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Governments spending and growth nexus with nonlinear adjustments: re-examining the Croatian and Slovenian case

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ABSTRACT

The objective of this paper is to analyze the governments spending - economic growth nexus and examine the asymmetries in the adjustment process between the two in the Croatian and Slovenian economy. The baseline relationship model between the variables of interest is grounded on the assumption of Wagner's Law and Keynesian hypothesis. A possible nonlinear asymmetric effect of governments spending and GDP toward their long-run equilibrium is tested for each case. The test results indicate the presence of nonlienarity in the relationship between public spending and GDP in Croatia and Slovenia as well. Eventually, country specific threshold cointegrating relationship between the considered variables are estimated and tested. The results reveal well suited threshold vector error correction model with significantly different error correction adjustments in normal and stress regimes for each of the two sample country.

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1. Introduction

Theoretical framework explaining the relationship between governments spending and economic growth ranges between the two fundamentally different assumptions. The first one assuming governments spending as an endogenous variable driven by the national income or economic growth, well known as Wagner's Law (Wagner, 1876). And the other one, assuming governments spending as an exogenous variable that drives economic growth, recognized as Keynesian hypothesis (Keynes, 1936). Besides Wagner's and Keynesian hypothesis, empirical literature recognized neutrality hypothesis and feedback hypothesis explaining the case where no causality and bi-directional causality between GDP and governments spending exist, respectively. But nonetheless, the empirical relationship depends on data selection and model specification and final conclusion often remains controversial. However, due to different

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governmental attitudes and policies or business cycles the relationship between governments spending and economic growth might take a different form and it is reasonable to believe that reality might be the mixture of two. Furthermore, the relationship might exhibit different long-term and short-term pattern behavior. These assumptions lead us to another one. Namely, the assumption of linearity in the relationship between governments spending and economic growth may not hold. Another important and well known fact in the empirical literature is that many economic time series are nonstationary in the sense that they are growing. Therefore, we consider tests that allow for the joint consideration of nonlinearity (threshold) and nonstationarity (unit roots) assuming that the presence of error correction is threshold dependent. Stationary economic series can be approximated by linear time series models, but due to transaction costs, policy interventions and other asymmetric properties it is generally accepted that the nonlinear models outperform its linear counterparts when modelling economic time series. Nonlinear models have been applied in a range of areas in macroeconomics and finance but only recently for modeling of governments spending. The paper brings the Croatian and Slovenian case, as well as the comparison between the two.

The remainder of the paper is organized as follows: section 2 briefly summarizes related literature. Section 3 shows research data and methodology, while Section 4 gives empirical results and discussion. The final section provides an overview of the main findings of the research.

2. Brief related literature overview

Empirical literature directed towards examining the relationship between governments spending and economic growth is extremely large and still ongoing. But nonetheless, it mostly relies on varieties of linear model specifications yield conflicting results. Alexiou (2009) used two different panel data techniques on the annual data sample for seven countries (Bulgaria, Serbia, The Former Yugoslav Republic of Macedonia, Croatia, Bosnia, Albania and Romania) from 1995 to 2005 and in line with Keynesian view, found positive impact from governments spending on economic growth. Sever et al (2011) analyzed budget spending and the effect on the growth and structure of the GDP of Croatian economy and out the vector autoregression (VAR) estimates found that the budget expenditures have not adequately affected the GDP growth. Trošt et al. (2015) applied Johansen cointegration procedure and Granger causality to examine the causal relationship between economic growth, exports and public wage bill spending in Slovenia test. The result of the Granger causality test showed an existence of causality from public wage bill spending to economic growth and exports and from exports to economic growth and public wage bill spending. Dolenc (2009) followed time series regression approach on the quarterly data sample for public and government spending and gross domestic product in Slovenia from 1992 until 2007 found that Wagner's law holds for the Slovenian case. Kargi (2016) tested the validity of Wagner's Law for the developing country group and the period of 1961-2013. Findings from Granger Causality Test pointed that Wagner's Law is not valid for majority of the considered countries. Thabane and Lebina (2016) using the ARDL

bounds testing procedure for the period 1980 to 2012 confirmed the presence of Wagner's Law in Lesotho. There are the varieties and still emerging linear model specifications applied to exemine the relationship between governments spending and economic growth over the globe (Akonji et al., 2013; Srinivasan, 2013; Maku, 2014; Rosoiu, 2015; Kalawole, 2016; Idenyi et al., 2016; Lupu and Asandului, 2017).

Nevertheless, very few and recent papers take ito account nonlinear nature of variables (Mencinger, 2014; Varol Iyidogan and Turan, 2017) and very recently nonlinear nature in their relationship (Cavicchiolia and Pistoresi, 2016; Ndoricimpa, 2017). Mencinger (2014) used panel dataset of 25 sovereign member states of the EU divided into subgroups distinguishing between so-called 'old' member states and 'new' member states and found nonlinear impact of public debt ratios on annual GDP per capita growth rates. Varol Iyidogan and Turan (2017) examined the relationship between the government size and economic growth by using threshold regression model and quarterly data over the period 1998:1–2015:1 for Turkeyand provided a strong evidence for the existence of a non-linear relationship. Cavicchiolia and Pistoresi (2016) confirmed the validity of Wagner's Law from 1862 to 2009 in Italy, only when considered nonlinear responses of government spending during the World War I and World War II period. Ndoricimpa (2017) used Threshold cointegration approach and examined the asymmetries in the tax-spending nexus in Burundi. The results indicate that the equilibrium restores when the budget situation is worsening, the adjustment is made by reducing spending. Conclusively, the studies of the relationship between governments spending and economic growth have not yielded robust results and this paper aims to contribute moving forward in this direction.

3. Research data and methodology

The research is based on the quarterly data on governments spending and gross domestic product by expenditure approach at constant prices of previous year. The Croatian case is examined on the data sample from the first quarter of 2000 to the last quarter of 2016 gathered from the Croatian Bureau of Statistics. The data sample for the Slovenian case is gathered from the Slovenian Bureau of Statistics and covers the period from the first quarter of 1996 to the first quarter of 2017. Descriptive statistics of the original series is provided in the appendix (Table A1 for the Croatian and Table A2 for the Slovenian case). The observed series are X-13-ARIMA seasonally adjusted and taken in (natural) log values (Figure 1 and Figure 2 in the Appendix). Stationarity diagnostic is provided by usual unit root tests (ADF, PP, KPSS). Following unit root test results, the linear Johansen (1995) cointegration tests is implemented and results indicated the presence of bivariate cointegration between governments spending and gross domestic product in Croatia. So, following Johansen (1988, 1991) and Johansen and Juselius (1990) linear VECM is estimated.the VECM specification for the case of two time series and both integrated to the same order can be represented by equation (1):

$$\Delta x_t = A' X_{t-1}(\beta) + u_t \tag{1}$$

where:

x_t - p-dimensional I(1) cointegrated time series with $p \times 1$ cointegrating vector β

A - coefficient matrix $\mathrm{k} \times p \mid \mathrm{k} = \mathrm{p} + 2$

$(X_{t-1}(\beta))$ - regressor and a $\mathrm{k} \times 1$ matrix given by the equation (2):

$$X_{t-1}(\beta) = \begin{bmatrix} 1 & w_{t-1}(\beta) & \Delta x_{t-1} & \cdots & \Delta x_{t-l} \end{bmatrix}' \tag{2}$$

$w_{t-1}(\beta) = \beta' x_{t-1}$ - error-correction term that needs to be stationary

u_t - vector martingale difference sequence with finite covariance matrix as presented in equation (3):

$$\sum = E(u_t u_t') \tag{3}$$

Linear approach to error correction modelling assumes that the speed of adjustment towards the long-run equilibrium is the same in every time period. Since the adjustment may occur only once the deviations from lon-run equilibrium exceed some critical value (threshold) and therefore the assumption of linearity may not hold as originally noted by Balke and Fomby (1997). Since the assumption may not hold in Wagner's relationship (Cavicchiolia and Pistoresi, 2016), we consider tests that allow for the joint consideration of nonlinearity (threshold) and nonstationarity (unit roots) assuming that the presence of error correction is threshold dependent. Eventually, we estimate and test the two-regime model (Hansen and Seo, 2002) of threshold cointegration between governments spending and gross domestic product in Croatian economy where the short-run dynamics involve two regimes, depending on the size of the lagged error correction term (threshold). Threshold cointegration model Hansen and Seo (2002) is presented in equation (4):

$$\Delta x_t = \begin{cases} A_1' x_{t-1}(\beta) + u_t, & w_{t-1}(\beta) \le \gamma \\ A_2' x_{t-1}(\beta) + u_t, & w_{t-1}(\beta) > \gamma \end{cases} \tag{4}$$

Where:

A_1 and A_2 – coefficient matrix for regime one and two respectively

x_t - p-dimensional I(1) cointegrated time series with $p \times 1$ cointegrating vector β

$w_{t-1}(\beta) = \beta' x_{t-1}$ - error-correction term that needs to be stationary

γ – threshold parameter

This paper observe bivariate $(p = 2)$ case of governments spending and gross domestic product in Croatia $\Delta x_t = [\Delta \log(\mathrm{EXP}) \quad \Delta \log(\mathrm{GDP})]$

All of the coefficients in equation (4) except β are allowed to switch between the regimes. Threshold effect only has content in case of $0 < P(w_{t-1}(\beta) \le \gamma) < 1$, otherwise we have form of linear cointegration. It is assumed that $\pi_0 < P(w_{t-1}(\beta) \le \gamma) < 1 - \pi_0$ where π_0 is triming parameter set to 0.05. The model estimates are obtained using maximum likelihood (ML) method as an estimator holding the assumptions that the residuals are iid Gaussian. The threshold cointegration between the governments spending and GDP is tested using Hansen and Seo (2002). Hansen and Seo (2002) test the presence of linear versus threshold cointegration:

$$SupLM = \sup_{\gamma_L < \gamma < \gamma_U} LM\left(\widetilde{\beta}, \gamma\right) \tag{5}$$

While $[\gamma_L, \gamma_U]$ present the search region where γ_L is the π_0 percentile of $\widetilde{w}_{t-1}$ and γ_U is the $(1 - \pi_0)$ percentile. Following Hansen and Seo (2002), threshold

cointegration *SupLM* test is applied with 73 gridpoints, and the p-values calculated by the parametric bootstrap. The lag length selection based on the AIC, BIC and HQ applied to the threshold vector error-correction model (VECM) leads to the value of $l = 1$and $l = 3$ for the Croatian and Slovenian case respectively. The threshold cointegration estimates are obtained following procedure of Hansen and Seo (2002). The model with the lowest value of $\log|\sum(\beta,\gamma)|$ out of grid-search algorithm is used to provide maximum likelihood estimation (MLE($\widetilde{\beta},\widetilde{\gamma}$)). Taking $\widetilde{A}_1 = \widetilde{A}_1(\widetilde{\beta},\widetilde{\gamma})$ and $\widetilde{A}_2 = \widetilde{A}_2(\widetilde{\beta},\widetilde{\gamma})$, with MLE($\widetilde{A}_1,\widetilde{A}_2$) out of grid-search algorithm parameter estimates are obtained.

4. Empirical results and discussion

Following the methodology in the previous section, unit root tests (ADF, PP, KPSS) results for the Croatian case are summarized in Table 1.

Unit root tests results in Table 1 indicate that Croatian GDP and governments spending are difference stationary series and in order to confirm cointegration between the series, we proceed with Johansen rank test. The Johansen rank test results for the Croatian case are summarized in Table 2.

The Johansen rank test results in Table 2 confirms the existence of cointegration between the observed series in Croatian Case. Following the same scenario we examine the Slovenian case and unit root test results for the Slovenian case are presented in Table 3.

Unit root test results in Table 3 show that GDP and governments spending are difference stationary series in Slovenia and Johansen cointegration rank tests results for the Slovenian case are provided in Table 4.

Table 1 Unit root test results for governments spending nad GDP in Croatia.

	Levels		First difference	
Variable and test	Constant	Constant and trend	Constant	Constant and trend
ADF test		**t-stat.**		
log(GC)	−2.052600	0.467542	−2.580321	−5.678729
log(GDP)	−2.624645	−1.905712	−1.954381	−4.653841
PP test		**Adj. t-stat.**		
log(GC)	−1.567943	−0.183752	−5.534323	−5.774241
log(GDP)	−4.279039	−1.301213	−3.098912	−4.881007
KPSS test		**LM-stat.**		
log(GC)	0.967699	0.243763	0.429726	0.179840
log(GDP)	0.927436	0.270016	0.733057	0.135963

Table 2 Johansen cointegration rank tests for the Croatian case.

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	*p*–value
None	0.448166	45.38989	15.49471	0.0000
At most 1	0.098592	6.746841	3.841466	0.0094
		Max-Eigen Statistic		
None	0.448166	38.64305	14.26460	0.0000
At most 1	0.098592	6.746841	3.841466	0.0094

Table 3 Unit root test results for governments spending nad GDP in Slovenia.

	Levels		First difference	
Variable and test	Constant	Constant and trend	Constant	Constant and trend
ADF test		**t-stat.**		
log(GC)	−4.930312	−1.195930	−2.393307	−6.666627
log(GDP)	−3.080270	−1.886170	−2.807434	−3.722007
PP test		**Adj. t-stat.**		
log(GC)	−6.454893	−0.934855	−3.632186	−6.906447
log(GDP)	−5.909513	−1.775643	−5.321391	−7.372751
KPSS test		**LM-stat.**		
log(GC)	1.077934	0.293015	1.062322	0.076847
log(GDP)	1.069916	0.296791	0.965965	0.126103

Table 4 Johansen cointegration rank tests for the Slovenian case.

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	*p*–value
None	0.255830	31.00751	15.49471	0.0001
At most 1	0.079331	6.777659	3.841466	0.0092
		Max-Eigen Statistic		
None	0.255830	24.22985	14.26460	0.0010
At most 1	0.079331	6.777659	3.841466	0.0092

Table 5 Linear VECM relationship estimates for the Croatian case.

Variables	$\Delta\log(GC)_t$	$\Delta\log(GDP)_t$
Intercept	0.0300*** (0.0062)	0.0150*** (0.0042)
w_{t-1}	−0.1757*** (0.0372)	−0.0763*** (0.0254)
$\Delta \log (GC)_{t-1}$	0.1443 (0.1071)	−0.0600 (0.0730)
$\Delta \log (GDP)_{t-1}$	−0.3739** (0.1968)	0.3994*** (0.1341)
AIC: −1230.607	BIC: −1230.607	SSR: 0.01117779

Notes: Estimations are performed using the Maximum Likelihood (ML) estimator; standard errors are in brackets; ***, ** denote significance at the: 1% and 5% significance level, respectively.

The Johansen rank test results in Table 4 indicates the existence of cointegration between the GDP and governments spending in Slovenia. Since we found integrated of order one I(1) and cointegrated time series I what follows the linear VECM is estimated for Croatian and Slovenian case. The linear VECM estimates for the Croatian case are summarized in Table 5.

The results in Table 5 show that there exists a statistically significant error-correction term in both (governments spending and GDP) equation. The higher error-correction coefficient is found in governments spending equation indicating a faster governments spending adjustment towards the GDP in the long-run equilibrium than the other way around. Based on the AIC, BIC and HQ The lag length is selected to be one ($l = 1$). Diagnostics checking confirm all of the related assumptions (Ljung–Box test, ARCH test and Jarque–Bera tes), and so the estimates could be accepted as the valid estimates. The linear VECM estimates for the Slovenian case are presented in Table 6.

The linear VECM estimates for the Slovenian Case in Table 6 indicate unirectional relationship from GDP to governments spending in Slovenia and we found no significant effect out of governments spending to GDP. Based on the AIC, BIC and HQ The lag length is selected to be three ($l = 3$). Diagnostics checking confirm all of the

Table 6 Linear VECM relationship estimates for the Slovenian case.

Variables	$\Delta\log(GC)_t$	$\Delta\log(GDP)_t$
Intercept	−0.0741*** (0.0173)	−0.0199 (0.0260)
w_{t-1}	−0.1263*** (0.0290)	−0.0374 (0.0435)
$\Delta \log (GC)_{t-1}$	0.1257 (0.1031)	−0.0465 (0.1549)
$\Delta \log (GDP)_{t-1}$	−0.1517** (0.0832)	0.1760 (0.1249)
$\Delta \log (GC)_{t-2}$	0.1275 (0.1015)	0.0658 (0.1524)
$\Delta \log (GDP)_{t-2}$	−0.0823 (0.0852)	0.3338*** (0.1280)
$\Delta \log (GC)_{t-3}$	0.1614 (0.0976)	0.1478 (0.1466)
$\Delta \log (GDP)_{t-3}$	0.0134 (0.0888)	−0.0712 (0.1333)
AIC: −1469.194	BIC: −1428.489	SSR: 0.01649165

Notes: Estimations are performed using the Maximum Likelihood (ML) estimator; standard errors are in brackets; ***, ** denote significance at the: 1% and 5% significance level, respectively.

Table 7 Threshold VECM relationship estimates for the Croatian case.

	1st regime - (71.2% obs) $w_{t-1}(\beta) \leq \gamma =$ 0.06160382		2nd regime - (28.8% obs) $w_{t-1}(\beta) > \gamma =$ 0.06160382	
Variables	$\Delta\log(GC)_t$	$\Delta\log(GDP)_t$	$\Delta\log(GC)_t$	$\Delta\log(GDP)_t$
Intercept	0.0167*** (4.0e-05)	0.0019 (0.4633)	0.0881*** (0.0082)	0.0315 (0.1559)
w_{t-1}	−0.2099*** (1.4e-05)	−0.0338 (0.2659)	−1.1869*** (0.0089)	−0.4053 (0.1803)
$\Delta \log (GC)_{t-1}$	0.2792*** (0.0174)	−0.1571*** (0.0476)	0.0514 (0.8498)	0.1631 (0.3789)
$\Delta \log (GDP)_{t-1}$	−0.7680*** (0.0052)	0.8843*** (7.9e-06)	−0.1526 (0.5883)	0.1041 (0.5877)
SSR: 0.009025557	AIC : −1241.633		BIC: −1204.409	
Threshold Value (γ): 0.06160382				
Cointegrating vector: (1, −0.8526197)				
Test of linear versus threshold cointegration of Hansen and Seo (2002):				
Test Statistic: 17.36162 (Maximized for threshold value: 0.168062)				
p-Value: 0.04 (Fixed regressor bootstrap)				

Notes: standard errors are in brackets; ***, ** denote significance at the: 1%, and 5% significance level, respectively.

related assumptions (Ljung–Box test, ARCH test and Jarque–Bera tes), and so the estimates could be accepted as the valid estimates.

However, to examine nonlinearity in the governments spending and growth relationship we make one step further i.e. test presence of threshold in the error correction term and estimate threshold error correction model. The test results and threshold error correction estimates are provided in Table 7.

Table 7 shows linear versus threshold cointegration test results and threshold vector error correction model estimates and diagnostics checking confirm all of the related assumptions (Ljung–Box test, ARCH test and Jarque–Bera tes).The multivariate LM test statistic amounts 17.36 and points on the existence of threshold cointegration between governments spending and growth in Croatia. The estimaed model has two regimes, defined by the value of the error-correction term in relation to estimated threshold $\tilde{\gamma}$ amounting 0.06160382. The error-correction term is defined by the equation (6):

$$w_t = \log(GC)_t - 0.8526197 \cdot \log(GDP)_t \tag{6}$$

The first regime explains 71.2% of observations and it's on when hold the equation (7):

$$\log(GC)_t \leq 0.8526197 \cdot \log(GDP)_t + 0.06160382 \tag{7}$$

The second regime explains 28.8% of observations and occures when hold the equation (8):

Table 8 Threshold VECM relationship estimates for the Slovenian case.

	1st regime - (12.3% obs) $w_{t-1}(\beta) \leq \gamma = -0.1377623$		2nd regime - (87.7% obs) $w_{t-1}(\beta) > \gamma = -0.1377623$	
Variables	$\Delta\log(GC)_t$	$\Delta\log(GDP)_t$	$\Delta\log(GC)_t$	$\Delta\log(GDP)_t$
Intercept	−0.0457 (0.1159)	−0.0458 (0.3290)	0.0129*** (0.0012)	0.0120** (0.0570)
w_{t-1}	−0.8382*** (8.7e-05)	−0.5568** (0.0915)	−0.0858*** (0.0008)	−0.0697** (0.0837)
$\Delta \log (GC)_{t-1}$	−0.2239 (0.3500)	0.8664*** (0.0283)	0.2096** (0.0636)	−0.3701*** (0.0442)
$\Delta \log (GDP)_{t-1}$	−0.1477 (0.5612)	−0.6220 (0.1346)	−0.1192 (0.1406)	0.1944 (0.1390)
$\Delta \log (GC)_{t-2}$	−0.4456 (0.1758)	0.2167 (0.6832)	0.1070 (0.3521)	0.1734 (0.3532)
$\Delta \log (GDP)_{t-2}$	−0.2877 (0.6136)	−0.4201 (0.6497)	−0.0661 (0.4079)	0.2962*** (0.0247)
$\Delta \log (GC)_{t-3}$	−0.0438 (0.9092)	0.2420 (0.6978)	0.1410 (0.1923)	0.2118 (0.2274)
$\Delta \log (GDP)_{t-3}$	−0.6051** (0.0775)	−0.6913 (0.2114)	0.0766 (0.3538)	−0.1369 (0.3076)
SSR: 0.0126127	AIC: −1484.976		BIC: −1405.959	
Threshold Value (γ): −0.1377623				
Cointegrating vector: (1, −0.8071852)				
Test of linear versus threshold cointegration of Hansen and Seo (2002):				
Test Statistic: 16.6989 (Maximized for threshold value: −0.09137085)				
p-Value: 0.03 (Fixed regressor bootstrap)				

Notes: standard errors are in brackets; ***, ** denote significance at the: 1%, and 5% significance level, respectively.

$$\log(GC)_t > 0.8526197 \cdot \log(GDP)_t + 0.06160382 \tag{8}$$

The second regime is prominent from the last quarter of 2008 (Figure 3 in the Appendix) and corresponds with the period of recession in Croatia (Bošnjak, 2016). Governments spending govern the adjustment from the short-run to the long-run equilibrium in both regimes. Furthermore, in the second regime the error corection term is higher and higher than one that might be considered as over adjustment. Even though the effect from governments spending to GDP is not recorded, due to high adjustment to GDP level it's reasonable to believe that governments spending might have pro-cyclical effects i.e act as an additional support to existing growth or recession. Governments spending and growth nexus appears to be as assumed by Wagner's Law.

The test results and threshold error correction estimates for the Slovenian case are summarized in Table 8.

The model presented in Table 8 satisfies all of (Ljung–Box test, ARCH test and Jarque–Bera tes), and so the estimates could be accepted as the valid estimates. Following the results in Table 8, the multivariate LM test statistic amounting 16.69 confirms the existence of threshold cointegration between governments spending and growth in Slovenia. The estimaed model identified two regimes, defined by the value of the error-correction term in relation to estimated threshold $\widetilde{\gamma}$ amounting −0.1377623. The error-correction term for the Slovenian case is defined by the equation (9):

$$w_t = \log(GC)_t - 0.8071852 \cdot \log(GDP)_t \tag{9}$$

The first regime explains 71.2% of observations and occures when hold the equation (10):

$$\log(GC)_t \leq \ 0.8071852 \cdot \log(GDP)_t + \ -0.1377623 \tag{10}$$

The second regime explains 28.8% of observations and it's on when hold the equation (11):

$$\log(GC)_t > \ 0.8071852 \cdot \log(GDP)_t + \ -0.1377623 \tag{11}$$

Contrarary to the Croatian case, the estimated results for the Slovenian case confirm the assumption of Keynesian hypothesis simultaneously and Wagner's Law, consistently with Dolenc (2009). However, governments spending govern the most of the adjustment from the short-run to the long-run equilibrium in both regimes. In Slovenian case, the second regime is more prominent from the last quarter of 2004 (Figure 4 in the Appendix) that corresponds to the Slovenian accession to European Union. The magnitude of the governments spending adjustment in regime one is sizable and amounts 83,82% while the GDP adjustment amounts 55,68%. The magnitude of adjustment is significantly smaller in regime two in governments spending and GDP equation as well. Furthermore, the estimated results for the Slovenian case show less support pro-cyclical effects since the short – run influence from governments spending is regime dependent. In the first regime governments spending show positive and significant influence on the GDP level with lag one, while in the second regime the influence is negative and significant with lag one. Therefore, the effect of governments spending in regime two is found to be countercyclical. Since the regime two comprehends the periods of contraction in the economy, pro-cyclical effects of governments spending in Slovenia cannot be supported.

5. Conclusion

There are several conclusions that can be drawn out of the research presented in this paper. Firstly, nonlinear threshold cointegrating model indicates presence of nonlinear adjustments between governments spending and GDP in Croatian and Slovenian economy. Therefore, linear vector error-correction model used to examine governments spending - growth nexus might be misspecified. Furthermore, nonlinear threshold cointegrating model approach provides richer insights into governments spending and growth interlinkages. Secondly, the research results reveals unidirectional causality in the long-run governments spending - growth nexus in Croatia. The influence depends on the regime process and runs from governments spending to GDP. The results revealed over adjustment for regime that corresponds to the period of contraction in the Croatian economy or recession. The proposed model supported the presence of Wagner's Law in Croatian economy. Additionally, the research results revealed that governments spending might have pro-cyclical effects on the Croatian economy. Unlike previous studies, research results reveals bidirectional causality relationship in the Slovenian case. The estimated model for the Slovenian case shows the presence of Wagner's Law and Keynesian hypothesis simultaneously. Even though, the Wagner's Low dominates over Keynesian hypothesis in Slovenia. Furthermore

and contrary to the Croatian case, the effects of governments spending to GDP in Slovenia is found to be countercyclical. The sizable speed of quarterly governments spending adjustment for reaching long run equilibrium and steady state is found in Slovenian case amounting 83,82%.

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APPENDIX

Table A1 Descriptive statistics for the variable of interest – Croatian case.

	GC	GDP
Min.	9.116	10.64
1st Qu.	9.298	10.99
Median	9.626	11.29
Mean	9.515	11.15
3rd Qu.	9.709	11.31
Max.	9.730	11.37

Table A2 Descriptive statistics for the variable of interest – Slovenian case.

	GC	GDP
Min.	6.142	7.861
1st Qu.	6.785	8.473
Median	7.255	8.961
Mean	7.109	8.790
3rd Qu.	7.487	9.115
Max.	7.548	9.237

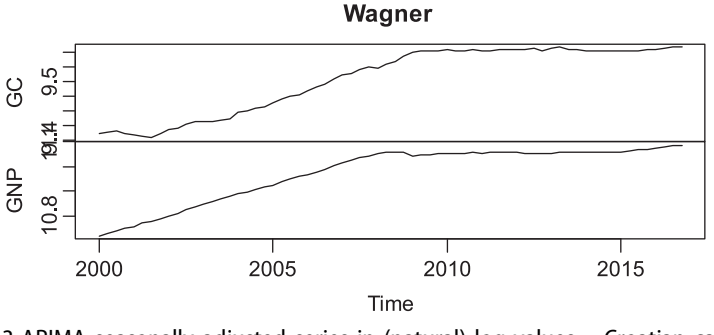

Figure 1. X-13-ARIMA seasonally adjusted series in (natural) log values – Croatian case.

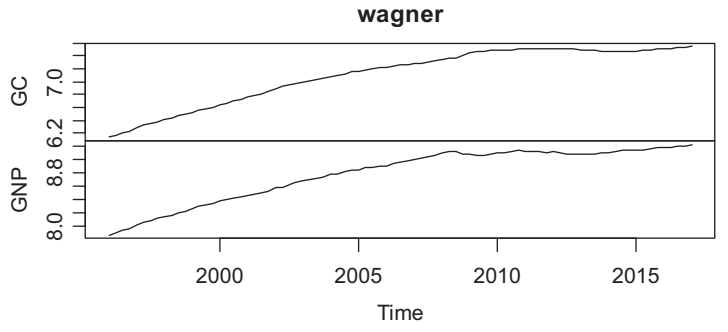

Figure 2. X-13-ARIMA seasonally adjusted series in (natural) log values – Slovenian case.

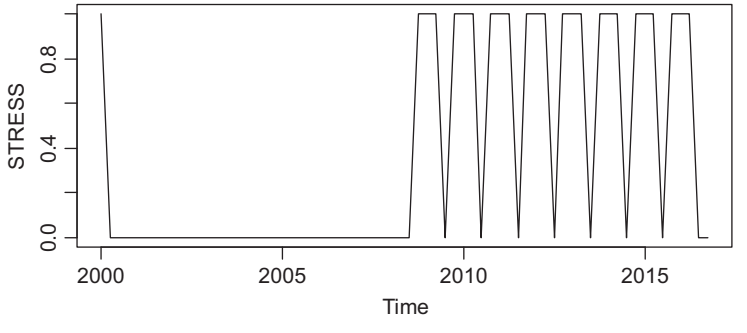

Figure 3. Regimes in Croatian case.

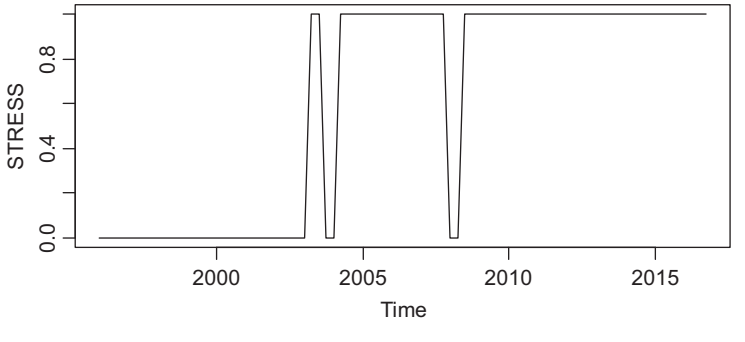

Figure 4. Regimes in Slovenian case.