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Public Spending and Economic Growth in Latin America Countries: A Panel Fixed Effect Analysis

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ABSTRACT

Purpose

This article studies the effects of public expenditure on economic growth in Latin America countries (LAC), especially the role played by foreign aid and public and private investment

Design/methodology/approach

Granger causality approach and Fixed effect method.

Findings

There is bidirectional causality between investment climate improvement, domestic investment and economic growth. Also, private investment, population growth rate, investment climate improvement and corruption reduction lead these countries economic growth.

Research limitations/implications

In these countries, to manage economic growth governments have to pay attention on population growth rate , level of corruption, domestic and private investment

Originality/value

There are numerous studies regarding the impact of public spending on economic growth, but this study focus on developing countries especially on one area which is Latin America Countries. Also, it shows that ,additionally to private investment ,domestic investment, population growth rate and corruption are economic growth determinants in this area

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1. Introduction

Public expenditure refers to expenditure incurred by the government, social security administrations, local authorities and the administrations and bodies attached to them. It acts as an economic lever. It can be classified into three categories: operating expenditure, which is used to improve the running of public services without any improvement (current expenditure on personnel and maintenance); transfer costs, mainly the provision of public services such as hospitalization or free education; or in cash (e.g business subsidies, pensions, family allowances, minimum social benefits, etc.).

Taxation (government revenue) and government expenditure are the two tools of public policy. Neither of excess is good for the society, it has to be balanced to achieve maximum social benefit. (*Dalton, 1992)* called

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this principle as "Maximum Social Advantage" and (*Pigou, 1912)* termed it as "Maximum Aggregate Welfare". According to its theory, determination of public expenditure and taxation will happen on the basis of public preferences. The cost of supplying a good is then taken up by the people. So, government has to be careful because this expenditure can have some effects on economic growth and population human development. In fact, the conventional wisdom is that a large government spending is a source of economic instability or stagnation.

Empirical research, however, does not conclusively support the conventional wisdom because many analyses about the effect of public expenditure on economic growth gave different answers. Some studies reported positive and significant relation between government spending and economic growth while several others found significant negative or even no relation between an increase in government spending and economic growth in real output. In our case, we use an adapted production function based on the neoclassical growth theory developed in the 19th century. This theory states that economic growth rate can be accomplished with the proper amounts of the three driving forces: labor, capital and technology. The neoclassical growth theory is based on the understanding that the accumulation of capital within an economy, and the ways in which people use that capital, is important for economic growth.

The production function of neoclassical growth theory is generally depicted as:

$Y = AF(K, L)$ or $Y = F(K, AL)$.

"Y" denotes an economy's gross domestic product *(GDP)*; "K" represents its share of capital; "L" describes the amount of unskilled labor in an economy; and "A" represents a determinant level of technology.

The adapted model is quite different because in this model, variables have been modified to reach our objectives which are to determine the nature and the direction of the relationship between public expenditure and economic growth rate in Latin America Countries.

So, in our case variables are: annual growth rate in real gross domestic product *(GDPGR)*, private investment as percent of gross domestic product *(PI)*, annual percentage change in population *(PGR)*, human capital *(HUM)*, government expenditure for domestic investment improvement as percent of GDP *(GI)*, government expenditure for infrastructures *(INF)*, government expenditure for institutional quality *(INS)*, government expenditure for investment climate improvement *(INV)*, government expenditure for corruption reduction *(CORR)*, government expenditure for governance quality *(GOV)*, net official development assistance from all donors as percent of recipient GDP *(ODA)*, annual percentage change in the ratio of the sum of export and imports to GDP, a proxy for trade-openness *(TO)*.

In this study, the analysis is conducted in two steps: The first step consists in analyzing the evolution trend ofthe main variables while the second step, by using an econometric method, examines the effects of private and public spending on economic growth.

The interests of the study are firstly to investigate the effect of each type of spending separately, secondly to emphasize the role of these spending on economic growth. Similar characteristics of the sample countries are expected to make the inferences derived from the empirical results more valid. We hope that this study will contribute, at a minimum, to the methodology of cross section analysis as it is applied to the economies of developing countries in this area of research.

Growth refers to a positive change in size, and/or maturation, often over a period of time. Growth can occur as a stage of maturation or a process toward fullness or fulfillment. It can also perpetuate endlessly, for example, as detailed by some theories of the ultimate fate of the universe.

In the *Barro model (1990)*, growth increases with taxes and spending at low levels and then falls as the distortionary effects outweigh the beneficial effects of public goods. Public spending and growth are positively related when public spending is below their optimal amount. *Keynes (1936)* showed theoretically that the use of the budget could influence the demand of economic agents and therefore be used in the context of a policy of regulating the economic situation in two ways: expansionist when states seek to support or promote economic activity (a situation where unemployment is high) or in a restrictive sense when they seek to reduce the demand for economic agents (inflationary situations or large external deficits). According to *Adolph Wagner*

(1892) "The more civilized society is, the more expensive the state is," it means that the more developed is the society, the more important will be the needs and the demand in infrastructure (roads, railways, water and sanitation network, airports electric services and 4G networks), that will therefore lead to an increase of public expenditures to meet this demand. Empirical growth studies have been broadly perceived as being too aggregated: most are done at the level of several countries, using aggregate variables such as average per capita gross domestic product *(GDP)*, total factor productivity *(TFP)* average, average savings rate, average measures of financial development, or indicators of average education. An effective education system will have a positive effect on long-term productivity growth, both by increasing the efficiency of innovation and investment technologies (both highly knowledge intensive), and by reducing the cost of skilled labor, thereby increasing profits and promoting innovators.

Benhabib and Spiegel (1994), as well as *Krueger and Lindhal (2001)*, showed that a larger stock of human capital increases a country's ability both to innovate and to imitate the most advanced technologies. In endogenous growth models, the growth rate of the economy depends largely on the initial conditions of the economies. While some countries have levels of human capital or initial physical capital below a certain threshold, external effects are not sufficient to sustain growth. Thus, human capital is complementary to other factors, especially physical capital. A stock of human capital must be "absorbed" by a production system that uses all the capacities of individuals.

Hénin and Ralle (1993) argued from the same perspective that human capital generates strong positive externalities when it is possible to communicate and interact with other people with the same level of knowledge; this is what we call the network externalities. Using an endogenous growth model of the U.S. economy in which government purchases directly affect both the utility of consumers and the productivity of firms, *Knoop (1999)* found that reducing the size of government reduces economic growth and welfare.

Devarajan, et al. (1996) examined the relation between the share of total government expenditure in GDP and the growth in per capita real GDP and found negative and significant relationship between the two variables.

Ghura (1995) tested the relation between government consumption as a percent of GDP and economic growth using data from developing countries. He found significantly negative relationship between government consumption and the growth in per capita real GDP.

Lindauer and Velenchik (1992) concluded that there is no significant direct relationship between government expenditure and economic growth. However, they argued that government spending may positively affect economic growth indirectly through its influence on the efficiency of the private sector allocation of inputs. *Khan and Reinhart (1990)* developed a growth model that examines separately the effects of public sector and private sector investments. Using cross-section data from a sample of 24 developing countries, they found that public investment has no direct effect on economic growth.

Aschauer (1990) reported positive and significant relation between government spending and the level of output .In a similar study, Aschauer specifies real output as a function of employment, stock of capital, productivity, and government expenditure. He concluded that the additions to nonmilitary structures increase the overall economic productivity.

Conte and Darrat (1988) examined the effect of government spending on output using one-sided Granger-causality analysis.Their findings are mixed but indicated no significant relationship between government spending and growth in output for most of the countries. *Ram (1986)* derived the empirical model from a production function that explicitly includes both private and public sectors. He reported that public investment is more productive than private investment in both studies. *Saunders (1985)* tested the effect of government expenditure on the economy by making a regression of the percentage change in real GDP on the share of the total government spending in GDP. Using data from OECD countries, he found negative relation between average economic growth and average share of total government expenditure in GDP.

Landau (1983) reported a negative relation between growth in government spending and the growth rate in real per capita GDP. In another paper, he defined government consumption as a ratio of GDP and the real output as an average rate of growth in real per capita GDP, and tests the model using cross-section data from

developed and developing countries for several sub-periods. His results showed that an increase in government consumption significantly reduces the growth rate in real per capita GDP. The empirical evidence regarding the effect of government spending on economic growth is clearly mixed. Furthermore, the literature review indicates that the empirical results are specification-dependent. In other words, the results seem to depend on how the government spending is specified in the empirical model. Based on the empirical review, it can be concluded that the relationship between government spending and economic growth is generally negative if the government spending is expressed as percent of GDP and is generally positive if it is expressed as an annual percentage change in the estimating equation.

2. Materials and methods

2.1 Materials

To make this analysis, we use Latin America countries data from 2002 to 2014. These data come from *World Development Indicators (WDI)* and *World Governance Indicators (WGI)*.

2.2 Methods

2.2.1 Model

The neoclassical production function is used as the basis for specifying the empirical model for this study.

Ignoring the level of technology (A), the standard aggregate production function is written as:

$$Y = F\left(K, L\right) \tag{1}$$

Where, Y is the level of output, K is the stock of domestic physical capital, and L is labor. As in *Feder (1982)* and *Ram (1985)* the standard aggregate production function can be modified to include the total government expenditure for capital formation (G) as an independent input and rewritten as:

$$Y = f\left(K, L, G\right) \tag{2}$$

For analytical purpose, the government expenditure is divided into domestic component (G^D) and foreign component (G^F), which represents the official inflow for development assistance. And labor is divided in labor force (L) and human capital (H). Government expenditure for domestic issues (G^D) is expressed as government expenditure for infrastructure (G^{INF}), institutional quality (G^{INS}), investment climate improvement (G^{INV}), corruption reduction (G^{CORR}), governance quality (G^{GOV}), and domestic investment improvement (G^K)

Disaggregating the government expenditure into its domestic and foreign components as in *Khan and Reinhart (1990)* and introducing a measure of openness (Z), the aggregate production function used in this analysis is specified as:

$$Y = g\left(K, L, H, G^{INF}, G^{INS}, G^{INV}, G^{CORR}, G^{GOV}, G^K, G^F, Z\right) \tag{3}$$

Taking total derivatives of equation (3) and normalizing the results by the gross domestic product (Y), except the labor force, yields to:

$$\begin{aligned} dY/Y = &\left(\partial Y/\partial K\right) dK/Y + \left(\partial Y/\partial L\right) dL/Y + \\ &+\left(\partial Y/\partial H\right) dH/Y + \left(\partial Y/\partial G^{INF}\right) dG^{INF}/Y + \\ &+\left(\partial Y/\partial G^{INS}\right) dG^{INS}/Y + \left(\partial Y/\partial G^{INV}\right) dG^{INV}/Y \\ &+\left(\partial Y/\partial G^{CORR}\right) dG^{CORR}/Y + \\ &+\left(\partial Y/\partial G^{GOV}\right) dG^{GOV}/Y + \left(\partial Y/\partial G^K\right) dG^K/Y + \\ &+\left(\partial Y/\partial G^F\right) dG^F/Y + \left(\partial Y/\partial Z\right) dZ/Y \end{aligned} \tag{4}$$

Where, ($\partial Y/\partial K$) is the marginal product of capital, ($\partial Y/\partial L$) is the marginal product of labor force, ($\partial Y/\partial H$) is the marginal product of human capital.

Similarly, $\left(\partial Y/\partial G^{INF}\right)$ is the marginal product of government expenditure for infrastructure, $\left(\partial Y/\partial G^{INS}\right)$ is the marginal product of government expenditure for institutional quality, $\left(\partial Y/\partial G^{INV}\right)$ is the marginal product of government expenditure for investment climate improvement, $\left(\partial Y/\partial G^{CORR}\right)$ is the marginal product of government expenditure for corruption reduction, $\left(\partial Y/\partial G^{GOV}\right)$ is the marginal product of government expenditure for governance quality, $\left(\partial Y/\partial G^{K}\right)$ marginal product of government expenditure for domestic investment improvement , $\left(\partial Y/\partial G^{F}\right)$ marginal product of official assistance received , and $\left(\partial Y/\partial Z\right)$ as the marginal product of trade openness.

The signs of all partial derivatives with respect to output are assumed to be positive. This means that private investment, labor force, human capital, government spending for infrastructure, institutional quality, investment climate improvement, corruption reduction, governance quality, domestic investment, and trade-openness are all expected to have positive and significant effect on economic growth. Trade-openness is expected to have a positive and significant effect on economic growth because open economies can have more access to foreign resources and markets. Thus, a more open economy is expected to have a higher growth rate than a closed economy.

For empirical analysis, $\partial Y/\partial K=\alpha_1, \partial Y/\partial L=\alpha_2, \partial Y/\partial H=\alpha_3, \partial Y/\partial G^{INF}=\alpha_4, \partial Y/\partial G^{INS}=\alpha_5, \partial Y/\partial G^{INV}=\alpha_6,$

$\partial Y/\partial G^{CORR}=\alpha_7, \partial Y/\partial G^{GOV}=\alpha_8, \partial Y/\partial G^{F}=\alpha_9, \partial Y/\partial G^{K}=\alpha_{10},$

and $\partial Y/\partial Z=\alpha_{11}$.

The variables are also expressed in more explicit notation as:

$dY/Y = GDPGR =$ annual growth rate in real gross domestic product (economic growth),

$dK/L = I/Y = PI =$ private investment as percent of gross domestic product,

$dL/L = PGR =$ annual percentage change in population, a proxy for the labor force

$dH/L = HUM =$ human capital as percent of gross domestic product,

$dG^{INF}/Y = G^{INF}/Y = INF =$ government expenditure for infrastructures ,

$dG^{INS}/Y = G^{INS}/Y = INS =$ government expenditure for institution quality,

$dG^{INV}/Y = G^{INV}/Y = INV =$ government expenditure for investment climate improvement

$dG^{CORR}/Y = G^{CORR}/Y = CORR =$ government expenditure for corruption reduction ,

$dG^{GOV}/Y = G^{GOV}/Y = GOV =$ government expenditure for governance quality, $dG^{K}/Y = G^{K}/Y = GI =$ government expenditure for investment climate improvement as percent of GDP, $dG^{F}/Y = ODA =$ net official development assistance from all donors as percent of recipient GDP, $dZ/Y = TOP =$ annual percentage change in the ratio of the sum of export and imports to GDP, a proxy for trade-openness. After making these adjustments in definitions and notations, the estimating equation is written as:

$$GDPGR_{it} = \alpha_0 + \alpha_1 PI_{it} + \alpha_2 PGR_{it} + \alpha_3 HUM_{it} + \alpha_4 INF_{it} + \alpha_5 INS_{it} + \alpha_6 INV_{it} + \alpha_7 CORR_{it} + \alpha_8 GOV_{it} + \alpha_9 GI_{it} + \alpha_{10} ODA_{it} + \alpha_{11} TOP_{it} + \varepsilon_{it} \quad (5)$$

Where, i=1,……., 22

t=1,……..,12

α_0 =the constant term,

ε_{it} = the error term

The model specified in equation (5) examines the independent effects of private investment and public investment on economic growth. The other variables in the model serve as control variables.

The study uses panel data from 22 countries of Latin America region. The data cover 2002-2014 period for the variables expressed in annual changes for a total of 286 observations. The data in level form were reported in U.S. dollars for all countries. All data were transformed to three year moving averages. The moving average process was applied to correct any autocorrelation problem.

2.2.2 Descriptive statistics

In this part, we want to show the evolution of foreign aid, economic growth and public spending in the analysis period, the relationship between these variables and their correlation.

a. Graphs

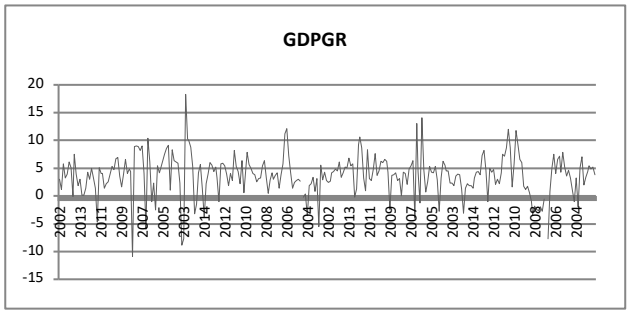

Figure 1: Latin America countries growth evolution

Source: Authors

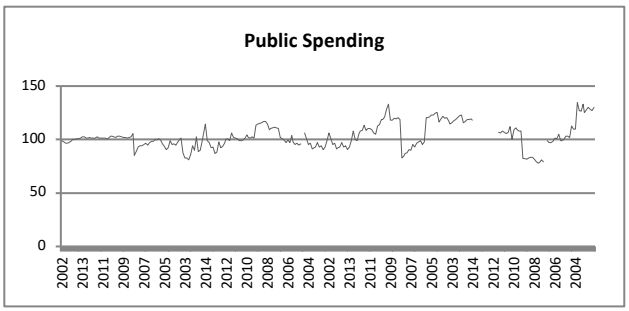

Figure 2: Latin America countries public spending evolution

Source: Authors

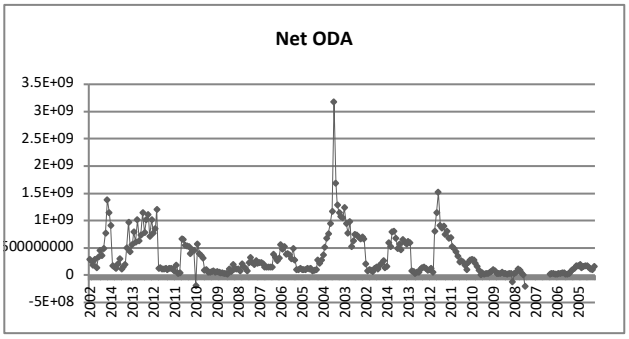

Figure 3: Latin America countries foreign aid received evolution

Source: Authors

The representation of GDP growth, public spending and foreign aid show mainly that these different variables are not constant on time, and they have known different level in their evolution. However, these graphics do not give clearly information about growth evolution and these different levels of investment. So we will analyze more precisely this relation by using econometric approach.

b. Correlation analysis

Table 1: Correlation matrix

	GDPGR	PI	PGR	HUM	INF	INS	INV	CORR	GOV	GI	ODA	T.O
GDPGR	1.0000	0.2074	0.3120	0.1725	-0.0539	-0.0486	-0.0810	0.0235	-0.0201	0.0650	-0.0549	0.0688
PI	0.2074	1.0000	0.2924	-0.1823	-0.0252	-0.2237	0.0070	-0.3267	-0.1954	0.4283	0.0407	0.0883
PGR	0.3120	0.2924	1.0000	-0.1027	0.0013	-0.4544	-0.2210	-0.5716	-0.4434	0.0581	0.3023	0.1731
HUM	0.1725	-0.1823	-0.1027	1.0000	0.2494	0.2488	0.1593	0.2208	0.3717	-0.1005	-0.2858	-0.0194
INF	-0.0539	-0.0252	0.0013	0.2494	1.0000	0.0932	0.0795	0.0139	0.2097	0.0266	0.0536	-0.0845

INS	-0.0486	-0.2237	-0.4544	0.2488	0.0932	1.0000	0.8434	0.8107	0.9074	-0.3682	-0.3421	-0.1632
INV	-0.0810	0.0070	-0.2210	0.1593	0.0795	0.8434	1.0000	0.5822	0.8028	-0.2057	-0.1654	-0.2328
CORR	0.0235	-0.3267	-0.5716	0.2208	0.0139	0.8107	0.5822	1.0000	0.8054	-0.2003	-0.4265	-0.1532
GOV	-0.0201	-0.1954	-0.4434	0.3717	0.2097	0.9074	0.8028	0.8054	1.0000	-0.2561	-0.4221	-0.1626
GI	0.0650	0.4283	0.0581	-0.1005	0.0266	-0.3682	-0.2057	-0.2003	-0.2561	1.0000	0.2400	0.0408
ODA	-0.0549	0.0407	0.3023	-0.2858	0.0536	-0.3421	-0.1654	-0.4265	-0.4221	0.2400	1.0000	-0.0757
T.O	0.0688	0.0883	0.1731	-0.0194	-0.0845	-0.1632	-0.2328	-0.1532	-0.1626	0.0408	-0.0757	1.0000

Source: Authors

The table shows positive correlation between *GDPGR* with all variables except *ODA*, *GOV*, *INF*, *INS*, and *INV*. It means that foreign aid, government expenditure for institution quality; government expenditure for infrastructure and institution quality have some negative influence on *GDP growth* evolution in these countries. On contrary, *PI* and *GI* have positive impact on *GDP growth rate*.

The table also shows that there is autocorrelation between *INS*, *INV*, *CORR* and *GOV*. To solve this autocorrelation problem, we remove in our analysis the variables *INS* and *GOV*.

3. Results

The model was estimated using two alternative estimation methods: *fixed effects* and *random effects* methods. And the reported results will be those of *random effect* method cause to *Hausman test* results. The data were also formally tested for heteroskedasticity by using the *Breusch Pagan test* and for multicollinearity by using the variance inflation factor analysis *(VIF)*.

3.1 Fixed effects method

Fixed effects explore the relationship between dependent *(GDPGR)* and independent variables within an entity, in this case within Latin America countries (Table 2). By using fixed effects methods, we assume that something within the individual may impact or bias dependent or independent variables and we need to control for this. Fixed effects remove the effect of time-invariant characteristics so we can assess the net effect of the independent on the dependent variable. Another important assumption of the fixed effects model is that those time-invariant characteristics are unique to the individual and should not be correlated with other individual characteristics.

Table 2: Fixed effect regression

GDPGR	**Coefficient**	**t**	**P** $\succ \lvert t \rvert$
PI	0.1579699	3.89	0.000
PGR	1.813498	2.46	0.014
HUM	0.0012811	0.96	0.340
INF	-0.0000118	-0.42	0.673
INV	-1.921206	-2.53	0.012
CORR	4.081731	5.01	0.000
GI	0.0005315	0.03	0.975
ODA	$1.18e-10$	0.16	0.870
T.O	2.323471	0.41	0.685
Constant	-0.2067915	-0.06	0.951

Source: Authors

In this case, *PI*, *PGR*, *INV*, *CORR* has a significant influence on dependent variable *GDP growth rate* (p-value is lower than 0.01 and 0.05).

Private investment (PI) has positive influence on economic growth, and when private investment increases by one unit, *GDP growth* increases by *0.1579699 unit.*

Population growth rate (PGR) has positive influence on economic growth, and when population growth rate increases by one unit, *GDP growth increases by 1.813498 unit.*

Climate investment improvement (INV) has negative influence on economic growth, and when government spending for climate investment improvement increases by one unit, *GDP growth* decreases by *1.921206 unit.*

Corruption reduction (CORR) has positive influence on economic growth, and when government expenditure

for corruption reduction increases by one unit, *GDP growth increases by 4.081731 unit.*

Like expected, without INV, the others variables coefficients are positive.

3.2 Econometrics tests

3.2.1 Hausman test

Prob>chi2= 0.0399

Hausman test shows that p-value is lower than 0.05, it means that it is better to choose fixed effect model to make this analysis.

3.2.2 Breusch Pagan test

Breusch Pagan test is used to know if there is heteroskedasticity problem in regression results or not.The test results indicate no heteroskedasticity problem:

Chi2 (1): 3.03

Prob>chi2: 0.0816

In fact, according to Breusch Pagan test, if p-value (Prob>chi2) is lower than 0.05, we reject hypothesis of homoscedasticity Ho. In this case p-value is higher than 0.05, hence we accept Ho. And we may say that there is no heteroskedasticity problem in this model.

3.2.3 Variance inflation factor (VIF) test

Table 3: VIF table

Variable	VIF	1/VIF
CORR	2.81	0.355564
INV	1.92	0.521536
PI	1.72	0.582888
PGR	1.61	0.619284
ODA	1.55	0.645722
GI	1.48	0.677736
HUM	1.23	0.811617
T.O	1.11	0.899400
INF	1.09	0.917730
Mean VIF	1.61	

Source: Authors

A variance inflation factor (VIF) less than 10 is generally viewed as evidence of absence of problematic multicollinearity among regressors.

3.2.4 Panel unit root tests

The first step, before analyzed the causality relationship between variables, is to determine whether all the variables are integrated of the same order. A number of panel unit root tests have been developed to determine the order of integration of panel variables.

We performed the panel unit root tests proposed by *Levin et al. (2002)* and *Im et al. (2003)* and panel unit root tests Fisher-ADF and Fisher-PP proposed by *Maddala and Wu (1999)*, and by *Choi (2001). Levin, Lin, and Chu (LLC) (2002)* test assumes that there is a common unit root process so that ρ_i is identical across cross-sections. The test employs a null hypothesis of a unit root. LLC test consider the following basic ADF specification:

$$\Delta y_{it} = \alpha y_{it-1} + \sum_{j\ 1}^{P_i} \beta_{ij} \Delta y_{it-j} + X_{it}^{'} \delta + \varepsilon_{it} \qquad (6)$$

Where we assume a common $\alpha = \rho - 1$, but allow the lag order for the difference terms, p_i to vary across cross-sections. The H_0 is $\alpha = 1$ (there is a unit root) and the alternative H_1 is $\alpha \prec 0$ (there is no unit root). *Im, Pesaran,* and *Shin (2003)* test allows for individual unit root processes so that ρ_i may vary across cross-sections. The test begins by specifying a separate ADF regression for each cross section (on the model of Eq(6)).

The null hypothesis may be written as $H_0 : \alpha_i = 0$, for all *i*, while the alternative hypothesis is given by:

$$\begin{cases} \alpha_i \prec 0, i = 1,2,...,N_1 \\ \alpha_i = 0, i = N+1, N+2,...,N \end{cases}$$

(where the *i* may be reordered as necessary) which may be interpreted as a non-zero fraction of the individual processes is stationary. Rejection of the null hypothesis does not necessarily imply that the unit root null is rejected for all *i*.

Maddala and Wu (1999), and *Choi (2001)* proposed an idea to derive tests that combine the p-values from individual unit root tests using *Fisher's (1932)* results.

The Fisher-ADF and PP tests allow for individual unit root processes so that ρ_i may vary across cross-sections. The tests are all characterized by the combining of individual unit root tests to derive a panel-specific result. The tests have null hypothesis of unit root, whereas the alternative hypothesis of some cross-sections do not contain a unit root.

Table 4: Test results for panel unit roots

Variables		Method			
		Levin, Lin and Chu t*	Im, Pesaran and Shin W-stat	ADF-Fisher Chi-square	PP- Fisher Chi-square
Levels	**GDPGR**				
	Statistic	-10.1900	-6.88663	127.131	63.1934
	Prob.	0.0000	0.0000	0.0000	0.0303
	PI				
	Statistic	-9.80878	-6.28592	96.1020	89.6549
	Prob.	0.0000	0.0000	0.0000	0.0000
	PGR				
	Statistic	-10.4226	-7.25473	158.288	118.539
	Prob.	0.0000	0.0000	0.0000	0.0000
	HUM				
	Statistic	-8.26198	-7.98049	99.8549	109.705
	Prob.	0.0000	0.0000	0.0000	0.0000
	INF				
	Statistic	-9.02654	-7.85417	68.9270	68.9259
	Prob.	0.0000	0.0000	0.0000	0.0000
	INV				
	Statistic	-15.7917	-11.9887	187.912	149.295
	Prob.	0.0000	0.0000	0.0000	0.0000
	CORR				
	Statistic	-12.5801	-12.6074	199.967	189.620
	Prob.	0.0000	0.0000	0.0000	0.0000
	GI				
	Statistic	-17.3734	-11.7246	99.1275	111.685
	Prob.	0.0000	0.0000	0.0000	0.0000
	ODA				
	Statistic	-1.08487	-2.89600	72.8288	83.8544
	Prob.	0.1390	0.0019	0.0022	0.0001
	T.O				
	Statistic	-5.33731	-4.24934	91.8662	109.137
	Prob.	0.0000	0.0000	0.0000	0.0000
First differences	**GDPGR**				

	Statistic	-13.2343	-8.30095	145.324	96.6033
	Prob.	0.0000	0.0000	0.0000	0.0000
	PI				
	Statistic	-12.5010	-9.39270	129.437	149.260
	Prob.	0.0000	0.0000	0.0000	0.0000
	PGR				
	Statistic	-57.3521	-31.9223	200.518	277.541
	Prob.	0.0000	0.0000	0.0000	0.0000
	HUM				
	Statistic	-18.9632	-10.9568	144.930	179.973
	Prob.	0.0000	0.0000	0.0000	0.0000
	INF				
	Statistic	-29.7285	-13.0266	70.4903	67.6553
	Prob.	0.0000	0.0000	0.0000	0.0000
	INV				
	Statistic	-13.6866	-10.1037	169.484	231.548
	Prob.	0.0000	0.0000	0.0000	0.0000
	CORR				
	Statistic	-20.3247	-11.2901	156.292	212.824
	Prob.	0.0000	0.0000	0.0000	0.0000
	GI				
	Statistic	-211.864	-60.4207	167.732	201.698
	Prob.	0.0000	0.0000	0.0000	0.0000
	ODA				
	Statistic	-8.58061	-8.74373	144.810	168.041
	Prob.	0.0000	0.0000	0.0000	0.0000
	T.O				
	Statistic	-26.4078	-14.1522	178.955	201.317
	Prob.	0.0000	0.0000	0.0000	0.0000

Source: Authors

We performed ten different statistics described above. The results of the LLC, IPS, Fisher-ADF and Fisher-PP panel unit root tests for each of the variable are shown in Table 4. We perform each test for the level and first difference of variables. In case of the level of variables the null hypothesis that variables assume common and individual unit root process cannot be rejected. However, after applying the first difference, all of the variables meet the requirements of the study. So, we can acknowledge their stationarity for the 95% confidence interval.

3.2.5 Granger causality test

In this step, we determine the direction of the causality between the variables in this panel framework; to achieve this goal, we apply the panel Granger causality test based on the model developed by *Dumitrescu and Hurlin (2012)*. This model allows for heterogeneity across the cross sections, while the conventional Granger-causality test (*Granger, 1969*) ignores this property.

The Dumitrescu-Hurlin panel Granger causality test is based on the individual Wald statistics of Granger non causality averaged across the cross-section units. This test uses the following model to test for Granger causality:

$$y_{i,t} - \alpha_i + \sum_{k\ 1}^{K} \gamma_i^{(k)} y_{i,t-k} + \sum_{k\ 1}^{K} \beta_i^{(k)} x_{i,t-k} + \varepsilon_{i,t}$$

Where α_i denotes the individual effects, K represents lag orders which is identical for all cross-sectional units of the panel, and $\gamma_i^{(k)}$ and $\beta_i^{(k)}$ are group-specific parameters. The null hypothesis assumes no causality exists in any cross-section, while the alternative hypothesis suggests that there is causality at least for some cross-sections. The null and alternative hypotheses are defined as:

$$H_0 : \beta_i^k = 0 \qquad \forall\ i = 1,\ldots..N$$

$$H_1 : \begin{cases} \beta_i = 0, i = 1,2,.....N \\ \beta_i^k \neq 0, i = N+1,.....N \end{cases}$$

Table 5: The *Dumitrescu and Hurlin (2012)* panel causality test

Null hypothesis	Zbar-Stat	Prob
GDPGR does not granger-cause PGR	2.7417	0.0061***
PGR does not granger cause GDPGR	0.8488	0.3960
GDPGR does not granger cause HUM	2.2152	0.0267**
HUM does not granger cause GDPGR	1.3392	0.1805
GDPGR does not granger cause INV	3.9731	0.0001***
INV does not granger cause GDPGR	4.7159	0.0000***
GDPGR does not granger cause CORR	3.6264	0.0003***
CORR does not granger cause GDPGR	-1.0973	0.2725
GDPGR does not granger cause GI	2.6667	0.0077***
GI does not granger cause GDPGR	9.3113	0.0000***
GDPGR does not granger cause ODA	1.6142	0.1065
GDPGR does not granger cause TO	2.4951	0.0126**

Source: Authors

Note: ***, **,* denote the rejection of the null hypothesis at the 1%, 5% and 10% significance levels, respectively.

We use the first difference of the data series as the test requires the variables to be stationary. Table 5 presents the results of the *Dumitrescu and Hurlin (2012)* heterogeneous panel causality test.

They indicate that there is a bidirectional causal relationship between economic growth and investment climate improvement. The result suggests that a good climate investment leads to an improvement in economic growth and vice versa in Latin American countries.

The findings also show evidence of a feedback relationship between GDPGR (economic growth) and GI (government expenditure for domestic investment improvement). This implies that both economic growth and domestic investment are driving each other , underlying the importance of domestic investment in Latin American countries.

However, no evidence of a significant causality is found between GDPGR (economic growth) and ODA (foreign aid), which may reflects that foreign aid has no effect on these countries economic growth and vice versa.

In sum, the causality test main results indicate that investment climate improvement and domestic investment have significant influence on economic growth.

4. Discussion

This paper has mainly examined the effects of public and private spendings on economic growth using panel data from 22 Latin America countries for the 2002-2014 periods. The model was estimated in its full and restricted versions by *fixed-effects* and *random-effects* techniques. The results produced by fixed-effects estimation has been used according to *Hausman test*

results.

The results from fixed effect method show that the *trade-openness* and *human capital* are not significant, so it has no effects on these countries economic growth. These results seem to imply that in these countries, *private investment*, *population growth rate*, *corruption reduction* create favorable economic environment for economic growth. In addition, the implication of government in *climate investment* has a negative impact on economic growth. The results also point out that the impact of *foreign aid* is not significant. Additionally, the causality test indicates that *investment climate improvement* and *domestic investment* have significant influence on economic growth.

The results of this study have policy implications; they are useful in the sense that they show that in these countries *foreign aid* is not necessary for economic growth. Moreover they encourage *public spending for corruption reduction*, *private and domestic investment*. In addition, the results show that the government action for the improvement of *investment climate* is not good for economic growth in these countries. Some of these analyses are necessary but, not sufficient because they only rely on the environment of spending. Analyses have also to pay attention of legal environment of investment and public spending. Recent works on the economy of institutions (*La Porta and al.*,2008, *Hall and Jones, 1999; Acemoglu et al.,2004*) showed that the ability of better protection of property rights promotes growth. Moreover, according to *Williamson (1999)*, in developing countries it is clear that it is not necessarily a matter of reducing or increasing the size of spending, but of spending better. So, the research must also pay attention of process of using public spending

END NOTES

1. Following some previous studies, both the domestic government spending for capital formation and the official development assistance have been expressed as percentages of domestic GDP rather than annual percentage changes.

2.In this study four countries (Guadeloupe, Martinique, Saint Barthelemy, St Martin) were dropped due to the lack of availability of complete data for the period under consideration.The countries in the sample are: Brazil, Mexico, Colombia, Argentina, Peru, Venezuela, Chile, Ecuador, Guatemala, Cuba, Haiti, Bolivia, Dominican Republic, Honduras, Paraguay, Nicaragua, El Savador, Costa Rica, Panama, Puerto Rico, Uruguay, French Guyana,. The main sources of data are *World Development Indicators 2016* and *World Governance Indicators 2016* published by the World Bank.

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Appendix

	VARIABLE	Proxy/measurement
1	Dependent variable: GDPGR (Economic growth)	Annual growth rate in real gross domestic product
2	Independent Variable: PI (Private Investment)	Private investment as percent of gross domestic product,
3	Independent variable: PGR (Population Growth Rate)	Annual percentage change in population, a proxy for the labor force
4	Independent variable:	Human capital as percent of gross domestic product,

	HUM (Human capital)	
5	Independent variable: INF(Infrastructures)	Government expenditure for infrastructures as percent of gross domestic product,
6	Independent variable: INS(Institution quality)	Government expenditure for institution quality
7	Independent variable: INV(Investment climate)	Government expenditure for investment climate improvement
8	Independent variable: CORR(Corruption)	Government expenditure for corruption reduction
9	Independent variable: GI (Domestic investment)	government expenditure for domestic investment improvement as percent of GDP,
10	Independent variable: ODA (Official development assistance)	Net official development assistance from all donors as percent of recipient GDP,
11	Independent variable: TOP (Trade openness)	Annual percentage change in the ratio of the sum of export and imports to GDP, a proxy for trade-openness.
12	Independent variable: GOV (Governance)	Government expenditure for governance quality