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# The evolution of the tax burden for EU companies

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## ABSTRACT

Since its creation, the EU has targeted tax harmonization to protect the single market and avoid capital outflow to regions that have lower tax rates. However, despite repeated attempts, complete convergence has not yet been achieved. Using the effective tax rate, the statutory tax rate, and the absolute difference between these two rates, this study explored the trends of the tax burden in 15 EU member states. The study period of 2006 to 2014 enabled analysis of the tax burden before and after the financial crisis. Analysis was conducted using an econometric model. The results suggest that during periods of economic stability, the tax burden tends to converge. In contrast, during periods of crisis, countries apply their own tax policies to protect themselves from the adverse effects of the crisis.

## KEY WORDS:

tax harmonization, effective tax rate, tax burden, European Union

**JEL Classification:** H26, H7

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## 1. Introduction

Since the creation of the EU, tax harmonization across member states has been a priority for successive governments (Osterloh & Heinemann, 2013). However, corporate income tax harmonization has never been fully achieved. Several scholars have provided evidence of significant differences between the tax rates of different EU member states (Buijink, Janssen, & Schols 2002; Giannini & Maggiulli, 2002; Marques & Pinho, 2014).

The 2008 financial crisis forced each member state to address its own problems by designing and applying its own tax policy to mitigate the adverse effects of the crisis

(Bustos, Climent, & Labatut, 2017). Accordingly, the tax gap grew during the height of the financial crisis. However, tax harmonization remains a target for most EU member states. It is hoped that tax harmonization will avoid the relocation of companies to regions that have lower tax rates. Thus, the goal is to avoid capital outflow and the consequent reduction in tax income and wealth.

In light of this situation, this study examined the differences between the tax burdens in different EU member states and investigated the tax harmonization trend over the period 2006 to 2014. The goal was to predict whether the trend of the tax burdens in 15 EU member states was convergent or, conversely, divergent.

To achieve our goals, we studied the effective tax rate (ETR) and the difference between the ETR and the statutory tax rate (STR). The STR is equivalent to the percentage of corporate income tax. For the EU member states, this percentage ranges from 12.5% for

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Ireland to 34% for Belgium. The ETR is the most commonly used variable to determine the tax burden that businesses actually face (Armstrong, Blouin, & Larcker 2012) after applying the tax deductions that are applicable under each country's tax policy.

This study contributes to the literature by adding to the few studies that have examined the trend of tax harmonization since the 2008 financial crisis. This study's scope covers political, economic, and social issues. In section 2, we present the theoretical framework and review the literature. In section 3, we describe the research design, including descriptions of the variables and sample. We then state our hypotheses. In section 4, we describe the method that we used to analyze the data. In sections 5 to 7, we present the results of our analysis. Finally, in section 8, we draw conclusions from our findings.

## 2. Literature review

The goal of tax harmonization across the EU is to eliminate tax avoidance and protect the European single market. Daly and Weiner (1993) explored the primary characteristics of corporate taxation in three federations: Canada, Switzerland, and the United States. The goal was to provide a guide to the member states of the recently created EU to tackle tax policy issues and achieve tax harmonization.

Tax harmonization of corporate tax is a research stream that has elicited considerable interest from the scientific community, as demonstrated by the extensive literature on the topic (Bettendorf, Devereux, van der Horst, Loretz, & de Mooij, 2010; Itaya, Okamura, & Yamaguchi, 2016; Mintz, 2004; Schindler & Schjelderup, 2009; Surugiu & Surugiu, 2012; Szabo & Condea, 2012). However, the alignment of tax policies is a complex issue because of the reluctance of countries that have low tax rates and the accession of Central and Eastern European countries, whose economic growth is comparatively slow (Wasserfallen, 2014). Sosnowski (2011) concluded that tax harmonization through an increase in tax rates would be a considerable encumbrance for the countries that recently joined the EU.

To resolve these issues, Conconi, Perroni, and Riezman (2008) proposed three possible tax harmonization scenarios: no tax harmonization, global tax harmonization, and partial tax harmonization.

Conconi, Perroni, and Riezman (2008) argue that if capital is sufficiently mobile, partial tax harmonization is the best course of action because it benefits all countries.

Osterloh and Heinemann (2013) conducted surveys of Members of the European Parliament and Members of the German Bundestag. Both surveys revealed support for tax harmonization and a minimum corporate tax. Similarly, Ohsawa (2003) created a multi-country model over a one-dimensional space, where each country seeks to maximize its tax income, subject to the constraint that its tax rate lies within a given common band. The results show that tax harmonization with very high minimum or very low maximum standard rates produces flat tax structures. Finally, Fernandez-de-Cordoba and Torres (2012) suggest that tax harmonization may be achieved through small changes in tax revenues and output for most countries.

## 3. Research design

### 3.1. Variable specification and research hypotheses

To study the evolution of the tax convergence across 15 EU member states for the period 2006 to 2014, we used the variables that are shown in Table 1.

ETR is the standard indicator to measure the tax burden (Armstrong et al., 2012; Buijink et al., 2002; Chang, Chen, & Chen, 2017). We compared the ETR with the STR, as in other studies (Chen, Cuestas, & Regis, 2016). While the ETR depends on the STR, it also depends on other tax mechanisms that are independent of the STR. These mechanisms are displayed in Table 2.

The variable DISAB was used to calibrate the deductions and permanent differences between accounting regulations and tax regulations. Thus, the DISAB was used to measure non-STR tax mechanisms (Buijink et al., 2002). Interpreting the sign of the variable DISAB is important because it indicates incentives or disincentives, as shown in Table 3.

We formulated and tested the following hypotheses regarding ETR:

$$H_0: ETR_i = ETR_j \text{ for all } i, j = 2006, 2007, 2008, \dots, 2014$$

$$H_1: ETR_{2006} > ETR_{2007} > ETR_{2008} > \dots > ETR_{2014}$$

**Table 1.** Description of variables

Variable name	Label	Description
Effective tax rate	ETR	$\frac{\text{Total income tax expense}}{\text{Financial accounting income before tax}}$
Statutory tax rate	STR	Percentage value of the nominal rate (provided by the European Commission)
Absolute difference between ETR and STR	DISAB	ETR – STR (absolute value)
Country	COUNTRY	EU15 member states
Year	YEAR	(2006–2014)

**Table 2.** Tax mechanisms that affect the ETR

	- Reduction of deductions
<b>Mechanisms that worsen the tax burden</b>	- Reduction of negative permanent differences - Increase in positive permanent differences
	- Increase in deductions
<b>Mechanisms that ease the tax burden</b>	- Increase in negative permanent differences - Reduction of positive permanent differences

**Table 3.** Interpretation of the sign of DISAB

Sign DISAB	Interpretation	Cause
DISAB (-)	Tax mechanisms that offer net incentives	Permanent differences (+) < Deductions + Permanent differences (-)
DISAB (+)	Tax mechanisms that offer net disincentives	Permanent differences (+) > Deductions + Permanent differences (-)

To avoid the problems that derive from negative values for DISAB, we considered DISAB in terms of net independent tax incentives. We formulated and tested the following hypotheses regarding DISAB:

$$H_0: \text{DISAB}_i = \text{DISAB}_j \text{ for all } i, j = 2006, 2007, 2008, \dots, 2014$$

$$H_1: \text{DISAB}_{2006} < \text{DISAB}_{2007} < \text{DISAB}_{2008} < \dots < \text{DISAB}_{2014}$$

### 3.2. Sample

We drew our sample from the population of companies located in 15 EU member states that have similar economic characteristics. We excluded the 13 EU

**Table 4.** Number of observations by country and year

EU member state	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total obs.	%
Germany	158	156	150	145	158	150	148	144	145	1354	21.7%
Austria	28	27	25	25	27	27	27	26	27	239	3.8%
Belgium	21	22	21	21	20	22	22	22	20	191	3.1%
Denmark	34	33	29	30	35	34	35	34	30	294	4.7%
Spain	26	26	25	27	26	24	22	19	25	220	3.5%
Finland	41	41	40	35	38	38	36	32	37	338	5.4%
France	87	91	87	82	90	87	88	84	87	783	12.5%
Greece	22	23	20	18	17	20	17	10	21	168	2.7%
Netherlands	28	28	24	25	28	27	24	27	24	235	3.8%
Ireland	18	20	20	18	20	19	20	19	18	172	2.8%
Italy	18	18	17	14	19	16	16	14	14	146	2.3%
Luxembourg	6	8	8	8	8	6	8	8	8	68	1.1%
Portugal	3	3	3	3	3	3	3	2	3	26	0.4%
UK	161	163	147	146	152	159	155	153	154	1390	22.2%
Sweden	70	70	69	66	69	72	64	70	75	625	10.0%
Total obs.	721	729	685	663	710	704	685	664	688	6249	100.0%
%	11.5%	11.7%	11.0%	10.6%	11.4%	11.3%	11.0%	10.6%	11.0%	100.0%	

Note: Total obs. – Total number of observations.

member states that joined after 2003. The sample comprised 777 listed companies from different sectors. We excluded companies from the financial sector, as in other studies (Crabbe & Vandebussche, 2009; Lisowsky, 2010). The period that we considered in this study was 2006 to 2014. This interval was chosen because it ranges from the period right before the crisis to the beginning of the economic recovery. Table 4 provides details of the sample.

#### 4. Method

After performing descriptive analysis, we used the Jonckheere-Terpstra test to identify significant differences. We applied this test because our hypotheses pre-

dict a specific order, namely the year-on-year decrease of ETR and the year-on-year increase of DISAB. Finally, we performed econometric analysis to estimate several multiple linear regression equations using the minimum least squares method. These models are defined as follows:

$$ETR = \beta_0 + \sum_{i=1}^8 \beta_i \text{Years} + \varepsilon_i \quad \text{Model 1}$$

$$DISAB = \beta_0 + \sum_{i=1}^8 \beta_i \text{Years} + \varepsilon_i \quad \text{Model 2}$$

We used a dummy variable to indicate the year. This variable took the value 1 if it corresponded to the year that was under study, and 0 otherwise. To avoid prob-

**Table 5.** Interpretation of the sign of the coefficient

	Sign in reference year 2006	Sign of coefficient in a given year that is not the reference year	
Model ETR	+	+	-
		Same sign as in reference year Increase in ETR	Different sign from in reference year Reduction in ETR
Model DISAB	+ Net tax disincentives	+	-
		Same sign as in reference year Increase in disincentives (Aggravating tax conditions)	Different sign from in reference year Reduction in disincentives (Easing tax conditions)
	- Net tax incentives	+	-
		Different sign from in reference year Reduction in incentives (Aggravating tax conditions)	Same sign as in reference year Increase in incentives (Easing tax conditions)

lems of perfect multicollinearity, we excluded the year 2006 from the model. This year was taken as a reference year and was represented by  $\beta_0$ . Thus, for each variable, the results of the coefficients represent the difference for each year with respect to the reference year of 2006.

Table 5 displays the interpretations of the sign of the coefficient for a given year for each model. Gray shading reflects the results that lead to the rejection of  $H_0$  and the acceptance of  $H_1$ .

The Levin–Lin–Chu unit-root test did not reveal stationarity in the dependent variable. We estimated the model using the White method with robust standard errors to avoid heteroskedasticity through cross-sectional weighting. The model's goodness of fit was measured using the adjusted  $R^2$  coefficient of determination. Finally, the Durbin–Watson statistic did not detect autocorrelation of the residuals in the overall EU models by year. Autocorrelation in the individual country models by year was detected only for Greece.

## 5. Descriptive analysis

### 5.1. Evolution of the statutory tax rate

Table 6 shows the statistics for the STR across all EU member states that were considered in this study. The cells that are shaded in gray display the means at the start and the end of the period as well as the overall

variation across the whole period. Figure 1 shows the mean STR across all EU member states that were considered in this study.

Table 6 illustrates a decreasing trend of the mean STR for the EU, which fell from 32% in 2006 to 27% in 2014. Thus, the mean STR decreased by 5 percentage points over the study period. Notably, the STR decreased much faster in the two years prior to the crisis. Over these two years, the mean STR for the EU fell by 2.5 percentage points. Over the next six years, the mean STR for the EU fell by the same amount but at a much slower rate.

### 5.2. Evolution of the effective tax rate

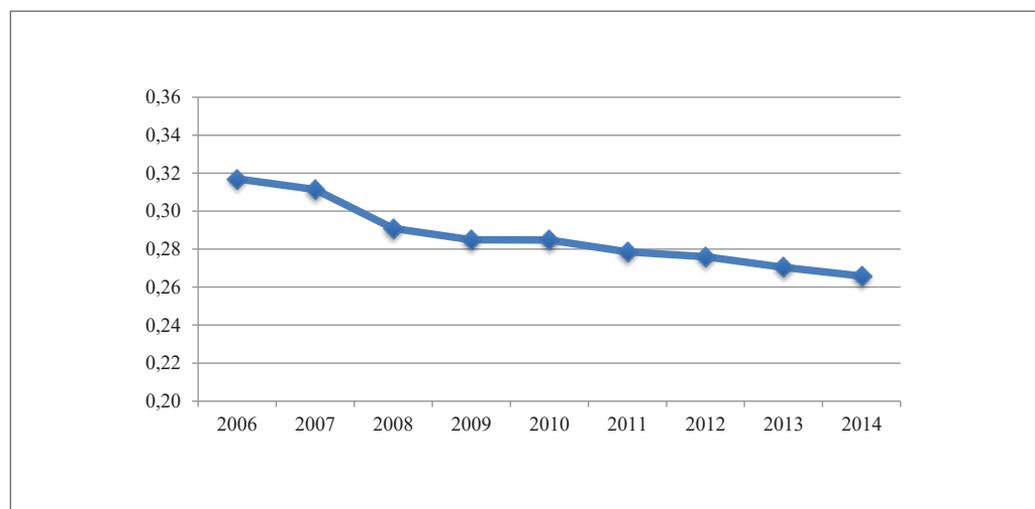
Table 7 presents the statistics for the ETR across all EU member states that were considered in this study. Gray shading indicates the EU-wide mean at the start and end of the study period as well as the overall variation across the study period. Figure 2 illustrates the mean ETR for the 15 EU member states that were considered in this study.

The descriptive analysis shows that the mean ETR for the EU also decreased in all years except 2010 and 2014. However, the ETR decreased less than the STR did. The ETR fell by 1.7 percentage points from 27.4% to 25.7%, whereas the STR fell by 5 percentage points. This smaller drop was a consequence of a restriction in tax incentives.

**Table 6.** STR statistics

	Obs.	Mean	Variation	Median	SD	Maximum	Minimum
<b>2006</b>	721	0.317		0.300	0.054	0.387	0.125
<b>2007</b>	729	0.311	-0.006	0.300	0.057	0.387	0.125
<b>2008</b>	685	0.291	-0.021	0.300	0.040	0.344	0.125
<b>2009</b>	663	0.285	-0.006	0.280	0.040	0.344	0.125
<b>2010</b>	710	0.285	-0.000	0.280	0.040	0.344	0.125
<b>2011</b>	704	0.279	-0.006	0.263	0.043	0.344	0.125
<b>2012</b>	685	0.276	-0.003	0.263	0.050	0.361	0.125
<b>2013</b>	664	0.270	-0.006	0.250	0.053	0.361	0.125
<b>2014</b>	688	0.266	-0.005	0.250	0.063	0.380	0.125
<b>2006–2014</b>	6249	0.287	-0.051	0.300	0.052	0.387	0.125

Note: Obs. – Number of observations.

**Figure 1.** Mean STR across EU15 member states 2006–2014

### 5.3. Evolution of the difference between the effective tax rate and the statutory tax rate

Table 8 presents the statistics for the variable DISAB across all EU member states that were considered in

this study. Gray shading indicates the EU-wide mean at the start and end of the study period as well as the overall difference across the whole period. Figure 3 shows the mean DISAB across the 15 EU member states that were considered in this study.

Table 7. ETR statistics

	Obs.	Mean	Variation	Median	SD	Maximum	Minimum
<b>2006</b>	721	0.274		0.283	0.103	0.585	0.000
<b>2007</b>	729	0.269	-0.005	0.278	0.100	0.582	0.000
<b>2008</b>	685	0.268	-0.001	0.278	0.096	0.598	0.000
<b>2009</b>	663	0.260	-0.008	0.271	0.104	0.589	0.000
<b>2010</b>	710	0.266	0.006	0.271	0.098	0.595	0.003
<b>2011</b>	704	0.260	-0.007	0.270	0.101	0.583	0.000
<b>2012</b>	685	0.259	-0.001	0.263	0.105	0.599	0.000
<b>2013</b>	664	0.253	-0.006	0.255	0.100	0.575	0.000
<b>2014</b>	688	0.257	0.004	0.255	0.108	0.597	0.000
<b>2006–2014</b>	6249	0.263	-0.017	0.271	0.102	0.599	0.0000

Note: Obs. – Number of observations.

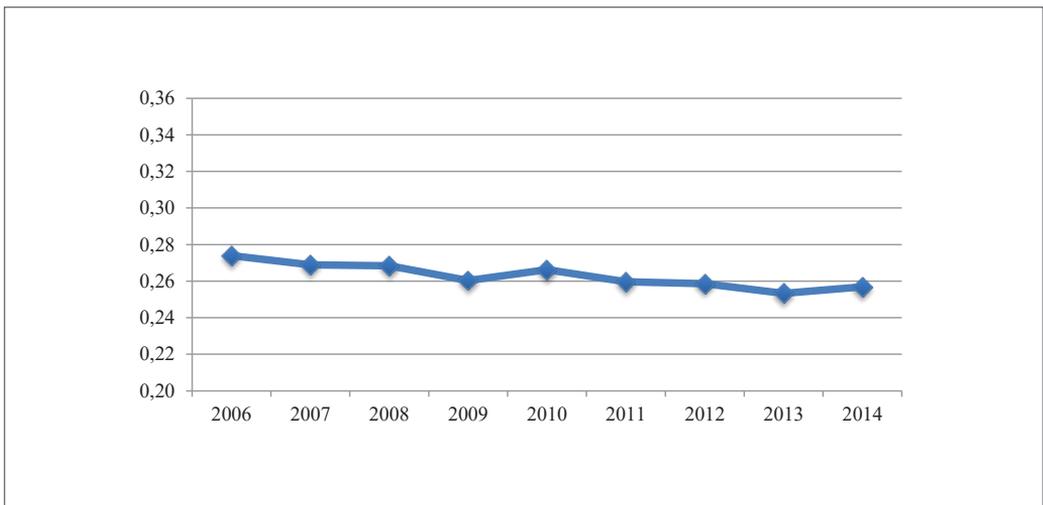


Figure 2. Mean ETR across EU15 member states 2006–2014

The sign of the variable DISAB was negative for all years in the study period. This result implies that there were net tax incentives across the EU over the entire study period. However, the DISAB increased (i.e., the tax incentives decreased) over the

study period, with the only exception being the year 2009. Although the net tax incentives did not disappear completely, in 2014, the ETR and ETR were very close, so the DISAB was less than 1 percentage point.

Table 8. DISAB statistics

	Obs.	Mean	Variation	Median	SD	Maximum	Minimum
<b>2006</b>	721	-0.043		-0.024	0.104	0.286	-0.380
<b>2007</b>	729	-0.043	0.001	-0.028	0.101	0.311	-0.384
<b>2008</b>	685	-0.023	0.020	-0.014	0.097	0.343	-0.340
<b>2009</b>	663	-0.025	-0.002	-0.010	0.105	0.335	-0.340
<b>2010</b>	710	-0.019	0.006	-0.012	0.099	0.322	-0.328
<b>2011</b>	704	-0.019	-0.000	-0.011	0.100	0.320	-0.340
<b>2012</b>	685	-0.017	0.001	-0.011	0.104	0.474	-0.340
<b>2013</b>	664	-0.017	0.001	-0.009	0.098	0.300	-0.340
<b>2014</b>	688	-0.009	0.008	-0.007	0.109	0.364	-0.344
<b>2006–2014</b>	6249	-0.024	0.034	-0.014	0.102	0.474	-0.384

Note: Obs. – Number of observations.

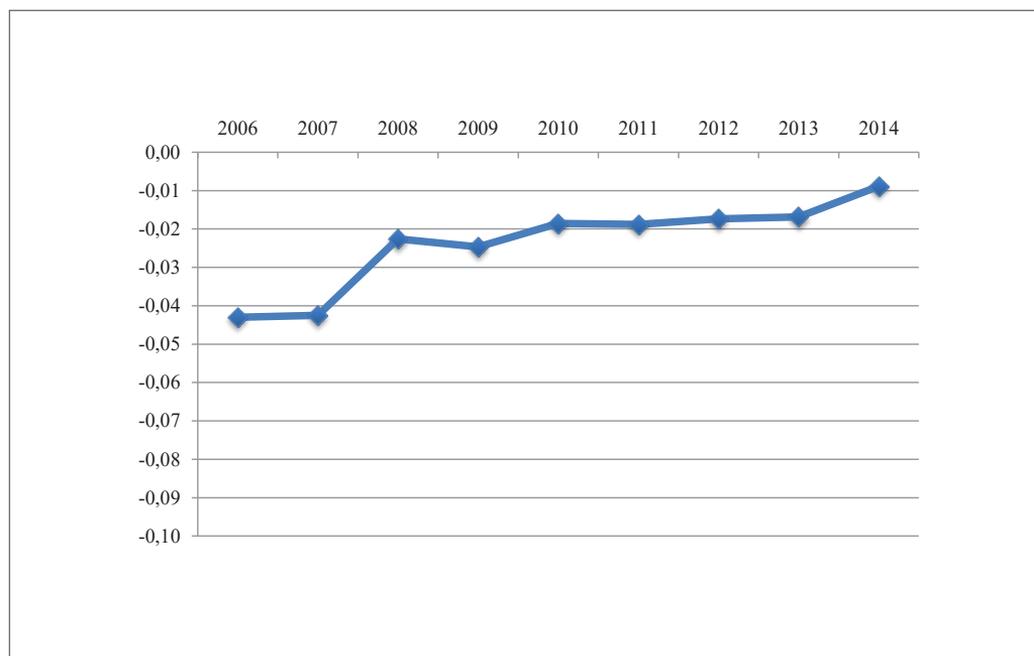


Figure 3. Mean DISAB across EU15 member states 2006–2014

**Table 9.** Econometric model: Estimated coefficients for the ETR

Year	Estimated coefficients
C	0.274046*** (0.002936)
2007	-0.004693 (0.004068)
2008	-0.006223 (0.004076)
2009	-0.012400*** (0.004325)
2010	-0.009077** (0.003911)
2011	-0.013670*** (0.003955)
2012	-0.016220*** (0.004061)
2013	-0.021053*** (0.004065)
2014	-0.016779*** (0.004302)
Adjusted R <sup>2</sup>	0.375681
Durbin-Watson	1.674827
F-statistic	5.801662
Akaike	-2.086601
Significance ***, **, * at 1%, 5%, and 10%, respectively	
Robust standard errors in parentheses	

## 6. Results for the effective tax rate

### 6.1. Jonckheere-Terpstra test for the effective tax rate

The Jonckheere-Terpstra test, which tests the significance of the results of the descriptive analysis, was asymptotically significant at the 1% level. Therefore, we

reject  $H_0$ , which proposes that the mean EU-wide ETR was the same in all years, and accept  $H_1$ , which proposes a year-on-year decrease in the mean EU-wide ETR.

### 6.2. Econometric analysis of the effective tax rate

We conducted econometric analysis of the ETR to identify convergence or divergence of the tax burden

**Table 10.** Econometric model: Estimated coefficients for the DISAB

Year	Estimated coefficients
C	-0.042582*** (0.003001)
2007	0.000415 (0.004146)
2008	0.020384*** (0.004112)
2009	0.019247*** (0.004401)
2010	0.022918*** (0.003980)
2011	0.023932*** (0.004033)
2012	0.024705*** (0.004134)
2013	0.024774*** (0.004153)
2014	0.033675*** (0.004421)
Adjusted R <sup>2</sup>	0.363496
Durbin-Watson	1.680945
F-statistic	5.554072
Akaike	-2.055147
Significance ***, **, * at 1%, 5%, and 10%, respectively	
Robust standard errors in parentheses	

among the EU member states that were considered in this study. Table 9 shows the estimated coefficients for the ETR in EU member states.

The model explains 38% of the variance of the ETR. The residuals were not correlated (Durbin–Watson was between 1.5 and 2.5). The ETR fell by just under 2 percentage points, from 27.4% in 2006 to 25.7% in

2014. The model once again confirms the results of the descriptive analysis. The negative sign of the coefficients indicates a reduction in the ETR of the EU member states. The ETR decreased year on year except in 2010 and 2014. Although the coefficients were still negative in 2010 and 2014, the coefficient rose with respect the previous year in both cases.

## 7. Results for the DISAB

### 7.1. Jonckheere-Terpstra test for the DISAB

The Jonckheere-Terpstra test, which tests the significance of the results of the descriptive analysis, was asymptotically significant at the 1% level. Therefore, we reject  $H_0$ , which proposes that the mean EU-wide DISAB was the same in all years, and accept  $H_1$ , which proposes a year-on-year increase in the mean EU-wide DISAB (i.e., year-on-year decreases in net tax incentives).

### 7.2. Econometric analysis for the DISAB

We conducted econometric analysis of the DISAB to identify whether the gap between the ETR and STR closed or widened for the EU member states that were considered in this study. The estimated coefficients for the DISAB in the EU member states are shown in Table 10.

The model explains 36% of the variance of the net tax incentives. The residuals were not correlated (Durbin–Watson was between 1.5 and 2.5). The DISAB rose by approximately 3.4 percentage points, from -4.3 percentage points in 2006 to -0.9 percentage points in 2014. The model once again confirms the results of the descriptive analysis. The model thus shows that the difference between the ETR and the STR, which in 2006 was 4.3 percentage points, decreased significantly by approximately 3 percentage points in absolute terms.

## 8. Conclusions

Since the creation of the EU, successive governments have strived to achieve tax harmonization to avoid capital outflow to regions with low tax rates. This study explored the convergence of the tax burden. In this study, the tax burden was measured in terms of the ETR and the DISAB, which was calculated as the absolute difference between the ETR and STR.

Our results show that between 2006 and 2014, the STR and ETR decreased. This decrease reflects a relaxing of the tax burden in EU member states. Notably, the reduction in the ETR was smaller than the reduction in the STR, reflecting a decrease in the net tax incentives over this period. Nevertheless, there was general tax convergence in the EU over this period.

The results also show that in 2010, there was a slight increase in the ETR as well as a slight drop in the DISAB with respect to the values for 2009. At this time, Europe was in the midst of the financial crisis.

Therefore, despite government goals of achieving tax harmonization, each country applied its own tax strategy during the crisis to protect its tax income. After 2010, the tax convergence trend returned, but in 2014, the ETR rose again, while the DISAB decreased. Thus, against the backdrop of the sovereign debt crisis, each country once again applied its own tax policy to address its individual needs.

Thus, in times of economic stability, the tax rates of EU member states tend to converge. However, in times of crisis, each country applies its own tax policy to address its individual problems and mitigate the negative impact of the crisis. Further study is nonetheless required to analyze the years posterior to 2014 and thus corroborate our conclusions.

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