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Validity of Double Dividend Hypothesis in EU-15 Countries

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Abstract

The increases in climate change, biological diversity loss, ecosystem degradation, effects of chemical pollution on the human health, scarcity of the sources, energy and water security have been experienced in the world in recent years together with globalization and the sharp increases in the mass production. In this regard, especially developed countries have begun to implement the policies such as environmental tax reforms to overcome these problems. This study examines the impact of environmental tax reforms on both environment and employment in EU-15 countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, United Kingdom) during the period 1995-2012 by using panel cointegration and Panel FMOLS tests. We found that the double dividend hypothesis was valid in EU-15 countries.

Keywords: double dividend hypothesis, environmental tax reform, panel data analysis

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1. Introduction

Today, for many countries both the problems of environment and unemployment have been started to become a major problem. Therefore, including developed countries, many countries have begun to take important steps to resolve these types of problems particularly in recent years. In most of the EU member countries, the heavy tax burden on employment has been suggested as one of the major causes of unemployment seen in the 1990s. In these countries, it has been accepted that the unemployment problem can be resolved through environmental tax reforms.

One of the objectives of environmental tax reform is also to protect of the environment and to increase the employment. For this, with constant of total tax burden, reducing taxes on labor and increasing taxes on the environment have been advocated. Thus, the protection of the environment and the increase in employment have been achieved. The double-dividend hypothesis as the theory suggests that environmental taxes can improve the environment and increase economic efficiency simultaneously. In this case the "double profit hypothesis" (double dividend hypothesis) is expressed. In other words, according to this hypothesis, environmental tax revenues obtained to protect the environment, are used to reduce taxes on labor. In this context the aim of the work is to defend the effectiveness of the hypothesis of a double dividend EU-15 countries and to test whether this hypothesis is valid.

In this context, the work is addressed primarily to the hypothesis that put forward earnings double on environmental taxes. Later literature is devoted to the empirical results with the data and methodology.

2. Double Dividend Hypothesis

The concept of Double-Dividend Hypothesis, firstly was driven by Tullock (1997), later on this hypothesis Terkl (1984), Lee and Misiola (1986), Pearce (1991) and D. D (1997) suggested more ideas on how the environmental tax revenues will be used (Hur, 2000). Since the 1990s, earning double hypothesis has been discussed by many scholars and important when politicians availability (Günaydın, 1999).

As well as a rise in employment and the quality of the environment by making the environmental tax reform, it is expressed as a double dividend hypothesis (Bovenberg & Ploeg, 1998). Placing a tax on activities affecting the environment adversely will correct existing distortions in economic decisions. Therefore economically useful abolition of taxes on activities will increase transfer efficiency on the activities of these economically harmful taxation (Günaydın, 1999).

There are several approaches achieved through environmental taxes in terms of revenue should be used for this purpose. Lowering the OECD by obtained on the environment according to a report published in 1996, the tax excessive tax burden on labor income in terms of efficiency of use for the reduction of unemployment through is said to be the most effective way (Hur, 2000).

3. Literature Review

Numerous empirical studies to test the validity of the hypothesis made use of double dividend. Some studies (see. Parry and Bento (2000), Manresa and Sancho (2005), Florczak et al.(2006), Benton and Jacobsen (2007), Taheripo et al. (2008), Conefrey (2008), Lutz and Meyer (2010), et al Markandya (2012), Fraser and Waschik (2013), Allen et al.(2014), Vandyck (2014)), support the hypothesis pair gain, in several studies (see.Parry et al.(1998), Gould et al.(1999), Willie ms (2002), Bovenberg et al. (2008), the findings were in the opposite direction.

A relatively small number of studies (Takeda, 2007) reached the complex findings. These contradictory results, the role of special factors, labor is due to the choice of tax instrument used to

assess the environmental tax revenues and tax interaction effect of supply (Fraser and Waschik, 2013: 283). In this section Which is about the validity of the hypothesis made we will cover the double dividend of some empirical findings.

Markandya et al. (2012) for Spain's economy, including the informal labor sector have developed a new general equilibrium model. Besides, undeclared labor force registered in the model is different from other models in the literature included in the labor force, but it is assumed to be missing a substitution between the two parts. Labor mobility between the formal and the informal, unregistered employment continues to the point where real wage is equal to the expected formal charges. Models covered by the CO_2 emissions by between 5 % and 30 % are looking to reduce the CO_2 tax determined for different amounts.CO_2 emissions derived from taxes,

- Lump sum payment transfers,
- Or reducing taxes on employment
- It is recycled to reduce the tax on capital.

All this comes against a neutral tax reform (public fixed income) were compared assuming prosperity effects. As a result of analysis of a portion of tax on their employment with the carbon tax shifting to Spain they have identified could lead to a small decline employment.

Fraser and Waschik (2013) computable general equilibrium model (CGE-computable a general equilibrium) is studied using the hypothesis of a double dividend for Australia and the United Kingdom. Especially coal in the production of specific energy commodities, mainly oil and natural gas as primary energy products (fixed) are identified as factors that play an important role. Using a CGI model of the Australian economy, as assessed by a drop in consumption tax revenues obtained from emission tax, they have found that up to 12-13 % decline in a powerful dual gain occurs. The United Kingdom, although not in the direction of the CG model hypothesis double earnings results, led by Australia and discounts up to a much lower level of about 2 %.

Orlova et al. (2013) were analyzed using the CGE model sectoral and macroeconomic impact of the carbon tax on the Russian economy by using the CGE model. The results of the study hypothesis of double earnings demonstrate that international mobility of capital have emerged under the following conditions:

- The presence of high labor supply elasticity.
- The presence of high-energy elasticity of substitution between labor and capital sum.
- The presence of low elasticity of substitution between capital and energy.

Nerudová and Dobranschi on (2014) 15 EU countries using Granger causality test period 1995-2011 have analyzed the validity of tax interaction effect. Causality test results have determined the only way to the environmental tax to income tax causation, the absence of a two-way relationship between two variables, the emergence of a revenue-conversion effect, so they reached the finding that the second gain is not valid double earnings hypothesis.

4. Data and Methodology

In this study, we investigated the validity of double dividend hypothesis in EU-15 countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and United Kingdom) during the period 1995-2012. We estimated two models in the study. We used the CO_2 emissions as dependent variable and environmental tax revenues (envtax), energy consumption (enecons) and real GDP (GDP) as independent variables in the first model. In the second model we used the unemployment rate (unemp) as dependent variable and

environmental tax revenues (envtax) and real GDP (GDP) as independent variables. We estimated two models in the study, because we want to test the validity of double dividend hypothesis by examining the impact of environmental tax revenues on the environmental pollution and unemployment. Our models were presented in (1) and (2) numbered equations:

Model 1: $CO_{2it} = \alpha_{it} + \beta_1 envtax_{it} + \beta_2 GDP_{it} + \beta_3 enecons_{it} + u_{it}$ (1)

Model 2: $UNEMP_{it} = \alpha_{it} + \beta_1 envtax_{it} + \beta_2 GDP_{it} + u_{it}$ (2)

The variables used in the study were presented in Table 1 and the variables were obtained from European Community Statistical Office (Eurostat).

Table 1**:** Variables used in the analysis and their symbol

Variables	**Symbol**	**Source**
Carbon Dioxide Emissions	CO_2	Eurostat
Unemployment	Unemp	Eurostat
Energy Consumption	Enecons	Eurostat
Real GDP	GDP	Eurostat
Environmental Tax Revenues	Envtax	Eurostat

Firstly we tested the time series properties of the panel data by Im, Pesaran and Shin (IPS) (2003) panel unit root test, then we estimated the long run relationship among the variables by Kao (1999) cointegration test and estimated the cointegrating coefficients by panel FMOLS.

5. Empirical Analysis

In the empirical analysis, we firstly tested the stationarity of the panel data by Im, Pesaran and Shin (IPS) (2003) panel unit root test, then we estimated the long run relationship among the variables by Kao (1999) cointegration test and the direction of the relationship by panel FMOLS.

5.1.Panel Unit Root Test

We tested the stationarity of the variables by Im, Pesaran and Shin (2003) panel unit root test. We selected Schwartz information criterion as the optimal lag length which eliminated the autocorrelation problem among the error terms. Also we applied unit root test with constant and trend, because the series included trend. The results of panel unit root test were presented in Table 2. The results of unit root test showed that the variables in Model 1 and Model 2 were not stationary at their level. So, we applied the unit root test after taking the first differences of the variables and the variables became stationary after first differencing.

Table 2: Model 1 and 2 Results of Panel Unit Root Tests

	Constant+Trend			
	Im, Pesaran&Shin			
Variables	**Level**		**The First Difference**	
	t stat.	**Prob**	**t stat.**	**Prob**
CO_2	3.322	0.9996	-15.3051***	0.0000
Envtax	1.965	0.9753	-6.44865***	0.0000
Enecons	5.517	1.000	-15.6858***	0.0000
RealGDP	3.139	0.9992	-5.42271***	0.0000
Unemp	1.106	0.8657	-4.29359***	0.0000

Note: ***, denotes significant at 1% level.

5.2. Results of Kao Cointegration Test

We examined the long run relationship among the variables in Model 1 and Model 3 by Kao cointegration test and the results of cointegration test were presented in Table 3. We rejected the null hypothesis (there was no cointegration relationship among the series) in both models and therefore, there was long run relationship among the series in Model 1 and Model 2.

Table 3. Results of Kao Cointegration

Model 1: $CO_{2it}= \alpha_{it} + \beta_1 envtax_{it} + \beta_2 GDP_{it} + \beta_3 enecons_{it} + u_{it}$		
	t-stat.	**Prob**
ADF	-6.232123***	0.0000
Residual variance	5.3060287	
HAC variance	5.8064882	
Model 2: $UNEMP_{it}= \alpha_{it} + \beta_1 envtax_{it} + \beta_2 GDP_{it} + u_{it}$		
	t-stat.	**Prob**
ADF	-1.597587*	0.0551
Residual variance	1.582362	
HAC variance	2.739364	

Note: ***, *, denotes significant at 1% and 10% level respectively. Kao cointegration test method used in Bartlett Kernel and Bandwidth width is determined by the Newey-West method.

5.3. Results of Panel FMOLS

We estimated the long run cointegrating coefficients and their direction by panel FMOLS and the results of the test were presented in Table 4. The results showed that there was negative relationship between environmental tax revenues and environmental pollution and unemployment. So we concluded that the double dividend hypothesis was valid for this group of countries.

Table 4. Results of Panel FMOLS

Model 1: $CO_{2it}= \alpha_{it} + \beta_1 envtax_{it} + \beta_2 GDP_{it} + \beta_3 enecons_{it} + u_{it}$			
Variables	**Coefficient**	**t-Stat.**	**Prob**
Envtax	-0.821109	-3.900483***	0.0001
Enecons	3967.466	33.80624***	0.0000
RealGDP	0.647547	2.173292**	0.0309
Model 2: $UNEMP_{it}= \alpha_{it} + \beta_1 envtax_{it} + \beta_2 GDP_{it} + u_{it}$			
Variables	**Coefficient**	**t-Stat.**	**Prob**
Envtax	-7.19E-05	-2.337765**	0.0204
RealGDP	-0.000836	-20.59349***	0.0000

Note: ***, **, denotes significant at 1 % and 5 % level respectively.

6. Conclusion

It is aimed to shift the taxes obtained from labor and capital to the emission which causes the environmental pollution with the double dividend hypothesis by pegging the total tax revenues. Thus, the environment will be protected and increases in the employment will be realized. Consequently, there will be increases in the welfare after the decreases in the tax burden on the labor and capital. In this regard, the validity of the double dividend hypothesis is very important. Therefore, we conducted econometric analysis to find out whether double dividend hypothesis is valid or not. We reached the finding that the double dividend hypothesis is valid for EU-countries and this finding is consistent with the general trend in the literature. We found that the increases in the environmental tax revenues decreased both the environmental pollution and the unemployment in this group of countries. We saw that the environmental tax reforms by developed countries contributed to the decreases in the environmental pollution and unemployment. Therefore, all the countries should consider to implement environmental tax reforms and to decrease the tax burden on the labor which may be a solution to overcome the problems of environmental pollution and unemployment.

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