Acikgoz, Bernur; Cinar, Serkan

Article

Public spending and economic growth : an empirical analysis of developed countries

Ekonomický časopis

Provided in Cooperation with:
Slovak Academy of Sciences, Bratislava

Reference: Acikgoz, Bernur/Cinar, Serkan (2017). Public spending and economic growth : an empirical analysis of developed countries. In: Ekonomický časopis 65 (5), S. 448 - 458.

This Version is available at:
http://hdl.handle.net/11159/3888

Public Spending and Economic Growth: An Empirical Analysis of Developed Countries

Bernur ACIKGOZ – Serkan CINAR***

Abstract

The purpose of this paper is to investigate the effects of public spending on economic growth and examine the sources of economic growth in developed countries since the 1990s. This paper analyses whether public spending effect on economic growth based on Cobb-Douglas Production Function with the two econometric models with Autoregressive Distributed Lag (ARDL) and Dynamic Fixed Effect (DFE) for 21 developed countries (high-income OECD countries), over the period 1990 – 2013. In comparison to similar empirical studies, our paper will add to the existing literature by extending the sample of developed countries and providing the latest empirical evidence for non-linear and structural breaks. Our model results are parallel to each other and the models support that public spending has an important role for economic growth. This result is accurate with theories and previous empirical studies.

Keywords: *public spending, economic growth, panel data, ARDL models*

JEL Classification: O47, H50, C33, H11

Introduction

Nowadays public spending and economic growth are in the centre of economic debate. Economists are divided as to whether public spending expansion helps or slows down economic growth. Some of the economists argue that government programs provide valuable "public goods" such as education and infrastructure. They also say that increases in public spending can assist economic growth by giving money to private sector. But some of economists have an opposite view. They explain that governments become too large and that higher expenditures

* Bernur ACIKGOZ, Izmir Katip Celebi University, Faculty of Economics and Administrative Sciences, Department of Public Finance, Cigli, Izmir, Turkey; e-mail: bernur.acikgoz@ikc.edu.tr

** Serkan CINAR, Celal Bayar University, School of Applied Sciences, International Trade Department, Manisa, Turkey; e-mail: serkan.cinar@cbu.edu.tr

damage economic growth by transferring resources from more productive sectors to government, which uses them less efficiently.

This paper evaluates the impact of public spending on economic growth. The main objective of this study is to define public spending effects on economic growth in developed countries. The secondary objective of this study is to assign the effectiveness of foreign direct investment (FDI), research and development (R&D) expenditures, high tech export and gross domestic savings on economic growth of those countries. The paper is organized as follows: The first part presents the introduction and comprehensive literature review. The second part shows data definitions, unit root and non-parametric cointegration tests and two econometric models (ARDL and DFE) for the long-run coefficients. The last part resumes the results and gives some comments.

1. Literature Review

In reviewing the literature on public spending, many empirical researches have been directed towards public spending that bears significant relation with economic growth. After the pioneering studies of Barro (1990), King and Rebelo (1990), and Lucas (1990), several papers have extended the analysis of public spending and growth, such as Jones, Manuelli and Rossi (1993), Stokey and Rebelo, (1995), Barro and Sala-i-Martin (1992; 1995), and Mendoza, Milesi-Ferretti and Asea (1997). They provide mechanisms by which fiscal policy can determine growth rate (Kneller, Bleaney and Gemmel, 1999, p. 5). In Table 1, one can find a comprehensive list of a literature review of effects of government expenditure on economic growth.

2. Data Definition

The indicators tested in this study are selected on the basis of economic growth theories and previous empirical literature. The indicators tested in the panel study are the economic growth determinants for which data have been found for developed countries for at least 24 years. Data sets related to a number of developed countries are sometimes discontinuous for some variables (i.e., not available for all 24 years). Also because of German unification and statistical issues linked to this historical event, the data sets reliably go back to 1990, and 2013 is the last year that was taken into account for this study. For that reason, while defining the source of economic growth in this study, 21 developed countries were selected for which uninterrupted balanced panel data sets could be found for 24 years for the principle variables. Hence, the forecasts related to this study were obtained under these constraints.

T a b l e 1

Literature Review

Authors	Type of study	Sample	Findings
Alexiou (2009)	Panel data	Seven transition economies in the South Eastern Europe	Government spending on capital formation, development assistance, private investment and trade-openness all have positive and significant effect on economic growth. Population growth in contrast, is found to be statistically insignificant.
Alshahrani and Alsadiq (2014)	Time-series data (period 1960 – 2010)	Saudi Arabia	Found that public investment, health care and education expenditures are factors affecting growth in the short-run while the long-run growth is determined by capital expenditure and health care spending.
Barro (1991)	Pooled cross section/ time-series data (period 1960 – 1985)	98 countries	GDP is positively related to human capital and negatively related to the level of real per capita GDP.
Burton (1999)	Pooled cross section/ time-series data (period 1970 – 1999)	OECD countries	Government outlays as a percentage of GDP, plays a significant role in raising the unemployment rate
Cashin (1995)	Time-series/ cross section (period 1971 – 1988)	23 developed countries	Results are obtained that support the proposed influence of the public finance variables on economic growth.
Chude & Chude (2013)	Error Correction Model (period 1977 – 2012)	Nigeria	Found that economic growth is clearly impacted by factors both exogenous and endogenous to the public expenditure in Nigeria.
Engen and Skinner (1992)	Pooled cross section/ time-series data (period 1970 – 1985)	107 countries	Suggested that a balanced-budget increase in government spending and taxation is predicted to reduce output growth.
Ghura (1995)	Pooled cross section/ time-series data (period 1970 – 1990)	Sub Saharan Africa/ 33 countries	Negative relationship between government consumption and economic growth
Guseh (1997)	OLS estimation, time-series data (period 1960 – 1985)	59 Middle income developing countries	Growth in government size has negative effects on economic growth, but the negative effects are three times as great in non- democratic socialist systems as in democratic market systems.
Jong-Wha (1995)	Pooled cross section/ time-series data (period 1960 – 1985)	Developing countries	Found that government consumption of economic output was associated with slower growth.
Knoop (1999)	OLS – method, time-series data (period 1970 – 1995)	USA	Finds that a reduction in the size of the government will have an adverse impact on economic growth and welfare
Kojo and Wolde- -Rufael (2013)	Causality (period 1950 – 2007)	Ethiopia	Found an unidirectional causality running from GDP to government expenditure for Ethiopia.
Nasiru (2012)	Time-series data (period 1961 – 2010)	Nigeria	Found an unidirectional causality between government spending and economic growth in Nigeria .
Nelson and Singh (1994)	Pooled cross-section/ time-series data	70 countries	Their findings were rather inconclusive as no significant relationship was established.

Source: Prepared by authors.

3. Econometric Methodology

The model of this paper is built on the long-run framework and is used to analyse relations between long-run economic growth and its determinants.

$$GDP_{it} = \propto + \beta_1 UNEMP_{it} + \beta_2 GDS_{it} + \beta_3 FDI_{it} + \beta_4 GEXPG_{it} + \beta_5 HT_{it} + \varepsilon_{it} \quad (1)$$

$$\varepsilon_{it} = \mu_{it} + \theta_{it} + u_{it}$$

In equation (1), the model used to a standard growth equation for country *i* in time period *t*; μ_i is a country-specific fixed effect, θ_t is a time fixed effect and ε_{it} is a normally distributed error term.

In equation (1):

GDP – GDP per capita (constant 2005 USD),
UNEMP – Unemployment, total (% of total labour force),
GDS – Gross domestic savings (% of GDP),
FDI – Foreign Direct Investment (net inflows % of GDP),
GEXPG – General government final consumption expenditure (constant 2000 USD) (% of GDP),
HT – High-technology exports (% of manufactured exports).

The data are taken from World Development Indicators (WB, 2015) over the period 1990 – 2013. Developed countries list is reported in Appendix.

In the first step, we have applied Breusch and Pagan (1980), Pesaran (2004) and Pesaran, Ullah and Yamagata (2008) LM test statistics for cross section dependence. We have also used the panel unit root tests (Levin, Lin & Chu – LLC test; Im, Pesaran and Shin – IPS test; Cross-Sectionally Augumented IPS – CIPS and Hadri-Kurozumi test) developed by Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003), Pesaran (2007) and Hadri and Kurozumi (2012), respectively. In the second stage, panel cointegration analyses were used based on the Westerlund model (Westerlund, 2005). Finally, long-run coefficients were established using Pesaran, Shin and Smith (1999) study.

3.1. Testing for Cross-Sectional Dependence

We have examined the significance of cross sectional correlations among residuals. This test for cross section dependence was carried out using the Breusch and Pagan (1980), Pesaran (2004) and Pesaran, Ullah and Yamagata (2008) LM test statistics. The Breusch and Pagan (1980) LM test are based on the sum of squared coefficients of correlation among cross sectional residuals ($\hat{u}_{it}$) obtained through OLS.

The test statistic denoted by CD_{LM1} can be calculated as:

$$CD_{LM1} = \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij}^{2} \tag{2}$$

where the $\hat{\rho}_{ij}$ stands for the sample estimate of the cross sectional correlation among residuals. Under the null hypothesis of no cross sectional correlations, fixed N and $T \to \alpha$, the CD_{LM1} statistic is distributed as chi-squared with $N(N - 1)/2$ degrees of freedom.

The test statistic CD_{LM2} can be represented as:

$$CD_{LM2} = \sqrt{\frac{1}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (T \hat{\rho}_{ij}^{2} - 1) \tag{3}$$

Here it is seen that under the null of no cross sectional correlations with first $T \to \alpha$ and then $N \to \alpha$, Pesaran (2004) test statistic (CD_{LM2}) is asymptotically distributed as a standard normal.

The bias-adjusted LM test (CD_{LMADJ}) of cross-section independence is consistent even when the Pesaran's (2004) CD_{LM} test inconsistent. However, the LM test has reasonable power in small sample panels. Assuming that under the null hypothesis of no cross sectionally correlation with first $T \to \alpha$ and then $N \to \alpha$.

The test statistic CD_{LMADJ} can be represented as:

$$LM_{adj} = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \frac{(T-k)\hat{\rho}_{ij}^{2} - \mu_{T_{ij}}}{v_{T_{ij}}} \tag{4}$$

3.2. Cointegration Test

The test of Westerlund (2005) is based on the null hypothesis of cointegration that allows for the possibility of multiple structural breaks in both the level and trend of a cointegrated panel regression. In this model, when variables are non--stationary, the model requires these variables to be cointegrated.

$$s_{it} = \alpha_{ij} + \tau_{ij} t + \beta_i (M_{it}) + \omega_{it} \tag{5}$$

where β_i is country specific slope parameters that are assumed to be constant over time, while α_{ij} and τ_{ij} are again country specific intercept and trend parameters that are subject to M_i structural breaks. The error is with that which we assumed be generated as;

$$\begin{aligned} \omega_{it} &= g_{it} + \varepsilon_{it} \\ g_{it} &= g_{it-1} + \rho_i \varepsilon_{it} \end{aligned} \tag{6}$$

with ε_{it} having a mean zero and stationary distribution that is independent across *i*. The fact that ε_{it} is only assumed to be stationary means that it can be both hetero-skedastic and serially correlated.

3.3. Long-run Coefficients

ARDL model was used to estimate long-run equation (Pesaran, 1997, p. 187). ARDL model can be represented as:

$$y_{it}\alpha_i + \phi_i y_{i},_{t-1} + \gamma_i X_{it} + \delta_i z_t + u_{it} \quad (7)$$

for $i = 1,2,...,N$, $t = 1,2,...,T$, where x_{it} is a k x i vector of agent-specific forcing variables and z_t is a vector of common forcing variables.

The estimators such as Mean Group estimator (MG), used to estimate individual ARDL models, do not allow for the short-run heterogeneity or long-run homogeneity related variables in this model. To overcome the shortcomings of the individual ARDL models, we have used a panel ARDL model and estimated it by making use of the Pooled Mean Group estimator (PMG). Pesaran, Shin and Smith (1999) developed two estimators; MG estimator and the PMG estimator. The MG estimator imposes no restrictions on the parameters of ARDL specifications and derives the long-run parameters from an average of the long-run parameters obtained from the individual ARDL estimates. The main shortcoming of this estimator is that it does not allow certain parameters to belong to the same cross panel members. To overcome this shortcoming of the MG estimator, the PMG estimator may be utilized instead. The PMG estimator requires the long--run parameters to be the same but allows intercepts, error variances, and the short-run parameters to differ freely across countries. Thus, it allows for the short-run heterogeneity in conjunction with the long-run homogeneity of the variables in the panel ARDL model.

This model is established and allow for differences between alternative model specifications. Tests of homogeneity of long-run parameters can be carried out individually or together by employing the likelihood ratio or other standard tests. However, Pesaran, Shin and Smith (1999) pointed out that in the case of cross--country studies, these tests tend to over reject the homogeneity hypothesis. Therefore, we have used Hausman (1978) type test for long-run homogeneity.

4. Empirical Findings

We examined the significance of cross sectional correlations among residuals. The tests statistics with their corresponding probabilities are shown in Table 2.

Table 2

Cross-Sectional Dependence Test Results

	GDP		*UNEMP*		*GDS*		*GEXPG*		*FDI*		*HT*	
Test Stat.	Value	Prob	Value	Prob	Value	Prob	Value	Prob	Value	Prob	Value	Prob
CD_{LM1}	67.441*	0.008	113.692*	0.000	88.265*	0.007	101.543*	0.000	88.265*	0.007	101.543*	0.000
CD_{LM2}	11.674*	0.001	10.370*	0.000	8.967*	0.001	6.738	0.000	8.967*	0.001	6.738*	0.000
CD_{LMADJ}	31.648*	0.007	19.83*	0.005	21.839*	0.006	17.293*	0.000	21.839*	0.006	17.293	0.000

Note: * Indicates cross-sectional dependence.

Source: Prepared by authors.

The correlations among cross-sectional residuals are highly significant according to CD_{LM1}, CD_{LM2} and CD_{LMADJ} tests. As a result, we have allowed for the cross section dependence when testing the stationarity of the series.

We used Levin, Lin and Chu (LLC), Im, Pesaran and Shin (IPS), Cross-Sectionally Augumented IPS (CIPS) and Hadri-Kurozumi (HK) tests developed by Levin et al. (2002), Im et al. (2003), Pesaran (2007) and Hadri and Kurozumi (2012) panel unit root tests, respectively.

Table 3

Panel Unit Root Tests Results

	$LLC_{t\text{-}stat}$		$IPS_{W\text{-}stat}$		$CIPS_{stat}$		*HK*	
	Intercept	Intercept + trend	Intercept	Intercept + trend	Intercept	Intercept + trend	Z_A^{SPC} Intercept + trend	Z_A^{LA} Intercept + trend
GDP	–8.22*	–9.48*	–4.65**	–5.33**	–3.82***	–6.82**	15.73*	16.45*
UNEMP	–1.88	–3.67***	–0.77	–3.22***	–2.92**	3.80***	8.89*	11.19*
GDS	–3.96***	7.29***	–2.15**	–6.42**	–2.402**	–2.53**	6.172*	9.823*
GEXPG	–4.37**	–12.14**	–1.46*	–11.58**	–1.99	–2.81*	9.31	11.92 *
FDI	–2.43**	–5.39*	–6.49**	10.37*	–2.41	–6.30*	17.92*	19.87*
HT	–1.88	–3.87**	–0.07	–3.42**	–2.92***	3.83**	20.83*	23.50*

Note: ***, * and * indicate the rejection of the null hypothesis at 1%, 5% and 10% level of significance, respectively. The lag lengths are selected using AIC. Newey-West bandwidth selection with Bartlett kernel is used for both LLC test. The critical values for the CIPS test were obtained from Pesaran (2007), Table 2c (Case III: Intercept and trend). The null distribution of the Z_A^{SPC} and Z_A^{LA} statistics are asymptotically standard normal. The Z_A^{SPC} and Z_A^{LA} the null hypothesis is stationarity.

Source: Prepared by authors.

As indicated in the Table 3, we observed that all the variables appear to be stationary especially for the intercept and trend. The results indicate that the non--stationarity cannot be rejected in only $LLC_{t\text{-}stat}$ in intercept for UNEMP, $IPS_{W\text{-}stat}$ in intercept for UNEMP, Z_A^{SPC} in intercept for GEXPG.

Westerlund (2005) Cointegration Test is done to test the null hypothesis of cointegration against the alternative of non cointegration, which is equivalent to testing $H_0 : \sigma_i^2 = 0$ for all i against $H_1 : \sigma_i^2 > 0$ for some i.

T a b l e 4

Cointegration Tests Results

	Test	Cointegration test
No breaks	Value p-value[a] p-value[b]	40.628 0.000 0.994*
Breaks	Value p-value[a] p-value[b]	22.492 0.011 0.943*

Note: The p-value[a] is based on the asymptotic normal distribution. The p-value[b] is based on the bootstrapped distribution. We use 1000 bootstrap replications. * indicates cointegration.

Source: Prepared by authors.

Table 4 indicates that the null hypothesis of cointegration is strongly rejected for the no break-model and asymptotic normal distribution. However, these results should be interpreted with caution, as erroneous omissions of structural breaks are known to make this type of test biased towards cointegration. “Break--model” is the null hypothesis of cointegration which is also unable to reject an asymptotic normal distribution. Indeed, if we allow for structural shifts as well as cross-country dependence, the null hypothesis of cointegration cannot be rejected at the 10 percent of level bootstrapped distribution. These findings suggest that the variables are strongly cointegrated.

Table 5 indicates the alternative estimation for relations between long-run economic growth and its determinants: MG, which imposes no restrictions; PMG which imposes common long-run effects (Pesaran et al., 1999, p. 628).

T a b l e 5

Results for PMG, MG and DFE

	PMG	MG	Hausman Test	DFE
Long-run coefficient				
GEXPG	0.061	0.184	0.81	0.046
UNEMP	–0.003	–0.026	0.91	–0.021
GDS	0.186	0.206	0.70	0.341
FDI	0.016	0.029	0.74	0.035
HT	0.011	0.056	0.56	0.009
Error correction coefficient				
Ø	–0.884	–0.861		
Diagnostics				
Log-likelihood	312.76	283.81		
χ^2_{SC}	4.62	3.21		
χ^2_{HE}	0.87	0.83		

Note: ***, * and * indicate the rejection of the null hypothesis at 1%, 5% and 10% level of significance, respectively. The maximum number of lags for each variable is set at two, and optimal lag lengths are selected by the AIC. χ^2_{SC}, χ^2_{HE} denote chi-squared statistics to test for no residual serial correlation and homoscedasticity, respectively.

Source: Prepared by authors.

The negative and significant error correction coefficients ($Ø_i$) illustrated on Table 5 indicates not only the presence of the cointegration among the variables but also the adjustment towards equilibrium between economic growth and other variables.

The Hausman test indicates that the null hypothesis of the long-run homogeneity for each variable cannot be rejected at 1% level of significance. This justifies a use of the PMG estimator, which is consistent and efficient under the long--run homogeneity. The diagnostic test results reported in Table 5 show the absence of any autocorrelations or heteroscedasticity in the individual equations, as can be seen in the long-run coefficients in Table 5. While a 1% increase in *GEXPG* increases economic growth by between the ranges of 0.18 – 0.06% in the developed countries, as indicated in the econometric findings, *GEXPG* has a positive effect on economic growth in the developed countries.

Results

In this study, ARDL and DFE models have used for the long-run relationship between economic growth and other variables. In the models, the explanatory variables have a strong positive effect on economic progress in developed countries, while unemployment (as a percentage of total labour force) has a negative impact on economic growth. The most significant variable of the PMG turns out to be gross domestic savings. MG estimator of the ARDL model results is consistent with the PGM results, but the most significant variable in the MG estimator becomes government expenditure. DFE model results are accurate with ARDL model. The most significant variable of the DFE model turns out to be gross domestic savings.

Based on these results, we can say that public spending has a positive effect on economic growth in developed countries and gross domestic savings, FDI, RD and High-technology exports are also important for most of the developed countries of our sample. In other words, not only developing countries but also developed countries need government expenditure, FDI inflows, RD, and High-technology exports. These variables play an important role in the growth process of developed countries. Additionally, these results show that the effective instrument with which government expenditures can influence the growth rate of the economy is public spending on productive investments, giving rise to a positive externality.

References

ALEXIOU, C. (2009): Government Expenditure and Economic Growth: Econometric Evidence from South Eastern Europa (SSE). Journal of Economic and Social Research, *1*, No. 1, pp. 1 – 16.

ALSHAHRANI, S. A. – ALSADIQ, A. J. (2014): Economic Growth and Government Spending in Saudi Arabia: an Empirical Investigation. [IMF Working Paper, WP/14/3, January 2014.] Washington, DC: International Monetary Fund.

BARRO, R. (1990): Government Spending in a Simple Model of Endogenous Growth. Journal of Political Economy, *98*, Part II, pp. 103 – 125.

BARRO, R. – SALA-i-MARTIN, X. (1992): Public Finance in Models of Economic Growth. Review of Economic Studies, *59*, No. 4, pp. 645 – 661.

BARRO, R. – SALA-i-MARTIN, X. (1995): Economic Growth. New York: McGraw-Hill.

BARRO, R. J. (1991): Economic Growth in a Cross-Section of Countries. Quarterly Journal of Economics, *106*, No. 2, pp. 407 – 443.

BREUSCH, T. S. – PAGAN, A. R. (1980): The Lagrange Multiplier Test and Its Applications to Model Specification in Econometrics. Review of Economic Studies, *47*, No. 1, pp. 239 – 253.

BURTON, A. (1999): The Effect of Government Size on the Unemployment Rate. Public Choice, *99*, No. 3 – 4, pp. 395 – 401.

CASHIN, P. (1995): Government Spending, Taxes and Economic Growth. [IMF Staff Papers, Vol. *42*, pp. 237 – 269.] Washington, DC: International Monetary Fund.

CHUDE, N. P. – CHUDE, D. (2013): Impact of Government Expenditure on Economic Growth in Nigeria. International Journal of Business and Management Review, *1*, No. 4, pp. 64 – 71.

ENGEN, E. M. – SKINNER, J. (1992): Fiscal Policy and Economic Growth. [Working Paper, No. 4223.] Cambridge, MA: NBER.

GHURA, D. (1995): Macro Policies, External Forces, and Economic Growth in Sub-Saharan Africa. Economic Development and Cultural Change, *43*, No. 4, pp. 759 – 778.

GUSEH, J. S. (1997): Government Size and Economic Growth in Developing Countries: A Political-Economy Framework. Journal of Macroeconomics, *19*, No. 1, pp. 175 – 192.

HADRI, K. – KUROZUMI, E. (2012): A Simple Panel Stationarity Test in the Presence of Serial Correlation and a Common Factor. Economics Letters, *115*, No. 1, pp. 31 – 34.

HAUSMAN, J. A. (1978): Specification Tests in Econometrics. Econometrica, *46*, No. 6, pp. 1251 – 1271.

IM, K. S. – PESARAN, M. H. – SHIN, Y. (2003): Testing for Unit Roots in Heterogeneous Panels. Journal of Econometrics, *115*, No. 1, pp. 53 – 74.

JONES, L. – MANUELLI, R. – ROSSI, P. (1993): Optimal Taxation in Models of Endogenous Growth. Journal of Political Economy, *101*, No. 3, pp. 485 – 519.

JONG-WHA, L. (1995): Capital Goods Imports and Long-Run Growth. Journal of Development Economics, *48*, No. 1, pp. 91 – 110.

KING, R. – REBELO, S. (1990): Public Policy and Economic Growth: Developing Neoclassical Implications. Journal of Political Economy, *98*, No. 1, pp. 126 – 151.

KNELLER, R. – BLEANEY, M. F. – GEMMEL, N. (1999): Fiscal Policy and Growth: Evidence from OECD Countries. Journal of Public Economics, *74*, No. 2, pp. 171 – 190.

KNOOP, T. A. (1999): Growth, Welfare, and the Size of Government. Journal of Economic Inquiry, *37*, No. 1, pp. 103 – 119.

LEVIN, A. – LIN, C. F. – CHU, C. (2002): Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. Journal of Econometrics, *108*, No. 1, pp. 1 – 24.

LUCAS, R. (1990): Supply-side Economics: An Analytical Review. Oxford Economic Papers, *42*, No. 2, pp. 293 – 316.

MENDOZA, E. – MILESI-FERRETTI, G. – ASEA, P. (1997): On the Effectiveness of Tax Policy in Altering Long-Run Growth: Harberger’s Superneutrality Conjecture. Journal of Public Economics, *66*, No. 1, pp. 99 – 126.

KOJO, M. – WOLDE-RUFAEL, Y. (2013): Government Expenditure and Economic Growth: The Ethiopian Experience, 1950 – 2007. Journal of Developing Areas, *47*, No. 1, pp. 263 – 280.

NASIRU, I. (2012): Government Expenditure and Economic Growth in Nigeria: Cointegration Analysis and Causality Testing. Academic Research International, *2*, No. 3, pp. 718 – 723.

NELSON, M. A. – SINGH R. D. (1994): Deficit-Growth Connection: Some Recent Evidence from Developing Countries. Economic Development and Cultural Change, *43*, No. 1, pp. 167 – 191.

PESARAN, M. H. (1997): The Role of Economic Theory in Modelling the Long Run. Economic Journal, *107*, No. 440, pp. 178 – 191.

PESARAN, M. H. (2004): General Diagnostic Test for Cross Section Dependence in Panels. [IZA Discussion Paper, No. 1240.] Bonn: IZA – Institut of Labor Economics.

PESARAN, M. H. (2007): A Simple Panel Unit Root Test in the Presence of Cross-section Dependence. Journal of Applied Econometrics, *22*, No. 2, pp. 265 – 312.

PESARAN, M. H. – ULLAH, A. – YAMAGATA, T. (2008): A Bias-Adjusted LM Test of Error Cross Section Independence. Econometrics Journal, *11*, No. 1, pp. 105 – 127.

PESARAN, M. H. – SHIN, Y. – SMITH, R. (1999): Pooled Mean Group Estimation of Dynamic Heterogeneous Panels. Journal of the American Statistical Association, *94*, No. 446, pp. 621 – 634.

STOKEY, N. – REBELO, S. (1995): Growth Effects of Flat-Rate Taxes. Journal of Political Economy, *103*, No. 3, pp. 510 – 550.

WESTERLUND, J. (2005): Testing for Panel Cointegration with Multiple Structural Breaks. Oxford Bulletin of Economics and Statistics, *68*, No. 1, pp. 101 – 132.

WB (2015): World Development Indicator 2015. Washington, DC: World Bank.

A p p e n d i x

Selected High-Income OECD Countries

Australia	Korea, Rep.
Austria	Netherlands
Canada	New Zealand
Denmark	Norway
Finland	Portugal
France	Spain
Germany	Sweden
Iceland	Switzerland
Ireland	United Kingdom
Italy	United States
Japan	

Source: Prepared by authors.