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Revisiting the Double Dividend Hypothesis with the Load Capacity Factor

Çifte Kazanç Hipotezinin Yük Kapasitesi Faktörü ile Yeniden Değerlendirilmesi

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Abstract
The aim of the paper is to test the validity of the double dividend hypothesis in the five OECD countries with the highest environmental taxes (Türkiye, Slovenia, Latvia, the Netherlands and Denmark) using panel data analysis. With this motivation, the paper analyses the effects of environmental taxes on the load capacity factor and unemployment through two models for the period 1997-2022. According to the empirical findings, environmental taxes are cointegrated with both the load capacity factor and unemployment. The coefficient results of the first model reveal that environmental taxes positively affect the load capacity factor in Türkiye and Slovenia as well as at the panel level. Environmental taxes cause environmental degradation only in Denmark. In the second model, environmental taxes reduce unemployment in Latvia, the Netherlands, Denmark and at the panel level. In sum, the paper confirms the double dividend hypothesis for the panel.

Keywords: *Double Dividend Hypothesis, Environmental Taxes, Load Capacity Factor, Unemployment.*

Jel Codes: *C23, E24, H23.*

Öz
Çalışmanın amacı, en yüksek çevre vergisine sahip beş OECD ülkesinde (Türkiye, Slovenya, Letonya, Hollanda ve Danimarka) çifte kazanç hipotezinin geçerliliğini panel veri analizi yardımıyla test etmektir. Bu motivasyonla araştırma, 1997-2022 dönemi için çevre vergilerinin yük kapasitesi faktörü ve işsizlik üzerindeki etkilerini iki model ile incelemektedir. Ampirik bulgulara göre, çevre vergileri hem yük kapasitesi faktörü hem de işsizlik ile eşbütünleşiktir. İlk modelin katsayı sonuçları, panel düzeyinin yanı sıra Türkiye ve Slovenya'da çevre vergilerinin yük kapasitesi faktörünü pozitif etkilediğini göstermektedir. Çevre vergileri sadece Danimarka'da çevresel tahribata neden olmaktadır. İkinci modelde ise, Letonya, Hollanda, Danimarka ve panel düzeyinde çevre vergileri işsizliği azaltmaktadır. Özetle, çalışma panel için çifte kazanç hipotezini onaylamaktadır.

Anahtar Kelimeler: *Çifte Kazanç Hipotezi, Çevre Vergileri, Yük Kapasitesi Faktörü, İşsizlik.*

Jel Kodları: *C23, E24, H23.*

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1. INTRODUCTION

Environmental pollution and unemployment are among the critical market failures for which governments seek solutions. These problems also constitute two of the topics of the Sustainable Development Goals (SDGs) (SDG 8 - SDG 13) set by the United Nations (UN, 2024). In this regard, researchers have shown great interest in the interactions between government instruments such as taxes and expenditures and various market failures in recent years.

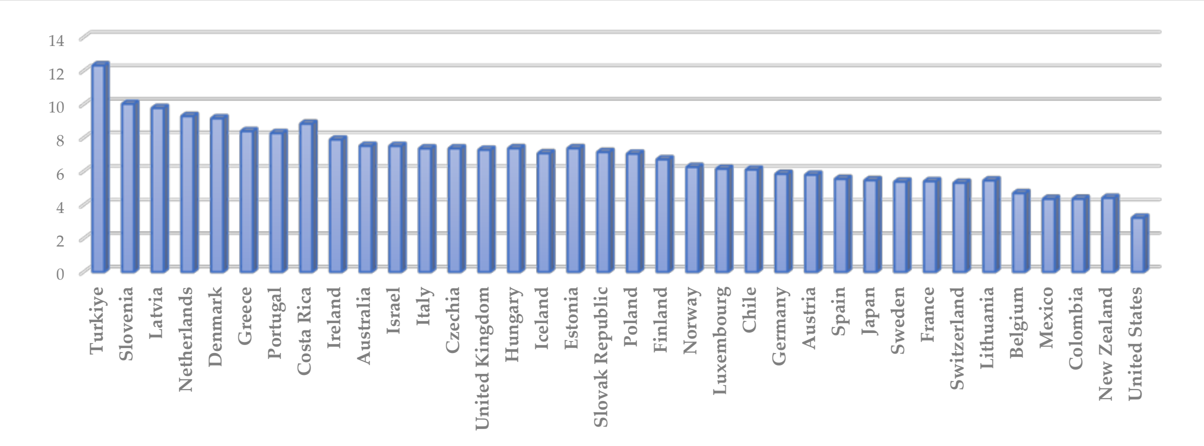
The paper explores the nexus of environmental taxes on environmental quality and unemployment within the scope of the double dividend hypothesis (DDH). This hypothesis postulates that environmental taxes have two benefits. First, taxes on polluters lead to environmental improvement. Second, environmental taxes generate additional revenue, reducing the need for distortionary taxes on labor supply and income. Hence, environmental taxes emerge as an incentive for employment (Fullerton and Metcalf, 1997). In DDH, the tax burden is shifted from labor to areas that cause environmental pollution. Thus, both environmental stress is reduced, and labor effort is encouraged. The literature on DDH is divided into weak and strong (OECD, 2006: 12).

Pigovian taxes are applied to internalize environmental damage measured by marginal external costs. Thus, it contributes to the budget by providing government revenue equal to the amount of emissions (pollution) reduced. Pollution-intensive goods are consumed less as a result of environmental taxes. The loss in consumer surplus represents the distortionary effect of environmental taxes. However, according to the weak form of the DDH, if all of the additional revenue from environmental taxes is transferred to consumers, the environmental improvement constitutes a net welfare gain. The strong form of DDH, which is accepted as less possible, implies that the revenue from environmental taxes is used to reduce distortionary taxes on factors such as income and labor. In this form, the surplus of producers and consumers resulting from the reduction of the excessive tax burden on the labor market needs to be larger than the distortionary effect caused by environmental taxes. Hence, the existence of an excessive tax burden increases the probability of the DDH in the strong form (Goulder, 1995: 159-162; Zimmermann and Gaynor, 1999: 41-42).

The paper examines the five countries with the highest share of environmental taxes in taxation among OECD countries as a sample. Graph 1 illustrates the share of environmental taxes in tax revenues in OECD countries[1]. According to the average of the analysis period, Turkey has the highest share with 12.3%. Then, Slovenia, Latvia, the Netherlands, and Denmark follow with 10%, 9.7%, 9.2%, 9.2% and 9.1%, respectively. On the other side, USA, New Zealand, Colombia, Mexico and Belgium have the lowest share. The OECD average is 5.5%. In this framework, the paper tests the DDH by investigating the effects of environmental taxes on environmental quality and unemployment in Türkiye, Slovenia, Latvia, the Netherlands and Denmark. In the paper, environmental quality is analyzed using the load capacity factor (LCF) calculated with the help of biocapacity and ecological footprint (EF). Although the share of environmental taxes is high in these countries, environmental quality is degrading rapidly. The average LCF of the five countries declined by 16.6% from

[1] Canada and S. Korea cannot be included due to lack of data.

0.72 in 1997 to 0.60 in 2022. Denmark has the highest environmental quality with an LCF of 0.57, while the Netherlands has the most degraded environment with an LCF of 0.18 in 2022 (GFN, 2024). Considering that the LCF threshold for a sustainable environment is 1, these countries are faced with environmental threats. The other component of the DDH is the employment/unemployment indicator. Over the analysis period, the average unemployment rate in the sample countries fluctuates between 5% and 10%, except for 2010. Türkiye and Latvia struggle with higher unemployment rates than the others (WB, 2024). Hence, the role of environmental taxes in environmental and unemployment problems is gaining importance.



Graph 1. Share of Environmental Taxes in Total Tax Revenues in OECD Countries (1997-2022 Average) (%)

Source: OECD (2024)

The paper makes two main contributions to the DDH literature. First, the paper uses the LCF as a proxy for environmental quality. Environmental pollution indicators such as carbon emissions (CO_2), greenhouse gas emissions (GHG) and EF are observed in the environmental tax literature. This paper provides holistic evidence by analyzing environmental quality instead of pollution. Second, the paper investigates the countries with the highest environmental tax collections as a share of total tax revenues. Thus, the paper explores the environmental and unemployment performance in countries with high environmental tax rates.

2. LITERATURE REVIEW

The literature on environmental taxes is generally discussed in terms of their impact on environmental pollution (Morley, 2012; Hashmi and Alam, 2019; Aydın, 2020; Yavuz, 2021; Rafique et al., 2022; Yavuz and Ergen, 2022; Zhang et al., 2023; Yu et al., 2023; Zhu et al., 2023; Dahmani, 2024). Recently, however, researchers have shown great interest in the effect of environmental taxes on employment/unemployment under the Environmental Phillips Curve hypothesis (Kashem and Rahman, 2020; Anser et al., 2021; Tariq et al., 2022; Durani et al., 2023; Yavuz et al., 2023a; Ayad and Djedaiet, 2024). The DDH focuses on the simultaneous effects of environmental taxes on both employment/unemployment and the environment.

In the literature on DDH, researchers intensively prefer simulation methods. For example, Freire-González (2018) reviews the literature investigating DDH by applying computable general equilibrium modeling with statistical and meta-regression methods. The results validate the DDH in 55% of the simulations. On the other hand, empirical studies such as the analysis of DDH with panel and time series approaches have also increased in recent years. This paper examines the empirical literature on DDH. There are few studies in the literature confirming DDH. For instance, Sasmaz (2016) investigates the impact of environmental taxes on both pollution and employment in 15 EU countries for the period 1995-2012. Panel FMOLS method confirms the validity of the DDH. Topal (2017) focuses on the effects of environmental taxes in OECD countries for the period 1994-2013. According to FMOLS results, DDH is verified at the panel level and for 14 countries. Alola and Nwulu (2022) test the DDH on the components of environmental taxes in the Nordic countries for the period 1995-2020. According to the results, DDH is confirmed for energy taxes in the panel model, for pollution and resource taxes in Finland, and for pollution, resource and transportation taxes in Sweden. Yiadom et al. (2024) question the DDH from the perspective of carbon tax and foreign direct investment for the period 1995-2019 in 43 Sub-Saharan African countries. The paper verifies the validity of the DDH, provided that carbon tax revenues are recycled into the economy. Osemwegie-Ero et al. (2024) concentrate on the results of empirical studies analyzing the DDH for Nigeria over the period 2015-2023. The paper predicts that environmental taxes will contribute to sustainable environment and employment policies.

The number of studies that generate evidence that the DDH is not valid is relatively dominant. Nerudová and Dobranschi (2014) test the validity of the DDH for the period 1995-2011 in 15 EU countries by Granger causality approach. The results claim that income tax cuts cause environmental damage due to increased public revenue from environmental tax. Hence, it implies that two dividends cannot be realized simultaneously. Arbolino and Romano (2014) evaluate Environmental Tax Reform in 26 EU member countries for the period 2000-2008 using hierarchical cluster, pre-post/with-without comparison, and quantitative SWOT analysis. The paper finds that the DDH is not valid. Radulescu et al., (2017) question the effects of environmental taxes in Romania and 28 EU countries for the period 1996-2015 via Ordinary Least Squares (OLS) and Vector Error Correction Model (VECM) methods. The empirical evidence rejects the validity of the hypothesis for both samples. He et al., (2019) examines the effects of environmental taxes with the panel ARDL model for the period 1994-2014 in 36 OECD countries. The findings discover an enhancing effect of environmental taxes on environmental indicators, but do not find a similar effect on unemployment. Degirmenci and Aydin (2023) examine the effects of environmental taxes for five African countries (South Africa, Ivory Coast, Cameroon, Uganda, and Mali). The findings of the analysis covering the period 1994-2017 highlight that the DDH is invalid and that command-control policies need to be abandoned. Dirgen-Oz and Cicek (2024) test the DDH in 24 EU countries for the period 1998-2018 using the Augmented Mean Group (AMG) method. According to the results, environmental taxes suppress environmental quality and employment.

Finally, the above mentioned papers prefer CO_2 (Nerudová and Dobranschi, 2014; Sasmaz, 2016; Topal, 2017; Degirmenci and Aydin, 2023) and GHG (Radulescu et al., 2017; He et al., 2019; Dirgen-Oz and Cicek, 2024) as environmental indicators. This paper differs from the literature in terms of the environmental quality indicator and the sample group.

3. DATA AND MODEL

The paper examines the DDH with the help of two models for the five countries (Türkiye, Slovenia, Latvia, the Netherlands and Denmark) with the highest environmental tax shares in the OECD. Spanning the period 1997-2022, the paper discusses the effects of the explanatory variable ENT on the dependent variables LCF and UNEMP in the first and second models, respectively. In the environmental literature, researchers commonly prefer various pollution indicators such as CO_2, GHG, and EF (Zaidi et al., 2019; Saidi and Omri, 2020; Zhou et al., 2021; Caglar et al., 2022; Chataut et al., 2023; Yavuz et al., 2023b; Raihan et al., 2023; Akcay et al., 2023; Nketiah et al., 2024). However, in recent years LCF that also accounts for environmental supply has become popular (Pata and Isik, 2021; Abdulmagid Basheer Agila et al., 2022; Caglar and Yavuz, 2023; Zheng et al., 2023; Zhao et al., 2024; Yavuz et al., 2024; Uche and Ngepah, 2024). The LCF is calculated as biocapacity divided by EF. An LCF of 1 or above points to environmental sustainability (Siche et al., 2010; Pata and Samour, 2022). UNEMP refers to the ratio of the number of unemployed to the total labour force (%). Finally, ENT expresses the share of environmental taxes in total tax revenues (%). LCF, UNEMP and ENT statistics are obtained from the GFN (2024), WB (2024) and OECD (2024) databases, respectively.

Table 1 reports the descriptive statistics of the raw data for the variables. Each variable consists of 130 observations. LCF ranges from 1.70 to 0.16, with a mean value of 0.62. UNEMP has a mean of 7.65, although the highest is about 20%. The standard deviation for UNEMP is 3.44, indicating more volatility compared to other variables. ENT, which has a difference of approximately 12% between the highest and lowest values, has an average of 10.1%.

Table 1. Descriptive Statistics

	Mean	**Std. Dev.**	**Max.**	**Min.**	**Number of Observations**
LCF	0,62	0,41	1,70	0,16	130
UNEMP	7,65	3,44	19,48	2,12	130
ENT	10,11	2,11	16,98	5,61	130

Note: Calculations are based on raw data.

The DDH is tested through two models. The first model investigates the impact of environmental taxes on environmental quality. The second model focuses on how environmental taxes affect unemployment. If the coefficients on the effects of environmental taxes are positive in the first model and negative in the second model, the DDH is accepted to be valid. On this basis, the models for the two hypotheses are shown in Equations 1 and 2:

$$\boldsymbol{Model\ 1}: LCF_{it} = a_{it} + ENT_{it} + \varepsilon_{it} \quad (1)$$

$$\boldsymbol{Model\ 2}: UNEMP_{it} = a_{it} + ENT_{it} + \varepsilon_{it} \quad (2)$$

In the models, a_{it} and ε_{it} refer to the constant term and error term, respectively.

4. METHODOLOGY

The paper uses pre-tests to determine which cointegration approach to apply. Firstly, the cross-sectional dependence of variables and models is checked with the CD_{LM} test proposed by Pesaran (2004). The formula of the test is given in Equation 3:

$$CD_{LM} = \sqrt{\frac{1}{N(N-1)}} \sum_{i=j}^{N-1} \sum_{j=i+1}^{N} (T\hat{\rho}_{ij}^2 - 1) \sim N(0,1) \tag{3}$$

The hypotheses of the CD_{LM} test are as follows:

$H_o: Cov\left(\varepsilon_{it}, \varepsilon_{jt}\right) = 0\ for\ all\ values\ of\ t\ i \neq j$ *"No cross-section dependency"*

$H_1: Cov\left(\varepsilon_{it}, \varepsilon_{jt}\right) \neq 0\ for\ all\ values\ of\ t\quad i \neq j$ *"Cross-section dependency"*

Secondly, the homogeneity of variables and models is tested with the Swamy S (Swamy, 1970) approach. The equation for the test is illustrated in Equation 4 (Pesaran and Yamagata, 2008):

$$\hat{S} = \sum_{i=1}^{N} (\hat{\beta}_i - \hat{\beta}_{WFE})' \frac{X_i' M_\tau X_i}{\hat{\sigma}_i^2} (\hat{\beta}_i - \hat{\beta}_{WFE}) \tag{4}$$

In the test, the hypothesis $H_o: \beta_i = \beta$ implies that the data structure is homogeneous, while the hypothesis $H_1: \beta_i \neq \beta$ indicates that the data structure is heterogeneous.

In the third stage, the paper runs the Cross-sectional Augmented Dickey-Fuller (CADF) unit root test, which produces robust results in the existence of cross-sectional dependence in the light of the pre-test findings. In the CADF test by Pesaran (2007), the null hypothesis ($H_o: \beta_i = 0$) expresses the existence of a unit root, while the alternative hypothesis ($H_1: \beta_i < 0$) indicates a stationary process. The equation of the CADF approach is as in Equation 5 (Pesaran, 2007: 268):

$$\Delta y_{it} = a_i + \beta_i y_{i,t-1} + \gamma_i f_t + \varepsilon_{it} \tag{5}$$

$$y_{it} = (1 - \emptyset_i)\mu_i + \emptyset_i y_{i,t-1} + u_{it},\ i = 1, 2, 3, \dots, N;\ t = 1, 2, 3, \dots, T \tag{5.1}$$

$$u_{it} = \gamma_i f_t + \varepsilon_{it} \tag{5.1.1}$$

For panel results, the Cross-sectionally Im, Pesaran and Shin (CIPS) statistic is calculated using Equation 6:

$$CIPS = \frac{\sum_{i=1}^{N} CADF_i}{N} \tag{6}$$

In the fourth stage, whether the models are cointegrated or not is tested with the Westerlund Error Correction Model (ECM) test, which is a second generation cointegration approach. In the Westerlund ECM approach, the null hypothesis ($H_o: \alpha_i = 0$) states cointegration or vice versa ($H_1: \alpha_i = \alpha < 0$). In case of cross-sectional dependence in the data set, the bootstrap critical value table provided by Chang (2004) is used at the decision stage. The formula of ECM is given in Equation 7 (Westerlund, 2007: 715):

$$\Delta y_{it} = \delta_i' d_t + \alpha_i y_{it-1} + \lambda_i' x_{it-1} + \sum_{j=1}^{p_t} \alpha_{ij} \Delta y_{it-j} + \sum_{j=0}^{p_t} \gamma_{ij} \Delta x_{it-j} + e_{it} \tag{7}$$

This test calculates P_τ and P_α statistics for the panel and G_τ and G_α statistics for group averages with Equations 8, 9, 10, and 11, respectively:

$$G_\tau = \frac{1}{N}\sum_{i=1}^{N}\frac{\hat{\alpha}_i}{SE(\hat{\alpha}_i)} \tag{8}$$

$$G_\alpha = \frac{1}{N}\sum_{i=1}^{N}\frac{T\hat{\alpha}_i}{\hat{\alpha}_i(1)} \tag{9}$$

$$P_\tau = \frac{\hat{\alpha}}{SE(\hat{\alpha})} \tag{10}$$

$$P_\alpha = T\hat{\alpha} \tag{11}$$

Finally, the paper uses the Pedroni (2001) Dynamic Ordinary Least Squares Mean Group (DOLSMG) estimator to determine the direction of cointegrated variables. The formula of the test is as in Equation (12):

$$\hat{\beta}_{DOLSMG} = N^{-1}\left[\sum_{i=1}^{N}\left(\sum_{t=1}^{T}(Z_{it}Z_{it}')\right)^{-1}\right]\left(\sum_{t=1}^{T}(Z_{it}\bar{Y}_{it})\right) \tag{12}$$

5. FINDINGS

Panel analysis begins by applying cross-sectional dependency and homogeneity tests. The results in Table 2 reveals the presence of cross-sectional dependency and heterogeneity in the variables and models. Hence, second generation panel approaches should be implemented for the data set.

Table 2. Pre-Test Results

Tests/Variables	Individual Results			Panel Results	
	LCF	UNEMP	ENT	Model 1 LCF-ENT	Model 2 UNEMP-ENT
Cross-Sectional Dependence - CD_{LM}	2,94***	4,16***	2,44**	3,29***	2,83***
Homogeneity – Swamy S	3975,93***	210,84***	36,28***	7777.64***	157,39***

Note: *** and ** indicates 1% and 5% significance level.

Table 3 shows the unit root test findings of the variables using the second generation CADF test. According to the findings (constant and constant & trend), all variables have a unit root at the level, while they are stationary in their first differences.

Table 3. Unit Root Test Results

	LCF		UNEMP		ENT	
	Level	First Diff.	Level	First Diff.	Level	First Diff.
Constant	-1,41 [1]	-4,12***[1]	-2,05 [4]	-2,62**[4]	-0,86 [0]	-5,13***[0]
Constant & Trend	-2,53 [1]	-4,15***[1]	-2,07 [4]	-2,91*[4]	-2,73 [0]	-5,47***[0]

Notes: ***, ** and * indicate significance level at 1%, 5% and 10%, respectively. Critical values of CIPS test for constant/constant & trend models are -2,21/-2,73, -2,33/-2.86 and -2,57/-3.10 for 1%, 5% and 10%, respectively. [ ] shows the appropriate lag length.

The unit root results for the variables in the models provide the assumptions of the Westerlund ECM test, which is the second-generation panel cointegration approach. Tables 4 and 5 share the cointegration and estimator results for the two models. In the LCF-ENT and UNEMP-ENT models, the null hypothesis of 'no cointegration' is rejected at 5% and 10% significance levels, respectively. Thus, environmental taxes move together with both environmental quality and unemployment in the long run. However, the paper utilises the DOLSMG estimator to understand how these interactions occur. According to the DOLSMG findings, a unit change in ENT affects LCF and UNEMP by 0.007 and -0.366 units, respectively. DOLSMG also produces country spesific coefficient results. In the LCF-ENT model, a unit change in ENT effects LCF by 0.019, 0.023 and -0.031 units for Türkiye, Slovenia and Denmark, respectively. In the UNEMP-ENT model, a unit change in ENT effects UNEMP by -0.92, -0.82 and -0.28 units for Latvia, the Netherlands and Denmark respectively. Other coefficients in the models are not statistically significant.

Table 4. Model 1 - Cointegration and Estimator Results

Cointegration Test - Westerlund ECM	**Coefficient Value**	**Bootstrap Prob. Value**
G_τ	-4,26	0,012**
Cointegration Estimator - DOLSMG	**Coefficient Value**	**T-Statistics**
Panel Results	0,007	1,744*
Country Spesific Results		
Türkiye	0,019	1,772*
Slovenia	0,023	4,495***
Latvia	0,013	0,899
Netherlands	0,009	1,163
Denmark	-0,031	-4,431***

Notes: ***, ** and * indicate significance level at 1%, 5% and 10%, respectively. In the t-table, the significance values at 10%, 5% and 1% are 1.645, 1.960 and 2.578, respectively. Bootstrap Value for Westerlund ECM test: 1000, Model Type: Constant. The lag length is 1.

Table 5. Model 2 - Cointegration and Estimator Results

Cointegration Test - Westerlund ECM	**Coefficient Value**	**Bootstrap Prob. Value**
G_τ	-2,43	0,068*
Cointegration Estimator - DOLSMG	**Coefficient Value**	**T-Statistics**
Panel Results	-0,366	-4,453***
Country Spesific Results		
Türkiye	-0,085	-0,202
Slovenia	0,284	1,323
Latvia	-0,921	-1,707*
Netherlands	-0,822	-1,676*
Denmark	-0,289	-7,697***

Notes: *** and * indicate significance level at 1% and 10%, respectively. In the t-table, the significance values at 10%, 5% and 1% are 1.645, 1.960 and 2.578, respectively. Bootstrap Value for Westerlund ECM test: 1000, Model Type: Constant. The lag length is 1.

Lastly, Table 6 summarises the panel and country spesific coefficient findings. The paper reveals that the DDH is valid by discovering that ENT contributes to environmental quality and employment for panel models. However, the country-based results differ from the panel models. Because no country can simultaneously provide the two assumptions of the DDH.

Table 6. Summary of Results

	LCF-ENT	UNEMP-ENT	DDH
Türkiye	+	~	X
Slovenia	+	~	X
Latvia	~	-	X
Netherlands	~	-	X
Denmark	-	-	X
Panel	+	-	√

Note: **+** : ENT has a positive effect. **-** : ENT has a negative effect. ~ : The effect of ENT is statistically insignificant. **√** : DDH is valid. **X** : DDH is not valid.

6. CONCLUSION

The paper questions the validity of the DDH in the five OECD countries with the highest environmental tax advantage via second generation panel cointegration and estimator approaches. The empirical analysis attempts to explain how environmental taxes affect the load capacity factor and unemployment indicators in Türkiye, Slovenia, Latvia, the Netherlands and Denmark with two models. Empirical evidence reveals that the variables in the models move together. The cointegration estimator offers evidence at the panel level that changes in environmental taxes improve/suppress environmental quality/unemployment. The results verify the validity of the DDH by reporting at the panel level that environmental taxes are effective fiscal instruments in the fields of environment and employment. The panel findings of the paper are in line with Sasmaz (2016), Topal (2017), Alola and Nwulu (2022), Yiadom et al. (2024), and Osemwegie-Ero et al. (2024) analyzing different samples.

Panel cointegration estimator also generates country-based results. The findings indicate that contrary to the panel level, none of the countries simultaneously realize the hypothesis conditions. According to the statistically significant results, environmental taxes enhance environmental quality in Türkiye and Slovenia, but increase environmental stress in Denmark. Therefore, there is a need to reform environmental taxes in the direction of environmental improvement in Latvia, the Netherlands and Denmark. In these countries, governments should design the tax system, particularly environmental taxes, to minimize negative environmental externalities by calculating the environmental costs of sector-based production/consumption behavior. On the other hand, it is among the findings that environmental taxes contribute to employment in countries except Türkiye and Slovenia. Therefore, governments can provide financing to encourage employment in green sectors by increasing/reducing the environmental tax burden in sectors that cause high/low environmental costs. Moreover, the tax wedge, which refers to the tax burden on labor force, can be reduced thanks to the increase in revenue from environmental taxes.

For future research, it can be recommended to analyze the DDH for different samples. In addition, researchers can enrich the literature with the help of different environment and unemployment/employment variables and recent empirical approaches.

DECLARATION OF THE AUTHORS

Approval of ethical committee: All procedures performed in studies comply with the ethical standards of comparable institutional and/or national research committees.

Declaration of Contribution Rate: The authors have equal contributions.

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