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Government Expenditures and Economic Growth: An Analysis of Developed, Developing and Underdeveloped Countries

Kamu Harcamaları ve Ekonomik Büyüme: Gelişmiş, Gelişmekte Olan ve Az Gelişmiş Ülkeler Üzerine Bir Analiz

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ÖZ

Bu çalışma 1980-2012 dönemi arasında gelişmiş, gelişmekte olan ve az gelişmiş ülkelerdeki kamu harcamalarının ekonomik büyümeyi nasıl etkilediğini incelemektedir. Sonuçlar, kamu harcamalarının azgelişmiş ülkeler için sabit ve rassal etki modellerinde ekonomik büyüme üzerinde olumlu bir etkiye sahip olduğunu; ancak, gelişmiş ülkelerde kamu harcamaları ile ekonomik büyüme arasında anlamlı negatif bir ilişki olduğunu göstermektedir. Gelişmekte olan ülkeler için ise kamu harcamaları, sabit efektif model durumunda ekonomik büyümeyi olumsuz etkilemekte; buna karşın rassal etki modelden elde edilen bulgulara göre değişkenler arasında pozitif ve anlamsız bir ilişki vardır.

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ABSTRACT

This paper assess how the government expenditures affected economic growth in developed, developing and underdeveloped countries by using the unbalanced panel approach for the period of 1980-2012. The results indicate that government spending has positive significant impact on economic growth in fixed and random effect models for underdeveloped countries, while for developed countries there is a significant negative relationship between government expenditure and economic growth in both fixed and random effect models. For the developing countries government spending has negative significant impact on economic growth in case of fixed effect model, while for the random effect model, there is positive and insignificant relationship of government spending to economic growth.

1. Introduction

Government expenditure and its effect on economic growth, and vice versa, has been an issue of sustained interest among economists who discussed the association between public expenditure and economic growth for decades. The causal relation between public expenditure and economic growth requires a close investigation. Questions of interest might include: is it economic growth leading to government expenditure or is it public expenditure bringing about the expanding economic growth? In this paper it is investigated whether the effect of government spending on economic growth has changed according to the level of economic development of the countries. This is one of the main differences from the other studies in the literature.

It is widely recognized that government is one of the main actors in the regulation of the economy. The basic economic objective of the government is to stabilize all the economic variables. Thus, government spending plays an important role in the country's economic growth and development. Government spending affects economic growth in different

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sets of channels. The first channel is the labor market channel which linked with the fiscal policy mechanism with higher wages, reduction of profits and investment leads to economic growth. The second channel is the private sector consumption leads to high investment, expected high profits and high economic growth (Alesina et al., 1999). The third main channel is fiscal adjustment with public debt reduction relying on the revenue and expenditures approach that can enhance output and economic growth (Baldacci et al., 2013). The forth channel is the interest rate channel which shows that the lower interest rate with the provision of debt to the private sectors by the government leads to higher investment and higher economic growth.

There are two schools of thoughts regarding the relationship between government expenditures and economic growth. On the one hand, Wagner's law describes that economic growth affects to the government expenditure which evidence the classical school of thoughts. Among several interpretations of Wagner's Law, the most popular one would be that the increase in economic activities leads to an increase in government activities, which in turn results in the increase of public expenditure (Bayrak and Esen, 2014). This implies that public expenditure can be treated as an outcome, or an endogenous factor of economic growth. On the other hand, Keynesian school of thought shows that government expenditure accelerates the economic growth through exogenous factors such as money supply, taxation, labor, technological and workforce growth and free markets. According to the Keynesian view, government could reverse economic downturns by borrowing money from the private sector and then returning the money to the private sector through various spending programs. High levels of government consumption are likely to increase employment, profitability and investment via multiplier effects on aggregate demand. Thus, government expenditure, even of a recurrent nature, can contribute positively to economic growth. In addition to these views, sometimes there might not be causality between government expenditures and economic growth, or even a negative relationship. In other words, it is assumed that the possible disruptions that may arise in an economy are temporary and that there are sufficient dynamics that can be eliminated within the structure of the market economy, therefore, it is argued that the intervention of the state to the economic life is unnecessary. However, if the state intervenes to the economy, it will not increase economic growth, on the contrary, it is expressed that the economy will distort the natural order that operates within its natural laws (Esen and Bayrak, 2015). Lots of empirical studies about this subject have found different results for the relationship between government expenditures and economic growth. According to the Ricardo-Barro Equilibrium Hypothesis, when the state gives the opportunity to spend more to the people by reducing taxes, they predict that the budget deficit that will arise will be covered by the debt and that these debts will be covered by the tax increase in the future and they will save money. Therefore, according to the Ricardo-Barro Equilibrium Hypothesis, the money transferred to the economic units by lowering the taxes does not come out as spending on the market as expected and does not create the expected refreshing effect. However, in the long run, the government's additional interest created by the introduction of the lendable funds market in order to close public deficits increases the resulting interest rates, which has the effect of reducing private sector borrowing demand and therefore investments. This is called exclusion. Because individuals are rational, they anticipate that public deficits will cover up with tax in the long term and they increase their savings by reducing their spending to meet these new taxes and supply these savings to the lendable funds market. As the state enters the market with the demand for additional borrowing, the increased interest rates start falling with the supply of funds of the individuals and the private sector will not be excluded. Hence, the equivalence hypothesis suggests that the effect of tax reductions is neutral (Eğilmez, 2017).

The purpose of this paper is to shed light on how government expenditures affects economic growth in developed, developing and underdeveloped countries using the unbalanced panel approach for the period of 1980-2012. The remainder of this paper is organized as follows. Section 2 sets out the literature review about the relationship between government expenditures and economic growth. In section 3 data and methodology are given and in section 4 findings with application are mentioned and after that some concluding remarks are offered in section 5.

2. Literature Review

Government expenditure and its effects on the economic growth can be predicted for the short as well as the long run. However, economists are really interested to find out the impact of government expenditure on economic growth. The question arises about the sign of the economic growth in developed, developing and underdeveloped countries.

Some studies such as Hsieh and Lai (1994), Rasiah and Shari (2001), Rodden (2003), Loizidies and Vamvoukas (2005), Barro (2005), Moraga and Pierre (2008), Futagami et al. (2008), Marrero (2008), Mourmouras and Peter (2009), Constantinos (2009), Hashimzade and Myles (2010), Park (2010), Dioikitopoulos and Kalyvitis (2010), Martin and Vanberg (2013), Palazuelos (2013) and Esen and Bayrak (2015) have found that government expenditures promote economic growth, while other studies, such as Barro (1990), Lipsmeyer (2002), Simonazzi (2003), Weller (2004), Noorudin and Simmons (2006), Garrett and Wheelcok (2006), Mattaeo (2009), Drmaechea and Marozumi (2013), Besley et al. (2010), Faricy (2011), Ellis and Faricy (2011), Barro and Redlick (2011), Taylor et al. (2012) and Rickard (2012) support the view that the expenditures hinder economic growth.

Fan and Rao (2003) and Akitoby et al. (2006); making their analysis for the 51 developing countries and found that there is long run positive co-integration relationship between the government expenditures and economic growth under the output channel; while the Wagner's law also hold. Wu et al. (2010) made their research under the panel econometric modeling for 182 countries and found that Wagner's law holds and the government expenditures have positive impact on economic growth under the Granger Causality approach. Government spending leads to negative economic growth in the developing countries because the wage-earners do not get their appropriate wage and fail to produce the output. Chamorro-Narvaez (2012) found that government expenditures and its impact on economic growth are inconclusive for developing countries under the neo-classical growth theory.

The reason behind the no long term effect of government spending on economic growth is the size of the government and various assumptions by the empirical researchers. Bader and Abu-Qarn (2012) found that there is bi-directional causality of government expenditures with economic growth with negative sign for the developing countries. The impact of government spending on economic growth is mixed in some studies for developing countries. In Africa, the impact of government spending on agriculture and health on economic growth is strong; while in Asia the impact of government spending on defense, agriculture and education has positive impact on economic growth. Dao (2012) by using the 28 developing countries for finding the impact of government expenditure on economic growth with the simultaneous equation model under demand side of Keynesian channel, observed that coefficient estimates do not have expected sign of government spending with economic growth due to collinearity among the independent variables such as spending on education and health expenditures. Dinca and Dinca (2013) indicated their results under the micro-econometric panel data for the East European countries and found that there is positive correlation amongst government expenditures and security expenditure; while there is negative association between government expenditure with national defense and general public services. There is no relationship between healthcare and educational expenditure and gross domestic product (GDP).

Some studies show the following results from government spending on economic growth for the developed countries through the different channels: (Barro, 1990) showed that government expenditure affect long term economic growth through the endogenous growth model for the USA. Hsieh and Lai (1994) by using the G-7 countries with multivariate time series, showed that the government expenditure and its impact on economic growth can be vary across time and across major industrialized countries. They showed that there is ambiguity for the determination of the sign of the relationship between government spending and economic growth. Under the cyclical adjustment and elasticity analysis for the European Union countries, Arapia and Turrini (2008) found that under the primary expenditure and output channel there is long run co-integration relationship of government spending and economic growth. Government expenditures positively affect economic growth in the Eastern European countries through the following channels: government spending on capital formation, development assistance, private investment and trade-openness (Alexiou, 2009). There is bi-directional causality of government expenditures with economic growth by using the simultaneous equation model under the labor market channels for the USA (Roy, 2012).

Lots of theories show the different channels of macroeconomics through which government expenditure affect economic growth under time series analysis for the single country analysis as a general perception. Economic growth can be determined through the exogenous population growth and technical progress rate (Solow, 1956). Government spending by means of providing the loans to the private sectors in less interest rate leads to efficient and positive growth. Arpaia and Turrini (2008) showed that government expenditure positively affects economic growth; if the government spends on agricultural development, health policies, transportation, communication, saving, and income determination. Economic growth can't be determined through the government expenditures for the long term. Alexiou (2009) showed that government expenditure negatively affects the economic growth if the government already has a balanced budget. Samimi and Habibian (2010) show that government expenditure affects economic growth positively through trade openness. Economides et al. (2011) showed that government expenditure negatively affects economic growth in the long run through the money supply channel. Besley et al. (2011) showed that government expenditure positively affects economic growth by funding, investing in development sectors such as constructions.

Rubio (2000) and Barro (1990) showed that if the government size is large then the government expenditures are negatively affecting to the economic growth; while in the small size of the government's economic growth is positively affecting to government expenditures.

Some studies found mixed results for developed, developing and under developed countries: Barro (1996) showed by using the developed and developing countries, that reduction in government expenditure on consumption, low government size, and human capital played a positive role on economic growth. Gwartney et al. (1998) showed that government expenditure and its impact on the economic growth is ambiguous for developed, developing and underdeveloped countries. Wu et al. (2010) showed by using the Granger Causality analysis for developed and developing countries for the period of 1959-2004, found that government expenditures affect economic growth through the Keynesian mechanism as well as Wagner's law. Government expenditure positively affect economic growth for underdeveloped country Nigeria by using the Johansen co-integration and revealed that there is long run relationship between government expenditure and economic growth (Muritala et al., 2011). Ramey (2011) showed that government using public spending in less efficient public sector and private sector in the credit market leads to high interest rate and a decrease in economic growth. Dinca and Dinca (2013) by using the micro-panel data for 10 developed and developing countries, showed that government expenditure are positively affect economic growth by using the real GDP per capita channel and negatively relating to public defense expenditures with general public services.

3. Data and Methodology

In this study we have taken total 185 countries: 50 developed, 91 developing and 44 underdeveloped countries from 1980 to 2012. Our main interest is to find the impact of public spending on economic growth, with an unbalanced panel, whether the impact is positive or negative. For this analysis, we obtained the data from International Monetary Fund (IMF). In order to measure this analysis, we used public expenditure on total public expending, GDP as a share of economic growth, GDP per capita in terms of U.S dollars. The countries used for our research are presented in Section 1. In Panel analysis for finding the long run co-integration relationship between the variables; Pedroni and Kao tests are utilized. The Pederoni test was first developed in 1999 for the co-integration. The panel regression is expressed in equation (1).

$$y_{it} = \alpha_{it} + \delta_{it} t + X_{it}\beta_i + e_{it} \tag{1}$$

In equation one the number and the size of equality of observable variables are expressed. This test is used for the panel co-integration relations with null hypothesis of co-integration with finite asymptotic properties with observations. For the long term and the dynamic model of co-integration relationship; the dynamic co-integrated panel allows measuring the heterogeneity among individual sections and with two groups. The first group composed of four statistics with intra size approach that are the panel $\rho -$ statistics, panel pp statistics, panel $\upsilon -$ statistics and panel ADF test. These statistics are used to measure the horizontal section with estimation of unit root tests of residual series that combines the autoregressive coefficient. The second group is based on inter-dimensional approach which is composed of three tests. These three tests are group $\rho -$ statistics, group pp statistics and group ADF statistics. These statistics are also used for the horizontal section of individual selection that is based on estimated average coefficient estimator (Lee, 2005: 419).

Pedroni (1999) has expressed the two group statistics based on the following equations:

Panel v-statistic

$$Z_v = \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^{2} \right)^{-1} \tag{2}$$

Panel ρ-Statistics

$$Z_\rho = \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^{2} \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \left(\hat{e}_{i,t-1} \Delta\hat{e}_{it} - \hat{\lambda}_i \right) \tag{3}$$

Panel PP-Statistics

$$Z_t = \left(\hat{\sigma}^2 \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^{2} \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \left(\hat{e}_{i,t-1} \Delta\hat{e}_{it} - \hat{\lambda}_i \right) \tag{4}$$

Panel ADF-Statistics

$$Z_t^* = \left(\hat{s}^{*2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^{*2} \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^{*} \Delta\hat{e}_{it}^{*} \tag{5}$$

Group ρ-Statistics

$$\tilde{Z}_\rho = \sum_{i=1}^{N} \left(\sum_{t=1}^{T} \hat{e}_{i,t-1}^{2} \right)^{-1} \sum_{t=1}^{T} \left(\hat{e}_{i,t-1} \Delta\hat{e}_{it} - \hat{\lambda}_i \right) \tag{6}$$

Group PP-Statistics

$$\tilde{Z}_t = \sum_{i=1}^{N} \left(\hat{\sigma}^2 \sum_{t=1}^{T} \hat{e}_{i,t-1}^{2} \right)^{-1/2} \sum_{t=1}^{T} \left(\hat{e}_{i,t-1} \Delta\hat{e}_{it} - \hat{\lambda}_i \right) \tag{7}$$

Group ADF-Statistics

$$\tilde{Z}_t^* = \sum_{i=1}^{N} \left(\hat{s}_i^2 \sum_{t=1}^{T} \hat{e}_{i,t-1}^{*2} \right)^{-1/2} \sum_{t=1}^{T} \left(\hat{e}_{i,t-1}^{*} \Delta\hat{e}_{it}^{*} \right) \tag{8}$$

In the above equation 1 we obtained residual $\hat{e}_{it}$, $\hat{L}_{11i}^2$ and $\Delta\hat{e}_{it}$ are obtained for the estimated long run co-variance matrix. Similarly $\hat{\sigma}_i^2$ and $\hat{s}_i^2$ $\left(\hat{s}_i^{*2}\right)$ are obtained for long term temporal co-variance for individual terms. These above seven tests fulfill the properties of asymptotic which follows standard normal distribution. Panel $\upsilon -$ statistics are obtained by rejecting the null hypothesis that long run co-integrated relationship exists with positive values; while the null hypothesis rejected the negative effect that was captured with statistics. Pedroni (1999) test is different than Kao (1999) with discrete and uniform special coefficients. Equation 9 is based on the following number of the panel regression model (Lau et al., 2011: 148):

$$y_{it} = x_{it}'\beta + z_{it}'\gamma + \varepsilon_{it} \tag{9}$$

In equation (9) y_{it} and x_{it} are co-integrated of order (1) and have the long run co-integration relationship. $z_{it} = \left\{\mu_i\right\}$; advocating the equality as Kao (1999) represented, that the series has the unit root and the test was investigated with DF and ADF for finding the co-integration relationship. DF and ADF series is calculated using the equations

$$\hat{\varepsilon}_{it} = \rho\hat{\varepsilon}_{i,t-1} + v_{it} \qquad \hat{\varepsilon}_{it} = \rho\hat{\varepsilon}_{i,t-1} + \sum_{j=1}^{p} \varphi_j \Delta\hat{\varepsilon}_{i,t-j} + \varepsilon_{it}$$

with the estimation of the error term $\hat{\varepsilon}_{it} = \tilde{y}_{it} - \tilde{x}_{it}\hat{\beta}$ and $\tilde{y} = y_{it} - \bar{y}_i$. In the light of this pattern we can have ρ and T statistics with OLS estimates:

$$\hat{\rho} = \frac{\sum_{i=1}^{N}\sum_{t=2}^{T}\hat{\varepsilon}_{it}\hat{\varepsilon}_{t-1}}{\sum_{i=1}^{N}\sum_{t=2}^{T}\hat{\varepsilon}_{it}^{2}} \; and \; \frac{(\hat{\rho}-1)\sqrt{\sum_{i=1}^{N}\sum_{t=2}^{T}\hat{\varepsilon}_{i,t-1}^{2}}}{S_e} \tag{10}$$

The equation (10) shows that series are assumed to have the co-integration relationship with null hypothesis whole the alternate hypothesis of no-integration relationship. Kao (1999) has calculated DF and ADF statistics with the following equations:

$$DF_\rho = \frac{\sqrt{N}T\left(\hat{\rho}-1\right) + 3\sqrt{N}}{\sqrt{51/5}} \tag{11}$$

$$DF_t = \sqrt{\frac{5t_\rho}{4}} + \sqrt{\frac{15N}{8}} \tag{12}$$

$$DF_\rho^* = \frac{\sqrt{N}T\left(\hat{\rho}-1\right) + \frac{3\sqrt{N}\hat{\sigma}_v^2}{\hat{\sigma}_{0v}^2}}{\sqrt{3 + \frac{36\hat{\sigma}_v^4}{5\hat{\sigma}_{0v}^4}}} \tag{13}$$

$$DF_t^* = \frac{t_\rho + \dfrac{\sqrt{6N}\hat{\sigma}_v}{2\hat{\sigma}_{0v}}}{\sqrt{\dfrac{\hat{\sigma}_{0v}^2}{2\hat{\sigma}_v^2} + \dfrac{3\hat{\sigma}_v^2}{10\hat{\sigma}_{0v}^2}}} \quad (14)$$

$$ADF = \frac{t_{ADF} + \dfrac{\sqrt{6N}\hat{\sigma}_v}{2\hat{\sigma}_{0v}}}{\sqrt{\dfrac{\hat{\sigma}_{0v}^2}{2\hat{\sigma}_v^2} + \dfrac{3\hat{\sigma}_v^2}{10\hat{\sigma}_{0v}^2}}} \quad (15)$$

In the equation (15), $\hat{\sigma}_v^2 = \hat{\Sigma}yy - \hat{\Sigma}yx\hat{\Sigma}^{-1}xx$ and $\hat{\sigma}_{0v}^2 = \hat{\Omega}yy - \hat{\Omega}yx\hat{\Omega}^{-1}xx$; the t-value is based on the following $\hat{\varepsilon}_{it} = \rho\hat{\varepsilon}_{i,t-1} + \sum_{j=1}^{T}\varphi_j\Delta\hat{\varepsilon}_{i,t-j} + \nu_{itp}$. Following for the co-integration analysis, cause-and-effect relationship between the variables for the first time in the literature was observed Granger (1964, 1969) and then imparted with causality analysis by Hamilton (1994). Granger causality of the relationship between the two variables X and Y, the direction was investigated. If the current value of Y affects the current value of X, or the current value is better estimated using the past value. For this analysis Granger causality is the better estimation (Charemz and Deadman, 1993: 190). Co-integration relationship and the causal relationship is investigated in equation (16) and (17) (Kutlar, 2007: 267):

$$Y_{it} = \sum_{i=1}^{n}\alpha_{it}Y_{i,t-k} + \sum_{i=1}^{n}\beta_{it}X_{i,t-k} + EC_{it-1} + u_{1it} \quad (16)$$

$$X_{it} = \sum_{i=1}^{n}\alpha_{it}X_{i,t-k} + \sum_{i=1}^{n}\beta_{it}Y_{i,t-k} + EC_{it-1} + u_{2it} \quad (17)$$

In equation (16) and (17), the error terms are uncorrelated. The dependent variables are based on the past value of dependent and independent variable, plus the lagged value of the error correction term. In the above equations (16) and (17) can there uni-directional causality, bi-directional causality between the variables? Our main interest is to find out that whether the causality exists or not based on the Granger Causality. Long-term relationship between the variables obtained from the co-integration equation error residuals that are incorporated with error correction term.

4. Findings with Application

In the panel estimation, the main investigation is that the variables have a unit root. To test whether the unit root exist in the panel data with cross-sectional dependence; if the hypothesis is rejected then cross sectional dependence. In section one the unit root test is being used with cross sectional dependence is valid; while in section two; horizontal dependence is found to be valid. The second section of the paper gives the more consistent result compared to section one. Table 1 shows the results of various tests that measure horizontal section reflects dependence (Çınar, 2010: 594).

Table 1. Cross Section Dependence Test Results

Test	Statistics	Probability
Developed Countries		
Brusch-Pagan LM Statistics	2.124	0.374
Pearson LM Statistics	0.672	0.815
Pearson CD Statistics	0.163	0.994
Friedman LM Statistics	177.415*	0.000
Frees Q Statistics	4.569*	0.000
Developing Countries		
Brusch-Pagan LM Statistics	2.458	0.224
Pearson LM Statistics	0.563	0.923
Pearson CD Statistics	0.738	0.737
Friedman LM Statistics	92.593*	0.000
Frees Q Statistics	7.561*	0.000
Underdeveloped Countries		
Brusch-Pagan LM Statistics	1.964	0.884
Pearson LM Statistics	0.397	0.963
Pearson CD Statistics	0.283	0.832
Friedman LM Statistics	101.639*	0.000
Frees Q Statistics	4.784*	0.000
Panel		
Brusch-Pagan LM Statistics	3.127	0.105
Pearson LM Statistics	0.622	0.836
Pearson CD Statistics	0.214	0.867
Friedman LM Statistics	126.519*	0.000
Frees Q Statistics	8.145*	0.000
Asymptotic Critical Values		
%1: 0.292	%5: 0.199	%10: 0.152

Note: The asymptotic critical values are only valid for Freese Q statistic. * Mark, about 1% of the value of statistics showed the significant level.

The first three statistics showed in Table 1 of cross sectional dependence with insignificant probabilities; while the last two statistics showed the cross-sectional correlations between the units and the cross sectional correlations can detect the presence of unit root and the last two statistics would be more appropriate for this analysis.

In Table 2 we discussed the diverse set of countries with panel unit root test. All three different groups of countries are taken into account with six stability test of the variables GDP and GE with level and first difference.

Taking into account that whether the data is stationary or non-stationary we have shown in the above table that all the variables are stationary with first difference. For determining the long run co-integration relationship, the Pedroni and Kao test is used. The results showed in Table 3 for the co-integration relationship.

Table 2. Panel Unit Root Test Results

Developed Countries												
	LLC t Statistics				Breitung *t* Statistics				IPS *W* Statistics			
Variables	Level	FD	N	Obs	Level	FD	N	Obs	Level	FD	N	Obs
GDP	0.764	-18.558***	50	1378	6.820	-6.226***	50	1328	-2.096**	-	50	1371
GE	-3.594***	-	50	1126	-4.766***	-	50	1076	-4.188***	-	50	1126
	ADF-Fisher χ^2 Statistics				PP-Fisher χ^2 Statistics				Hadri *Z* Statistics			
Variables	Level	FD	N	Obs	Level	FD	N	Obs	Level	FD	N	Obs
GDP	160.910***	-	50	1371	51.892	929.709***	50	1415	15.938	0.512**	50	1515
GE	161.525***	-	50	1126	128.391**	-	50	1156	11.355	0.790*	50	1156

Developing Countries												
	LLC *t* Statistics				Breitung *t* Statistics				IPS *W* Statistics			
Variables	Level	FD	N	Obs	Level	FD	N	Obs	Level	FD	N	Obs
GDP	9.104	-24.045***	90	2387	17.117	-6.923***	90	2297	11.581	-22.924***	90	2387
GE	-6.363***	-	90	1573	-0.473	-12.565***	90	1404	-4.479***	-	90	1573
	ADF-Fisher χ^2 Statistics				PP-Fisher χ^2 Statistics				Hadri *Z* Statistics			
Variables	Level	FD	N	Obs	Level	FD	N	Obs	Level	FD	N	Obs
GDP	104.400	933.751***	90	2387	67.558	1151.96***	90	2448	19.610	0.776**	90	2538
GE	300.838***	-	90	1573	330.791***	-	90	1624	15.223	0.673*	90	1694

Underdeveloped Countries												
	LLC *t* Statistics				Breitung *t* Statistics				IPS *W* Statistics			
Variables	Level	FD	N	Obs	Level	FD	N	Obs	Level	FD	N	Obs
GDP	3.110	-14.795***	44	1127	7.134	-6.275***	44	1083	3.708	-14.916***	44	1127
GE	-6.648***	-	44	810	-1.405*	-	44	766	-4.007***	-	44	810
	ADF-Fisher χ^2 Statistics				PP-Fisher χ^2 Statistics				Hadri *Z* Statistics			
Variables	Level	FD	N	Obs	Level	FD	N	Obs	Level	FD	N	Obs
GDP	78.398	451.889***	44	1127	49.099	873.614***	44	1147	12.149	0.885*	44	1235
GE	156.083***	-	44	810	167.334***	-	44	824	0.557***	-	44	868

Panel												
	LLC *t* Statistics				Breitung *t* Statistics				IPS *W* Statistics			
Variables	Level	FD	N	Obs	Level	FD	N	Obs	Level	FD	N	Obs
GDP	8.871	-33.619***	184	4892	19.595	-11.045***	184	4708	8.862	-32.392***	184	4892
GE	-8.929***	-	184	3509	-3.670***	-	184	3325	-7.202***	-	184	3509
	ADF-Fisher χ^2 Statistics				PP-Fisher χ^2 Statistics				Hadri *Z* Statistics			
Variables	Level	FD	N	Obs	Level	FD	N	Obs	Level	FD	N	Obs
GDP	343.709	1932.11***	184	4892	168.551	2955.28***	184	5010	30.452	0.762***	184	5194
GE	618.445***	-	184	3509	626.516***	-	184	3604	0.452**	-	184	3788

Note: GDP shows the gross domestic product while GE shows the government expenditure. In the above table the results are obtained for the unit root with level and first difference. FD shows the first difference, N shows the number of countries while the Obs shows the observations. Fisher tests specified for the asymptotic distribution of statistics and other test statistics are calculated taking into account the asymptotic normality assumption. *, ** And ***, respectively, of the variables related marks 10%, 5% and 1% at significance level that reflects stable analysis. Statistics when calculating the optimal lag length criteria SIC are used. Also, LLC, PP-Fisher and Hadri statistic values are used for calculating both the Barlett kernel and Newey-West bandwidth criteria.

Table 3. Pedroni and Kao Co-integration Test Results

Developed Countries			Developing Countries		
Pedroni Co-integration Test Results			Pedroni Co-integration Test Results		
Test	Statistics Value	Probability	Test	Statistics Value	Probability
Panel v Statistics	-4.882	1.000	Panel v Statistics	-1.691	0.954
Panel rho Statistics	-10.681***	0	Panel rho Statistics	-15.564***	0
Panel PP	-22.081***	0	Panel PP	-35.738***	0
Panel ADF Statistics	-18.918***	0	Panel ADF Statistics	-17.772***	0
Group rho Statistics	-4.325***	0	Group rho Statistics	-2.516***	0.005
Group PP Statistics	-22.886***	0	Group PP Statistics	-34.980***	0
Group ADF Statistics	-17.431***	0	Group ADF Statistics	-19.918***	0
Kao Co-integration Test Results			Kao Co-integration Test Results		
Test	Statistics Value	Probability	Test	Statistics Value	Probability
Kao-ADF Statistics	3.533***	0	Kao-ADF Statistics	-16.436***	0

Underdeveloped Countries			Panel		
Pedroni Co-integration Test Results			Pedroni Co-integration Test Results		
Test	Statistics Value	Probability	Test	Statistics Value	Probability
Panel v Statistics	-6.919	1.000	Panel v Statistics	-8.899	1.000
Panel rho Statistics	-3.635***	0	Panel rho Statistics	-20.534***	0
Panel PP	-10.570***	0	Panel PP	-42.656***	0
Panel ADF Statistics	-12.070***	0	Panel ADF Statistics	-35.740***	0
Group rho Statistics	-2.350***	0.009	Group rho Statistics	-5.164***	0
Group PP Statistics	-19.585***	0	Group PP Statistics	-45.972***	0
Group ADF Statistics	-15.124***	0	Group ADF Statistics	-30.338***	0
Kao Co-integration Test Results			Kao Co-integration Test Results		
Test	Statistics Value	Probability	Test	Statistics Value	Probability
Kao-ADF Statistics	-1.901**	0.028	Kao-ADF Statistics	-8.174***	0

Note: To determine Co-integration relationship in both tests we used Bartlett kernel and Newey-West bandwidth. Related to the variables in the calculation of the optimal lag length we used SIC criteria. Statistical values related marks ** and ***, respectively, 5% and 1%.

Table 3 shows that by using the Pedroni and Kao test for the developed, developing and under developed countries, the related variables have long run co-integration relationship. By obtaining the long-run co-integration relationship among the variables, it is expected that at least one-way causality exist between the variables. Therefore, in Table 4 the cause and effect between the variables we used the Granger Causality analysis for this fact.

Table 4. Granger Causality Analysis Results

Developed Countries			
Model Lag Length: 3			
Type of Variable	Direction of causality	*F* Statistics	EC_{t-1}
GDP-GE(1)	→	7.682***	-0.672***
GE-GDP(1)	-	0.394	-0.134
Underdeveloped Countries			
Model Lag Length: 1			
Type of Variable	Direction of causality	*F* Statistics	EC_{t-1}
GDP-GE(1)	-	0.498	0.114
GE-GDP(1)	→	13.322***	-0.897***
Developing Countries			
Model Lag Length: 1			
Type of Variable	Direction of causality	*F* Statistics	EC_{t-1}
GDP-GE(1)	→	20.691***	-0.957***
GE-GDP(1)	→	8.485***	-0.737**
Panel			
Model of the Delay Length: 8			
Type of Variable	Direction of causality	*F* Statistics	EC_{t-1}
GDP-GE(1)	→	8.616***	-0.770***
GE-GDP(1)	→	3.193***	-0.547**

Note: Values in parentheses, calculated using the AIC and SIC criteria reflect the optimal lag length. SIC criteria. For determining the length of the delay models; maximum of eight delay values are taken into account. *, ** And ***, showed level of significance , 10% , 5% and 1% respectively EC term, derived from the co-integration equation represents the error correction mechanism.

There is long run co-integration relationship between the variables in table 4. To find the long run co-integrated value we use the EC (Error Correction) analysis. In developed countries public spending positively affects economic growth while in underdeveloped countries the relationship is uni-directional. In the developing countries the relationship is bi-directional for public spending and economic growth. The value of the error correction is negative which showed the convergence of the variables in the long run. We have discussed the causal relationship between the variables. For the basis of causality analysis we will determine the fixed and random effect model for the countries. For the appropriate model determination, F-test and LM test are carried out in Table 5.

Table 5. F and LM test Result based on Time and Unit Effect

Developed Countries			
F Test		LM Test	
Test	Statistics	Test	Statistics
$F_{\text{-Unit}}$	2.587***	$LM_{\text{-Unit}}$	30.708***
$F_{\text{-Time}}$	26.082***	$LM_{\text{-Time}}$	2.935*
F-Unit Time	12.003***	LM-Unit Time	11.673***
Developing Countries			
F Test		LM Test	
Test	Statistics	Test	Statistics
$F_{\text{-Unit}}$	1.533***	$LM_{\text{-Unit}}$	3.454*
$F_{\text{-Time}}$	12.674***	$LM_{\text{-Time}}$	3.311***
F-Unit Time	4.630***	LM-Unit Time	2.873**
Underdeveloped Countries			
F Test		LM Test	
Test	Statistics	Test	Statistics
$F_{\text{-Unit}}$	7.889***	$LM_{\text{-Unit}}$	2.856*
$F_{\text{-Time}}$	3.149***	$LM_{\text{-Time}}$	2.798*
F-Unit Time	5.846***	LM-Unit Time	3.011**
Panel			
F Test		LM Test	
Test	Statistics	Test	Statistics
$F_{\text{-Unit}}$	3.083***	$LM_{\text{-Unit}}$	96.448***
$F_{\text{-Time}}$	22.733***	$LM_{\text{-Time}}$	2.767*
F-Unit Time	5.963***	LM-Unit Time	9.103***

Note: *, ** and ***, showed level of significance, 10%, 5% and 1% respectively.

In Table 5, under the assumption of fixed and random effects in the direction of F and LM tests and the effects of time of two-way unit has revealed that the results are valid. Upon detection of unit and time effects taken into account in the model in order to identify relationships between variables;

fixed and random effects models are estimated and the results of analysis are presented in Table 6.

By using the Hausman test for analyzing the model for precision for three types of countries, the fixed effect model shows the more consistent result. In the above table, the developed and developing countries showed the public spending negatively affects economic growth while underdeveloped countries it is positive. With the advanced level of economic globalization showed that by using the level of public expenditure is adversely affecting to economic growth. For being the integration of economy and relative performance; in underdeveloped countries workers are having in autarky situation which embodied the well-functioning of economic growth with the public spending. The underdeveloped countries are having the positive impact of government spending with economic growth that raises the level of market system and apply the liberal economic structuring with developed countries. The overall powers of the model with explanatory variables are significance probability while the model is stable. There is no problem of autocorrelation and heteroskedasticity in the model. The model with negative error correction term showed that the dynamics of convergence between the macroeconomic variables.

Table 6. Country Groups Aide Model Estimation Results

Developed Countries					
Fixed Effect Model			Random Effect Model		
Variables	Coefficient	*t* -Statistics	Variables	Coefficient	*t* -Statistics
C	3052.651***	3.963	C	2263.598***	4.097
GE	-46.636***	-2.950	GE	-27.371***	-3.616
EC(-1)	-0.108*	-3.475	EC(-1)	-0.136***	-3.620
Model Statistics					
R^2: 0.482 F: 12.085*** F(p): 0.000 DW: 1.979 $\chi^2_{BG}(2)$: 0.607 (0.583) χ^2_{BPG} : 7.651 (0.632)			R^2: 0.028 F: 16.330*** F(p): 0.000 DW: 1.986 Hausman Test: 65.774 (0.000) $\chi^2_{BG}(2)$: 0.435 (0.748) χ^2_{BPG} : 6.522 (0.483)		

Developing Countries					
Fixed Effect Model			Random Effect Model		
Variables	Coefficient	*t* -Statistics	Variables	Coefficient	*t* -Statistics
C	311.140***	3.829	C	150.985***	3.363
GE	-3.670*	-1.937	GE	1.814	1.247
EC(-1)	-0.101***	-3.586	EC(-1)	0.026	1.001
Model Statistics					
R^2: 0.470 F: 4.529*** F(p): 0.000 DW: 1.936 $\chi^2_{BG}(3)$: 0.716 (0.662) χ^2_{BPG} : 8.137 (0.284)			R^2: 0.001 F: 1.298 F(p): 0.273 DW: 1.971 Hausman Test: 130.341 (0.000) $\chi^2_{BG}(3)$: 0.435 (0.748) χ^2_{BPG} : 6.520 (0.483)		

Underdeveloped Countries					
Fixed Effect Model			Random Effect Model		
Variables	Coefficient	*t* -Statistics	Variables	Coefficient	*t* -Statistics
C	65.722**	2.459	C	19.867*	1.716
GE	0.006*	1.987	GE	1.736***	3.427
EC(-1)	-0.227***	-4.131	EC(-1)	-0.444***	-4.445
Model Statistics					
R^2: 0.503 F: 6.626*** F(p): 0.000 DW: 1.967 $\chi^2_{BG}(1)$: 0.642 (0.628) χ^2_{BPG} : 3.631 (0.772)			R^2: 0.209 F: 106.939*** F(p): 0.000 DW: 2.055 Hausman Test: 132.889 (0.000) $\chi^2_{BG}(1)$: 0.536 (0.409) χ^2_{BPG} : 2.006 (0.935)		

Panel					
Fixed Effect Model			Random Effect Model		
Variables	Coefficient	*t* -Statistics	Variables	Coefficient	*t* -Statistics
C	1554.502***	4.570	C	232.339***	2.808
GE	-33.355***	-4.704	GE	7.486***	3.127
EC(-1)	-0.080***	-3.557	EC(-1)	-0.183***	-4.251
Model Statistics					
R^2: 0.477 F: 5.934*** F(p): 0.000 DW: 1.998 $\chi^2_{BG}(2)$: 0.527 (0.712) χ^2_{BPG} : 7.301 (0.226)			R^2: 0.037 F: 69.166*** F(p): 0.000 DW: 2.012 Hausman Test: 339.573 (0.000) $\chi^2_{BG}(2)$: 0.494 (0.775) χ^2_{BPG} : 6.128 (0.379)		

5. Conclusion

Utilizing the annual data, this study attempts to find the relationship of government spending to economic growth for developed, developing and underdeveloped countries. Unbalanced panel approach is conducted for this analysis for the period of 1980-2012. Our results show that there is long run co-integration relationship between the variables. For finding the long run co-integrated value, EC (Error Correction) analysis was used. The value of the error correction is found negative, which shows the convergence of the variables in the long run. Granger Causality test shows that in underdeveloped countries public spending is affecting to economic growth, while in developed countries the causality has been found from economic growth to government expenditure. In the developing countries the relationship has been found bi-directional from public spending to economic growth and vice versa. Regression results show that government expenditures has positive significant influence on economic growth in fixed and random effect models for underdeveloped countries, whereas for developed countries there is negative significant relationship of government spending to economic growth in fixed and random effect models. For the developing countries government expenditures have negative significant impact on economic growth in case of fixed effect model, although for the random effect model, there is positive insignificant relationship of government spending to economic growth. As policy proposal it can be said that in low-level economies where the private sector is not developed well, the state must take an active role to maximize total welfare for economic growth. So, it seems that public spending encourages growth. However, after a certain income level has been exceeded and a private sector with strong capital structure has emerged, the share of the state in the economy has to decrease in parallel with these developments. For this reason, as the level of development increases, public spending needs to be reduced and the private sector needs to be supported

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Appendix 1. Countries Included in the Scope of Work

Developed Countries
Australia, Austria, Bahrain, Belgium, Brunei Darussalam, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Equatorial Guinea, Estonia, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan , Korea, Kuwait, Latvia, Lithuania, Luxembourg, Netherlands, New Zealand, Norway, Oman, Poland, Portugal, Qatar, Russia, Saudi Arabia, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Taiwan, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States, Uruguay, Venezuela
Developing Countries
Antigua and Barbuda, Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Bahamas, Barbados, Belarus, Belize, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Cameroon, Cape Verde, China, Colombia, Costa Rica, Fiji , Côte d'Ivoire, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Gabon, Georgia, Ghana, Guatemala, Guyana, Honduras, Hungary, India, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Laos, Lebanon, Lesotho, Libya, Macedonia, Maldives, Malaysia, Malta, Mauretania A, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Namibia, Nicaragua, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Republic of Congo, Romania, Senegal Seychelles, Serbia, South Africa, Sri Lanka, South Sudan St. Lucia, Sudan, Suriname, Swaziland, Syria, Thailand, Timor Leste, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Uzbekistan, Vietnam, Yemen, Zambia
Underdeveloped Countries
Afghanistan, Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Dominica, Eritrea, Ethiopia, Guinea, Guinea-Bissau, Grenada, Haiti, Kenya, Kyrgyzstan, Liberia, Madagascar, Malawi , Mali, Marshall Islands, Micronesia, Mozambique, Nepal, Niger, Palau, Rwanda, Samoa, Sao Tome and Principe, Sierra Leone, Solomon Islands, St. Kitts and Nevis, St. Vincent and the Grenadines, Tajikistan, Tanzania, Tonga, Tuvalu, Gambia, Uganda, Vanuatu, Zimbabwe

Note: In determining the categories of development of the countries prepared by the “World Bank Atlas Method” criteria were taken into consideration. According to this criterion, in 2012 per capita Gross National Product (GNP) is $ 1,025 or less for underdeveloped countries , $ 1,026 $ -12,475 for developing countries and $ 12,476 and more for the developed countries has been categorized.

Atlas Conversion Factors for a certain period t is calculated by the following equation:

$$e_t^* = \frac{1}{3}\left[e_{t-2}\left(\frac{P_t}{P_{t-2}} \Big/ \frac{P_t^{S\$}}{P_{t-2}^{S\$}} \right) + e_{t-1}\left(\frac{P_t}{P_{t-1}} \Big/ \frac{P_t^{S\$}}{P_{t-1}^{S\$}} \right) + e_t \right]$$

T means for time period, GDP per capita in US dollar is calculated with the following formula $Y_t^{\$} = \left(Y_t / N_t \right) / e_t^*$. In this equation e_t^* , t; are the time and ATLAS for the change factor with annual average exchange rate period. The GDP deflator for the time period t denominated in the US dollar, SDR deflator, on the basis of GDP per capita the level of local currency for the period of current GDP level and mid-year population has been used.