Environmental taxation and its determinants in Europe. Is there any relationship with rule of law, ICT and imports?

Concetta Castiglione[1,2], Davide Infante[2] and Janna Smirnova[2]

[1]Trinity College Dublin, Department of Economics; e-mail: castiglc@tcd.ie

[2]University of Calabria, Department of Economics, Statistics and Finance;

e-mail: davide.infnante@unical.it; janna.smirnova@unical.it

Abstract

The paper analyses the determinants of environmental taxation in European countries, which is one of the most widespread but controversial environmental policy instruments in Europe. Besides investigating the most expected factors responsible for tax collection, such as those related to production and consumption activity and environmental quality, particular attention is paid to some non-trivial determinants. Firstly, we analyse the importance of institutional context that is argued to be crucial for the enforcement of environmental policies. Secondly, the consumption of rapidly obsolescent goods, such as ICT goods characterised by substitution phenomena, and consequently by intensive waste generation, is taken into account. Finally, we consider that a large part of European countries transfer their production process abroad which increases the importation of goods. This process leads to the decrease of local emissions release and, consequently, influences environmental taxation. The results demonstrate that the above determinants have a heterogeneous impact in developed and former-transition European economies. In developed countries, the rule of law stringency and the importation of ICT goods have a positive impact on environmental taxation while the importation of other goods has a negative effect. As expected, these results are not valid for former-transition economies, which can be due to a still weak institutional context and different patterns of their economic development.

Keywords: Environmental taxation, institutions, ICT, imports

JEL Classification: H23, O43, O44, P28, Q58

1. Introduction

Environmental taxation (ET) is one of the most widespread environmental policy instruments in Europe introduced gradually in state members since the early nineties. Its functionality is registered by numerous studies that demonstrate the positive impact of taxation on environmental quality (EEA, 2005; Ekins, 1999; Ekins and Barker, 2001; Scrimgeour et al., 2005). At the same time, ET is argued to have another important impact that regards economic performance. This is expressed through the Environmental Tax Reform (European Commission, 1997) that shifts taxation burden "from economic function, sometimes called 'goods', such as labour (personal income tax), capital (corporate income tax) and consumption (VAT and other indirect taxes), to activities that lead to environmental pressures and natural resources use, sometimes called 'bads'" (EEA, 2005: pp.83). The importance of this goal is evident since it recognises ET as an instrument to reconcile economic growth and the environment (Ekins, 2011). Despite the importance of ET for environment and for economic performance, there is little contribution that delineates the determinants of ET itself (Anger et al., 2006; Ward and Cao, 2012). The identification of the main factors that influence the ET seems necessary in order to create a favourable context for the applicability, functioning and monitoring of the taxation system. This paper aims to fill these lacunae and analyses different determinants in this regard by estimating a panel data of European countries from 1996 to 2011.

In addition to the most expected factors that influence ET, such as the energy intensity of the economy and environmental degradation, we investigate the incidence on environmental taxation of some non-trivial factors. These factors are the institutional context, the consumption of information and communication technology (ICT) goods characterised by intensive waste generation and, finally, the economic openness. To test these hypotheses we consider the institutional context, expressed by the rule of law, ICT importation, and importation of other goods that captures the differences between internal and external goods consumption.

The findings provide evidence on the importance of the specific factors for environmental taxation policy. First, the rule of law is found to be decisive for the enforcement of the environmental taxation policy. Second, the results demonstrate that the environmental taxation can be decreased not only by a fall in pollution but also by

the delocalization abroad of industrial production and importation of final goods. Third, the impact of importations on ET differs if the ICT sector is taken into consideration. Given that this sector is characterised by rapid goods obsolescence and their fast substitution with more updated ones, the ICT consumption produces a large amount of waste and, therefore, has a positive impact on ET. Finally, we provide empirical evidence that the effects of the above specific factors are highly heterogeneous among European countries due to different patterns of institutional and economic development.

The remainder of the paper is structured as follows: section two introduces the theoretical background, section three presents the econometric model and the data utilized. Section four discusses the results, while section five concludes the paper.

2. Theoretical background

While the consequences of ET are well documented in empirical studies, the factors that contribute to its functioning are left in the shade. A few studies make an effort to analyse the environmental taxation policy instrument and identify factors crucial for its efficacy (Bovenberg and de Mooij, 1997; Ekins and Barker, 2001; Muller and Sterner, 2006, Castiglione et al., 2012). In the light of these studies, the most expected determinants of ET can be determined. The first is what is called "bads" – environmentally harmful goods producing pollution or emissions that constitute an environmentally harmful tax base. These can be classified in the following broad categories (Kosonen, 2010): energy, transport, pollution and resources. The "bads" are clearly related to any activity of both production and consumption processes and may be referred to different indicators, such as energy intensity of the economy, manufacturing production, waste, emission release and others.

It is important to spend some words on the recent tendencies of "bads" that lead the discussion to the relationship between economic development and the environmental quality. Most of the studies of this field demonstrate the existence of an Environmental Kuznets Curve (EKC) that links economic growth and environmental degradation (e.g. Markandya et al., 2006; Baek, 2009; Dutt, 2009; Costantini and Martini, 2010; Lipford and Yandle, 2010). Generally, the evidence for an EKC is based

on various theories concerning how socioeconomic progress relates to environmental protection (Galeotti et al., 2006). The theory suggests that economic growth and social well-being calls for environmental awareness, thus opting for environmental protection policy as a consequence of economic development. In this way, compatibility between economic growth and environmental quality is supported by the application of effective environmental policies. The contribution of green taxation to environment and economic performance, known as double dividend theory, has been largely studied by empirical literature (reviewed by Kosonen, 2010). While agreement on the positive impact on the first dividend of ET, such as environmental quality, is unanimous, the second dividend, such as better economic performance, gives mostly positive although less robust results.

Therefore, in analysing the determinants of ET, the state intervention such as energy intensity, environmental spending, and the use of alternative energy should be considered. Being an instrument of economic policy, the decisive factor for ET is the quality of governance, and therefore, the capacity of the state to create, maintain and monitor the taxation system. Obviously, the quality of governance is strongly related to the institutional enforcement. Institutions such as property rights, legal origins, democracy and governance have been shown to have an important impact on environment (Damania et al., 2003; Cole, 2007; Leitão, 2010; Castiglione et al., 2012a) and, consequently, on ET (Castiglione et al., 2012b). From the environmental perspective the institution of the rule of law has particular importance since it reflects the supremacy of law and the quality of institutional context itself. The institutional enforcement and particularly that of the rule of law should define the capacity of the state to impose, collect and monitor general taxes, as well as environmental taxes. The links between the rule of law stringency and effective environmental policies are discussed in Panayotou (1997) and in Bhattarai and Hammig (2001).

Finally, another important but controversial factor determining ET is economic openness. As demonstrated by Baek et al. (2009), economic openness, economic development and environmental quality are highly interdependent. The empirical and theoretical research that considers this dependency covers a wide range of factors, among which are hypotheses of pollution havens, EKC and ET double dividend. For developed countries, economic openness has particular features that should be

considered in our analysis. The first feature is the delocalization of industrial production to developing economies. From an environmental perspective, for the manufacturing goods, this process means the exporting of pollution and importing of final consumption goods. As a consequence, given the evident reduction of home manufacturing production, the total ET entries in home economies decrease with the increase of imports.

The same process of transferring the production process abroad has an opposite effect on ET, if we consider goods consumption that implies the generation of a high amount of waste. One of these examples is ICT consumption goods that have the particular characteristics of rapid obsolescence and fast substitution (around 25-50%, as argued by Parisi et al., 2002). The ICT have received increased attention from economists over the past decades. Most of the studies recognize the importance of these technologies in determining firm productivity (Brynjolfsson and Hitt, 1996; Castiglione, 2012) firm efficiency (Becchetti et al., 2003) and economic growth (Gordon, 2000). However, nowadays, continuously evolving technological change makes the ICT goods unsuitable for consumers even though the product is still perfectly functioning. Goods such as mobile phones, tablets, computers and television sets in developed economies are continuously displaced by new standards and new applications that render impossible the use of the "old" models that are rapidly replaced by the technologically new ones. Considering the fact that ICT consumption increases with the number of users, the process of substitution of obsolete products involves numerous consumers that produce technological waste. For this reason, the consumption of ICT goods is expected to have a positive influence on environmental taxation. It is interesting to note that ICTs were introduced, during the seventies and eighties, as energy saving technologies to reduce the depletion of those natural resources that were used in the mechanical technologies (such as oil, iron and other raw materials). Instead, nowadays the ICTs are becoming a new source of pollution. Given that in developed countries almost all ICT goods are produced abroad and imported, the influence of ICT consumption on ET can be approximated by ICT imports.

Finally, it should be noted that the above determinants could have different impacts on ET among European countries. The differences are first of all due to heterogeneity in economic welfare, institutional environment and production activity.

In fact, it has been demonstrated that environmental policies, including environmental taxation are more functional in countries with high economic welfare and a strong institutional context, such as countries-leaders in application of Environmental Taxation Reform: Sweden, Denmark, the Netherlands, the United Kingdom, Finland, Norway, Germany, France and Italy (Bosquet, 2000; EEA, 2005). Former-transition countries that are still characterised by a developing institutional context and lower life standards are expected to have different contributions of the above-defined ET determinants. Therefore, to capture the differences in ET determinants in Europe, countries are divided in two groups, developed countries and former-transition economies, since we hypothesize that their different patterns of institutional and economic development influence their environmental taxation policy.

3. Econometric model and data

The aim of this study is to take into account, in addition to the most traditional determinants of ET, which are linked to environmental taxation, some innovative factors, such as, the institutional context, the consumption of ICT goods and the openness to international markets. Therefore, in addition to the investigation on the contribution of factors reflecting production process, energy consumption, environmental degradation and protection, other factors are tested. First, we test to what extent institutional enforcement determines environmental taxation taking as a proxy of institutional context the rule of law index. As we expect, institutional enforcement should influence positively environmental taxation. Second, we check for the incidence on taxation of the ICT sector by considering the importation of ICT goods and expect that these goods influence negatively environmental taxation given the intensive waste generation of the sector. Our final hypothesis tests whether incurring into the importation of goods leads to the decrease in environmental taxation due to the transfer of a high energy consuming, and therefore, polluting production process abroad. Therefore, in order to study the above hypotheses we estimate the following model:

$$ET_{it} = \alpha + \beta_1 Rol_{it} + \beta_2 ICT\_imp\_pc_{it} + \beta_3 IMP\_other\_pc_{it} + \beta_4 Z_{it} + \varepsilon_{it} \quad (1)$$

where *ET* is environmental taxation; *RoI* is the rule of law, *ICT_imp_pc* and *IMP_other_pc* are, respectively, the importation of ICT goods and all other goods, while *Z* represents a vector of the most expected determinants of *ET* (energy intensity of the economy, greenhouse gas emissions, environmental protection expenditure, use of alternative energy). The variables are expressed in logarithms, so that the results could be interpreted as elasticity.

The analysis is based on three different sources of data: Eurostat Environmental Accounts (2013), Kaufmann et al. (2013) and World Development Indicators (World Bank, 2013). The environmental taxation data is provided by Eurostat Environmental Accounts (2013) and it is measured in percentage of GDP. The rule of law index is provided by Kaufmann et al. (2013). Data on this index, from 1996 to 2002, is available every two years, while data from 2003 to 2011 is given yearly. The missing data for the years 1997, 1999, 2001, is imputed as the average value between two adjacent years. The index varies between -2.5 and +2.5. In order to take the log we sum +5 to this variable. ICT imports of goods and services and imports of goods and services minus ICT imports are taken from the World Development Indicators (World Bank, 2013).

Other independent variables used are: energy intensity of the economy, environmental protection expenditure, use of energy form alternative sources and greenhouse gases emissions. The indicator of energy intensity of the economy is provided by the World Development Indicators (World Bank, 2013). All the other variables are taken from Eurostat.

The resulting data forms a panel of 26 European countries and spans the timeframe from 1992 to 2011. Table 1 reports the description of variables and source of data, while Table 2 presents a summary of the sample statistics.

In estimating panel data, it is important to consider the difference between fixed and random effect models (Cameron and Trivedi, 2009). The effect of country-specific characteristics, potentially correlated with the dependent variable, can be explored by estimating both the fixed and random effects models. If country-specific characteristics are not correlated with the explanatory variables, the fixed effects should be preferred to random effects. Otherwise, random effects estimation is consistent and efficient.

Given the significance of Hausman test statistics (not reported), the fixed effects model is rejected in favour of the random effects model. For this reason, we only report the results from the random effects estimation. Moreover, to confirm the robustness of the model, a Tobit approach is also applied and provides similar to random effects results, confirming the structural validity of estimation.

To capture the differences between developed and former-transition countries the sample is divided into two groups. The first group reflects developed countries and is composed of: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, Malta, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom. The second group is composed by former European transition countries: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

4. Results and discussion

The model of ET determinants is estimated for two groups of European countries: developed (G1) and former-transition (G2). The results of the random effects estimation for G1 and G2 are presented in the firs two columns of Table 3 and Table 4 respectively.

Concerning our main variables of interest, i.e. institutional context, ICT and other goods importations, the obtained results support our hypotheses. In particular, the coefficient of the rule of law that ensures the process of tax collection and monitoring carries, as expected for developed economies, a positive sign. This confirms the evidence on the importance of the institutional strength for the enforcement of environmental policies. The parameter is strongly significant and with a high magnitude. This result, as expected, does not hold for former-transition countries that are still characterised by a weak institutional context. In fact, as expected, the rule of law coefficient is demonstrated not to be significant for these economies.

As far as concerns the importation of ICT goods, we observe that for developed economies a positive relationship between ICT and environmental taxation is found. As argued, high levels of income in these countries permit a continuous substitution of obsolete ICT goods with new upgraded ones. The excessive consumption, substitution and discharge of these goods in the home market imply the payment of taxes, which

increases the volume of ET. This is supported by the sign and significance of the ICT estimated parameter. The former-transition economies, in turn, do not demonstrate this effect, but this is not surprising given that lower levels of income imply both a smaller importation and substitution of ICT goods and longer utilization of existing technologies. This tendency does not create as much specific technological waste and, therefore, green taxes, as in developed economies.

The importation of other than ICT goods has also heterogeneous effects for developed and former-transition economies. The incidence on ET is negative in G1 group. This confirms the evidence on the transferring abroad of the production processes of developed economies and, as a consequence, the decrease of pollution. For these countries a greater importation of manufacturing goods reflects a shrinking production sector at home, and, as a consequence, a smaller environmental taxation burden. In fact, according to our estimation, an increase of one per cent of importation of goods decreases environmental taxation by 15.4%. The picture is different for G2 group, where the coefficient of importation is not significant due to the smaller propensity of these economies to transfer the production processes abroad. This can be due to the presence of net FDI inflow (Gorbunova et al., 2012) and less expensive labour. In these countries domestic production still largely takes place, constituting a base for the environmental taxation entries.

The traditional variables that are expected to influence ET, such as those considering production and consumption activities, environmental quality, government environmental policy and alternative energy are now taken into account.

To reflect the production and consumption processes, energy intensity of the economy is considered and carries the expected sign, influencing positively the ET in developed economies. The non significant impact in the G2, in our opinion, can be explained by a different application of environmental policies that are not yet introduced or still weakly enforced in this group of countries.

The next determinant taken into account is the environmental degradation. This is considered through per capita greenhouse gases generation that has a positive and significant impact on the collection of environmental taxation in G1, while is not significant in G2 group. This confirms that G1 countries are applying more intensive environmental policies respect to the G2 countries. To check for robustness and to

follow the criticism regarding the susceptibility of per capita pollution indicators provided by Luzzati and Orsini (2009), we also control for greenhouse generation per countries' surface. This approach does not change the significance of the environmental degradation indicator and does not affect the significance of other parameters. The results of this estimation are presented in the third and fourth column of Table 3 for G1 and in Table 4 for G2.

As expected, the government environmental policy expressed through government environmental expenditure influences negatively the ET, which is intuitive given that this kind of expenditure is aimed to improve environmental quality. This relation is homogeneous in the two groups of countries with a similar impact.

Interestingly, the use of energy from alternative sources such as water, solar, wind, wave and nuclear energy influences the ET positively in both groups of countries. This can be explained by the subsidising system of the introduction of green technologies. In fact, the installation of green sources of energy is often subsidised by governments through the entries collected from environmental taxation itself. It means that greater use of alternative source of energy is pulled by increasing environmental taxes, which is confirmed by our findings that show very similar magnitude and significance of the parameters between the two groups.

Given the censored nature of our dependent variable, which reports only positive values, we also estimate our model using the Tobit methodology. The results, reported in Tables 5 and 6 respectively, are demonstrated to be similar to a random effects model. Our main hypotheses on the importance of institutional context, of the consumption of ICT goods and of transferring of the production process abroad in determining environmental taxation are confirmed in this estimation for both developed (Table 5) and former-transition economies (Table 6). Other control variables also maintain their signs and significance.

5. Conclusions

In this paper we analyze the determinants of environmental taxation, which is one of the important and effective environmental policy instruments in Europe. The importance to investigate on ET determinants becomes crucial if we take into account the specific characteristics of this environmental policy instrument. On the one hand,

excessive taxation of "bads", as well as taxation of "goods", undermines the economic activity and the households' income. On the other hand, insufficient green taxation implies the acceleration of environmental degradation. In order to provide the policy-maker with the tools for establishing the equilibrium level of ET, it is necessary to have a clear vision of the factors affecting this policy instrument. To this end, together with most expected environmental taxation determinants we consider some new variables: the strength of institutions, the importation of ICT goods and the importation of other goods.

The analysis covers 26 European countries and utilizes data between 1996 and 2011. We find that the determinants of ET are heterogeneous within the EU countries due to their different patterns of institutional and economic development.

As we demonstrate, institutional enforcement in the form of rule of law contributes positively to ET in developed countries, while former-transition economies with weaker institutions do not take advantage of the rule of law enforcement. The importation of ICT goods that are characterized by rapid products' obsolescence turns out to be very important. In developed economies the importation of these goods has a positive impact on ET. Given the high per capita income of these countries, this effect may indicate a fast substitution of ICTs with new technologically updated goods, therefore, increasing waste production. Turning to policy implications this is an important result. In fact, ICT goods, originally introduced to reduce the depletion of natural resources, can be now considered as a source of new technological wastes that environmental taxation should take into consideration as "bads". The relationship between environmental taxation and ICT importation is not significant for former-transition countries where, given lower levels of income, ICT goods are not easily discarded and substituted by new high-tech products.

The importation of other than ICT goods is found to be negatively related to ET in developed countries, while does not have influence in former-transition economies. This result indicates the delocalization of industrial production to other countries and importation of goods produced abroad. As a result, this phenomena leads to the decrease of environmental taxation inflow in the home markets. We have not found the confirmation of this hypothesis for former-transition countries that have not so intensively transferred abroad their production processes.

The traditional components that determine environmental taxation are those related to production and consumption processes and environmental degradation, i.e. energy intensity of the economy, the emission of greenhouse gases, the environmental expenditure and the use of energy from alternative sources. As demonstrated, the heterogeneity among European countries is also persistent in relation to these determinants. In fact, while environmental expenditure and the use of alternative sources of energy have expected, respectively, negative and positive signs in both groups of countries, the situation is different for the other two indicators. In fact, energy intensity gives a positive contribution to environmental taxation in developed but not in former-transition economies. This may probably depend on the fact that in the latter countries the presence of lobbies and rent-seekers, supported by the weakness of institutional context, obstacles the introduction of the environmental taxation. It is interesting to note that also the variable that reflects the environmental degradation, such as the release of greenhouse gases, is not significant in former-transition economies, confirming our hypothesis on a still weak introduction of environmental policies and, consequently, on the lacunae in their application.

While our analysis confirms the importance of traditional determinants, its major contribution is the detection of less obvious factors, such as rule of law stringency, consumption of ICT goods and transferring of goods produced abroad. We find the evidence that these factors matter for ET in different ways in developed and former-transition countries, which should be taken into account by EU countries when deciding on environmental taxation policy enforcement.

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Table 1: Variables description and sources

Variables	*Description*	*Source*
ET	Total environmental taxes, percentage of GDP	Eurostat (2013)
Rol	Rule of Law measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes	Kaufmann et al. (2013)
ICTimp	ICT imports of goods and services (constant 2005 US$)	WB-WDI (2013)
IMP_other	Imports of goods and services minus ICT imports, (constant 2005 US$)	WB-WDI (2013)
Intensity	Energy intensity of the economy: gross inland consumption of energy divided by GDP (kg of oil equivalent per 1000 Euro)	Eurostat (2013)
GGEsa	Greenhouse Gas Emissions (CO2 equivalent), thousands of tonnes per surface area	Eurostat (2013)
GGEpc	Greenhouse Gas Emissions (CO2 equivalent), thousands of tonnes per capita	Eurostat (2013)
Pub_exp	Per capita environmental protection expenditure (constant 2005 US$)	Eurostat (2013)
Altern_Energ	Alternative and nuclear energy (% of total energy use)	WB-WDI (2013)

Table 2: Descriptive statistics

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
lnET	448	0.976	0.238	0.166	1.643
lnRolp	493	1.813	0.105	1.514	1.946
lnICTimp	343	16.630	3.993	13.427	41.774
lnIMP_other	489	4.715	4.361	2.994	27.943
lnIntensity	431	5.403	0.624	4.383	7.252
lnGGEsa	452	0.104	2.293	-5.624	8.418
lnGGEpc	439	-4.768	1.625	-9.275	-0.389
lnPub_exp	314	8.941	1.422	1.830	11.324
lnAltern_Energ	479	1.698	1.913	-5.807	3.927

Table 3: Determinants of environmental taxation in developed countries, random effects estimation

Variable	*parameter*	*t-statistics*	*parameter*	*t-statistics*
lnRolp	1.14	(4.41)**	1.17	(4.49)**
lnICTimp	0.09	(3.53)**	0.099	(3.82)**
lnIMP_other	-0.154	(2.39)*	-0.165	(2.54)*
lnIntensity	0.223	(2.19)*	0.247	(2.65)**
lnGGEsa			0.138	(2.24)*
lnGGEpc	0.164	(2.02)*		
lnPub_exp	-0.106	(5.63)**	-0.115	(6.06)**
lnAltern_Energ	0.049	(2.33)*	0.055	(2.60)**
constant	-1.417	(1.27)	-2.406	(2.69)**
sigma_u	0.433	(3.87)**	0.373	(4.49)**
sigma_e	0.039	(14.81)**	0.04	(15.24)**
LR(chi)2	198.61	0.000	112.90	0.000
LogLikelihood	111.93		199.10	
Obs	138	138	138	138

* $p<0.05$; ** $p<0.01$

Table 4: Determinants of environmental taxation in former transition countries, random effects estimation

Variable	*parameter*	*t-statistics*	*parameter*	*t-statistics*
lnRolp	0.798	(1.45)	0.813	(1.48)
lnICTimp	-0.05	(0.97)	-0.053	(1.02)
lnIMP_other	0.119	(0.93)	0.122	(0.97)
lnIntensity	-0.077	(0.58)	-0.08	(0.62)
lnGGEsa			0.013	(0.49)
lnGGEpc	0.01	(0.33)		
lnPub_exp	-0.056	(3.35)**	-0.056	(3.37)**
lnAltern_Energ	0.052	(3.14)**	0.052	(3.16)**
constant	0.675	(0.41)	0.661	(0.42)
sigma_u	0.147	(3.92)**	0.145	(3.91)**
sigma_e	0.105	(13.29)**	0.105	(13.29)**
LR(chi)2	23.60	0.001	23.72	0.001
LogLikelihood	68.19		68.25	
Obs	100	100	100	100

* $p<0.05$; ** $p<0.01$

Table 5: Determinants of environmental taxation in developed countries, tobit estimation

Variable	*parameter*	*t-statistics*	*parameter*	*t-statistics*
lnRolp	1.329	(4.55)**	1.342	(4.60)**
lnICTimp	0.097	(3.40)**	0.106	(3.68)**
lnIMP_other	-0.169	(2.41)*	-0.198	(2.72)**
lnIntensity	0.165	(1.65)	0.151	(1.56)
lnGGEsa			0.121	(2.77)**
lnGGEpc	0.104	(3.61)**		
lnPub_exp	-0.087	(3.69)**	-0.092	(4.04)**
lnAltern_Energ	0.038	(1.78)	0.044	(2.39)*
constant	-1.989	(1.88)	-2.455	(2.63)**
sigma_u	0.4	(4.59)**	0.375	(4.51)**
sigma_e	0.041	(13.92)**	0.04	(13.92)**
Wald(chi)2	183.13	0.000	129.03	0.000
LogLikelihood	149.16		150.40	
Obs	138	138	138	138

* $p<0.05$; ** $p<0.01$

Table 6: Determinants of environmental taxation in former transition countries, tobit estimation

Variable	*parameter*	*t-statistics*	*parameter*	*t-statistics*
lnRolp	0.879	(1.53)	0.907	(1.58)
lnICTimp	-0.05	(0.84)	-0.055	(0.92)
lnIMP_other	0.118	(0.86)	0.127	(0.94)
lnIntensity	-0.099	(0.72)	-0.1	(0.74)
lnGGEsa			0.019	(0.72)
lnGGEpc	0.019	(0.63)		
lnPub_exp	-0.049	(2.80)**	-0.049	(2.81)**
lnAltern_Energ	0.064	(2.68)**	0.062	(2.69)**
constant	0.646	(0.39)	0.574	(0.35)
sigma_u	0.144	(3.50)**	0.142	(3.49)**
sigma_e	0.103	(10.62)**	0.103	(10.62)**
Wald(chi)2	15.22	0.033	15.46	0.030
LogLikelihood	27.06		27.12	
Obs	100	100	100	100

* $p<0.05$; ** $p<0.01$