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An empirical study of factors influencing total unemployment rate in comparison to youth unemployment rate in selected EU member-states

Filip KOKOTOVIĆ
Dag Hammarskjöld University College of International Relations and Diplomacy,
Zagreb, Croatia
filip.kokotovic@hotmail.com

Abstract. *The issue of youth unemployment rate in the heavily indebted and less developed EU countries is currently on the margins of both media interest and policy debates. This paper compares the influence of several economic variables on the total unemployment rate and the youth unemployment rate. The countries that are studied are three countries with the highest youth unemployment rate: Greece, Croatia and Spain, and three countries with the lowest youth unemployment rate: Germany, Denmark and the Czech Republic. By implementing an Autoregressive Distributed Lags (ARDL) approach, this paper concludes that the youth unemployment rate is significantly more affected by the increase of the public debt-to-GDP ratio in comparison to the total unemployment rate in Croatia and Spain. This paper finds significant differences in the factors that impact youth unemployment rate in comparison to total unemployment rate. Notably, the impact of economic growth is far stronger in decreasing total unemployment rate than youth unemployment rate. The main conclusion of this paper is that there should be a new European economic framework that will focus on combating rising youth unemployment rate in order to avoid potentially dangerous consequences and restore faith in the EU and national institutions which has still not recovered from the 2008 crisis.*

Keywords: macroeconomic imbalances, ARDL Bounds testing, 2008 Economic Crisis, youth unemployment.

JEL Classification: H63, E24, C32.

1. Introduction

The effects of the aftermath of the 2008 crisis are still strongly present in EU member-states. A group of countries commonly referred to as PIIGS [1] is especially displaying highly disturbing macroeconomic trends. High levels of public debt, a high primary budget deficit and lack of achieving a higher level of economic growth have contributed to the fact that many of these countries are struggling to recover from the crisis. Even amongst these five countries there are significant differences. Italy, for instance, has long been known to have a high public debt and in the opinion of Jones (2012), that level of public debt is sustainable due to a very conservative banking sector and a significant amount of domestic savings. The situation in Greece is entirely different. While it was close to common knowledge that the financial situation in Greece was far from stable, the attempts made by Greek officials to conceal the actual level of both the public debt-to-GDP ratio and other macroeconomic indicators, as indicated by Loizides (2013), further caused the erosion of both political and investor confidence in Greece. Now as it seems that the public debt of Greece is no longer sustainable, the only potential solution seems to be an attempt at achieving a political compromise (Robbins, 2015). While the summer of 2015 at times displayed all of the difficulties of finding a political compromise, amongst the reform plans, pension cuts, ideas of reforming the administrative apparatus and many other issues that remain at the forefront of the political debate. At the same time several far more significant issues remain in the shadows.

The current levels of youth unemployment in the PIIGS countries are either the highest or amongst the highest in the EU. This is a significant factor, both viewed from a political and economic viewpoint. A large critical mass of unsatisfied and seemingly forgotten youth, as well as the radicalization of the entire political spectrum, has provided Europe with Syriza in Greece, Podemos in Spain and the rise of the radical right in Eastern Europe. This paper aims to critically asses which factors have mostly contributed to the rise of youth unemployment in the countries where the youth unemployment is highest and compare the relationship of these economic factors to the countries where there is a low level of youth unemployment within the EU.

2. Literature review

The literature review focuses on numerous empiric studies that have observed the effect of various economic and political variables on both the unemployment rate, as well as the youth unemployment rate. Ghoshray, Ordóñez and Sala (2016) conducted breakpoint unit root tests on data from European economies and concluded that comparatively to the average unemployment rate; youth unemployment is more sensitive to business cycle oscillations. They further recommend that generic labour market reforms are not effective in solving the rising issue of youth unemployment in Europe and propose educational policies that raise average qualifications (Ghoshray et al., 2016: 1). Tang (2009), using Granger Causality and cointegration tests, determines that there is Granger causality going from unemployment and inflation towards the crime rate in Malaysia. Tamesberger (2015) conducts a General Least Squares (GLS) regression on the data for Austria and

concludes that high internal flexibility in a corporatist labour market regime is the key reason why Austria was able to maintain a low youth unemployment rate.

Kawaguchi and Murao (2014) conducted an analysis of the OECD countries in the period 1960 – 2010 and concluded that, on average, a worker who experiences a 1 percentage point higher unemployment rate while the worker is 16-24 years old has a 0.14 percentage point higher unemployment rate at ages 25-29 years and 0.03 percentage points higher at ages 30-34 years. They further conclude that these effects can be even more negative if a country has stricter employment protection legislation (Kawaguchi and Murao, 2014:95). Balan (2014) conducts an Ordinary Least Squares (OLS) regression on the data regarding youth unemployment, GDP and net average wage and concludes that there is a statistically significant negative effect of GDP on unemployment, while the effect of net average wage on youth unemployment is positive. Kim (2005) employs a Vector Error Correction Model (VECM), as well as Johansen cointegration tests on the data for South Korea in order to conclude that the causality is unidirectional going from unionization towards unemployment and economic growth. The interpretation of these results is that unionization in general has a negative effect on the Korean economy (Kim, 2005:232). Isengard (2003) implements a standard OLS model in which the factors that are significant to youth unemployment are considered. Based upon the analysis for Great Britain and Germany, the conclusion is that the individual level of education is one of the most significant determinants (Isengard, 2003: 357).

Hassan and Nassar (2015) conducted several time series models for Greece, Italy, Spain, Portugal, Ireland, England, France, Germany and the USA, testing the relevance of the unemployment rate, GDP and public debt. Based upon their analysis they concluded that for the majority of the observed countries the unemployment rate is negatively affected by economic growth, although they believe that the effect is not as negative as past research suggests (Hassan and Nassar, 2015: 67-68). This is mostly related to the original work of Okun (1962), whose main finding was that a 3% increase in real GDP output is associated with a 1% decrease in the unemployment rate. Today known as Okun's law, which is often empiricaly examined, as may be seen in the example of Akram et al. (2014), where they examine Okun's original findings for Pakistan using the following basic equations:

$$(Y_t - Y^*) = \beta(U_t - U^*) + \epsilon_t \quad (1.1)$$

$$(Y_t - Y_{t-1}) = \alpha + \beta(U_t - U_{t-1}) + \epsilon_t \quad (1.2)$$

$$dY_t = \beta_0 + \beta_1 U_t + \beta_2 U_{t-1} + \beta_3 U_{t-2} + \beta_4 dY_{t-1} + \beta_5 dY_{t-2} \quad (1.3)$$

Yt Real GDP output
Ut Unemyployment rate
Y* Potential GDP output
U* Natural unemployment rate
$Y_{t\text{-}1\ldots t\text{-}2}$ t-1 and t-2 delayed output rate
$U_{t\text{-}1\ldots t\text{-}2}$ t-1 and t-2 delayed unemployment rate
α intercept
β Okun's coefficient
ε_t error term

Using these three models: the Gap version, the Differenced version and the Dynamic version, and by implementing a standard OLS regression, Akram et al. (2014) conclude that there is no empiric evidence of the presence of Okun's law in Pakistan. Gil-Alana (2010) conducted Impulse response functions for the USA, UK and Japan and concluded that the effect of a shock in GDP on unemployment is negative in the cases of US and UK, while in the case of Japan it is not statistically significant. The conducted literature review suggests additional research should be conducted to investigate if there are any differences in factors that affect youth unemployment in comparison to total employment, aside from the study conducted by Ghoshray, Ordóñez and Sala (2016). Perhaps more importantly, the majority of these studies do not consider the relevance of youth unemployment in heavily indebted countries.

3. Data and methodology

The data was extracted from the Eurostat database (2016) from the first quarter of 1995 to the first quarter of 2016. Primarily, the data for youth unemployment was analyzed and based upon the data for the final quarter of 2015 two sets of countries were selected based upon their youth unemployment rate.(2) The first was countries with the lowest youth unemployment rate: Germany, Denmark and the Czech Republic. The second is the group of countries that are the primary interest of this paper, the countries with the highest youth unemployment rate: Greece, Spain and Croatia.(3) This paper prefers the methodology of individual time series analysis, rather than considering a panel setting. The key reason is understanding whether there are any country specific effects amongst the heavily indebted countries. Aside from understanding the impact of various economic variables on youth unemployment, this paper also analyses whether there are any differences between the effect of the various economic variables on total employment in comparison to youth unemployment. All of the variables considered in this paper, as well as their brief descriptions and the period for which they were available for the majority of the countries, are presented in Table 1. A log transformation is applied to the variables exports of goods and services and GDP.

Table 1. *Variable specification*

Variable	Abbreviated	Measurement	Period
Youth unemployment	YouthUnemp	Percentage rate	1995Q1 – 2016 Q1
Total unemployment	TotalUnemp	Percentage rate	1995Q1 – 2016 Q1
Gross Domestic Product	GDP	2010 real chained Euros	1995Q1 – 2016 Q1
General government consolidated gross debt	Pdebt	Percentage of GDP	2000Q1 – 2016Q1
Air transport, accommodation, travel agency, tour operator reservation service and related activities	Tourism	Index turnover, 2010=100	2000Q1 – 2016 Q1
Exports of goods and services	Export	2010 real chained Euros	1995Q1 – 2016Q1

Source: Eurostat.

For the majority of the countries there are no significant data constrains. However, some more significant data constrains are: the data regarding the debt of Greece is highly limited, due to the previously mentioned issue regarding Greek government data reliability, there is no data available for Denmark regarding the tourism activities turnover rata and for Croatia the majority of the data is available in the period 2000Q1 – 2015Q4.

Regarding econometric tests, before further analysis we perform unit root tests, the test originally proposed by Elliott, Rothenberg, and Stock (1996) and by Kwiatkowski et al. (1992). The null hypothesis of the ADF - GLS test is non-stationarity, meaning that the rejection of the null hypothesis is necessary before conducting further tests. The null hypothesis of the KPSS test is stationarity, meaning that in order to ensure the stationarity of the variables the test statistic values must fail to reject the null hypothesis of the KPSS test and reject the null hypothesis of the ADF – GLS test at the 5% significance level. Upon confirming the stationarity of the variables, further econometric tests are conducted.

For each of the countries considered by the paper, a two-step empirical approach is conducted. The first step focuses the analysis on the relevance of GDP, exports, tourism revenue and the public debt on the total unemployment rate. The second step will be analyzing the impact of the same explanatory variables on the youth unemployment rate. This will be conducted by implementing Autoregressive Distributed Lags (ARDL) models, originally introduced by Pesaran and Shin (1999), with the following equations:

$$TotalUnemp_t = \alpha_0 + \sum_{i=1}^{p} \beta_i TotalUnemp_{t-i} + \sum_{j=0}^{q} \gamma_j \ln(GDP)_{t-j} + \sum_{j=0}^{q} \delta_j \ln(Export)_{t-j} + j{=}0q\theta jPdebtt{-}j{+}\ j{=}0q\mu jTourismt{-}j{+} \epsilon_t \quad (2.1)$$

$$YouthUnemp_t = \alpha_0 + \sum_{i=1}^{p} \beta_i YouthUnemp_{t-i} + \sum_{j=0}^{q} \gamma_j \ln(GDP)_{t-j} + \sum_{j=0}^{q} \delta_j \ln(Export)_{t-j} + \sum_{j=0}^{q} \theta_j Pdebt_{t-j} + \sum_{j=0}^{q} \mu_j Tourism_{t-j} + \epsilon_t \quad (2.2)$$

TotalUnemp	Unemployment rate
YouthUnemp	Youth unemployment rate
GDP	Gross Domestic Product
Pdebt	Public debt-to-GDP ratio
α_0	Constant
$\beta, \gamma, \delta_j, \theta_j, \mu_j$	Coefficients
ϵ_t	Error term

These tests are performed using the specified (p, q) respected lag lengths, that are determined based upon the information criterion originally introduced by Akaike (1974). After establishing the lag length and performing diagnostic tests to ensure that the models are adequate, the Bounds test that was introduced by Pesaran, Schin and Smith (2001) will be implemented. If based upon the test results evidence of a long-term relationship is detected, the long-run coefficients will be estimated and interpreted. The diagnostic tests employed are the Breusch and Pagan (1979) heteroscedasticity test, the autocorrelation LM test introduced by Breusch (1978) and Godfrey (1978), as well as the stability of the parameters CUSUM test based upon the work of Page (1954) and Barnard (1959). The ARDL approach can be implemented regardless if the variables are stationary in level or in their first difference, but if they are stationary in their second or higher differences, the ARDL model is unsuited for such a model (Pesaran and Shin, 1999).

4. Results and discussion

In Table 2, the results of the unit root tests are provided.

Table 2. *Unit root tests summary*

	Croatia		**Greece**		**Germany**	
	ADF GLS	**KPSS**	**ADF GLS**	**KPSS**	**ADF GLS**	**KPSS**
Export	-4.264** (0.0000)	1.279**	-1.802 (0.0681)	1.647**	1.603 (0.9739)	2.139**
ΔExport	-8.351** (0.0000)	0.062	-7.236** (0.0000)	0.222	-5.149** (0.0000)	0.195
GDP	-0.342 (0.5622)	0.865**	-0.546 (0.4808)	0.796**	0.981 (0.9142)	2.107**
ΔGDP	-3.175** (0.0015)	0.418	-2.827* (0.0045)	0.422	-4.464** (0.0000)	0.0404
Pdebt	1.683 (0.9781)	1.371**	-0.123 (0.6425)	1.058**	-0.455 (0.5182)	1.412**
ΔPdebt	-2.322* (0.0195)	0.411	-4.269** (0.0000)	0.1003	-3.847** (0.0001)	0.199
TotalUnemp	-0.943 (0.3086)	0.391	-0.848 (0.3487)	1.144**	-1.061 (0.2612)	1.315**
ΔTotalUnemp	-4.813** (0.0000)	0.223	-2.008* (0.0427)	0.361	-2.971** (0.0003)	0.394
Tourism	-6.062** (0.0000)	0.656*	-5.223** (0.0000)	0.375	-3.417** (0.0006)	1.313**
ΔTourism	-9.167** (0.0000)	0.431	-8.412** (0.0000)	0.103	-6.312** (0.0000)	0.292
YouthUnemp	-1.211 (0.2075)	0.543*	-0.527 (0.4888)	1.083**	-1.782 (0.0711)	0.464*
ΔYouthUnemp	-5.012** (0.0000)	0.137	-3.682** (0.0002)	0.276	-3.529** (0.0004)	0.294
	Denmark		**Spain**		**Czech Republic**	
	ADF GLS	**KPSS**	**ADF GLS**	**KPSS**	**ADF GLS**	**KPSS**
Export	0.364 (0.7896)	2.012**	-0.134 (0.6377)	2.064**	2.158 (0.9931)	2.071**
ΔExport	-10.607** (0.0000)	0.417	-8.788** (0.000)	0.143	-2.583** (0.0094)	0.165
GDP	0.548 (0.8436)	1.805**	-0.106 (0.6472)	1.864**	0.518 (0.8278)	2.011**
ΔGDP	-4.259** (0.0000)	0.413	-2.015* (0.0421)	0.433	-3.895** (0.0000)	0.175
Pdebt	-0.691 (0.4178)	0.423	-0.402 (0.5393)	1.03**	0.371 (0.7915)	1.497**
ΔPdebt	-4.645** (0.0000)	0.256	-1.943* (0.0497)	0.431	-3.257** (0.0011)	0.222
TotalUnemp	-1.385 (0.1548)	0.569*	-1.546 (0.1149)	0.779**	-1.79 (0.0698)	0.253
ΔTotalUnemp	-3.671** (0.0001)	0.169	-2.244* (0.0239)	0.411	-3.015** (0.0025)	0.293
Tourism	/	/	-5.039** (0.0000)	0.318	-4.285** (0.0000)	0.463*
ΔTourism	/	/	-8.265** (0.0000)	0.021	-5.984** (0.0000)	0.078
YouthUnemp	-1.267 (0.1893)	1.206**	-1.257 (0.1925)	0.956**	-1.469 (0.1329)	0.537*
ΔYouthUnemp	-5.289** (0.0000)	0.087	-2.224* (0.0252)	0.386	-3.724** (0.0001)	0.252

Source: Author's calculations and E-Views 9.5 output.
Note: values in the parenthesis represent the p value. * and ** indicate statistical significance at the respected 0.05 and 0.01 levels of significance.

The results of the conducted unit root test clearly indicate that all of the variables reject the null stationarity hypothesis of the ADF GLS test either in level or in the first difference, while also failing to reject the null hypothesis of stationarity of the KPSS test in the same level. For the majority of the variables both tests suggested the same result, but there were a few differences mostly for the variable tourism where the ADF GLS test suggested stationarity in level, while the KPSS test suggested the variable was I(1). These minor inconsistencies are not relevant as the ARDL models can be applied regardless if the variables are I(0) or I(1). The first step is performing the Bounds test to establish whether there is a long term relationship between the variables.

Table 3. *Bounds test*

ARDL Bounds Test		
Null hypothesis: *No long-run relationship exists*		
Country	Dependent variable	F statistic value
Croatia	Total Unemployment	3.245*
	Youth Unemployment	4.5****
Czech Republic	Total Unemployment	9.983****
	Youth Unemployment	5.917****
Denmark	Total Unemployment	5.555****
	Youth Unemployment	5.254****
Germany	Total Unemployment	4.936****
	Youth Unemployment	10.439****
Greece	Total Unemployment	3.683**
	Youth Unemployment	3.761**
Spain	Total Unemployment	18.925****
	Youth Unemployment	17.014****
Critical value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

Source: Author's calculations and E-Views 9.5 output.
Note: *, **, *** and ***** indicate statistical significance at the respected 0.1, 0.05, 0.025 and 0.01 levels of significance. The Bounds test critical values for Denmark are different because tourism is not included in the model, the critical test value needed for the variables to be I1 bound at the 1% level is 4.66.

In Table 3, the models are always identified by their dependent variable and for all of the considered models it is possible to reject the null hypothesis of no long-run relationship. The value of the statistics is such that the majority of models can reject the null hypothesis at the 1% significance level, the models for Greece at the 5% significance level and only the model that analyses total unemployment rate in Croatia can reject the null hypothesis only at the 10% significance level. Before estimating and analysing the long-term coefficients, key statistics and results of the diagnostic tests regarding the models are provided in Table 4.

Table 4. *Key statistics of the ARDL models*

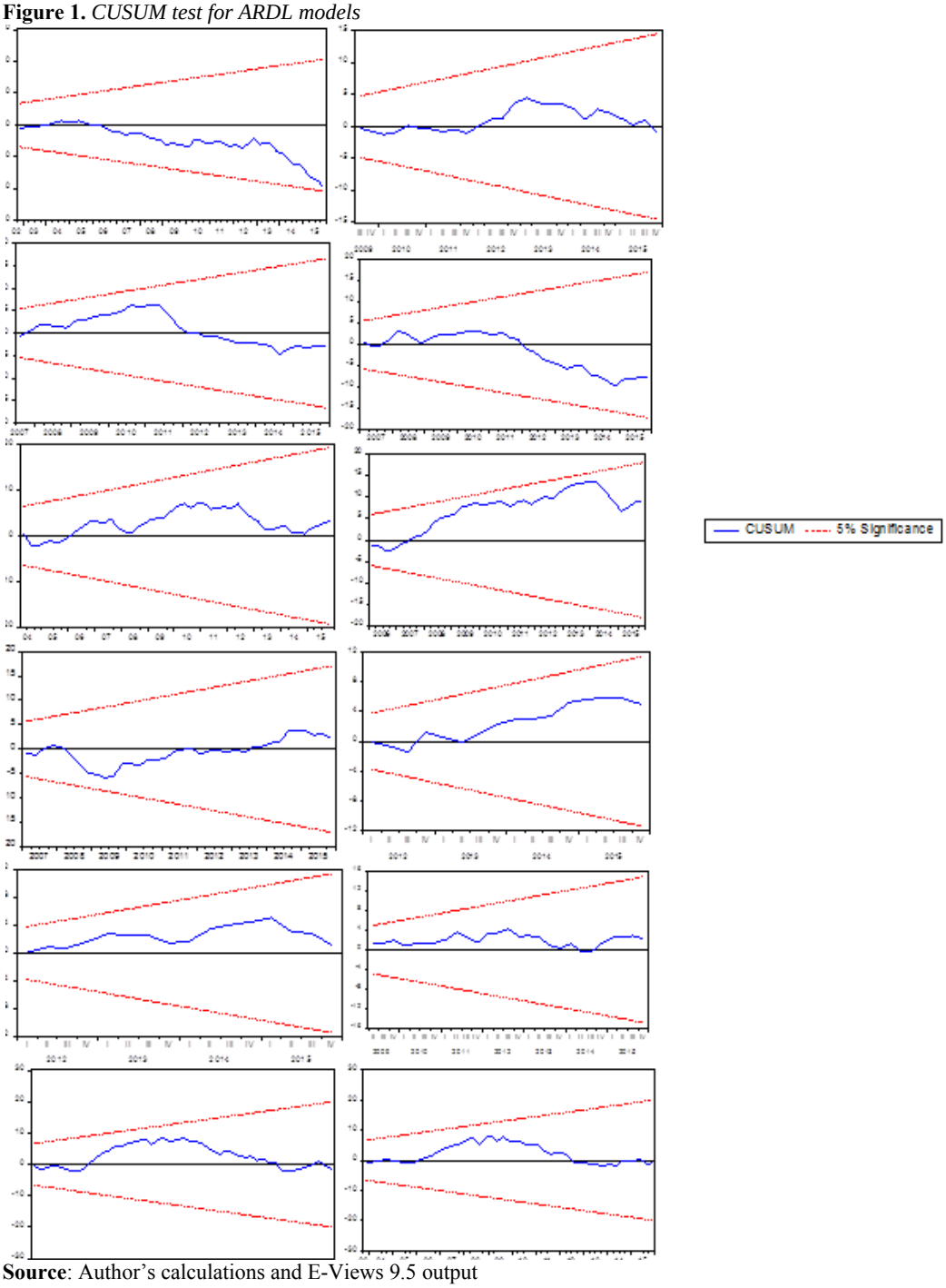
Total Unemployment Models						
Country	**Croatia**	**Czech Republic**	**Denmark**	**Germany**	**Greece**	**Spain**
Model lag length specification	(2,0,0,0,0)	(4,5,5,5,0)	(3,2,0,2)	(2,4,4,1,3)	(3,4,0,4,0)	(4,4,0,1,0)
R-squared	0.959	0.987	0.983	0.999	0.999	0.999
Adjusted R-squared	0.955	0.978	0.978	0.998	0.999	0.998
Sum squared residuals	19.393	0.981	2.019	0.322	0.768	3.129
F-statistic	213.001	113.71	209.2	1206.94	2449.569	3294.35
Probability (F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LM Autocorrelation F Statistic	0.547 (0.5818)	0.227 (0.7981)	0.032 (0.9686)	1.127 (0.3357)	1.023 (0.3848)	0.165 (0.8481)
Heteroscedasticity F statistic	1.399 (0.2253)	0.774 (0.7372)	1.183 (0.3211)	0.6203 (0.8848)	1.183 (0.3705)	0.712 (0.7325)
Jarque-Bera	5.68 (0.076)	0.089 (0.956)	1.549 (0.461)	3.023 (0.151)	2.296 (0.317)	2.409 (0.299)
Youth Unemployment Models						
Model lag length specification	(2,3,4,5,5)	(3,3,5,5,0)	(5,0,5,5)	(9,5,5,4,7)	(4,4,2,0,0)	(4,4,0,1,0)
R-squared	0.974	0.966	0.966	0.999	0.997	0.999
Adjusted R-squared	0.947	0.947	0.952	0.996	0.996	0.999
Sum squared residuals	88.09	20.519	13.358	0.374	23.725	12.289
F-statistic	35.433	49.352	67.778	377.62	707.24	4080.61
Probability (F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LM Autocorrelation F Statistic	1.229 (0.3104)	0.185 (0.8320)	1.345 (0.2727)	0.649 (0.5378)	0.338 (0.7166)	0.431 (0.6522)
Heteroscedasticity F statistic	1.59 (0.1189)	0.825 (0.6739)	0.687 (0.7960)	1.369 (0.2529)	0.884 (0.5783)	1.521 (0.1488)
Jarque-Bera	1.215 (0.544)	0.469 (0.791)	2.422 (0.298)	1.855 (0.396)	1.172 (0.557)	0.169 (0.919)

Source: Author's calculations and E-Views 9.5 output.

Note: the model lag lengths specification lists the number of lags for the variables in the following order: the dependent variable – total unemployment in the first model and youth unemployment in the second, followed by GDP, export, the public debt-to-GDP ratio and tourism revenue. The exception is Denmark where tourism was not included so there are only four lag lengths, presented in the order as described above.

Based upon the statistics presented in Table 4, it is clear that all of the models are statistically significant and have a very high explanatory value based upon the value of the R-squared and Adjusted R-squared values. Based upon the results of the diagnostic tests, it is clearly possible to state that at the 5% significance value the models do not exhibit signs of autocorrelation, heteroscedasticity and that the residuals are normally distributed. Based on the results of the CUSUM tests in Figure 1 it is possible to see that all of the models are structurally stable.

Figure 1. *CUSUM test for ARDL models*



Source: Author's calculations and E-Views 9.5 output

Note: the models to the left are the total unemployment models, while the models to the right are the youth unemployment models. Starting from the top, the CUSUM tests are in the following order: Croatia, the Czech Republic, Denmark, Germany, Greece and Spain.

After taking into account that the models are statistically significant and proving that the variables have a statistically significant long-term relationship based upon the results of the Bounds test, the estimations of the long-term coefficients for the total unemployment models are provided in Table 5.

Table 5. *Long-run coefficients of the ARDL Total Unemployment models*

	Croatia	Czech Republic	Denmark	Germany	Greece	Spain
GDP	-24.848***	-143.55**	-11.915	-149.55**	-70.661***	21.172
	(0.0000)	(0.0419)	(0.8159)	(0.0262)	(0.0000)	(0.1499)
Export	-1.489	57.761*	3.043	59.15*	4.804**	-12.143
	(0.5045)	(0.0518)	(0.7400)	(0.0745)	(0.0484)	(0.2370)
Pdebt	0.1256***	-0.6005*	0.0598	-0.4897	-0.0622*	0.183***
	(0.0000)	(0.0799)	(0.6999)	(0.1176)	(0.0626)	(0.0002)
Tourism	0.0059	0.0009	/	-0.297	-0.0212	0.0039
	(0.5391)	(0.9401)		(0.2308)	(0.1014)	(0.8020)
Constant	249.73***	956.099**	103.86	1336.509**	751.65***	-116.88
	(0.0000)	(0.0361)	(0.8378)	(0.0297)	(0.0000)	(0.1759)

Source: Author's calculations and E-Views 9.5 output.
Note: *, ** and **** indicate statistical significance at the respected 0.1, 0.05 and 0.01 levels of significance.

As can be seen from the results, there are significant differences between the countries that have a low youth unemployment rate and the countries that have a high youth unemployment rate. Most notably, in the cases of Germany and the Czech Republic it was detected that a rise in GDP is associated with a significant decline of the unemployment rate. In general, this conforms to Okun's (1962) hypothesis that an increase of GDP is associated with the decrease of the unemployment rate, although there is no evidence of the exact 3% of GDP growth being associated with a 1% decrease in unemployment. We find similar evidence in the cases of Croatia and Greece, but fail to find such evidence at a statistically significant level for Spain and Denmark. Croatia, Greece and Spain are all highly dependent upon tourism revenue as one of the primary motivators of their economic growth, and yet this paper fails to detect any statistically significant evidence that the increase of tourism revenue causes a reduced unemployment rate.

These countries also have very high public debt-to-GDP ratios, large primary budget deficits and are generally considered as examples of unstable macroeconomic environments. These countries have been the subject of a significant number of articles and one of the primary questions was whether the austerity policies implemented as a result of the 2008 crisis had a positive effect. Albonico, Paccagnini and Tirelli (2016: 29) question the quality of the fiscal policies in the PIIGS countries as it is entirely possible that the EMU institutions and the governments of the PIIGS countries did not react adequately to the crisis. Similarly to this finding this paper concludes that there is evidence of the public debt-to-GDP ratio increasing the total unemployment rate in Croatia and Spain, while the value of the coefficient for Greece is only slightly negative. In Denmark and Germany there is no evidence of such a relationship, as the relationship does not appear to be statistically significant in this model setting.

For the Czech Republic, the increase of the public debt-to-GDP ratio seems to cause the decrease of the total unemployment rate, although this result should be taken with caution as the coefficient is significant only at the 10% statistical significance level. This is

understandable as the Czech Republic does not have significant issues regarding macroeconomic imbalances and thus an increase in public debt may be used to fund infrastructural projects or invested into the industrial sector. This paper is unable to establish a statistically significant link between exports and the total unemployment rate. It is either statistically insignificant or significant only on the 10% level of statistical significance with the exception of Greece where it seems to have a role in increasing the unemployment rate. After this short analysis it is possible to compare these results with those of the youth unemployment ARDL models, which are presented in Table 6.

Table 6. *Long-run coefficients of the ARDL Youth Unemployment models*

	Croatia	Czech Republic	Denmark	Germany	Greece	Spain
GDP	271.396 (0.1053)	3026.99 (0.8679)	-73.51* (0.0907)	15.838 (0.7709)	-73.028** (0.0188)	49.099 (0.1981)
Export	-190.351* (0.0503)	-1306.2 (0.8671)	26.123*** (0.0055)	8.36 (0.3605)	-6.435 (0.7365)	-17.784 (0.5033)
Pdebt	1.855** (0.0200)	11.505 (0.8642)	-0.05 (0.6128)	-0.157*** (0.0013)	-0.079 (0.4489)	0.3007** (0.0383)
Tourism	-0.695* (0.0847)	-0.132 (0.8872)	/	-0.405*** (0.0034)	-0.201** (0.0312)	0.0204 (0.6403)
Constant	-933.106 (0.2281)	-19043.3 (0.8685)	552.68 (0.1608)	-253.288 (0.6770)	924.09** (0.0219)	-384.38* (0.0938)

Source: Author's calculations and E-Views 9.5 output.
Note: *, ** and **** indicate statistical significance at the respected 0.1, 0.05 and 0.01 levels of significance.

These results have some similarities in comparison to those obtained from the total unemployment models. The most significant similarity is that the public debt is a statistically significant factor of increasing the unemployment rate in Croatia and Spain. The effect of the increase of GDP is not consistent throughout the six youth unemployment ARDL models and in the majority of cases is not significant at the 5% significance level. Surprisingly, the only exception is Greece where the increase of GDP is associated with the decrease of the youth unemployment rate.

It would also seem that tourism revenue leads to the decrease of the youth unemployment rate. As this was not the case in the total unemployment models it is possible that the majority of the workforce in the tourism sector is generally younger and thus has a more pronounced effect on the youth unemployment rate. While the chosen variables were mostly statistically significant in the total unemployment rate model, here it seems that despite the very high explanatory value of the models not all factors are individually significant. Therefore, there are two possible explanations: the high explanatory value of the models is a result of the lags of the youth unemployment itself or the variables have a jointly statistically significant value. Due to the fact that the coefficients of the lags of the youth unemployment are for most of the models only relevant in the first lag instance, the second conclusion, that the chosen explanatory variables are jointly significant, seems more likely.

Further research should be conducted to determine exact factors that have an impact on the youth unemployment rate as it would seem that aside from the public debt-to-GDP ratio and tourism revenue, the majority of the selected variables that have a statistically significant impact on the total unemployment rate do not have as much of an impact on the youth unemployment rate. The results from both models seem to suggest that the

extensive austerity measures that were present in Spain, Croatia and Greece have made both the youth unemployment rate and the total unemployment rate prone to shocks caused by the increase of the public debt-to-GDP ratio. Such a conclusion conforms to the results of Gil-Alana (2010) who when conducting his Impulse response functions showed that the response of unemployment to economic growth can be negative, but that it can also be statistically insignificant. The results also conform to the finding of Ghoshray, Ordóñez and Sala (2016), whose main conclusion was the inefficiency of the current methods of decreasing the youth unemployment rate.

Perhaps the most important conclusion of those that have been obtained from the ARDL models is the relevance of the public debt-to-GDP ratio in Spain and Croatia. An increase of the public debt-to-GDP ratio has a more pronounced effect on youth unemployment in comparison to the total unemployment rate. This conforms with the conclusion of Ghoshray, Ordóñez and Sala (2016) that in comparison to the total unemployment rate, the youth unemployment rate is more sensitive to business cycle oscillations. The most significant policy recommendation is to keep in mind that when forming austerity measures the impact of these measures should be towards achieving a fully employed and sustainable economy rather than ensure the short-term liquidity of the EU member-states *vis-à-vis* their creditors. The long-term impact of a high youth unemployment rate would have potentially dangerous political, economic, demographic and many other consequences that should be avoided at any cost.

5. Conclusion

In the aftermath of the 2008 crisis, the majority of EU member-states employed austerity measures in order to ensure a return to a more stable macroeconomic environment. These measures were especially difficult for the economically less developed states that have struggled with containing macroeconomic imbalances. These countries have now developed not only a public debt-to-GDP ratio that many of them cannot sustain, but an alarmingly high youth unemployment rate. This paper finds, using an ARDL model approach, that the public debt-to-GDP ratio increase has a more pronounced effect of increasing the youth unemployment rate in comparison to the total unemployment rate.

In addition, there is only evidence of such a relationship in Spain and Croatia, while there was evidence of no such relationship in Greece or the countries that have a low youth unemployment rate. The main policy recommendation of this paper is the development of a long-term strategy that will ensure the stability of countries that have most been affected by the 2008 crisis. The policy of continued political struggle and economic instability between two bailout programs, when the situation requires it, is not sustainable in the long term. A coherent economic policy that accepts the reality that many of the current debt regimes will have to be reworked in order to avoid these countries continuing their path into economic uncertainty and ensuring their long-term sustainable development. In creating such a policy it is imperative that both the policy makers of the EU and of the national member-states recognize the importance of the current youth

unemployment rate and provide a new framework that will focus on significantly decreasing the current youth unemployment rate.

Perhaps such a new approach may help decrease the possibly dangerous impact of the British exit from the EU. Such a new and positive approach may also increase faith in both the institutions of the EU and in the national political systems, both of which have been strongly shocked by the crisis of 2008 and have yet to recover from the initial shock.

Notes

(1) These countries are: Portugal, Ireland, Italy, Greece and Spain.

(2) The data for the final quarter for 2015 was used as a reference point rather than the first quarter of 2016 due to the fact that for the final quarter of 2015 data was available for all 28 EU member-states.

(3) It is interesting to note that the five countries with the highest youth unemployment rate are four of the five PIIGS countries, as well as Croatia that in recent years has seen a significant growth of its public debt-to-GDP ratio.

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