

# **THE EFFECT OF THE STATE’S WEIGHT ON ECONOMIC GROWTH: A COMPARISON OF COUNTRY GROUPS WITH DIFFERENT DEVELOPMENT LEVELS<sup>1</sup>**

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## **1. INTRODUCTION**

The question of how big the state should be in the economy has been a topic of discussion among economists for many years. The acceleration of this discussion approximately coincided with the Great Depression. Until the 1929 crises, the dominant economic thought of the classical/liberal school, “laissez faire,” was widespread worldwide. Many economists were not questioning the claim that the state’s weight in the economy should be minimized, but the fact that “laissez faire” was not a solution to the 1929 crisis made state intervention necessary. This necessity was propounded under the leadership of John Maynard Keynes.

After the 1929 crisis, the increase in the state’s weight in the economy reduced the negative effects of the crisis, and thus, the concerns about “laissez faire,” classical/liberal school’s view, which involve the idea that the state should not interfere in the economy, increased. Therefore, from the World War II to the mid-1970s, there were not much objection to the significant increase of the state’s size in the economy. However, after the 1973-74 oil crisis, monetarist school, which was led by Milton Friedman and has organic ties with the classical/liberal school, began to loudly express the claim that the state’s weight in the economy should be reduced. The rearticulating of the

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widespread classical opinion before the Great Depression with different arguments and its implementation after 1980 caused these practices to be known as neo-liberal policies. The economic events underlying the emergence of neoliberal policies in developed and developing countries are as follows. When the Organization of the Petroleum Exporting Countries (OPEC) increased oil prices approximately five times in 1974, developed European economies experienced stagflation problem (Boratav, 2015: 195). Since the high prices paid by developing countries for oil, which is the basic energy source, increased their imports, they were unable to export to European countries because the shrinking of the European economies significantly reduced their exports. This situation made developing countries formulate policies to address foreign trade deficit (Kepenek and Yentürk, 2010: 210). All these economic problems led to the questioning of the state's size, which increased after the great depression, in the economy. The rising objections against the state's intervention in the economy apply to international organizations, such as the International Monetary Fund (IMF) and World Bank (WB). Organizations such as the IMF and WB offered a uniform solution to all countries experiencing economic problems from the 1980s to the 2000s without considering the level of their development (Hu, 2014: 318). The most important feature of this common solution is the reduction of the state's weight in the economy.

Neoliberal policies that were applied after the 1980s were regarded as the cause of the financial crises that became widespread worldwide from the 1990s. Because of the loss of welfare due to the financial crises, in many parts of the world, people were against neoliberal policies, which include the idea of reducing the weight of the state in the economy (Hudson, 2004: 237-238). Thus, the debates about the state's size in the economy have been reignited since the 1990s. It should not be forgotten that there are many different schools of economics that have discussed the state's weight in the economy since the Great Depression. Although these schools differ from each other in small details, just as monetarists have the characteristic of being a continuation of the liberal school, they are basically a continuation of either the liberal or Keynesian school.

This study uses empirical tests to explain the effect of the size of the state on the economy in various countries with different levels of development from 1980 to 2016. Rather than participating in the aforementioned discussion under the umbrella of an economics school, analyzing the role of the state at different development levels is important to also understand the circumstances under which organizations, such as the IMF and WB, propose a uniform policy

without considering the countries' level of development and are generally not successful in most countries (Eiras, 2003: 1; Stiglitz, 2003: 195-196). The starting time of this study is 1980, when neoliberal policies began to regain dominance worldwide. The literature review reveals that instead of being a party to economics schools in the debate about the state's weight in the economy, many other economists have also looked for empirical evidences, which contribute to this discussion. In the studies of these economists, public expenditure data are often used as a proxy of the state's size in the economy (Chen and Lee, 2005: 1054). Whether the state's weight in the economy has a positive impact is usually evaluated using growth data. In this context, various forms of GDP are used as indicators of economic growth in similar studies.

Differences in the sample sets, econometric methods, or data led to the different results in the existing studies. In this study, the panel corrected standard errors (PCSE) method is used (the reasons will be addressed in more detail in the following sections) to investigate the effect of public spending on economic growth from 1980 to 2016 in country groups with different levels of development. Therefore, this study contributes to the literature by using different sample set, period, and econometric method. Furthermore, investigating how big the state's size should be according to different levels of development is another feature that distinguishes this study from similar research. In this study, the claim of any school is not a preliminary acceptance in the study, and this study proves that the claims of both schools can be valid at different levels of development. Moreover, 175 out of the 193 independent countries registered with the United Nations are included in the econometric analysis. This study is also different from similar research since it covers a very large sample set.

## **2. THEORY AND LITERATURE**

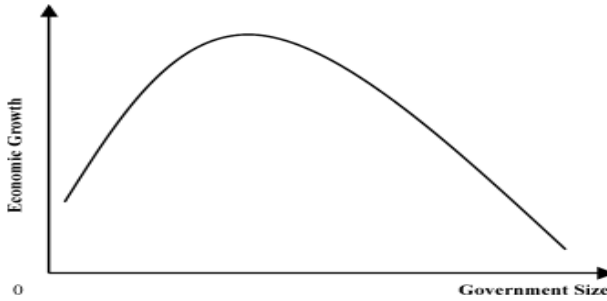
Public spending can be handled narrowly or broadly. In a narrow sense, it refers to expenditures made due to services provided by the central administration. In a broad sense, it covers central administration expenditures and expenditures incurred by the state and its local institutions for economic initiatives and social security services (Akdoğan, 1987: 52-53). Therefore, public spending varies according to time and country (Şahin, 2018: 5). The state spends at different levels in different years for production, consumption, investment, or subsidizing its indigent citizens. When incurring these expenditures, it intervenes in the market directly or indirectly. These interventions may affect the market positively or negatively. Whereas positive

effects often appear as regulatory and developer effects on the market, negative effects are inefficient use of resources (Sattar, 1993: 27-31).

Those who believe that public expenditures have a negative effect on economic growth claims that the public sector is less efficient than the private sector. According to this view, regulatory activities of the public sector impose additional transaction costs on the market. Moreover, the fiscal and monetary policies implemented by the state cause imperfect competition in the market and have a negative impact on the overall efficiency of the market (Ram, 1986: 191). The most extreme position on this subject is the one adopted by the classic/liberal school, which argues that any increase in public expenditure reduces economic growth, implying that public expenditure has decreasing returns to scale (Yüksel and Songur, 2011: 368).

Those who think that public spending has a positive effect on economic growth argue that the state minimizes conflicts of interest between individuals and society through its expenditures. Furthermore, the state ensures the efficient functioning of the factor and product markets by preventing monopolistic trends and operating in markets that are not sufficiently developed, thereby contributing to economic growth (Ghali, 1999: 975-976). The presumption that public spending has a positive effect on growth is one of the most prominent arguments of Keynesian economics. Keynesian school often relies on a multiplier mechanism. According to this mechanism, a unit increase in public expenditure increases economic growth by more than a unit (Yüksel and Songur, 2011: 368).

Unlike the liberal and Keynesian schools, some economists have suggested different methods and tools to demonstrate the role of the state in the economy. In the literature, the relationship between the size of the public sector and economic growth is illustrated with an inverse U-shaped Armeý curve (Armeý, 1995: 92). The Armeý curve, which is based on the law of diminishing returns, is shown in Figure 1. The Armeý curve reflects the relationship between public spending and economic growth, which is positive up to a point and then becomes negative (Vedder and Gallaway, 1998: 2).

**Figure 1. A Typical Armeý Curve**

According to the Armeý curve, a very low output is produced when there is no public sector. This output level can theoretically be considered as zero. An increase in public expenditure initially increases GDP, and then it makes a maximum contribution to growth at a certain point. At the point where economic growth is maximum, the marginal efficiency of public spending equals the marginal efficiency of private-sector spending, and the economic contribution of increasing public spending is zero. After this point, an increase in public expenditure decreases the rate of growth because of the law of diminishing returns. Therefore, at this point, the output may be increased by reducing the state's expenditures. Moreover, at this point, a further increase in public spending will lead to economic stagnation and shrinkage. Unlike the two schools mentioned earlier, the ideas put forward by Armeý do not emphasize that the existence of the state is completely bad but only reveals that excess state expenditure has a negative effect on growth (Altunç and Aydın, 2012: 85-87; Vedder and Gallaway, 1998: 2).

Many empirical studies have been conducted to investigate the claims of the Keynesian and classical/liberal schools about public expenditures or the state's weight in the economy. Some of them prove that public spending positively affects growth, whereas others prove that public expenditures negatively affect growth. In some of these studies, no significant relationship between public spending and growth was identified. Furthermore, in some other studies, the empirical findings confirming the Armeý curve proposed that public spending has an initial positive impact on growth but after some time, the impact changes to negative. Some studies on this subject, the period covered, the countries investigated, the method used, and the findings are included in the table below.

**Table 1. Summary of the Relevant Literature**

Author	Period and Country	Method	Conclusion
Al-Fawwaz (2016)	1980-2013 / Jordan	OLS (Ordinary Least Squares)	Public spending has a positive impact on growth.
Bagdigen and Cetintas (2004)	1965-2000 / Turkey	Cointegration and Causality Tests	There is no relationship between public spending and growth.
Chang et al. (2004)	1951-1996, 1951-1995, 1952-1995, 1954-1996, 1954-1996, 1951-1996, 1951-1996, 1951-1996, 1951-1996 / Australia, Canada, Japan, South Korea, New Zealand, South Africa, Taiwan, Thailand, United Kingdom, United States (Respectively)	Cointegration Tests and ECM (Error Correction Model)	There is no relationship between public spending and growth in Australia, Canada, New Zealand, South Africa, and Thailand. Growth has a positive impact on public spending in the rest of the countries.
Engen and Skinner (1992)	1970-1985 / 107 countries	Panel OLS and 2SIV (Two-Stage Instrumental Variables)	Public spending has a negative impact on growth.
Fölster and Henrekson (1999)	1970-1995 / 23 OECD Countries	Panel OLS and WLS (Weighted Least Squares)	Public spending has a negative impact on growth.
Huang (2006)	1979-2002 / China and Taiwan	UECM (Unrestricted Error Correction Model) Model	There is no relationship between public spending and growth.
Komain and Brahmairene (2007)	1993-2006 / Thailand	Causality Tests and OLS	Public spending has a positive impact on growth.

Author	Period and Country	Method	Conclusion
Loizides and Vamvoukas (2005)	1948-1995, 1950-1995, 1960-1995 <sup>4</sup> /Greece, UK, Ireland	Cointegration and Causality Tests and ECM	Public spending has a positive impact on growth in all countries in the short run. In the long run, it has a positive impact in Ireland and the UK.
Nuta and Nuta (2014)	2000-2011 / Romania	Hyperbolic Regression Model	The evidence does not confirm the Armey curve.
Pula and Elshani (2018)	2002-2015 / Kosovo	OLS	Public spending has a positive impact on growth.
Romero-Avila and Strauch (2008)	1960-2001 / 15 EU countries	Panel Cointegration Tests and Panel FMOLS (Fully Modified OLS)	Public spending has a negative impact on growth.
Schaltegger and Torgler (2006)	1981-2001 / 26 Swiss cantons	Panel OLS, Random and Fixed Effect Models	Public spending has a negative impact on growth.
Vedder and Gallaway (1998)	1830-1988, 1854-1988, 1862-1988, 1881-1988, 1926-1988 / UK, Denmark, Italy, Sweden, Canada	OLS	The evidence confirms the Armey curve.
Yilgör et al. (2012)	1980-2010 / Turkey	VAR (Vector Autoregression) Model	Public spending has a positive impact on growth.

*Studies in which public expenditures are either less separated or not separated at all are included in the table of the literature.*

### 3. METHOD AND DATA

This study examines the impact of the state's size on economic growth at different levels of development. Based on the Human Development Index (HDI) published annually by the United Nations Development Programme, the countries were categorized as Very High Human Development (VHHD-

<sup>4</sup> Unemployment data of Ireland and the UK, the other data of Ireland and the UK is from 1950 to 1995.

47 Countries), High Human Development (HHD-52 Countries), Medium Human Development (MHD-38 Countries), and Low Human Development (LHD-38 Countries), and the effect of public spending on economic growth, which is a proxy of the weight of the state in the economy, was investigated at each level of development. Therefore, based on the available data, we included 175 countries out of 188 published in the Human Development Report in our analyses. Public expenditure (PE) is the independent variable; public revenues (PR) and public debt (PD) are the control variables because they are also indicators of the size of the state in the economy, whereas GDP is the dependent variable. By including control variables in the analysis, the structure of the econometric model was intended to be strengthened and the effects of other indicators of state's size on economic growth at different levels of development were determined. In addition, the most important factor in selecting PD and PR as control variables is their ability to influence PE. Furthermore, the analysis was carried out using unbalanced panel data method since the complete set of data of the countries from 1980 to 2016 were not found. All the data used in the study are from the IMF World Economic Outlook database. All variables included in the analysis were stated in their total values. Inflation was ignored since it affects all variables at the same rate. In addition, all the econometric tests used in the study were implemented using STATA 14.

### **3.1. Cross-Sectional Dependence**

Cross-sectional dependence (CD), which is an outcome of globalization, is also an important reason for using panel data econometrics (Herzer, 2013). CD can be defined as the impact of an economic shock or healing occurring anywhere in the world on another part of the world during the same or later period (Cavalcanti et al., 2011). The period for the analysis was selected to determine whether the interaction between countries will affect the efficiency of the subsequent econometric tests (Nazlioglu et al., 2011: 6617-6618). For example, unit root tests that do not consider the CD can yield biased results for understanding unit root existence/absence (Herzer, 2013). Therefore, including or failing to include CD can change the results of the econometric tests that will be conducted (Breusch and Pagan, 1980; Pesaran, 2004). In other words, considering the CD can severely impair the power of the test statistics employed (O'Connell, 1998). Although there are several cross-section tests in the literature, we used Pesaran's (2004) CD test because the cross-sectional dimension (number of countries) was larger than the time

dimension (37 years) in all the country groups. Equation 1 below is used to conduct the Pesaran (2004) CD test.

$$\Delta Y_{it} = a_i + b_i + y_{i,t-1} + \sum_{j=1}^{p_i} c_{ij} \Delta Y_{i,t-j} + d_i t + h_i \overline{y_{t-1}} + \sum_{j=0}^{p_i} \eta_{ij} \Delta \overline{y_{i,t-j}} + \varepsilon_{i,t} \quad (1)$$

There is a correlation between the residuals. The statistical consistency of such correlation was tested with Pesaran (2004) CD test.

$$CD = \sqrt{\frac{1}{N(N-1)}} \sum_{i=j}^{N-1} \sum_{j=i+1}^N (T p_{ij}^2 - 1) \sim N(0,1) \quad (2)$$

The hypotheses of the CD test are as follows.

H0:  $p_{ij} = p_{ji} = \text{cor}(u_{it}, u_{jt}) = 0, i \neq j$  (No CD)

H1:  $p_{ij} = p_{ji} \neq 0, i \neq j$  (CD exists)

**Table 2. CD Test Results of the VHHD Group**

Variables	VHHD CD Test Results	HHD CD Test Results	MHD CD Test Results	LHD CD Test Results
<b>GDP</b>	169.21 (0.00)	189.57 (0.00)	135.80 (0.00)	143.58 (0.00)
<b>PE</b>	148.26 (0.00)	153.70 (0.00)	107.76 (0.00)	110.57 (0.00)
<b>PD</b>	111.76 (0.00)	125.50 (0.00)	75.53 (0.00)	41.44 (0.00)
<b>PD</b>	143.83 (0.00)	155.34 (0.00)	103.89 (0.00)	104.15 (0.00)

*The values shown in the table are the test statistic values. The values in parentheses represent the probability values.*

Since the probability values in Table 2 are smaller than 0.05, Ho is rejected, and CD is detected in all the variables. The results of the test reveal that the 175 countries included in the analysis were influenced by each other because of globalization. To obtain more effective and consistent predictive results, unit root tests should be performed because of the CD in the next stage of the study. Unit root tests that consider CD are included in the literature as second-generation unit root tests. We then conduct a second-generation unit root test cross-sectionally augmented Dickey-Fuller (CADF) test.

### 3.2. Testing of Stationarity

To find out whether there is a long-term relationship between the variables, we first investigate the stationarity of the variables and whether they are equally co-integrated; CADF and a panel root test developed by Pesaran (2007) are used to conduct these tests. The most important feature of this test is that it considers the CD and gives reliable results when  $N > T$  or  $T > N$ . Although it is a heterogeneous test, CADF gives individual results for each

horizontal section. The CADF panel unit root test is based on the following model.

$$y_{it} = (1 - \phi_i)\mu_i + \phi_i y_{i,t-1} + \mu_{it} \quad i = 1, \dots, N; t = 1, \dots, T \quad (3)$$

The term  $\mu_{it}$  in Equation 3 refers to error and is calculated as follows:

$$\mu_{it} = \gamma_i f_t + \varepsilon_{it} \quad (4)$$

In Equation 4,  $\mu_{it}$  represents the unobservable common element and is always assumed to be stationary.  $\varepsilon_{it}$  is a variable-specific element and exhibits independent and identical distribution. In this model, the CD is due to the presence of the unobservable common element. Equations (3) and (4) can be converted as follows:

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \gamma_i f_t + \varepsilon_{it} \quad (5)$$

In Equation 5,  $\alpha_i = (1 - \phi_i)\mu_i$ ,  $\beta_i = -(1 - \phi_i)$  and  $\Delta y_{it} = y_{it} - y_{i,t-1}$ .

In the CADF test, H0 and H1 are expressed as follows.

H0:  $b_i = 0$  when the variable is stationary.

H1:  $b_i < 0$  when the variable is not stationary ( $i = 1, 2, \dots, N$ )

Pesaran obtained the CIPS statistics by calculating the simple arithmetic mean of the variables as follows:  $CIPS = \frac{\sum_{i=1}^N CADF_i}{N}$  (Pesaran, 2007: 268). Because CIPS statistics do not show a standard normal distribution, critical values have been obtained by simulation using Pesaran's CD test (2007).

The CADF test is an extended version of the first-generation augmented Dickey-Fuller (ADF) unit root test that investigates the stationarity of the CD of the variables. The CADF test is a unit root test that assumes that a shock in any of the cross sections will affect other cross sections.

This test was performed on a variable basis for all the countries in the four groups. In addition, whereas the stationarity was tested, the lag length is taken as one for levels since high latency lengths weaken econometric tests. Moreover, since the panel is unstable, applying a high latency to the already missing data may lead to biased results (Jaunky 2011; Ketenci, 2013; Mitze, 2012).

**Table 3. CADF Test Results of VHHD Group**

Level	GDP	PE	PD	PR
$z[t\text{-bar}](C)$	1.646(0.9)	6.944(1.0)	2.688(0.9)	5.102(1.0)
<b>1. Difference</b>				
$z[t\text{-bar}](C)$	-7.872(0.0)	-11.920(0.0)	-8.347(0.0)	-12.344(0.0)
Level	GDP	PE	PD	PR
$z[t\text{-bar}]C+T$	3.301(1.0)	4.031(1.0)	4.137(1.0)	4.184(1.0)
<b>1. Difference</b>				
$z[t\text{-bar}]C+T$	-5.099(0.0)	-9.945(0.0)	-6.794(0.0)	-11.339(0.0)

*Values in parentheses are probability values. The CADF test has two test statistics,  $t\text{-bar}$  and  $z[t\text{-bar}]$ . In non-stationary panels, the  $z[t\text{-bar}]$  statistic is valid.*

As shown in Table 3, all variables in the VHHD group are non-stationary in both fixed and fixed trend models. Then, the variables whose first difference are taken as  $I(1)$  become stationary in both fixed and fixed trend models at the 1% significance level.

**Table 4. CADF Test Results of HHD Group**

Level	GDP	PE	PD	PR
$z[t\text{-bar}](C)$	16.963(1.0)	8.071(1.0)	8.337(1.0)	2.951(0.9)
<b>1. Difference</b>				
$z[t\text{-bar}](C)$	-13.343(0.0)	-13.626(0.0)	-9.309(0.0)	-16.171(0.0)
Level	GDP	PE	PD	PR
$z[t\text{-bar}]C+T$	6.118(1.0)	5.826(1.0)	4.233(1.0)	3.109(0.9)
<b>1. Difference</b>				
$z[t\text{-bar}]C+T$	-12.977(0.0)	-11.726(0.0)	-7.382(0.0)	-13.890(0.0)

*Values in parentheses are probability values. The CADF test has two test statistics,  $t\text{-bar}$  and  $z[t\text{-bar}]$ . In non-stationary panels, the  $z[t\text{-bar}]$  statistic is valid.*

As shown in Table 4, all variables in the HHD group are non-stationary in both fixed and fixed trend models. However, the variables whose first difference are taken as  $I(1)$  become stationary in both fixed and fixed trend models at the 1% significance level.

**Table 5. CADF Test Results of MHD Group**

Level	GDP	PE	PD	PR
$z[t\text{-bar}](C)$	8.134(1.0)	3.572(1.0)	2.576(0.9)	2.005(0.9)
<b>1. Difference</b>				
$z[t\text{-bar}](C)$	-9.948(0.0)	-10.938(0.0)	-4.692(0.0)	-9.923(0.0)
Level	GDP	PE	PD	PR
$z[t\text{-bar}]C+T$	3.165(0.9)	3.792(1.0)	4.409(1.0)	2.440(0.9)
<b>1. Difference</b>				
$z[t\text{-bar}]C+T$	-8.790(0.0)	-10.904(0.0)	-3.484(0.0)	-9.948(0.0)

*Values in parentheses are probability values. The CADF test has two test statistics,  $t\text{-bar}$  and  $z[t\text{-bar}]$ . In non-stationary panels, the  $z[t\text{-bar}]$  statistic is valid.*

As shown in Table 5, all variables in the MHD group are stationary in both fixed and fixed trend models, when the first difference is taken as  $I(1)$ .

**Table 6. CADF Test Results of LHD Group**

Level	GDP	PE	PD	PR
$z[t\text{-bar}](C)$	5.662(1.0)	-0.741(0.2)	2.257(0.9)	-0.352(0.3)
<b>1. Difference</b>				
$z[t\text{-bar}](C)$	-14.226(0.0)	-13.357(0.0)	-9.923(0.0)	-13.327(0.0)
Level	GDP	PE	PD	PR
$z[t\text{-bar}]C+T$	2.680(0.9)	0.588(0.7)	2.341(0.9)	1.323(0.9)
<b>1. Difference</b>				
$z[t\text{-bar}]C+T$	-12.456(0.0)	-11.269(0.0)	-7.976(0.0)	-12.840(0.0)

*Values in parentheses are probability values. The CADF test has two test statistics,  $t\text{-bar}$  and  $z[t\text{-bar}]$ . In non-stationary panels, the  $z[t\text{-bar}]$  statistic is valid.*

Table 6 shows that the variables of countries in the LHD group are similar to the variables of the other three country groups, and the first difference of the variables  $I(1)$  is stationary in both fixed and fixed trend models.

### 3.3. Panel Data Analysis

There are several different versions of panel data analysis in the literature. The first is panel data analysis that assumes that all cross sections in the model have the same properties. This analysis is called pooled panel data analysis (Gujarati, 2004: 28). However, this assumption is unrealistic because the different features of the countries used in the analysis are rejected in the model. Therefore, Equation 6 cannot fully explain many aspects (Griffits et al., 1993: 571-573), and although the grouping of countries in this study reduces heterogeneity, this difference cannot fully disappear when examining many countries (175 countries).

$$Y_{it} = \beta_{1it} + \beta_{2it}X_{2it} + \beta_{3it}X_{3it} + \varepsilon_{it} \tag{6}$$

Due to this limitation of pooled panel data analysis, other panel data methods with fixed and random effects are introduced. In both models, it is assumed that error terms are independent and distributed as  $N(0, \sigma_e^2)$  in the entire period been studied and for each cross section (Griffits et al., 1993: 573). The variation due to differences in the cross sections and the differences occurring in some of the cross sections during the observation period is modeled assuming that the fixed effects model causes some or all the regression coefficients to change. The panel data analysis that assumes that the coefficients change according to the units or the units and time is called a fixed effects model (Pazarlıoğlu, 2001).

$$y_{it} = \beta_1 + \alpha_i + \beta_{2it}X_{2it} + \dots + \beta_{kit}X_{kit} + \varepsilon_{it} \quad i=1, \dots, 47/52/38/38, \quad t=1, \dots, 37 \tag{7}$$

In Equation 7,  $y_{it}$  represents GDP;  $\beta_1$  average represents the fixed term;  $\alpha_i$  is the difference in the average fixed term;  $X_{it}$  represents the independent variables (PE, PD, and PR);  $i$  47/52/38/38 denotes countries used in the analysis;  $t$  denotes time (1980-2016), and  $\varepsilon_{it}$  refers to the error term. The model expressed by this equation is fixed effects panel data analysis.

Tables 7 shows the estimates of the coefficient of the fixed effects model for the country groups.

**Table 7. Fixed Effects Model**

Variab les	Coefficients (VHHD)	Coefficients (HHD)	Coefficients (MHD)	Coefficients (LHD)
PE	2.28 (0.00)	7.19 (0.00)	8.05 (0.00)	5.13 (0.00)
PD	-0.15 (0.00)	0.89 (0.00)	-1.10 (0.00)	0.64 (0.00)
PR	2.21 (0.00)	-2.18 (0.00)	-2.02 (0.00)	-1.80 (0.00)

*Values in parentheses are probability values.*

According to Table 7, a unit increase in PE will increase economic growth by 2.28 units. A unit increase in PD will decrease economic growth by 0.15 units. Finally, a unit increase in PR will increase economic growth by 2.21 units, which is similar to that of PE. The coefficient of each independent variable in the VHHD group is significant at the 1% level.

Regarding the countries in the HHD group, a unit increase in PE will increase economic growth by 7.19 units. A unit increase in PD will also increase economic growth by 0.89 units. Finally, a unit increase in PR will decrease economic growth by 2.18 units. The coefficient for each independent variable is significant at the 1% level.

A unit increase in PE will increase economic growth by 8.05 units. A unit increase in PD will decrease economic growth by 1.10 units. Finally, a unit increase in PR will decrease economic growth by 2.02 units. The coefficient for each independent variable in the MHD group is significant at the 1% level.

Regarding countries in the LHD group, a unit increase in PE will increase economic growth by 5.13 units. A unit increase in PD will also increase economic growth by 0.64 units. Finally, a unit increase in PR will decrease economic growth by 1.80 units. The coefficient for each independent variable is significant at the 1% level.

Unlike the fixed effects model, in the random effects model, only the changes in units or units and time are added to the model as an element of error term of random effects regression. The most basic reason for this practice is to avoid the loss of freedom level in the fixed effects model (Baltagi, 1995: 13). In addition, this model includes certain external effects that the fixed effects model does not include in the regression (Greene, 2012: 632).

It has been suggested that different trend values exist in each cross section of the random effects model and these values do not change over time. Moreover, there is a cross section relationship between the dependent and independent variables in this model. The trend values of the cross sections in this model are due to a common trend value, such as the  $\alpha$ . The error term that generates random variation differs, depending on the cross sections but remains constant in a certain period, which is another feature of this model. Thus, the error term is derived from  $\alpha$  and is used to measure the random deviation of each cross section (Brooks, 2008). The random effects model is as expressed in Equation 8.

$$y_{it} = \beta_1 + \beta_2 X_{1ij} + \dots + \beta_k X_{kij} + \alpha_i + \varepsilon_{it} \quad (8)$$

In the random effects model, the common trend value ( $\alpha$ ) is assumed to be uncorrelated with each independent variable. Therefore, the random effects model is made to fit this uncorrelation by using the assumptions, which is expressed by the following equation.

$$Cov(X_{ij}, \alpha_i) = 0 \quad t = 1, 2, \dots, J \quad j = 1, 2, \dots, k \quad (9)$$

Table 8 shows the coefficient of the random effects model for the various country groups.

**Table 8. Random Effects Model**

<b>Variab les</b>	<b>Coefficients (VHHD)</b>	<b>Coefficients (HHD)</b>	<b>Coefficients (MHD)</b>	<b>Coefficients (LHD)</b>
PE	-0.65 (0.00)	8.24 (0.00)	1.68 (0.00)	5.96 (0.00)
PD	-0.20 (0.00)	0.50 (0.00)	-0.42 (0.00)	0.47 (0.00)
PR	5.43 (0.00)	-2.99 (0.00)	4.65 (0.00)	-2.30 (0.00)

*Values in parentheses are probability values.*

According to Table 8, a unit increase in PE is likely to decrease economic growth by 0.65 units. A unit increase in PD will also decrease economic growth by 0.20 units. Finally, a unit increase in PR will increase economic growth by 5.43 units. The coefficient of each independent variable in the VHHD group is significant at the 1% level.

Regarding the countries in the HHD group, a unit increase in PE will increase economic growth by 8.24 units. A unit increase in PD will increase economic growth by 0.50 units. Finally, a unit increase in PR will decrease economic growth by 2.99 units. The coefficient of each independent variable is significant at the 1% level.

A unit increase in PE will increase economic growth by 1.68 units. A unit increase in PD will decrease economic growth by 0.42 units. Finally, a unit increase in PR will increase economic growth by 4.65 units. The coefficient of each independent variable in the MHD group is significant at the 1% level.

Regarding the countries in the LHD group, a unit increase in PE will increase economic growth by 5.96 units. A unit increase in PD will increase economic growth by 0.47 units, which is similar to that of PE. Finally, a unit increase in PR will decrease economic growth by 2.30 units. The coefficient of each independent variable is significant at the 1% level.

Several tests, such as Hausman and Breusch-Pagan, can be conducted to determine the model (fixed, random, or pooled) to use for the panel data analysis (Tatoğlu Yerdelen, 2005: 47). However, the literature is not consistent on these tests used for choosing a model. Many studies (Akıncı et al., 2014; Kaya, 2014; Pazarlıoğlu and Gürler, 2007) have employed these tests to select an appropriate model; some (Erlat, 2006; Greene, 2012: 576) have stated that differentiating between such models may lead to erroneous results. This inconsistency in the literature about the method to use for research will not be discussed further in this study since it is out of the scope of this study.

The Hausman test is used to determine whether the fixed or the random effects model yields the most consistent results (Greene, 2003: 301). This test

assumes that the fixed effects estimator is consistent and unbiased. The hypotheses used in the Hausman test are as follows (Baltagi, 2005: 66).

Ho: random effects model [  $E(\alpha_i/x_i)=0$  ]

Ha: fixed effects model [  $E(\alpha_i/x_i) < > 0$  ]

Hausman test statistic is used to investigate whether the difference between the coefficients ( $X_{it}$ ) of the fixed effects model and the coefficients ( $X_{ij}$ ) of the random effects model are statistically significant (Cameron and Trivedi, 2005: 717). The sharp difference between the fixed and random effects models is explained by whether the fixed time effects are related to the explanatory variables. When the random effects model is valid, the fixed effects estimator provides more reliable coefficient estimates. The random effects model should not be used unless the fixed effects model is used to measure all the fixed time factors associated with other explanatory variables.

It is an indisputable fact that neither model produces extraordinary results since the random effects model yields redundant results, whereas the fixed effects model produces insufficient results (Johnston and Dinardo, 1997: 403).

Hausman test statistic exhibits a chi-square distribution with k-degree of freedom under the hypothesis

Ho: The coefficient of the random effects model is correct.

In the case of realization, the error term components of the random effects model are uncorrelated with the independent variables. This hypothesis suggests that the fixed effects model will yield more consistent results.

**Table 9. Hausman Test Results**

Values	VHHD	HHD	MHD	LHD
<b>H. Stat.</b>	1071.37	190.49	383.30	194.31
<b>Probability</b>	0.0000	0.0000	0.0000	0.0000

Table 9 shows that according to the Hausman test, the results of the fixed effects model are more consistent in all the four groups.

### 3.4. Heteroscedasticity

One of the most important assumptions of the panel least square method is homoscedasticity (Orhunbilge, 2000; Tari, 2006). The least square method assumes that the variance in the unit values of the dependent variable is fixed, whereas the unit values of the independent variables change, which is referred to as homoscedasticity in the econometrics literature (Gujarati, 1995; Yamak

and Köseoğlu, 2006). The assumption of homoscedasticity can be expressed as follows.

$$E(\varepsilon_i^2) = \vartheta^2 \quad i=1,2,\dots\dots\dots N$$

$$E(\varepsilon\varepsilon') = \vartheta^2 I = \vartheta^2 \begin{pmatrix} 1 & 0 & \dots & 0 \\ 0 & 1 & \dots & 0 \\ \vdots & \dots & \ddots & \vdots \\ 0 & 0 & \dots & 1 \end{pmatrix}_{NXN} = \begin{pmatrix} \vartheta^2 & 0 & \dots & 0 \\ 0 & \vartheta^2 & \dots & 0 \\ \vdots & \dots & \ddots & \vdots \\ 0 & 0 & \dots & \vartheta^2 \end{pmatrix}_{NXN} \quad (10)$$

When the variance of the error term differs across the independent variables, it is called heteroscedasticity, and this makes the panel least square analysis complicated. In such a model, the variance of the errors is not fixed and can differ by exhibiting an increasing, decreasing, or both increasing and decreasing distribution. The heteroscedasticity can be represented with Equation 11.

$$E(\varepsilon\varepsilon') = \vartheta^2 \Omega \quad \text{ve } \Omega \neq 1 \quad (11)$$

In the  $\Omega$  matrix of Equation 11, the off-diagonal elements are zero, but the  $i$  variances of the diagonal are different from each other.

There are various reasons for the problem of heteroscedasticity; some are as follows:

1. Exclusion of important explanatory variables
2. Incorrect measurement or definition of the dependent variable
3. Working on heterogeneous population

The problem of heteroscedasticity has significant effects on the results of the model. A least square model with heteroscedasticity can be unbiased and consistent but may not maintain its minimum-variance or efficiency. Therefore, partial t and general F tests are considered unreliable (Yamak and Köseoğlu, 2006). In summary, the estimates obtained using the models established lose their efficiency if there is heteroscedasticity problem.

The modified Wald test proposed by Greene (2012) was used to test the problem of heteroscedasticity. The results of the test are presented in Table 10.

**Table 10. Wald Test Results**

Values	VHHD	HHD	MHD	LHD
<b>Chi-square</b>	1.2e+17	3.0e+22	2.2e+25	1.3e+15
<b>Probability</b>	0.00	0.00	0.00	0.00

According to the results of the variance test of each of the four country groups presented in Table 10,  $H_0$ , which states that “there is no heteroscedasticity problem” is rejected. In other words, the variance differs across the units.

### 3.5. Autocorrelation

Another important diagnostic test of the panel LS method is the autocorrelation test, which is used to investigate the relationship between the error terms and the lagged values. The autocorrelation test according to Wooldridge (2002) is shown in Equation 12:

$$\widehat{\varepsilon}_{it} = \widehat{P}_1 \varepsilon_{i,t-1} + error_{it} \quad t = 3, 4, \dots, T; i = 1, 2, \dots, N \quad (12)$$

To show that there is no autocorrelation in estimating the delays in the error terms, as in Equation 12, the coefficient of  $\widehat{P}$  must be approximately -5. The following hypotheses are used to test the coefficient:

$H_0$ : No autocorrelation exists

$H_a$ : Autocorrelation exists

If the probability values of the F statistic in Equation 13 are significant, the  $H_0$  hypothesis is rejected, and  $H_a$  is accepted (Drukker, 2003).

$$Fstat = \frac{\frac{(RRSS - URSS)}{g}}{\frac{URSS}{df}} \quad (13)$$

Restricted residual sums of squares (RRSS) in Equation 13 represents the sum of squared errors in the restricted model, and unrestricted residual sums of squares (URSS) represents the sum of squared errors in the unrestricted model. The number of restrictions is denoted by  $g$ . The degrees of freedom are represented by  $df$ . The results of the autocorrelation test of all the four country groups are presented in Table 12.

**Table 12. Wooldridge Test Results**

Values	VHHD	HHD	MHD	LHD
<b>F-statistics</b>	350.377	37.596	845.580	24.728
<b>Probability</b>	0.00	0.00	0.00	0.00

As Table 11 reveals, there is autocorrelation problem in the model established for all the four country groups.

### 3.6. Panel Corrected Standard Errors (PCSE)

As demonstrated, the models involving all the four country groups have heteroscedasticity and autocorrelation problems. In addition to these problems, the applied fixed and random effects models do not consider the CD determined at the beginning of the study. However, the fixed and random coefficient estimators used to test the autocorrelation and heteroscedasticity problems are essential in finding the most accurate panel coefficient estimator. As mentioned by Reed and Ye (2011: 989), determining the existence of these three problems is important when using the panel data coefficient estimator.

In the literature, two methods are preferred by researchers who encountered similar problems (Canarella and Gasparyan, 2008; Ghazalian and Furtan, 2007; Kim and Jennings, 2009; Llera and Valinas, 2013; Thomas et al., 2014; York, 2007). The methods are feasible generalized least squares (FGLS) method and panel-corrected standard errors (PCSE), which is also known as the Prais-Winsten model. The studies by Beck and Katz (1995, 1996) suggest that the PCSE method provides more reliable evidence when  $N > T$ . To achieve the most consistent estimation results, we employed the PCSE model, which is resistant to autocorrelation, heteroscedasticity, and CD, which are not considered by the fixed and random effects models.

In the PCSE model proposed by Beck and Katz (1995), the panel error term is expressed as follows:

$$\varepsilon_{it} = P \varepsilon_{it-1} + V_{it} \quad (14)$$

In Equation 14, the average  $V_{it}$  is zero, representing a new error term that is independently and identically distributed.  $P$  signifies the first-degree autocorrelation coefficient. When the PCSE model is applied, the original model is first estimated using the least square model. Using the error terms obtained from this estimation, Equation 14 is also estimated using the least square model and the coefficient of  $P$  is determined. Then, the variables are redefined by transforming them with the estimated coefficient of  $P$ . In the next stage, the transformed variables are re-estimated using the least square model. In the conversion process, the first degree difference is obtained using the coefficient of  $P$ . In other words, whereas the new the dependent variable is  $Y_{it} = Y_{it} - PY_{it-1}$ , the new vector of the independent variables is  $X_{it} = X_{it} - PX_{it-1}$ . Another advantage of the PCSE model is that it employs a special technique to prevent loss of observability. For example, the transformed first observation of the dependent variable will be as follows:  $(\sqrt{1 - P^2} * Y_1)$ .

**Table 12. PCSE Coefficient Estimation Results**

<b>Variab les</b>	<b>Coefficients (VHHD)</b>	<b>Coefficients (HHD)</b>	<b>Coefficients (MHD)</b>	<b>Coefficients (LHD)</b>
<b>PE</b>	1.64 (0.00)	3.13 (0.00)	2.42 (0.00)	4.41 (0.00)
<b>PD</b>	-0.07 (0.30)	1.65 (0.00)	0.95 (0.00)	0.50 (0.02)
<b>PR</b>	2.52 (0.00)	0.99 (0.18)	0.76 (0.21)	-0.54 (0.53)

*Values in parentheses are probability values.*

Table 12 demonstrates that regarding the countries in the VHHD group a unit increase in PE will increase economic growth by 1.64 units. A unit increase in PD will decrease economic growth by 0.07 units. Finally, a unit increase in PR will increase economic growth by 2.52 units. However, the coefficient of PD is not statistically significant. The coefficients of the other independent variables are significant at the 1% level.

As demonstrated in Table 12, regarding the countries in the HHD group, a unit increase in PE will increase economic growth by 3.13 units. A unit increase in PD will increase economic growth by 1.65 units, which is similar to that of PE. Finally, like the other two independent variables, a unit increase in PR will increase economic growth by 0.99 units. However, the coefficient of PR is not significant. The coefficients of the other independent variables are significant at the 1% level.

Regarding the countries in the MHD group, a unit increase in PE increase economic growth by 2.42 units. A unit increase in PD will increase economic growth by 0.95 units. Finally, a unit increase in PR will increase economic growth by 0.76 units. The coefficient of each independent variable is significant at the 1% level.

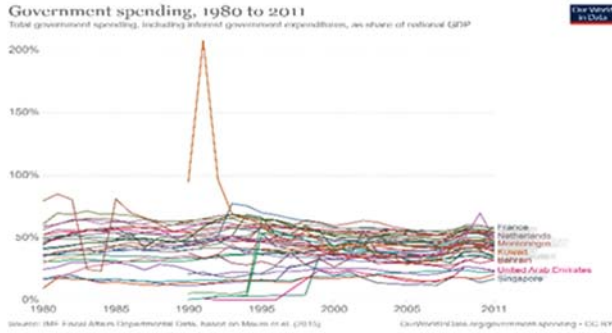
According to Table 12, regarding the countries in the LHD group, a unit increase in PE will increase economic growth by 4.41 units. A unit increase in PD will increase economic growth by 0.50 units, which is similar to that of PE. Finally, unlike the other two independent variables, a unit increase in PR will decrease economic growth by 0.54 units. However, the coefficient of PR is not significant. The coefficient of the PD variable is significant at the 5% significance level, and that of the PE is significant at the 1% level.

#### **4. PUBLIC SPENDING AMOUNTS OF EVERY SINGLE COUNTRY GROUP**

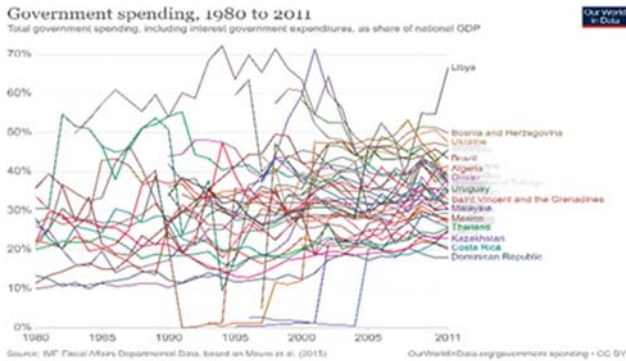
The empirical analysis shows that the impact of public spending on economic growth is positive in the four country groups categorized according to the HDI. However, public spending is most effective on growth in countries

that are least developed, whereas it is least effective in the most developed countries. This situation also requires examining the amount of public expenditures made by each country group. The graphs below show the public spending amounts for all the four country groups as a proportion of national GDP.

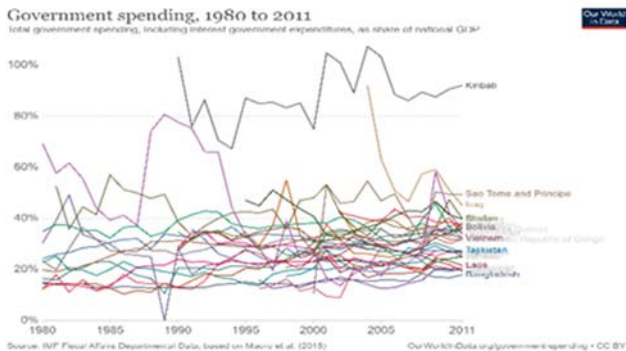
**Figure 2. Public Spending Amount in the VHHD Group**

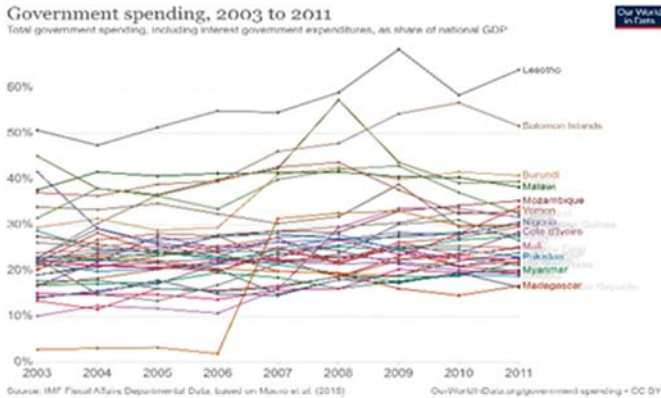


**Figure 3. Public Spending Amount in the HHD Group**



**Figure 4. Public Spending Amount in the MHD Group**



**Figure 5. Public Spending Amount in the LHD Group**

Source: <https://ourworldindata.org/>

As shown in the figures above, whereas in the VHHD group, the proportion of public spending in GDP is between 40 and 60%, this ratio is between 25 and 45% in the countries in the HHD group. Public expenditures of countries in the MHD group was between 20 and 45% of their GDP, which is similar to those in the HHD group; that of countries in the LHD group is between 15 and 35%. Sattar (1993: 39) and Mauro et al. (2013: 9-29) clearly stated that governments spend more as the level of development increases. Whereas a unit increase in PE in the LHD group, which consists of the least developed countries, which are also the least in spending, is likely to increase economic growth by 4 times, a unit increase in PE in the VHHD group, which comprises of the most developed countries that also spend the most, will increase economic growth by approximately only 1.5 times. In both MHD and HHD groups, which comprise of moderately developed countries that spend moderately, a unit increase in PE will increase economic growth by nearly 2.5 and 3 times, respectively. The prevalence of some factors, such as corruption<sup>5</sup>, in the countries in the MHD group more than in the countries in the HHD group may further increase the decreasing efficiency of public expenditure. Therefore, since both groups incur more public expenditures than the LHD group, public expenditures in these groups are less effective than those in the LHD group. The VHHD group is the least effective group for public expenditures because it spends more than the other three groups. This situation may imply that increasing the state's weight in the economy less and less

<sup>5</sup> When Corruption Perception Index (2016) is examined, it would be obviously seen that corruption is more common in MHD group than HHD group.

positively affects economic growth. In other words, it can be concluded that public spending is subject to the law of diminishing returns.

## **5. CONCLUSION**

The findings of this study seem to be consistent with the views of the Keynesian school. However, the results of the analyses suggest that every increase in public expenditure tends to promote economic growth on a declining efficiency trend. This situation means that the empirical evidence supports the Armeý Curve hypothesis. Hence, the following questions arise: Is there an optimal level of public spending? After what level will an increase in public spending affect growth in a negative way? Moreover, according to the results of the analyses, the Keynesian multiplier mechanism may not be valid when there is an excessive increase in public expenditure, that is, after a certain level of public spending, a unit increase in public expenditure will lead to less than a unit increase in economic growth. Moreover, most of the coefficients of PD and PR are statistically insignificant. So, it would not be appropriate to comment on PD and PR. As already mentioned, this situation is not important in this study, since most studies use various forms of public spending data as the main indicator of the size of the state in the economy.

At this point, it is worth mentioning the debates between the schools about the phenomenon of the state's weight in the economy. As stated previously, the LHD group comprises of underdeveloped countries. The adoption of Keynesian policies seems to have contributed to economic growth in these countries. The MHD and HHD groups usually comprise of developing countries. In these countries, although Keynesian policies also exert some influence on economic growth, they are not as efficient as that of the LHD group. However, the efficiency of public expenditure tends to decline considerably in the VHHD group or developed countries. Thus, we suggest that Keynesian policies should initially be adopted in underdeveloped countries to reach high growth rates, and then as the level of development increases, the high growth rate can be sustained by shifting to classical policies. Therefore, discussions about whether the state should interfere in economic activity would not contribute much to the science of economics, but discussions about the type of societies that the state should be the driving force behind economic growth and those that it should keep its activity at the minimum level would promote prosperity across the globe. Another issue is whether institutions or market structure tend to assume the position of the state when the level of development increases. In particular, institutions or emerging market in economies that are initially growing through public

expenditure may also be hindering the efficiency of public expenditure over time.

There are only two determinants of economic growth in the classical model: increase in production factors and technology. Therefore, this theory considers state intervention in economic activity as an unwelcome interference. When the government intervenes in the market through public expenditure, it leads to the deterioration of institutional or market structure that is already keeping the market operational, which occurs through certain factors, such as crowding out effect. In other words, resource utilization and resource allocation provided by the active institutions of the market can be disrupted by government intervention. This may cause the impact of public spending on growth to decrease. It is also another indication that public spending is subject to the law of diminishing returns. Although in the early stages of development, the active institutions of the market are created through public expenditures, in the later stages of development, these institutions created by public expenditures may become a factor that reduces the efficiency of public expenditures. This situation can be the reason for the classical school's claims.

Another point that can be derived from our results is that in countries with poor institutional or market structure, the state may fill the institutional or structural gap by intervening in the market. Whereas markets with efficient institutions can offer the lowest transaction costs to the market actors, other markets with poor institutional structure suffer from relatively high transaction costs. However, since the state is the strongest institution in these markets, it can use its hegemonic power to undertake its investments without being subject to such high transaction costs. This is another approach that can be adopted to explain why public spending in countries with no efficient institutional structure exerts such a huge impact on economic growth.

Another important point is that production in a country can primarily be achieved by cultivating the most fertile soil, the most intelligent and capable people, and the most productive mines. However, as production increases, less efficient production factors need to be included in the input components. In this context, channeling public expenditure primarily to areas with high productivity (production factors) could be another reason for the high efficiency of the LHD group, which has low production capacity. Unlike the LHD group, since the production level in the VHHD group is already high, public spending cannot be channeled to high-yielding areas (production factors). Based on these reasons, we can argue that countries with a strong

institutional structure should spend in areas where they can further reduce transaction costs, thereby increasing the impact of public spending on economic growth. However, when populist economic policies of politicians are considered, this suggestion is unlikely to be implemented.

In conclusion, although public expenditure in the LHD countries is low, it makes an immense contribution to economic growth since it initially strengthens institutional or market structure through projects, such as infrastructure investment. However, the dialectical nature of economic growth reduces the efficiency of the positive impact of public expenditure on institutional or market structure. Therefore, the state should assume a regressive role, after the market has been strengthened. Thus, it can get rid of the effects of the law of diminishing returns and enable the whole society to benefit more effectively and efficiently from resources that are collected from the market through public debts and public revenues to finance public expenditure. Since the state performs a regressive role, it can ensure that the majority of these resources remain in the market. According to the analyses, instead of suggesting standardized policies for all countries, as the IMF and WB do, underdeveloped countries should be offered policies that will enable the state to strengthen the market. However, liberal policies in which the state will have only regulatory and supervisory role should be suggested to countries as the level of development increases.

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