RE-EXAMINING ECONOMIC GROWTH: A WORLD, REGIONAL AND COUNTRY ANALYSIS[1]

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Abstract

The evaluation of the main determinants of economic growth is still an open question. The previous literature has found different determinants depending of the region or the income level. In this study, it is re-evaluated the main determinants of economic growth with a panel data model with a sample of 81 countries and five years average annual data spanning from 1980 to 2019 with macroeconomic and governance variables. Also, the model is re-estimated only in the case of the Latin American and Caribbean region with a sample of 20 countries over the same period of time and in the case of Guatemala. The study found empirical evidence that the main determinants of economic growth are human capital, physical capital, savings, exports, openness to trade, foreign direct investment, the rate of population growth, government spending, and the initial level of GDP per capita.

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[1] The opinions expressed in this document are the sole responsibility of the author.
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Contents

I.   Introduction

The study of the main determinants of economic growth is still an open question and vital in order to understand the economic development of a country. Since the seminal paper of Solow (1956) titled a Contribution of the Theory of Economic Growth, there are several studies which have been searching the main factors which explain economic growth.

Variables like human capital, physical capital, exports, openness to trade, exports, savings, and foreign direct investment are considered to have a positive impact on economic growth while the initial level of GDP, the rate of population growth, and government spending are believed to have a negative impact on it. Furthermore, the governance indicators such that rule of law, corruption, voice and accountability are also included in the research in order to test if a good governance help to explain the effect that the macroeconomic variables have on economic growth. The factors that determine economic growth may differ across regions and country due to an economic, institutional and cultural factors.

The estimation of the economic growth is made with a world sample of 81 countries with five years average annual data spanning from 1980 to 2019. The countries in the sample are divided in 7 regions according with the classification of the World Bank: East Asian and pacific (11 countries), Europe and Central Asia (22 countries), Latin America and the Caribbean (20 countries), Middle East and North Africa (11 countries), North America (3 countries), South Asia (4 countries), and Sub – Saharan Africa (11 countries).

In this document, the main determinants of economic growth are re-examined with a panel data model for the World, the Latin America and Caribbean region, and Guatemala in order to test if they are the same across regions due to the heterogeneity observed in the data. The variable selected as economic growth is GDP per capita growth.

The following sections are organized as follows. Section II provides a brief literature review about economic growth. Section III details the methodology implemented in the study. Section IV presents the main results of the estimation of the panel data model. Finally, Section V presents the final remarks of the paper.

II. Literature Review

The analysis and evaluation of the determinants of economic growth is an important goal that the Central Banks should aim in order to understand the patterns of economic growth and how it can be address to achieve economic development. In this section, it is described a briefly review of the literature about economic growth. First, it is described the theoretical underpinnings of growth and second, the empirical estimation of it.

There are hundreds of papers which have been exploring the theoretical framework of economic growth since the seminal paper of Solow (1956) named: A contribution to the Theory of Economic Growth. Besides, the researchers also proposed models of endogenous growth in order to explain the long run economic growth (Rebelo (1991), Barro (1991), Mankiw et al. (1992), Barro and Sala-i.Martin (2004), and Agneor and Montiel (2015)).

The previous literature has estimated a variety of empirical models with the objective of explaining the economic growth through a set of explanatory variables which varies across countries, regions, and income level.

The standard empirical model to estimate economic growth has been the panel data model where it is chosen a sample of selected countries over a period of time. Besides, the use of dynamic panel data and Panel VAR models are recently being consider to explain growth.

Also, the main dependent variable uses as a measure of economic growth is GDP per capita growth, and the main explanatory variables included in the previous studies are classified in macroeconomic, financial, and capital flows. In addition, the previous studies also added governance indicators to control for good governance.

A. Theoretical Framework

In this subsection, there is a brief review of the literature about the initial papers which established the structural framework of economic growth.

Solow (1956) considers a Cobb – Douglas production function with two inputs: physical capital and labor in order to explain the patterns of the economic growth, where it is assumed decreasing returns to physical capital and labor. The model is known as the Solow model. The main conclusions are that the steady state of GDP per capita is positively explained by a sustained increase of the rate of savings and negatively explained by an increase of population growth.

In addition, the endogenous growth models were proposed in order to explain the long run economic growth, where the main assumption is to dismiss decreasing returns to scale. Moreover, these types of models consider endogenous explanatory variables. Rebelo (1991) develops the AK model to explain the output per capita as a function of capital per capita and technological progress. In this model, the capital per capita includes both physical and human capital, and it is assumed to show constant returns to scale. The main conclusion is that it is possible to achieve long run economic growth with capital under constant returns to scale and it is not necessary to use nonreproducible factors (Agneor and Montiel (2015)).

Also, Barro and Sala-i-Martin (2004) consider models with learning by doing and knowledge spillovers with two main assumptions. The first one is that an increase in capital stock produces also an increase in the stock of knowledge. The second one is that the knowledge obtained in a firm can be spillover to the whole economy because they assume that it is a public good. With these assumptions, it is possible to obtain a long run economic growth without the assumption of diminishing returns to scale.

Furthermore, Mankiw et al. (1992) added to the Solow model, the human capital accumulation as endogenous variable alongside with the physical capital and labor in order to explain in a better way the long run economic growth, which is known as the augmented Solow model. Their model explained the variation of output for around 80 percent.

B. Empirical Studies

The previous literature has been taking two approaches to analyze economic growth. The first approach is estimating the relationship between economic growth and other key

variables, such that government expenditure (Afonso and Gonzalez (2008)), human capital formation (Alataş and Çakir (2017), Cuevas and Calderon (2020)), financial development (Fuinhas et al. (2021)), or institutional variables (Amorin and Alves (2018), Góes (2015)). In this subsection, there is a brief review of some empirical papers. The second approach is finding the main determinants of economic growth.

Some studies investigate how human capital formation affects economic growth. First, Alataş and Çakir (2017) examine the relationship between human capital and economic growth by estimating a panel of 65 countries with annual data spanning from 1967 to 2011, where the dependent variable was the real GDP per capita and the explanatory variables: an index of human capital per person based on schooling and return of educations from Penn Table and the mortality rate as a proxy of health. The countries were divided depending of the level of income. Their main results were that health and education had a positive impact on economic growth in the cluster of the developing countries while the health has a negative impact on economic growth in the case of the cluster of less developed countries. Second, Cuevas and Calderón (2020) explores the relationship between human capital formation and other key variables on economic growth with a sample of 52 countries over a 13 years period and the explanatory variables were physical capital, human capital, population growth as a proxy of labor, openness, corruption, and institutional development. They classified the countries into six groups according with the Inequality – adjusted Human Development Index and found statistical evidence of the positive impact of both physical and human capital on economic growth in the six groups, while the relationship of the other variables on growth varied depending of the group of study.

Other studies analyze the relationship between government and economic growth. Afonso and Gonzalez (2008) evaluated the impact of public expenditure on economic growth by estimating a panel data model with a sample of 27 countries of the European Union with a dataset which covers the period 1971-2006. The set of explanatory variables includes population growth, labor force growth, terms of trade, private investment alongside with public consumption, public investment, direct taxation and social contributions. Their main

findings were that public consumption and social security had a negative impact on economic growth, while public investment had a positive impact on it.

Also, the literature examines the relationship between governance and economic growth. Amorim, and Alves (2018) estimate the relationship between governance and economic with a Panel VAR model over the period of 1996 to 2014. They used as a measure of governance, the dataset of Worldwide Governance Indicators (WGI), and the GDP per capita growth as a proxy of economic growth. They found that a shock in governance quality have a positive and significant effect on economic growth and it is statistically significant more than ten year after the shock. Also, the 33% of the variation in GDP can be explained by good governance. Also, Góes (2015) studied the relationship between institutions and growth with a Panel Structural VAR model for a short panel of 119 countries over 10 years. The author considers the Fraser Institute's Economic Freedom of the World Index as a proxy for institutional quality. The main finding of the study was that a one percentage shock in institutional quality generates an increase of 1.7 percentage in economic growth after six years.

Besides, the literature also analyzes the relationship between financial development and economic growth. Fuinhas et al. (2021) look into the relationship between economic growth, inflation, stock market development and banking sector development by the estimation of a panel VAR model with a sample of sixteen high-income countries for the period between 2001 to 2016. The author found empirical evidence of a positive relationship between the development of the banking sector and the stock market with economic growth.

In the case of the second approach, the researchers have been looking at the main determinants of economic growth. Salai-I-Martin, Doppelhofer and Miller (2004) test the robustness of explanatory variables in a cross – country economic growth regressions with a Bayesian Averaging of Classical Estimates. The authors chose 67 explanatory variables and found that 18 of them were statistically significant and robustly partially correlated with long – term economic growth. Also, the strongest evidence of significance was found for the relative price of investment, primary school enrollment, and the initial level of real GDP per capita.

Moral – Benito (2010) looked at the determinants of economic growth by estimating a Bayesian Panel data model with a sample of 73 countries spanning from 1960 to 2000. The main explanatory variables consider in the study are: initial GDP, life expectancy, investment price, political rights, population growth, urban population, trade openness, investment share, distant to the big cities, primary and secondary education, consumption share, and government share. The author found that the most robust determinants of economic growth are the price of investment, distance to big cities, political rights index; and the less robust determinants are population growth, urban growth, openness, investment share, government consumption share, and civil liberties.

Besides, Veredia-Jerez and Chasco (2016) searched for the long – run determinants of economic growth through a two – equation framework with a dynamic panel data for South American countries from 1960 to 2008. Their main explanatory variables were physical and human capital, exports, institutions, foreign direct investment, investment share and trade openness. Their main findings were that economic growth is explained mostly by physical and human capital accumulation as well as export. Also, institutions played an important role to maintain a sustainable economic growth.

After doing a brief literature review about growth, it is shown the methodology in this study in the next section.

III. Methodology

The main goal of the study is to revisit the main determinants of economic growth with a sample of 81 countries which are classified by regions following the classification of the World Bank. Following the literature, it is used five years annual data spanning from 1980 to 2019 for both the dependent and the explanatory variables. The main dependent variable is GDP per capita growth as a proxy for economic growth by following the previous literature.

The study chose to estimate the behavior of economic growth with a fixed effect panel data model because it is the standard model used by the previous literature and also allows to include for the estimation a broad set of explanatory variables since the goal of the study is to find the main determinants of growth.

The methodology applied in the paper is as follow: First, it is estimated the model with the world sample in order to determine which explanatory variables explain economic growth. Second, the model is re-estimated only for Latin America and Caribbean countries to test whether the same explanatory variables hold or they are different in the explanation of economic growth. Finally, it is inferred from the model which variables help to explain the economic growth in Guatemala.

In the first subsection, there is an explanation of the selection and the treatment of the variables in the study and the sample chosen. In the second subsection, there is the setup and the justification of the specification of the model. In the final subsection, it is illustrated a brief graphic analysis of the behavior of GDP per capita growth across the regions and Guatemala.

A. Sample and Data Analysis

The study considers a sample of 81 countries divided in regions according with the classification of the World Bank (see Appendix I, table 1). The countries are divided in seven regions: East Asian and Pacific (11 countries), Europe and Central Asia (22 countries), Latin America and the Caribbean (20 countries), Middle East and North Africa (11 countries), North America (3 countries), South Asia (4 countries), and Sub – Saharan Africa (11 countries). The selection of the countries in every region was due to the data availability in order to have a balanced panel data model.

The dependent variable of the study is GDP per capita growth which is used to measure economic growth in this research. The study selected the main explanatory variables that the

previous literature has been used to explain economic growth. They are classified in two groups: Macroeconomic variables and governance indicators.

The macroeconomic were obtained from the World Development Indicator Dataset (see Appendix II, table 2) and the governance Indicators were obtained from the Worldwide Governance Indicators (see Appendix II, table 3). Both sources are from the World Bank Dataset.

The frequency of both the set of the macroeconomic variables and the governance indicators is annual spanning from 1980 to 2019. Also, all variables including the dependent variable, were transformed into moving five years averages in order to avoid business cycle fluctuations with the exception of the initial real GDP per capita which represents the initial value of every period of five years.

B. Model Specification

The model chosen in this study to estimate the main determinants of economic growth is the fixed effect panel data model. The model has two dimensions: entities and time. The entities represent the countries, and the time are the years.

Following Wooldridge (2010), the setup of the model is as follow:

$$y_{it} = x_{it}\beta + c_i + u_{it} \tag{1}$$

Where $i = 1, \ldots\ldots n$, *represents* the countries, $t = 1, \ldots T$, represents the years consider in the study, y_{it} is the dependent variable, GDP per capita growth, x_{it} is a vector of the explanatory variables, β is the coefficient matrix of the explanatory variables, c_i represents the entity specific intercepts that capture heterogeneities across entities, and u_{it} are the error terms across entities and time.

The main explanatory macroeconomic variables used in this study included in x_{it}, are:

$gdpgrowth_{i,t}$ = GDP per capita growth.

$gdpinit_{i,t}$ = Initial real GDP per capita (constant 2015 US$).

$eduprim_{i,t}$ = Human capital formation, primary schooling.

$inv_{i,t}$ = Physical capital as a share of GDP.

$gov_{i,t}$ = Government spending as a share of GDP.

$exports_{i,t}$ = Exports as a share of GDP.

$imports_{i,t}$ = Imports as a share of GDP.

$remitt_{i,t}$ = Personal remittances as a share of GDP.

$fdi_{i,t}$ = Foreign direct investments as a share of GDP.

$savings_{i,t}$ = Domestic savings as a share of GDP.

$poggrowth_{i,t}$ = Population growth (annual %)

$CPI_{i,t}$ = Consumer price index (annual %)

$poggrowth_{i,t}$ = Population growth (annual %)

$openness_{i,t}$ = Openess to trade (annual %)

Also, the main explanatory governance indicators used in this study included x_{it}, are:

$Corruption_{i,t}$ = Control of corruption.

$goveff_{i,t}$ = Government effectiveness

$polstab_{i,t}$ = Political stability and absence of violence

$regqua_{i,t}$ = Regulatory quality.

$rulelaw_{i,t}$ = Rule of law.

$Voice_{i,t}$ = Voice and accountability.

First, the model of economic growth is estimated with only the macroeconomic variables as explanatory variables with five years average annual data from 1980 to 2019. Second, the model is re-estimated with the addition of the governance indicators but with a sample spanning from 1998 to 2019 due to data availability.

Second, the model is estimated for the World, the Latin American and the Caribbean region and finally, it is estimated in the case of Guatemala.

C. Graphic Analysis

In this subsection, there is a brief graphical analysis of the patterns of the GDP per capita growth which is the measure consider in this study to explain growth. Figure 1 illustrates the average GDP per capita growth of the seven regions of the countries according with the classification of the World Bank.

From figure 1, the region 4, which correspond to Middle East and North Africa, shows the biggest average GDP per capita growth in 1990 of 12.49% and the second biggest average GDP per capita growth in 2004 of 7.65%.

Besides, in 2009, there was a decrease in the average GDP per capita growth in all regions and was more prolonged in region 2 (Europe and Central Asia) and region 5 (North America) due to the Global Financial Crisis.

Moreover, the biggest average GDP per capita growth in the sample period was register in region 1 (East Asian and Pacific) with a 3.57% followed by region 6 (South Asia). On the other hand, the lowest average GDP per capita growth in the sample period was register in region 7 (Sub – Saharan Africa) followed by region 4 (Middle East and North Africa). In the case of Latin American and Caribbean, the average GDP per capita growth in the sample period was 1.32%.

Therefore, it is observed a great heterogeneity between regions that can be controlled with a fixed effect panel data model.

Figure 1: Average GDP per capita growth by Regions.
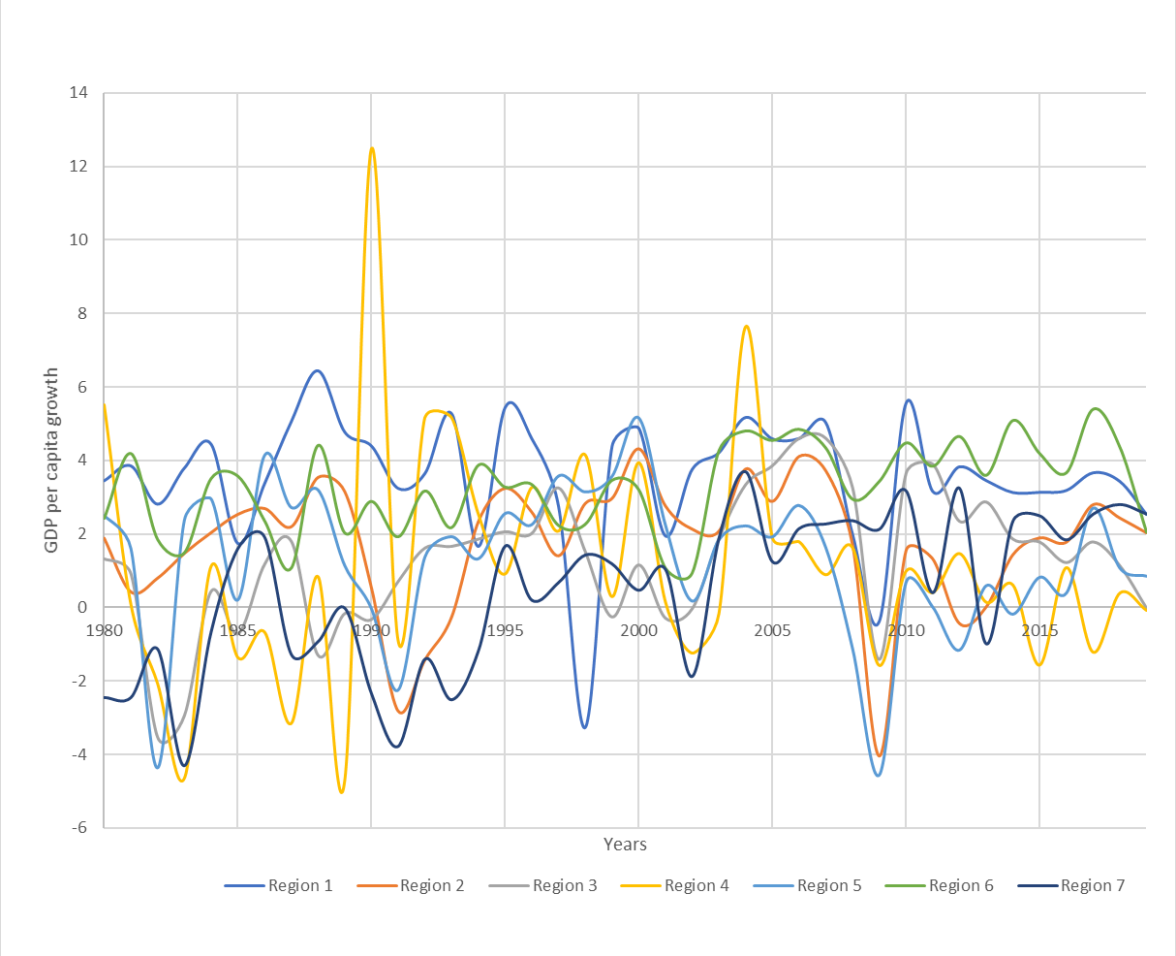
Source: Own elaboration, World Development Indicators, World Bank Dataset

In addition, figure 2 depicts the behavior of GDP per capita growth for Latin America and Caribbean and Guatemala over the sample period.

From figure 2, it is observed that the GDP per capita growth of Guatemala is oscillating around the average GDP per capita growth of Latin American and Caribbean. Its highest

GDP per capita growth is reached in 1980 with 3.29% and its lowest GDP per capita growth is reached in 1986 with -3.87%.

Figure 2: GDP per capita growth for Latin America and Caribbean and Guatemala
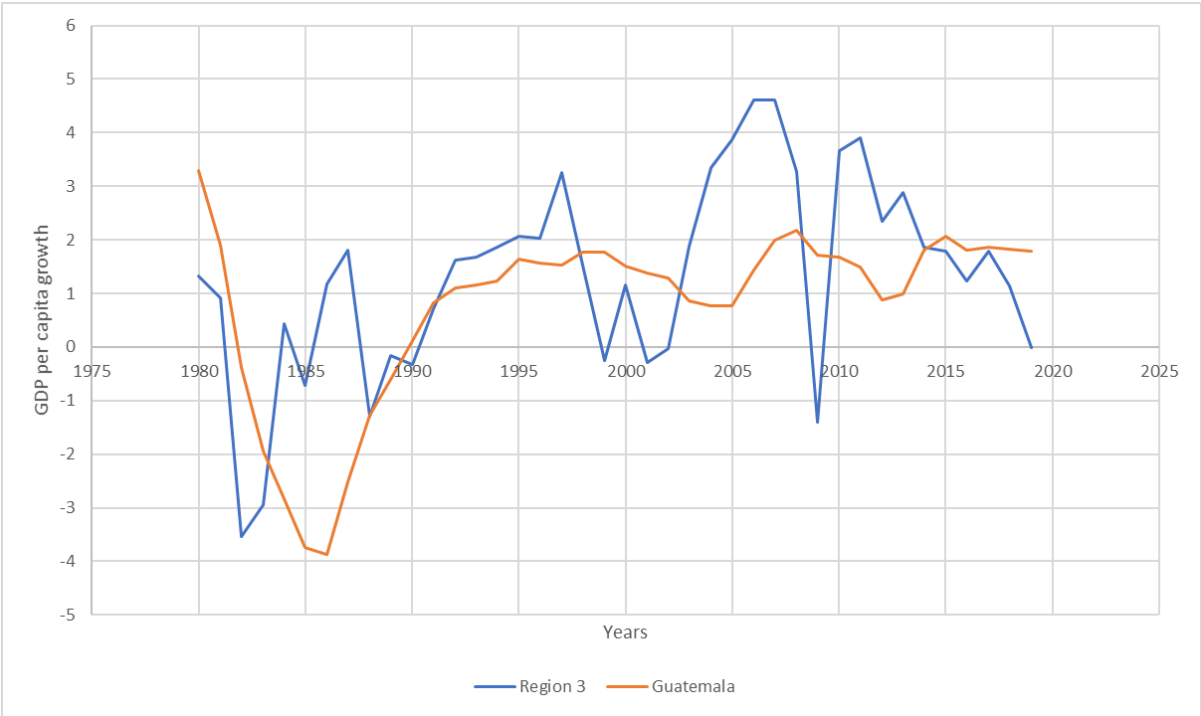
Source: Own elaboration, World Development Indicators, World Bank Dataset

IV. Empirical Analysis

In this section, it is shown the main results of the estimation of economic growth. The main goal is to determine the main determinants of growth of the world, every region, and Guatemala and compare whether they are the same. The methodology is as follow.

First, it is estimated the fixed effect panel model with a world sample of 81 countries divided into seven regions according with the classification of the World Bank with five years average annual data from 1980 to 2019. When the governance indicators are added, the sample period is from 1998 to 2019 due to data availability.

Although there is a great heterogeneity observed in the data between regions, the benefits to estimate a model with a world sample is that it is possible to inferred from it the behavior of each region and specially a country.

Second, it is estimated the fixed effect panel model only in the case of Latin America and the Caribbean to test it the same determinants of economic growth are found in comparison with the world sample.

Finally, it is estimated a model in the case a Guatemala to determine the main determinants of growth and then compare them with the world and Latin America and Caribbean region.

A. Estimation of Economic Growth for the World

The dependent variable considers as a proxy of economic growth is GDP per capita growth, following the previous literature and it was considered the set of the explanatory variables explained in the previous section.

Table 4 depicts the main results of the estimation of a fixed effect panel model. The Hausman test confirmed that the best specification was fixed effect which help to control for the large heterogeneity across regions observed in the data. Also, the explanatory variables are included with one lag in order to break down the double causality between them and the dependent variable. Besides, the study includes a dummy variable for the global financial crisis, $dglobal_{i,t}$. Finally, the period of time finished in 2019 to avoid the covid outbreak.

The second colum of table 4 shows that the real initial GDP per capita and population growth have a negative and statistically significant impact on GDP per capita growth while exports as a share of GDP has a positive and statistically effect on GDP per capita growth. The remaining explanatory variables are not statistically significant at any level.

Then, in the third colum, physical capital as a share of GDP is substituted by gross domestic savings as a share of GDP. The results remain the same although the significance of the

initial GDP per capita and exports as a share of GDP diminishing from 1% to 5% level. Similarly, in the fourth column, government spending as a share of GDP is added but it is not statistically significant at any level. The remaining explanatory variables remains the same.

Table 4: Fixed Effect Panel Model with a World Sample

Variables	$gdpgrowth_{i,t}$	$gdpgrowth_{i,t}$	$gdpgrowth_{i,t}$	$gdpgrowth_{i,t}$	$gdpgrowth_{i,t}$
$gdpinit_{i,t-1}$	-0.683***	-0.717**	-0.583**	-0.347**	-0.420**
	(0.245)	(0.274)	(0.224)	(0.201)	(0.239)
$eduprim_{i,t-1}$	0.017	0.015	0.010	0.032***	0.030***
	(0.013)	(0.013)	(0.013)	(0.010)	(0.106)
$exports_{i,t-1}$	0.031***	0.030*	0.030**	0.029**	0.028**
	(0.013)	(0.015)	(0.013)	(0.015)	(0.012)
$popgrowth_{i,t-1}$	-1.250***	-1.270***	-1.332***	-1.010***	-1.00**
	(0.278)	(0.289)	(0.292)	(0.230)	(0.232)
$invest_{i,t-1}$	0.034		0.028	0.014	0.017
	(0.044)		(0.045)	(0.029)	(0.027)
$savings_{i,t-1}$		0.01			
		(0.036)			
$gov_{i,t-1}$			-0.092	-0.156***	-0.169***
			(0.061)	(0.047)	(0.525)
$remitt_{i,t-1}$				0.014	0.022
				(0.038)	(0.037)
$corruption_{t-1}$					-0.018
					(0.011)
$rulelaw_{t-1}$				0.010	
				(0.010)	
constant	5.990***	7.107***	7.670***	4.371***	4.632***
	(2.321)	(2.755)	(2.309)	(1.930)	(1.920)
$dglobal_{i,t}$	0.782***	0.766**	0.763***	0.692***	0.682***
	(0.187)	(0.186)	(0.859)	(0.158)	(0.158)
Observations	2174	2174	2174	1695	1695
R-squared	0.60	0.62	0.70	0.75	0.76

Note: Asterisks denote significant coefficients, with ***, **, * indicating significance at 1%, 5% and 10% level respectively. Standard deviations reported in parenthesis

Source: Own elaboration

Also, in the fourth colum, there is the addition of two variables: personal remittances of a share of GDP and rule of law index. In this estimation, government spending as a share of GDP has a negative and statistically significant effect on economic growth while human capital formation has a positive and statistically significant impact on economic growth.

Therefore, the addition of a governance indicator helps to make both government spending and human capital formation statistically significant. The remaing variables remains the same. Finally, in the fifth column, control of corruption is changed instead of rule of law. The results remains the same.

In sum, the study found empirical evidence that the initial GDP per capita, population growth, and government spending has a negative and statistically significant impact on GDP per capita growth. Also, the study found empirical evidence that exports as a share of GDP and human capital formation have a positive and statistically significant effect on GDP per capita growth. Also, controlling for good governance made statistically significant both government spending and human capital formation.

B. Estimation of Economic Growth for Latin America and Caribbean

In this subsection, it is estimated the model for Latin America and Caribbean with a sample of 20 countries with five years average annual data spanning from 1980 to 2019. Besides, when the governance indicators are added to the model, the sample period is from 1998 to 2019 due to data availability. The goal to estimate the model only for this region is to determine if the determinants of economic growth are the same with the world sample or differ.

Table 5 depicts the main results of the estimation of a fixed effect panel model in the case of Latin America and Caribbean. The Hausman test confirmed that the best specification was fixed effect too.

The second column of table 5 depicts that population growth has a negative and statistically significant impact on GDP per capita growth while human capital, exports as a share of GDP and physical capital as a share of GDP has a positive and statistically effect on GDP per capita growth. The remaining explanatory variables are not statistically significant at any level. Different from the previous estimation with the world sample, physical capital as a share of GDP became statistically significant and the initial real GDP per capita is not statistically significant.

Similarly, in the third column, physical capital as a share of GDP is changed by gross domestic savings as a share of GDP. The coefficient of the gross domestic savings as a share of GDP is positive and statistically significant at 10% level. The other variables hold their signs and statistically significance.

Table 5: Fixed Effect Panel Model, Latin America and Caribbean

Variables	$gdpgrowth_{i,t}$	$gdpgrowth_{i,t}$	$gdpgrowthi$	$gdpgrowth_{i,t}$	$gdpgrowth_{i,t}$	$gdpgrowth_{i,t}$
$gdpinit_{i,t-1}$	-0.553	-1.01	-0.428	-0.294	-0.313	-0.263
	(0.387)	(0.740)	(0.402)	(0.372	(0.782)	(0.717)
$eduprim_{i,t-1}$	0.041**	0.31**	0.040***	0.031**	0.016	0.020
	(0.016)	(0.014)	(0.017)	(0.013)	(0.019)	(0.18)
$exports_{i,t-1}$	0.040**	0.030*		0.036**	0.047**	0.028**
	(0.016)	(0.015)		(0.016)	(0.016)	(0.012)
$Openness_{i,t-1}$			0.014			
			(0.010)			
$popgrowth_{i,t-1}$	-1.650***	-1.768***	-1.684***	-1.734***	-1.209***	-1.324**
	(0.521)	(0.627)	(0.524)	(0.517)	(0.468)	(0.464)
$invest_{i,t-1}$	0.079***		0.077**	0.058**		0.042**
	(0.032)		(0.033)	(0.024)		(0.027)
$savings_{i,t-1}$		0.097*			0.080**	0.079**
		(0.045)			(0.039)	(0.362)
$gov_{i,t-1}$				-0.145***	-0.180***	-0.194***
				(0.034)	(0.049)	(0.501)
$remitt_{i,t-1}$					0.041	0.058
					(0.038)	(0.041)
$corruption_{t-1}$						-0.011
						(0.016)
$rulelaw_{t-1}$					0.010	
					(0.014)	
constant	1.368	6.564	0.866	3.060	4.371***	2.743***
	(4.945)	(6.834)	(5.188)	(4.627)	(1.930)	(6.600)
$dglobal_{i,t}$	1.135***	1.170***	1.166***	1.168***	0.921***	0.895***
	(0.358)	(0.293)	(0.400)	(0.349)	(0.238)	(0.234)
Observations	727	727	727	727	426	426
R-squared	0.65	0.67	0.64	0.75	0.76	0.75

Note: Asterisks denote significant coefficients, with ***, **, * indicating significance at 1%, 5% and 10% level respectively. Standard deviations reported in parenthesis

Source: Own elaboration

Also, in the fourth column, exports as a share of GDP is substituted by openness to trade and physical capital as a share of GDP is adding instead of gross domestic savings as a share of GDP. Openness to trade is not statistically significant at any level and physical capital as a

share of GDP again has a positive and statistically significant effect of GDP per capita growth. The remaining variables holds their signs and statistically significance.

Besides, in the fifth column, government spending as a share of GDP is added as an explanatory variable. Different from the estimation with the world sample, gross domestic savings as a share of GDP has a positive and statistically significant impact on GDP per capita growth and government spending as a share of GDP has a negative and statistically significant effect on GDP per capita growth. The remaining variables hold their signs and statistically significance.

The sixth colum of table 5 shows the addition of two variables: personal remittances as a share of GDP and rule of law indicator for good governance. With the addition of the governance index, the human capital is not any more statistically significant although it remains positive which is different from estimation with the world sample. Also, personal remittances is positive but not statistically significant at any level. The remaining variables remains the same.

Finally, in the seventh column, rule of law index is substituted with corruption index. The variable is not statistically significant although it is important its addition to control for good governance. The other variables kept their signs and statistically significance.

All in all, in the case of Latin American and Caribbean countries, the study found empirical evidence that population growth and government spending have a negative and statistically significant impact on GDP per capita growth. Besides, exports, human capital formation, physical capital and savings have a positive a statistically significant impact on GDP per capita growth.

C. Estimation of Economic Growth for Guatemala

The final step is the estimation of the model in the case of Guatemala after looking at the determinants of economic growth for both the World and the Latin American and the Caribbean countries. Table 6 depicts the main results of the estimation of GDP per capita

growth in the case of Guatemala. It seems that the main determinants remain the same in the case of Guatemala comparing with their region and the world.

The second column of table 6 shows that the initial level of GDP per capita and the rate of population growth has a negative and statistically significant impact on GDP per capita growth while the human capital, exports as a share of GDP, and physical capita have a positive and statistically significant impact on GDP per capita growth. Moreover, an increase in 1 percentage point in human capital formation will increase in 0.132 percentage point in GDP per capita growth and an increase in 1 percentage point in the ratio of exports to GDP will generate a rise in 0.160 percentage points in GDP per capita growth. On the other hand, an increase in 1 percentage points in the rate of population growth will generate a decrease in 1.80 percentage points in the GDP per capita growth. These results are consistent with those obtained in the estimation of the Latin American and Caribbean region with the exception of the initial level of GDP per capita.

From the third column of table 6, the physical capital is substituted by the savings as a share of GDP. The remaining variables are the same. The rate of savings as share of GDP is positive and statistically significant at 1% level which means that an increase of 1 percentage point in the ratio of savings as a share of GDP generates an increase in 0.54 percentages point in GDP per capita growth.

In column fourth, table 6, there is the addition of government spending as a share of GDP in the estimation of economic growth. The other variables remain the same. An increase in 1 percentage point in the ratio of government spending as a share of GDP generates a decrease in around of 0.558 percentage point in GDP per capita growth, and the coefficient is statistically significant at 1% level. The other variables kept their signs and statistically significance.

Similarly, the fifth Colum depicts the results of the estimation of growth with the addition of the variable openness to trade instead of the ratio of exports to GDP. An increase of 1 percentage point of openness to trade will rise in 0.072 percentage point the GDP per capita

growth, and the coefficient is statistically significant at 1% level of confidence. The remaining variables kept their signs and statistically significance.

In the sixth column of table six, there is the addition of personal remittances as a share of GDP due to the importance that this variable has for the Guatemalan economy and the variable rule of law as a governance indicator. The other variables remain the same. The ratio of personal remittances as a share of GDP is positive but not statistically significant at any level. On the other hand, the rule of law indicator has a positive and significant effect on GDP per capita growth.

Table 6: Fixed Effect Panel Model, Guatemala

Variables	$gdpgrowth_{i,t}$	$gdpgrowth_{i,t}$	$gdpgrowth_i$	$gdpgrowth_{i,t}$	$gdpgrowth_{i,t}$	$gdpgrowth_{i,t}$
$gdpinit_{i,t-1}$	-0.534***	-0.534***	-0.358***	-0.374***	-1.127	-0.703
	(0.040)	(0.040)	(0.062)	(0.061)	(0.713)	(0.546)
$eduprim_{i,t-1}$	0.132***	0.314***	0.314***	0. 310***	0.172**	0.106***
	(0.046)	(0.046)	(0.060)	(0.059)	(0.072)	(0.035)
$exports_{i,t-1}$	0.160***	0.160***	0.181***			
	(0.052)	(0.053)	(0.042)			
$Openness_{i,t-1}$				0.072***	0.117***	0.105***
				(0.014)	(0.028)	(0.022)
$popgrowth_{i,t-1}$	-1.800***	-1.800***	-0.835***	-0.888***	-0.691*	-0.686**
	(0.216)	(0. 216)	(0.292)	(0.290)	(0.371)	(0.250)
$invest_{i,t-1}$	0.540***			0.058**		
	(0.134)			(0.024)		
$savings_{i,t-1}$		0.540***	0.607***	0.663***	0.759**	0.576**
		(0.134)	(0.105)	(0.104)	(0.166)	(0.126)
$gov_{i,t-1}$			-0.558***	-0.505***	-0.959***	-0.194***
			(0.146)	(0.143)	(0.290)	(1.296)
$fdi_{i,t-1}$						0.486***
						(0.089)
$remitt_{i,t-1}$					0.041	-0.964
					(0.038)	(0.041)
$corruption_{t-1}$						-0.410***
						(0.085)
$rulelaw_{t-1}$					0.225***	
					(0.056)	
constant	4.620***	6.564***	2.953***	3.09***	1.024***	0.746***
	(3.613)	(6.834)	(0.561)	(0.556)	(0.646)	(0.483)
$dglobal_{i,t}$	0.308	0.307	0.244	0.083	-0.208*	-0.35*
	(0.263)	(0.263)	(0.242)	(0.219)	(0.214)	(0.179)
Observations	38	38	38	38	25	25
R-squared	0.870	0.872	0.910	0.92	0.80	0.89

Note: Asterisks denote significant coefficients, with ***, **, * indicating significance at 1%, 5% and 10% level respectively. Standard deviations reported in parenthesis

Source: Own elaboration

Finally, in the last column of the table, there are two addition and one drop. It is added the ratio foreign direct investment as a share of GDP and it is also added the corruption indicator instead of the rule of law indicator. The coefficient of the corruption indicator is negative and statistically significant at 1% level while the coefficient of the foreign direct investment as a share of GDP ratio is positive and statistically significant at 1% level. Also, the coefficient of personal remittances as a share of GDP is negative but it is not statistically significant at any level. The other variables kept their signs and statistically significance

In sum, the study found empirical evidence that human capital, exports, openness to trade, physical capital, savings, and foreign direct investment have a positive and statistically significant impact on economic growth measured with the GDP per capita growth. On the other hand, there is also empirical evidence that the initial level of GDP per capita, the rate of population growth, government spending and corruption have a negative and statistically effect on economic growth.

In the next subsection, it is depicting a final brief analysis of the findings of the study.

D. Comparative Analysis

Table 7 illustrates the comparison of the determinants of economic growth found in this study between the World, Latin America and Caribbean and Guatemala.

From table 7, it is shown that the factors that explained economic growth are not the same in the world that in the Latin America and the Caribbean region. This is because of the heterogeneity of the regions.

Also, it is observed that human capital formation, exports as a share of GDP are positive and statistically significant while population growth and government spending are negative and statistically significant for the World, Latin America and the Caribbean and Guatemala

Furthermore, savings as a share of GDP and physical capital as a share of GDP are positive and statistically significant only in the case of the Latin America and the Caribbean region and Guatemala. Similarly, the initial level of GDP per capita is negative and statistically significant only in the case of the World and Guatemala.

Finally, the variables openness to trade, foreign direct investment as a share of GDP are positive and statistically significant only in the case of Guatemala. Similarly, rule of law indicator is positive and statistically significant and corruption is negative and statistically significant only in the case of Guatemala.

Table 7: Comparison of the results across the World, Latin America and Caribbean and Guatemala

Variables	World		Latin America and Caribbean		Guatemala	
	Effect	Statisticallly significance	Effect	Statisticallly significance	Effect	Statisticallly significance
Initial GDP per capita	Negative	Yes	Negative	No	Negative	Yes
Human capital	Positive	Yes	Positive	Yes	Positive	Yes
Physical capital	Positive	No	Positive	Yes	Positive	Yes
Exports	Positive	Yes	Positive	Yes	Positive	Yes
Population growth	Negative	Yes	Negative	Yes	Negative	Yes
Openness	Positive	No	Positive	No	Positive	Yes
Savings	Positive	No	Positive	Yes	Positive	Yes
Government spending	Negative	Yes	Negative	Yes	Negative	Yes
Foreign direct investment	Positive	No	Positive	No	Positive	Yes
Personal remittances	Positive	No	Positive	No	Negative	No
Rule of law	Positive	No	Positive	No	Positive	Yes
Corruption	Negative	No	Negative	No	Negative	Yes

Source: Own elaboration

V. Final Remarks

The study re-examined the main determinants of economic growth with a fixed effect panel data with a sample of 81 countries for the world, 20 countries for the Latin America and the Caribbean region, and in the case of Guatemala.

The research found empirical evidence that the initial level of GDP per capita and the rate of population growth have a negative and statistically impact on economic growth in the case of the world sample. Similarly, human capital and exports as a share of GDP has a positive and statistically significant impact on economic growth.

Also, the study found empirical evidence that the human capital, exports as a share of GDP, physical capital as a share of GDP, and savings as a share of GDP have a positive and statistically significant impact on economic growth in the case of the Latin America and the Caribbean countries. Besides, the rate of population growth and government spending as a share of GDP has a negative and statistically significant effect on economic growth.

Moreover, there is an empirical evidence that human capital, exports as a share of GDP, openness to trade, physical capital as a share of GDP, savings as a share of GDP, foreign direct investment as a share of GDP, and the rule of law have a positive and statistically significant effect on GDP per capita growth. Furthermore, the initial level of GDP, the rate of population growth, and the government spending as a share of GDP has a negative and statistically significant effect on GDP per capita growth.

For further research, it is possible to estimate a Panel VAR model for the Latin America and Caribbean region in order to make an impulse response analysis with some of the determinants found in this study. Similarly, it is important to estimate a Structural Vector Autoregressive model in the case of Guatemala to make policy analysis with the main determinants of economic growth.

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Appendix I

This appendix illustrates the countries considered in the sample of the study divided by regions according with the classification of the World Bank. The selection of the countries was due to the data availability in the period of the study.

Table 1: Classification of Countries according to the Region.

Region I: East Asian and Pacific	Region II: Europe and Central Asia	Region III: Latin America and the Caribbean	Region IV: Middle East and North Africa	Region V: North America	Region VI: South Asia	Region VII: Sub - Saharan Africa
Korea Rep.	Albania	Argentina	Algeria	Bermuda	India	Ethiopia
Phillipines	Norway	Paraguay	Kuwait	Canada	Pakistan	Nigeria
Australia	Greece	Peru	Saudi Arabia	United States	Sri Lanka	Gambia
Singapore	Poland	Dominican Republic	Lebanon		Nepal	Ghana
Cambodia	Portugal	Ecuador	Egypt			Senegal
Malysia	Austria	El Salvador	United Arab Emirates			Cameroon
China	Hungary	Bolivia	Iraq			Kenya
Thailand	Romania	Guatemala	Morocco			Central Africa Republic
Indonesia	Russia	Brazil	Israel			Madagascar
Japan	Belgium	Haití	Oman			Cote D'ivoire
New Zealand	Italy	Honduras	Yemen, Rep.			
	Bulgaria	Chile				
	Spain	Jamaica				
	Sweden	Colombia				
	Switzerland	Mexico				
	Czech Republic	Costa Rica				
	Denmark	Nicaragua				
	Finland	Cuba				
	United Kingdom	Panama				
	France	Uruguay				
	Netherlands					
	France					

Source: Own elaboration, World Bank Data.

Appendix II

The appendix depicts the sources of data of the explanatory variables employed in the panel data estimations. Table 2 depicts the macroeconomic and financial variables while table 3 illustrates the governance variables of the study.

Table 2: Macroeconomic and Financial Variables

Indicator Name	Definition
GDP per capita growth (annual %)	Economic Growth
Gross Capital Formation (% of GDP)	Physical Capital
School Enrollment, primary (%)	Human Capital Formation
Exports of Goods and Services (% of GDP)	Exports
Import of Goods and Services (% of GDP)	Imports
GDP per capita (constant 2015 US$)	Real Initial GDP per capita
General Government Final Consumption Expenditure (% of GDP)	Government Spending
Consumer Price Index (annual %)	Inflation
Personal Remittances, received (% of GDP)	Remittances
Population growth (annual %)	Population Growth
Foreing Direct Investment, Net Inflows (% of GDP)	Foreign Direct Investment
Central Government Deb, Total (% of GDP)	Government Debt
Openess to trade (annual %)	openess to trade
Gross Domestic Savings (% of GDP)	Savings

Source: Own elaboration, World Development Indicators, World Bank.

Table 3: Governance Indicators.

Indicator Name	Definition
Control of Corruption: Percentile Rank	Corruption
Government Effectiveness: Percentile Rank	Government Effectiveness
Political Stability and Absence of Violence / Terrorism: Percentil Rank	Political Stability
Regulatory Quality: Percentile Rank	Regulatory Quality
Rule of Law: Percentile Rank	Rule of Law
Voice and Accountability	Voice

Source: Own elaboration, Worldwide Governance Indicators, World Bank Data.