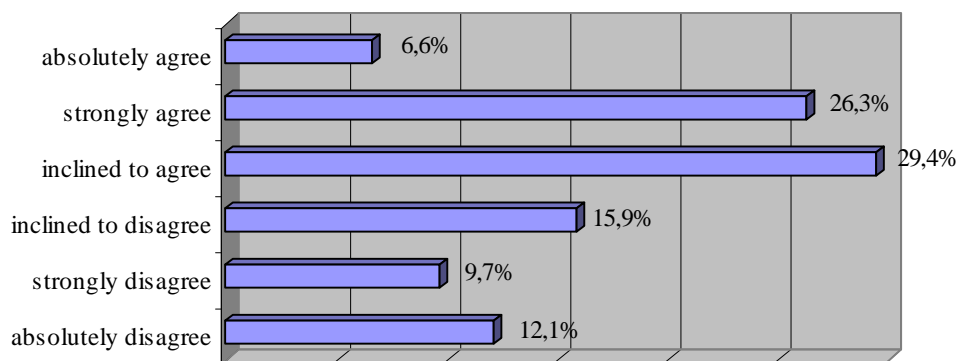
Figure 3
The Evaluation of the Effect of the Environmental Taxes on the Quality of the Environment
Source: own compilation

According to the results of the model calculations there is a correlation between *the confidence in the effectivity of the environmental taxes* and the following factors:

- *age* (people between 41 and 60 are the less likely to believe in the effectivity of the environmental taxes);
- *school qualification* (people with secondary school qualification and the certificate of the National Qualification Registry tend to believe the environmental taxes to be effective the least);
- *income* (the higher the income is, the more effective the environmental taxes are thought).

There is no statistically demonstrable correlation between the belief in the effectivity of environmental taxes and the other variables.

The Support for the Introduction of the CO_2 Tax

From the 503 respondents 12,7% would support the CO_2 tax under no considerations, which is not a meagre proportion. Most of the respondents would support the introduction of the tax for all the polluters but with a compensational mechanism. It is conspicuous that almost half of the respondents would support the introduction of the tax for the corporations, while almost nobody supports a CO_2 tax levied only on individuals. (Figure 4)
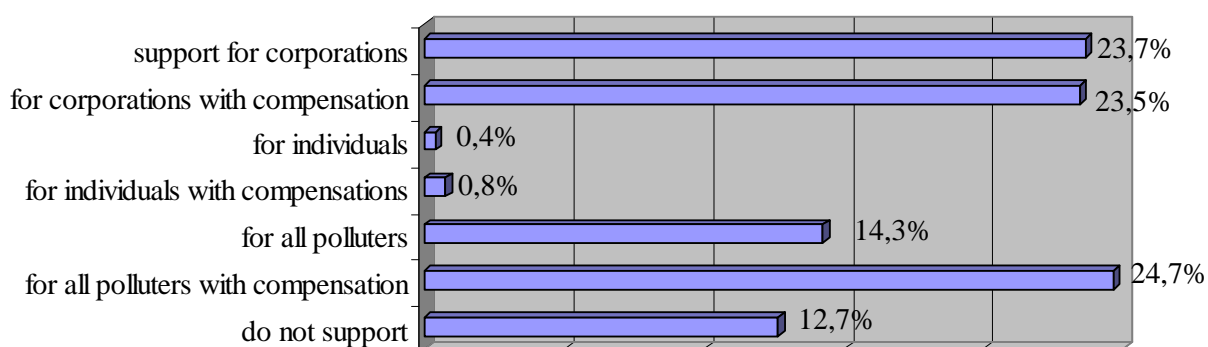
Figure 4
Support for the Introduction of the CO$_2$ Tax
Source: own compilation

According to the results of the analysis of contingency tables there is no statistically demonstrable correlation between the support for the introduction of the CO$_2$ tax and the other variables.

The Most Serious Problems

From the answers for the open questions I concluded that the members of the society indeed find environment pollution a serious problem, and many of them would prohibit all polluting activity. Wastewater and garbage treatment are regarded as especially sensitive fields. The taxation and punishment of all kinds of ground, water, air, noise and light pollution are deemed necessary. It was a common reflection that sanctions should be imposed on littering, smoking, excessive urban car-usage and irrational cooling and heating ("greenhouse" offices). Banning the distribution of products from non-recyclable and degradable (plastic) materials was among the recurring answers. The respondents established a claim for the support for selective waste collection, renewable sources of energy and environmentally friendly technologies.

However in notable part of the answers outspoken anti-tax attitudes and often firm resistance can be manifested. A lot of respondents worded that they do no find taxes an appropriate solution for the containment of environment pollution, and preferred to reward the positive activities instead of punishing the negative activities. They see the point in environmental education, guidance and promoting intrinsic motivation. The respondents would put more emphasis on the compliance of the regulations, stricter control and the introduction of deterrent fines. (These results correspond with the 2011 survey of Eurobarometer.) The most often mentioned reason of taxophobia is that the respondents discredit that the tax revenues would be spent on reduction and restitution of the consequences of environment pollution, and the fear that the taxes and fees would eventually be paid by the costumers since they would be built in the price.

3.2.2   Examination of Environmental Awareness in the Population Aged 10–18

Aggregated Environmental Awareness Index

I formulated the aggregated environmental awareness index from the answers to the following questions: the degree of environment protection, the degree of the concerns for the environmental

problems and the degree of the perceived own responsibility for the quality of the environment. The higher the value of the aggregated environmental awareness index is, the more favourable it is for the environment.

The average environmental awareness index of the respondents is 3,89. However the high value of the standard deviation warns that among the 434 persons there are intensely environment aware and absolutely not environment aware respondents as well.

According to the results of statistical modelling there is a statistically verifiable correlation between *the level of environment awareness* and the following factors:

- *sphere of interest* (the environmental awareness index is higher in the case of those with a complex range of interest and wider horizon);
- *gender* (girls are more aware of the environment);
- *nature of settlement* (those living in cities are the most environmentally aware, then at second place those living in rural towns and the inhabitants of the capital are the less aware of the environmental issues);
- *time spent outdoors* (those respondents who spend most of their free time in the open air have a higher environmental awareness index, however the correlation is rather weak);
- *the knowledge about the consequences of climate change* (those students who have better knowledge about the consequences of climate change have a higher environmental awareness index);
- *environmental education*.

We can only state with a 5,2% probability of failure that there is a difference between the environmental awareness of the age groups, therefore it is not statistically verifiable, even though by the above mentioned significance level the most stringent post-hoc test also discovers differences between the environmental awareness of the 10-14-year old and the 15-16-year old age groups, which coincides with the shift from elementary school to secondary school.

According to the modelling calculations the fact whether *someone has a brother or a sister or the number of siblings and the regional location of the residence* does not determine the level of environmental awareness.

I arranged the respondents into homogenous groups in accordance with the parameters they gave using the method of cluster analysis. I finally came to three significantly different groups:

1st   The first group contains 239 persons – they represent those with intermediate environmental awareness, mostly characterized by mixed circle of interest, fifty-fifty girls and boys mainly from the 10–14 age group having more than one siblings and typically living in Pest county towns.

2nd   The second group (169 persons) is composed of the least environmentally aware – most of them boys with interest in humanities, typically at the age of 15–16 living in the capital and having none or few siblings.

3rd   The third group consists of only 19 persons, those with the highest level of environmental awareness, most of them interested in science subjects, mainly girls in the 17–18 age group with a brother or a sister living in urban towns.

Car Usage

It is to be laid down that *the frequency of car usage is influenced by the nature of settlement. Those living in the capital travel the least by car*, which can be explained with the dense net of public transport lines. *Those living in rural towns rarely arrive at school by car*, which can be reasoned by the smaller distances and the safety of cycling. Those living in urban towns travel to

school regularly, or rather daily by car, which is accounted for the less frequent public transport lines, the greater distances or the fact that their parents travel by car and pick them up to drop them at school. Nevertheless *environmental activity has no effect on car usage*.

Selective Waste Collection

According to the results of the analysis of contingency tables there is a correlation between selective waste collection and the following factors:
- *the degree of environmental activity* (those who have a low degree of environmental activity do not collect the waste selectively);
- *orientation* (those with interest in humanities are certainly do not collect the waste selectively, and those with a mixed interest do);
- *place of residence* (Those living in Pest country typically collect the waste selectively, while those living in the Northern Great Plain do not).

Selective waste collection does not depend on gender, age, existence and number of siblings, the nature of settlement.

Environmental Activity

According to the results there is a correlation between environmental activity and the following factors:
- *the fields of interest of the students* (those exclusively with an interest in humanities have a low level environmental activity, while those with a mixed interest have a high level environmental activity);
- *gender* (the environmental activity of boys is rather low, while it is almost certainly not low in the case of girls; however the force of the relation is very weak, the knowledge of the gender seems to be an insufficient forecaster for environmental activity);
- *age* (as the age grows the level of environmental activity decreases, which is partly the consequence of the fact that those activities – e.g. paper collection, metal collection – that are regularly organized at elementary schools, are not held in all secondary schools);
- *the nature of settlement* (the environmental activity of the inhabitants of the capital is low, of those living in urban towns is medium and of those living in rural towns is definitely high);
- whether the respondents have siblings (those without siblings have a low level of environmental activity, while the environmental activity of those having at least one sibling is medium).

The number of siblings and the regional location of the residence do not affect the level of environmental activity.

3.3. NEW AND NOVEL SCIENTIFIC RESULTS

On the basis of my research I draw up the following new and novel scientific results:

1st   On secondary databases using scientific methodology I proved that environmental tax and fee revenues significantly determine the macroeconomic performance, and also revealed the regulatory role of these budgetary sources.

2nd   I constituted a simulation model that is appropriate to predict the volume of the extra revenues from the introduction of a presumed CO_2 tax in view of the necessary parameters, and also the possible fluctuation in the rate of the personal income tax and social security contribution depending on the utilization of the CO_2 tax revenues.

3rd   Relying on empirical research I found that the willingness to accept the introduction of the new tax in Hungary is the lowest in the most important taxpaying generations, while the scepticism in the environment improving effect of the taxes is strong, which may be an obstacle in the way of the introduction and efficient application of the CO_2 tax, and might set back the implementation of the environmental tax reform.

4th   I proved that the attitudes of specific social groups formed according to definite aspects toward the environmental tax reform are differing, however there is an identifiable segment that can be counted upon as allies in the regulatory procedure of the introduction of the tax reform.

5th   I demonstrated the negative fact that the average level of environmental awareness among youngsters is lower than among the adult population, which in the field of sense of responsibility for the protection of the quality of the environment predicts a negative tendency for the future.

3.4. COMPLETION OF RESEARCH HYPOTHESES

Summarizing the results of the examinations completed the following assessment can be given about the completion of the research hypotheses:

1. Hypothesis (**H_1**):
   In the rank of European countries regarding environmental awareness Hungary belongs to the more aware countries.
   Status: verified.
   The hypothesis is verified according to the environmental awareness index, the comparison between the environmental tax revenues in the percentage of the GDP, the green index of Hungary taken from the professional literature and the answers to the questionnaires.

2. Hypothesis (**H_2**):
   The introduction of a Hungarian green tax reform has to face the rejection of the population since the Hungarian population is dismissive to taxes and has no confidence in state action.
   Status: partially verified.
   According the open question of the questionnaire the dismissive attitudes toward and the mistrust in taxes are verified, however the introduction of the CO_2 tax met categorical refusal in the case of 12.7% of the respondents, which on the contrary does not verify the hypothesis.

3. Hypothesis (**H_3**):
   Green tax reform has a double dividend materializing in the growing rate of employment besides the improvement in the quality of the environment.
   Status: verified.
   According to the close correlation between the domestic employment rate and the employers' contribution burdens the double dividend in the growing rate of employment is verified. According to the results of the questionnaire survey the respondents are willing to pay extra for products manufactured with environmentally friendly technologies, therefore a development in innovation as double dividend may also be expected. Products of environmentally friendly technologies offer greater marketing opportunities on the global markets, which – through the advancement of the balance of trade – may result in the growing volume of the GDP as a further case of double dividends, provided that the additional tax revenues are appropriated for the support of technological and technical development. If we set aside the traditional fields of utilization, the additional revenues could be spent on the support of environmentally friendly production, which – considering that this is a labour intensive activity – could promote rising rate of employment as double dividend.

4. Hypothesis (**H_4**):
   The level of the environmental awareness of the adult population is high, and correlates with gender, demographic parameters, school qualification, marital status and the level of income.
   Status: partially verified.
   The high level if environmental awareness of the adult population and the influence of gender, age, marital status, the number of children and the place of residence are

verified, while there is no verifiable correlation between environmental awareness and school qualification, the nature of settlement and income level.

5. Hypothesis (**H₅**):
   The level of the environmental awareness of the adolescent population is high, and correlates with gender, age, fields of interest, the existence of siblings, demographic parameters, the amount of time spent outdoors, the knowledge about the consequences of climate change and the type of school.
   Status: partially verified.
   The high level of the environmental awareness of the youth and the effect of gender, fields of interest, the amount of time spent outdoors, the knowledge about the consequences of climate change and the type of school are verified, while age, the existence and number of siblings and place of residence have no effect on the environmental awareness index.

4. CONCLUSIONS AND SUGGESTIONS

The research problems expounded in my dissertation suggest the formulation of the following conclusions:

–   On the basis of the procession of the scientific literature and the presented databases I come to the conclusion that *income and living labour (that promote positive economic processes) are taxed more intensively in Hungary compared to the other EU member states. The tax revenues from taxes on environment pollution (that generate negative economic, social and environmental processes) attain an average level represented in the percentage of the GDP. Looking at the percentage of the environmental taxes in the aggregated tax revenues Hungary lags behind not only the average of the EU-15 countries, but also the average of the countries joining the European Union in 2004 and in 2007.* It is advisable to consider whether to relocate the centre of state revenues from the taxation of socially beneficial processes to the taxation of harmful activities. An ecological tax reform could promote such a rearrangement.

–   *Hungary is the fourth in the ranking of the EU-27 countries regarding the burdens on living labour,* which explains the relatively higher rate of illegal labour and the lower income declared in the income tax returns, and may also be an obstacle for the inflow of foreign working capital. On the other hand the level of the wages is remarkably low and the domestic market is dominated by big corporations. That means the low level of wage costs does not necessarily inspire the expansion of employment, but increase the profit of corporations in monopolistic situation. While the reduction of the employers' contributions would advance the competition conditions of the small and medium-sized enterprises. In my opinion it is not advisable to cover the expenses of the social security funds only from the contribution revenues, but should also be financed from the taxation of environmentally damaging activities that are also responsible for illnesses and early retirement.

–   Having examined the general equilibrium and the econometric models and simulations of numerous international scientific analyses I came to the conclusion that the *ecological tax reform has a primary dividend, so there is an environmental benefit. The effect of the environmental taxes regarding double dividends (increase in GDP and the rate of employment) is different.* The effect of the ecological tax reform in the improvement of the quality of the environment is obvious, since environment pollution becomes more expensive due to the polluter pays principle. However the positive effects of the environmental taxes on the rise of the rate of employment and economic growth can only be expected on the long run as a result of complicated and indirect relations. The effects of the eco-taxes may be significantly different in the case of the individual activities and products. In countries with a medium or lower average income – like Hungary – where the marginal benefit of leisure time is meagre, the double effect would certainly prevail. The effect of the tax reform on job creation largely depends on the fact how the additional tax revenues are redistributed in the economy. The greatest impact on employment can be secured if the redistribution is extended to the whole economy. The level of domestic energy consumption may also be decreased with the tax reform; although consumer demand is only slightly influenced by the rise of energy prices, it promotes serious retrenchment in the corporate sector. It is not advisable to tax the more flexible labour demand even in order to decrease the social deadweight loss. Therefore the most subservient way to utilize the additional revenues from the introduction of environmental taxes is the reduction of the employers' contribution burdens. This statement is underpinned by the fact that the rate of employment closely correlates with the contribution burdens of employers. The decline of the level of competitiveness due to such tax reform cannot be expected, since the energy prices in Hungary are mainly at the same level as in Europe or even higher in some cases. *From the*

examination performed it cannot be unambiguously concluded that by the reform of the domestic tax system, the alteration of tax types, the rearrangement of social obligations the tax reform has a double dividend in economic growth beyond the effective improvement in the quality of the environment, but the increase of the rate of employment can be expected.

– From the analysis of the environmental fees and the macroeconomic figures I came to the conclusion that *the environmental taxes show the closest correlation with the economic growth index and the gross domestic product (GDP)* among the examined factors. Since the circle of the economic taxes introduced in Hungary has only a short history, far-reaching consequences should not be drawn from these examinations. However it can be stated the due to the existing relation – without knowing the exact cause and effect relations – the taxes might play a regulatory role. Since the pace of growth in the case of the two variables is different, it cannot be declared that the rise of the level of environmental taxes would unambiguously generate economic growth. This is due to the fact that in order to increase output going hand in hand with economic growth more and more such sources are used and as a result of production (therefore economic growth) more and more such products are manufactured whose usage is the subject of environmental taxation, so these revenues would necessarily increase.

– From the review of the circle of environmental taxes and fees it can be concluded that almost all the fees aim at the protection of all environmental factors, most of these fees are not enough high to obtain the deterrence power necessary for the protection of the quality of environment. The margin between the world market price and the cost of the domestic hydrocarbon production should be paid for the state budget as mining fee, however only a meagre sum pours into the budget. The unduly great benefit must be regarded as state support.

– In order to reduce environment pollution, and especially air pollution the following tools might be effective: congestion charge, urban tolls, parking fees, the lift of road tolls, airport fee. The introduction of the coverage fee would also enhance the quality of the environment.

– The most important task before the introduction of a green financial reform is the elimination of the direct and indirect subsidies that distort market competition and keep prices of products from severely environment and health damaging activities under the real costs. Exception can only be made in case of the production of public goods and public services for the final costumer. The prices of the scarce natural sources do not reflect the actual scarcity of these goods (e.g. the low level of mining fee and land protection fee) and therefore allocate a significant economic advantage to their users. In all the cases when the consequences of the polluting or environment damaging activities are born by others, the polluter is rewarded with a subsidy equal to the amount of the externality. *It is inevitable to internalize the external effects* in order to get a real picture. The deterioration of the quality of the environment, the depletion of the natural resources and the unfavourable changes in the quality of human capital add up to a greater amount of state debt than the financial state debt itself.

– Among the compelling tasks there is *the elaboration of the green GDP* which is appropriate to take into account the shrinkage of natural resources, the environmental damages and social tensions as well. The traditional GDP measures only the quantity of production, the upshot from the process of economic growth. This means that environment pollution, and even ecological disasters may increase the amount of GDP. Since state subsidies should solely be provided for the production of public goods and all the rest should be the responsibility of the markets, it is inevitable to determine the scope of public goods. When examining the regulatory tools in the field of environment protection it can be asserted that the modes of intervention are moving in the direction of economic (market) tools. To reach the necessary change in the way of thinking and behaviour of the people that is suitable for the requirements of sustainable development a

large-scale informative activity is inevitable. Civil organizations can play a significant role not only in the campaigns for the education of the public, but they serve as the most important control of the governments. For the sake of the success of the implementation of the tax reform the effectivity of the performance of the public sphere must be significantly enhanced, especially regarding the rolling back of corruption.

– From the environmental awareness matrices of the European countries it can be stated that in the 1996-2007 period the member states of the European Union (EU-15) could decrease the emission of polluting materials, and the tendency of the average emission of the European Union (EU-25) was also declining after the first enlargement cycle of 2004, but the pace of decline fell back with the enlargement round of 2007 (EU-27), however this latter pace of decline in the emission of polluting materials is still larger than in the time of the EU-15 countries. It can be asserted that the countries joining the EU in 2004 on the whole polluted the environment to a smaller extent in the examined period than those joining the EU later. Especially Bulgaria was the country from the latter group that caused the less favourable figure of emission. Denmark was the country that reduced its emission most remarkably; however the high level of its average emission explains it. Beyond a level countries do not keep on reducing their pollution emission due to the economic processes and competitiveness, therefore a low emission level cannot be spectacularly reduced (Romania, Hungary). It can be noted that the Czech Republic and the Netherlands did not significantly reduce their emission in spite of the high level of average pollution emission. However from the aspect of environment protection Luxemburg, Estonia, Finland, Ireland and Cyprus pose a greater threat, since these countries further increased their emission in spite of the high average CO_2 emission per person values.

– In all those countries where an environmental tax reform had been implemented the average CO_2 emission decreased. On the other hand, examining the introduction and the lift of the environmental taxes the decrease of the CO_2 emission cannot be experienced in all the countries. In those countries where the emission level ascended the average amount is not significantly higher than the EU-27 emission average.

– *From the map drawn according to the data of the National Allocation Plan (NKT)* it can be stated that among the counties of Hungary the most notable CO_2 levels are to be expected in Heves and Borsod-Abaúj-Zemplén counties both in absolute value and calculating per thousand people and per million forints of the GDP. That means the inhabitants of these counties are the most exposed to the physical and other effects of CO_2, while due to its unlocalizable nature the consequences of climate change are to be borne by the whole population.

– From the tendencies of the emission of greenhouse gases it can be concluded that in spite of the fact that the restriction of the emission is observable in all the EU member states except for a few countries, and the obligations of the Kyoto Protocol have been fulfilled, the prevention of climate change would demand more drastic measures. Examining the tendencies of the greenhouse gas emission for the period 2005–2008 it can be observed that there was a permanent decrease, and within that it was the emission of the households that decreased more significantly. Examining the extent and the tendencies of the greenhouse gas emission on the European level it can be asserted that Hungary has a rather limited influence on the struggle against climate change, but the reduction of the emission level is our economic and medical interest.

– In the modelling calculations examining the revenue creating effect of a 10 EUR/t CO_2 tax on the amount of the emitted greenhouse gases it can be concluded that in case of a tax levied on all polluters counting with 2008 figures approximately 201,6 billion forints would be disposable, which would give the opportunity for a 2,33% point reduction of the personal

income tax rates, the 2,92% point reduction of the social security contribution rate or the support of energy rationalizing projects. Such reduction would mean an annual maximum of 40.000 HUF personal income tax save or – calculating with the minimum wage – an annual 24.000 HUF social security contribution save per person. Examining the revenue creating effect of the introduction of the tax using the 2009 figures it can be stated that assuming the effect of the tax exchange is even greater, since the increase of the currency exchange rates resulted in a higher level of CO_2 revenues, while the personal income tax and the social security contribution revenues fell back compared to the previous year. That means the tax exchange would promote a maximum of annual 50.000 HUF personal income tax save or – calculating with the minimum wage – an annual 26.000 HUF social security contribution save per person. From the tendencies it can be concluded that the effect of the tax exchange is less significant in the case of decreasing CO_2 emission level and increasing personal income tax and social security contribution revenues, so its effect is less sensible. The tax that is taken as the base of the tax exchange must have a wider tax base. A CO_2 emission under an annual 1.600.000-ton level for the whole economy of Hungary would not eventuate any effectual consequence after the tax exchange. From the tendencies of the personal income tax and social security contribution revenues for the period 2000–2009 I deduced the presumptive values for 2020 using the calculation of moving averages. According to the prognosis the feasible personal income tax revenues fall into the 2.000-4.250 billion HUF zone, while the feasible security contribution revenues fall into the 2.800-6.200 billion HUF zone.

– *From the procession of the answers of the adult population (over the age of 18) it can be asserted that the environmental awareness index of the respondents is high*, the average is 4,03 on a 1-to-5 scale. According to the self-concept of the respondents their sensitiveness toward the quality of the environment is high on the average. The level of their concerns for the revealed environmental issues is also above the medium. In addition to that they prefer goods from environmentally friendly production. Therefore it can be concluded that the necessity of the measures directed at the protection of the environment is an objective that is not controversial in the society. The survey revealed that the environmental awareness of women and those living in a permanent relationship is higher, and also increases with age and the number of children, which means that persuasion and the acceptance of the measures are the easiest in these segments of the society. The examination verified that environmental awareness is independent from school qualification and income level. *The environmental load index* – constituted from the purchase habits of food, furniture and electric devices, and the attitudes toward packaging, recycling and car usage – *is somewhat lower than the medium value*: it is 2,73 on a 1-to-5 scale. According to the survey the environment load index of men, people with higher school qualification, urban inhabitants (but not those living in the capital) and those with higher income pose a greater environmental load. However the positive correlation with higher school qualification can be explained by the fact that the income level of those with higher school qualification is higher. The positive correlation between income level and environmental load is also underpinned by the different environmental load of the developed and the developing countries. Examining the willingness to pay extra for products from environmentally friendly manufacture it can be stated that the price sensitivity of men is higher, while women are more willing to pay extra. The members of the 41–60 year age group and those with secondary school qualification or the certificate of the National Qualification Registry are the least confident in the positive effect of the environmental taxes on the quality of the environment. *When considering the introduction of subsequent taxes it must be taken into account that it is the generation of the most important tax payers that would not support the introduction of environmental taxes*. Environmental taxes are regarded as effective by those in the higher income brackets, which can also be explained by the fact that they are less sensitive to further expenditures due to their higher income level. 12,7% of the respondents would not support the introduction of the CO_2 tax in no wise. It must be taken into consideration that this answer was

given by the most important taxpayers' generation. Among the supporters of the new tax most of the respondents would support the introduction for all polluters with a compensational mechanism. It is prominent that almost half of the respondents would support it when levied on corporations, while a CO_2 tax levied exclusively on private individuals has almost no support at all. From the answers on the question what environment pollution activities they would tax, it is unambiguous that there is a serious demand for the reduction of pollution and environment protection. On the other hand there is a pervasive anti-tax attitude and even a tough resistance among the respondents. *A lot of respondents put it straight that they do not hold taxes an appropriate solution to roll back environment pollution, and instead of the punishment of negative activities they would opt for the re-compensation of positive activities.* They emphasized the necessity of environmental education, guidance and the formation of inner motivation. They underline the need for the enforcement of regulations, stricter supervision and deterring fines. These demands justify the existence of the tools of direct regulation and not the effectivity of economic regulators (e.g. taxes). The often mentioned reason of the anti-tax attitudes is the objective of the utilization of tax revenues and the additional costs of the final consumer. From the answers of the adult population it is to be concluded that the willingness to accept further taxes is low, which is an obstacle in the way of the introduction and effective operation of the CO_2 tax.

– *According to the results of the survey performed in the 10-18-year age group the average environmental awareness index of the respondents is well above the medium,* and reaches 3.89 on a 1-to-5 scale. According to the results of the modelling calculations environmental awareness does not correlate with age, the existence and number of siblings and the regional location of the place of residence. The survey revealed that those with a mixed interest for both humanities and sciences, with a more complex breadth of view, girls and urban inhabitants (but not living in the capital) have a higher level of environmental awareness. I explored a positive correlation between the environmental awareness index and the time spent outdoors, the knowledge on the consequences of climate change and the attendance of schools where there is an emphasis on the promotion of environmentally aware attitudes. I came to the conclusion that *environmental awareness can be positively influenced by the following means: promoting outdoor activities that can be pursued in direct physical connection with nature, providing information on the negative consequences of environment pollution and strengthening environmental education at schools.* Examining the frequency of car usage it can be asserted that the nature of settlement has a decisive role and it is not in correlation with environmental activity. The frequency of selective waste collection and the examination of its usage reveals that it is statistically verifiable those with a low level of environmental activity are surely not liable to collect the waste selectively, while those with a mixed interest certainly are; the inhabitants of Pest county are, while those living in the Northern Great Plain are not. The willingness to selective waste collection is not determined by gender, age, the existence and number of siblings and the nature of settlement. The participation in activities and projects organized for the protection of the environment (e.g. litter collection) allows us induction for environmental activity of the respondents. Analyses justify that the environmental activity of those with a mixed interest for humanities and sciences have a high level of environmental activity, so do those between the age of 10 and 14, those living in rural towns and those having at least one brother or a sister, while the environmental activity of boys is low. This observation unambiguously underscores the organization of the paper and litter collection campaigns of the elementary schools of rural towns, and the decrease in the environmentally oriented projects of secondary schools. The number of siblings and the regional location of the place of residence have no effect on environmental activity. Secondary schools may utilize effective waste treatment as a tool for raising the level environmental activity. *The realization of the opportunity of selective waste collection, the creation of the easily accessible collecting places of hazardous waste could not solely be the task of schools, but also of public institutions and*

pharmacies. I came to the conclusion that the most effective allies of the change in environmental attitudes and the promotion of environmental education could be the women with children in permanent relationship.

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