

ECONOMIC GROWTH OF LATIN AMERICA: 1951-2000**CRECIMIENTO ECONÓMICO DE AMÉRICA LATINA: 1951-2000**Nicolás Rivera Garzón¹Miller Rivera Lozano²**Abstract**

The objective of the paper is to identify the determinants of economic growth in Latin America for the period 1951-2000. For this, three fixed effects models with panel data are estimated, capable of controlling unobservable heterogeneity within the sample. The results show that the growth of the Latin American income level has a positive and significant relationship with the capital stock, population growth, final household consumption, gross capital formation and the volume of exports. While the number of inhabitants at any given time, the final consumption of the general government and the level of inflation have a negative relationship. The number of Latin American inhabitants grew, they had more wealth and income at the end of the XX century, their education levels increased and in general: their quality of life improved.

Keywords: Economic growth, Latin America, empirical analysis, 20th century, macroeconomics, per capita income.

Resumen

El objetivo del artículo es identificar los determinantes del crecimiento económico en América Latina para el período 1951-2000. Para ello, se estiman tres modelos de efectos fijos con datos panel, capaces de controlar heterogeneidad no observable dentro de la muestra. Los resultados muestran que el crecimiento del nivel de ingreso latinoamericano tiene una relación positiva y significativa con el stock de capital, el crecimiento de la población, el consumo final de los hogares, la formación bruta de capital y el volumen de exportaciones. Mientras que el número de habitantes en un momento dado, el consumo final del gobierno general y el nivel de inflación tienen una relación negativa. El número de habitantes latinoamericanos creció, tenían más riqueza e ingresos a fines del siglo XX, sus niveles de educación aumentaron y en general: su calidad de vida mejoró.

Palabras clave: Crecimiento económico, América Latina, análisis empírico, siglo XX, macroeconomía, renta per cápita.

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Introduction

The use of panel data estimates has been a methodological approach characteristic of the literature on economic growth, which aims to find long-term relationships between variables typical of endogenous and exogenous growth theories. Works such as those by Alesina, Özler, Roubini and Swagel (1996), Barro (2000) and Altman and Castiglioni (2009) manage to identify empirical regularities between levels of growth and capital accumulation, public spending, product distribution and specific institutional factors from each country or region.

Studies in Latin America have not been the exception to this data treatment. The role of capital, labor and growth model have been analyzed by Barro (1999), Thornton (2001), Blyde, Daude and Fernández-Arias (2010) and Rivera and Rivera (2019). The conclusions of these studies expose the importance of government policies, household preferences, the availability of natural resources and the initial levels of physical and human capital over the level of growth. Likewise, the authors argue that financial crises and the predominant monetary policy are also determining factors in explaining the growth in a country's product.

Gramlich (1994), Hutchinson and Schumacher (1997), Esfahani and Ramírez (2003), Imran and Niazi (2011), Ramírez (2007) and Jaramillo, Meisel and Ramírez (2017) state that public spending must focus on the provision of pure public goods, without affecting the intertemporal fiscal sustainability of the government. Furthermore, investment in pure public goods generates positive externalities and productive chains over other activities in the country.

Institutions and the political economy of growth have also been studied in Latin America as evidenced by the works of Alesina and Perotti (1994), Alesina, Özler, Roubini and Swagel (1996), Barro (2000), Altman and Castiglioni (2009) and Orozco and Rivera (2018). These studies conclude that higher levels of democracy lead to higher and more stable levels of growth over time. High unequal levels of income and access to land property weaken growth in low- and middle-income countries.

The impacts on growth caused by the insertion of Latin American economies in world trade have been studied by Dagum (1964), Cottani, Cavallo and Khan (1990), Rivera-Batiz and Romer (1991), Chen (1999), Fernández-Arias and Montiel (2001), Naveed and Shabbir, (2006), Rodrik (2008) and Díaz and Navarrete (2017). Foreign trade has brought great benefits to the economic performance of Latin America. The trend of the export sector largely determines the growth trajectory of the countries of the region.

Considering the above context, the objective of the article is to identify the determinants of economic growth in Latin America for the period 1951-2000. The countries that make up the sample are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Uruguay and Venezuela. Three fixed effects models with panel data are estimated, capable of controlling unobservable heterogeneity within the sample. The results obtained show that the growth of the Latin American income level has a positive and significant relationship with the capital stock, population growth, final household consumption, gross capital formation and the volume of exports. While the number of inhabitants at any given time, the final consumption of the general government and the level of inflation have a negative relationship.

This paper is organized as follows. Section I presents the main determinants of the performance of an economy highlighting household consumption, financial crises, the state, and institutions. Section II details the methodology, conceptual characteristics, and sources of the database that is used to perform the empirical analysis. Sections III discuss the results and analysis of the econometric exercise carried out. Section IV discusses, and Section V concludes.

Theoretical framework

Theories of growth are classified as growth by factor accumulation, innovations, and institutional assumptions. Within the first group are Solow's (1956) exogenous growth model, Romer's (1990) endogenous technological change model, and Ramsey-Cass-Koopmans model. In the second group are the works of Schumpeter (1911), Young (1928), and Lorente (2018). Institutional hypotheses are found in Acemoglu, Johnson and Robinson (2001) and Engerman and Sokoloff (2002). Despite the fact that each group of theories has its theoretical and methodological peculiarities, there are elements common to all of them; that largely determine the performance of an economy, and therefore its growth. The cross-cutting elements of any growth theory are household consumption, saving - investment, the role of the state and institutions. With this in mind, the objective of section II is to present precisely these four great determinants of economic growth.

Household consumption

Individuals face the problem of how to distribute their consumption throughout their lives. Because individuals are rational, they try to avoid drastic changes in their consumption, that is, they try to have a stable path of consumption. In the process of intertemporal maximization, their consumption and saving functions are based on two types of income: permanent or expected income and transitory or stochastic income. The previous explanation is known as Milton Friedman's permanent income hypothesis, where changes in permanent income motivate changes in consumption patterns. Households only spend a portion of its permanent income and save the surplus, the concept that captures this fact is the marginal propensity to consume (Stiglitz and Gallegati, 2011).

According to Friedman's hypothesis, a family always spends a constant proportion of its permanent income, regardless of its wealth. The model predicts that savings rates should be independent of household income and should remain stable over time (Frank and Levine, 2007; Lorente, 2018). In that case, changes in income distribution have no effect on individual spending patterns; the only event that can modify the consumption pattern is a change in its permanent income. Friedman's explanation falls into the error of treating the individual in isolation as a perfect maximizing agent that has no relation to its environment. When analyzing a social system, it is important to evaluate the number of subjects, the connective processes, and the dynamics between agents (Thaler, 2000; Ahn, Ostrom and Walker, 2003; Janssen and Ostrom, 2006; Rivera and Rivera, 2019a). The limitation of the theory of permanent income makes necessary to present a consumption theory in a complex and constantly evolving social environment.

Frank and Levine (2007) create the term *expense cascade* to describe a process whereby increasing spending by some individuals leads others just below them on the income scale to spend more, which in turn leads others just below the second group to spend more, and so on. In a simple way, this mechanism captures the two most important findings in the literature on the behavior of demonstration effects: 1) The comparisons between income scales are highly localized in time and space 2) Households generally look at others above them on the income scale instead of those below (Ormerod, 2010). In this context, the distribution of income and the processes of information exchange between the individual and the environment are essential for making decisions about spending, consumption and saving.

A third causal explanation of the process of consumption and expenditure is that of Kiminori Matsuyama. His explanation does not focus on the consumer but on the firm and the

effect that changes in productivity have on the mass consumption of a society. Matsuyama states that

As productivity improves, consumer goods prices drop and become affordable for an increasing number of households. This, in turn, generates larger markets for these goods, which induce further improvement in productivity, creating a virtuous circle of productivity gains and expanding markets. Or bidirectional causality may mean that the economy stagnates because lack of productivity and lack of markets reinforce each other. (Matsuyama, 2002, p. 1038)

What is most striking about Matsuyama's explanation is the possibility of positive feedback processes or, as he calls them, virtuous circles of productivity gains and expanding markets. Matsuyama's explanation incorporates innovations as an endogenous factor capable of explaining household spending and consumption patterns without neglecting income distribution. He argues that for the entire mechanism to function properly, the economy should be in a middle point of income distribution; with a totally egalitarian society the economy stagnates in a poverty trap, and with a totally unequal one, growth stops very quickly.

From the three models analyzed, important implications for economic analysis can be obtained. First, technological change is a dynamic process that represents increased revenue and profit for the innovative industry. These patterns depend on whether the underlying macroeconomic shocks affect investment demand or desired savings more. This balance depends, in turn, on the permanence of shocks and on whether they operate mainly as income effects or as changes in the productivity of capital (Barro and Ursúa, 2008). Second, the notion of needs and luxuries is relative since it depends on the point of view that is taken, a luxury for a low-income home may be a necessity for a high-income home. Third, there is a complementary demand for low and high priority goods; by lowering the price of food due to increases in productivity, households may have sufficient income for new goods. Finally, the market size of a good depends on the number of households that buy that good and not on the total income of the economy.

Savings and Investments

The product of an economy can be analyzed from two points of view: its uses and its sources. Its uses are final consumption of households (c), total investment (i), public spending (g) and exports (x). While its sources are private consumption (c), private savings (s), taxes (t) and imports (m). By joining both points of view the following identity is obtained:

$$c + s + t + m \equiv y \equiv PIB \equiv c + g + i + x \quad (1)$$

With a simple algebraic manipulation, the savings-investment balance is:

$$0 = (s - i) + (t - g) + (m - x) \quad (2)$$

The first term corresponds to the savings of companies and families, the second to that of the government and the third to external savings that is equal to the current account deficit or surplus. In this way it is represented the fundamental macroeconomic equation:

$$0 = S_p + S_g + S_x \quad (3)$$

The deficit or private saving (S_p) in equation (3) has its origin in the consumption and saving decisions of the agents; at the time they choose their consumption they are also determining their savings and vice versa (Blanchard, Amighini and Giavazzi, 2012). Government behavior is more complex to explain because it does not follow regular behavior like that of consumers; public spending is fundamentally determined by the political cycle and the ideology of the party in power. Despite the above, the macroeconomic fiscal deficit (S_g) is relevant for macroeconomic analysis, Hernández (2005) argues that the macroeconomic fiscal deficit is consistent with the general

macroeconomic theoretical framework and allows analyzing how state activity affects production, consumption, and capital accumulation. Finally, external saving (S_x) explains whether an economy is net debtor or creditor with respect to the rest of the world.

The sum of the savings of all types of agents determines the ability of an economy to acquire new capital goods and increase its productive capacity. The acquisition of these assets is known as gross capital formation (GCF). Lorente (2018) argues that the GCF can be adopted as the gross investment of the period since it represents the stockholders' equity, which is the only one that can be known by the management of the company and its shareholders and is the production factor that intervenes in the cost equation of the firms and in the distribution of the product. With this in mind, in the econometric exercise of the third section the GCF is taken as the equivalent of the gross investment of the respective period.

The materialization of the investment is the capital stock at a given moment and its growth is known as capital accumulation. This process is expressed in equation (4), which is central to the explanation about the accumulation of factors that make the growth models of Solow (1956) and Romer (1990). In this way, the capital stock in period t can be understood as:

$$K_t = K_{t-1} + (GCF)_{t-1,t} - \delta K_{t-1} \quad (4)$$

Equation (4) represents the sum of the capital stock in the immediately preceding period with the investment or gross capital formation carried out between the current period and the immediately preceding period, less the depreciation rate (δ) of the capital. By means of this equation it is possible to see what has been the process that capital accumulation has taken in an economy and it is possible to explain its variations.

State and Public Expenditure

Why should a State spend? What should a state spend on? The answers to these questions are strongly related to the issue of fiscal policy, but economists usually fall into the mistake of downplaying the political and legal facts behind any fiscal act carried out by any state order. In view of this it must first be to understand what the state is.

In the first place, the state is a relation of political power; in simpler words, the state is the people who have command power over a territory (Hernández, 2005). In this way, the modern state (considered since the beginning of the 20th century) has sovereign power translated into command power in its three branches: executive, legislative, and judicial power. It has rights and privileges translated into the capacity to impose its orders (political power), to have a monopoly on the use of force in a territory, to impose fines or punishments and to collect taxes. Clearly, it also has duties. It could very easily fall into the error that the duty of the state is to guarantee the common good, theoretically it is correct, but in practice the duties of the state are the ones that the state chooses since it has the power to determine itself.

A second integral element for the state is to know what pillars support it, these are three. The first and most important is the use of force translated in its army, judicial branch, and police; all three are needed to make its submission force effective. The second element is the taxes that are a debt that the inhabitants contract with the state simply for the fact of having chosen it and that has to be paid in a currency chosen by the command power. As a consequence of the political fact of the state election, monetary sovereignty is legal and enforced (Hernández, 2005). The bureaucracy is the third pillar that supports the modern state, is in charge of collecting taxes and enforcing the sovereignty of the state in charge; that is, keeping everything working properly.

To answer the first question proposed in this section, the vision of public spending should be abandoned as if it were something totally technical and economic; spending is both an economic

and a political variable. In order to gain a monopoly on the political power of the state, political parties must compete and once they have succeeded, they must seek reelection. Hernández (2005) proposes that public spending is a function of the popularity of the government and its ideology, in addition, there is an inverse relationship between these variables. In times when its popularity is high, the state spends following ideological purposes; when its popularity is low, the state makes expenses to increase it.

The process of intertemporal maximization carried out by the political parties in power generates dilemmas for international institutions such as the World Bank when it comes to providing international aid. According to Easterly (2010), granting a loan to a ruling party in power equals to generate political interference; and it cannot be assumed that there is a correct separation between economic policies and ideological motivations. But transfers only represent a small percentage of the external financing that a government receives; most are made up of credit. In that order of ideas, sovereign debt ratings determine the access of countries to international capital markets and the conditions under which funds can be obtained. In emerging economies, there is a strong link between currency crises and debt default; therefore, downgrades in credit ratings are usually an alarm signal (Reinhart, 2002; Reinhart & Rogoff, 2009).

Sovereign credit ratings play an important role in determining countries' access to international capital markets and the terms of that access. In principle, there is no reason to expect that sovereign credit ratings should systematically predict currency crises. If credit ratings are forward looking and currency crises in emerging market economies are linked to defaults, it follows that credit rating downgrades must systematically precede currency crises (Reinhart, 2002).

Regarding the second question, the state must limit itself to providing only pure public goods (Hernández, 2005). This means that the state must provide goods that are non-rival and non-exclusive in their use. Non-rivalry refers to the fact that the good can be used simultaneously by many individuals and if one agent is using it, she cannot prevent another from using it. Non-exclusion simply refers to the fact that no individual can be excluded from the consumption of that good. The marginal cost of providing that good is zero. Because of this the private sector is not interested in producing it, the only way that this good reach the market is if the state provides it and finances it from public debt or taxes. Also, Blanchard et al. (2010) argue that the economic development of a country drives social pressures to increase public spending for two reasons: 1) As it is a more complex society with a greater number of conflicts, it requires greater state intervention 2) Due to the characterization of public goods and services, its income elasticity of public spending is greater than unity. This translates into a percentage variation in the state's income that supposes a greater percentage variation in the quantity supplied.

All of the above arguments demonstrate that fiscal policy plays a very important role within modern macroeconomic stability. Despite this, monetary policy has been more important since the 1980s. Blanchard et al. (2010) present five reasons for this fact: 1) The effects of fiscal policy stemming from Ricardian equivalence 2) If monetary policy can keep the output gap to a minimum, there is no point in using another tool 3) The priority to stabilize debt levels with an anti-cyclical fiscal policy 4) Fiscal measures usually come late in minimizing the effects of a recession 5) Discretionary fiscal measures can totally damage the central bank's forecasts.

Finally, several investigations identify a stylized fact in large data panels, this finding is Wagner's Law. It postulates that there is a positive correlation between economic growth per capita and public spending. Hernández (2005) shows three factors that justify this relationship: 1) Displacements of the private sector in the face of an increase in state spending 2) Increases in

public education expenses and income redistributive policies 3) Possession of economic monopolies by the State.

Institutions and Economic Growth

Society is a polycentric, complex, adaptive system and has no central authority that controls everything, there is no guarantee of finding a combination of rules that will bring that group of people to an optimum (Ostrom, 1999; Ostrom, 2010; Rivera and Rivera, 2019a). Institutions emerge as endogenous mechanisms that regulate society and impose clear rules of the game for all its members. North (1991) defines institutions as

(...) Man-made limitations that structure political, economic, and social interaction. They consist of informal restrictions (sanctions, taboos, customs, traditions and codes of conduct) and formal rules (constitutions, laws, property rights) (...) They evolve incrementally, connecting the past with the present and the future; consequently, history is very much a history of institutional evolution in which the historical performance of economies can only be understood as part of a sequential history. Institutions provide the incentive structure of an economy; As that structure evolves, it shapes the direction of economic change toward growth, stagnation, or decline.(p. 97).

The definition given by North is overly broad and does not allow to differentiate beyond the formality of one institution from another, precisely for this reason it is necessary to explore the most accepted classification. Acemoglu and Johnson (2005) classify institutions into two main groups: property rights institutions and contracting institutions. Property rights institutions are tasked with protecting individuals from theft and expropriation by the government and elites. The second group of institutions does just what its name implies; enforce private contracts. The next thing in the exposition is to exemplify some institutional aspects that determine the aggregate performance of an economy, they are made up of state capture or corruption, education, technology, and geography.

The literature on corruption focuses on the concept of "State Capture", this classification is made with the aim of expressing that some private interests may take over the functioning of the state. Kaufmann and Kraay (2002) define this concept as the undue and illicit influence of the elite in shaping the laws, policies, and regulations of the state. The concept of state capture departs from traditional visions where corruption equals bribery; the concept involves the participation of public officials and private citizens (Kaufmann & Vicente, 2011).

Despite all the negative that the capture of the state by a small group may mean, citizens have a counterweight. In a democratic system, citizens can exercise mechanisms such as voting, popular protest, media criticism, and in extreme cases, violence (Easterly, 2010). If most of these mechanisms work correctly, the government is said to be accountable. In this way, the government intervenes if any social group harms another with its actions, either indirectly or directly. The biggest problem with this mechanism is that it is based on a relationship of political power between social groups and the state. Those who do not enjoy any type of influence will hardly be protected when their rights are violated. Usually in this group without political power is the poorest population of each country (Sachs, 2002).

Second, knowledge, education, and technology are causal channels through which historical events have long-term impact (Nunn, 2009). Education is essential for the development of skills of the population; there is a direct relationship between education and increases in productivity (Orozco and Rivera, 2018). In addition, countries with better institutions provide a greater amount of public goods, including education. Institutional quality is not limited to the

provision of public goods, it also refers to the protection of rights that allow for greater returns on investments in physical and human capital.

Finally, some authors defend the idea that fixed geographic factors are the main determinants of long-term economic development. In other words, each country is different and has its own ecology, climate, natural resources, and native diseases. Orozco & Rivera (2018) argue that geography determines the behavior of firms since it potentiates or hinders productive processes and the creation of inter-industrial chains.

Methodology

Since the objective of the document is to identify the determinants of economic growth in Latin America for the period 1951-2000, it is necessary to divide the econometric exercise in two. First, the methodology focuses on analyzing the contribution of capital and labor to per capita income, it then goes on to examine the relationship between product components and the price level with economic growth in the region.

Data

Data on real gross domestic product and population are obtained from the Maddison Project Database (MPD), specifically four variables are taken:

1. Real GDP per capita: expressed in 2011 US dollars correcting US inflation to provide comparable magnitudes over time, but it is a *correct* measure in that the relative (implicit) prices used vary for income comparisons between countries over time (Bolt et al., 2018).
2. Real GDP per capita (TC): is a measure of real GDP per capita using growth rates from national accounts, the objective of this variable is to compare relative growth rates between countries over a long period of time (Bolt et al., 2018). Like the previous variable, it is also expressed in 2011 US dollars.
3. Population: number of inhabitants in the middle of each year.

The importance of product analysis is that it reflects the productive capacity of an economy, and is usually associated with the well-being, health, and employment of a country's population. The growth rates of each economy are obtained from the variable real GDP per capita (TC); in this way the variable is not used in its original form provided by MPD, but as a growth rate. While the variable real GDP per capita is used in its original form to refer to the income of an economy at any given time.

The following set of variables is obtained from Penn World Table 9.0 (PWT). The variables are grouped as components of the real gross domestic product of each country and all are measured by their participation in the total product (% of GDP). Feenstra et al. (2015) construct a measurement of real GDP on the supply side using final goods prices at current purchasing power parity and then divide the product into its most important components:

4. Final consumption of households: market value of all goods and services including durable goods, payment of rental of housing, payments of licenses and permits to the government. It is important to clarify that this variable excludes the purchase of houses that is classified as an investment.
5. Gross capital formation: fixed assets include purchase of machinery and equipment, road construction and infrastructure (gross government capital formation), and land improvements. On the other hand, inventories are inventories owned by a company to face unexpected fluctuations in the production and marketing of a product. Gross capital

formation also measures investment in valuables that are non-financial assets that serve as a store of value and that are not used in the economic circuit of production and consumption.

6. General government final consumption expenditure: all current government expenses for the purchase of goods and services (Feenstra et al., 2015). Excludes all expenses that are part of government capital formation.
7. Exports of goods and services: value of all goods and other market services provided to the rest of the world.
8. Imports of goods and services³: value of all market goods and services received from the rest of the world.

The PWT also provides the measure of the amount of productive equipment in the economies of the region:

9. Capital stock: measured at constant national prices, based on investment and prices of structures and equipment (Feenstra et al., 2015). This variable is expressed in 2011 US dollars and aims to analyze the growth of the capital stock over time.

Inflation data is obtained from Reinhart & Rogoff (2011), the authors calculate the continuous rise in the price level based on country-specific data and work making it the most accurate database available on inflation.

As stated in the introduction, the countries that make up the sample are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, the Dominican Republic, Uruguay, and Venezuela. The study period is 1951-2000 with an annual periodicity of the data.

Specification

With the specific objective of analyzing the long-term contribution of capital and labor to the per capita income of the region and controlling the individual characteristics of each country, equation (5) is estimated through a fixed effects model or within estimator:

$$Y_{it} = \alpha_i + \beta K_{it} + \gamma L_{it} + U_{it} \quad (5)$$

where Y_{it} refers to the real GDP per capita of country i , K_{it} is capital stock, L_{it} is the number of inhabitants and α_i is a country-specific intercept. Equation (5) is estimated with data from the following years: 1960, 1970, 1980, 1990 and 2000. In the results section, the model in equation (5) is referred to as the “Basic Level Model”.

Equation (6) is estimated with fixed effects to examine the relationships between factor growth rates and income. With this in mind, the regression takes the following specification:

$$gY_{it} = \alpha_i + \beta gK_{it} + \gamma gL_{it} + U_{it} \quad (6)$$

where the variable gY_{it} refers to the growth of GDP per capita⁴, gK_{it} is the growth of the capital stock and gL_{it} is population growth. In the results section, the model in equation (6) is referenced as “Basic Model in Growth Rates”.

Equation (7) explores the relationship between the components of GDP and price level with economic growth. An expanded panel data model with fixed effects is estimated:

$$gy_{it} = \alpha_i + \delta X_{it} + U_{it} \quad [7]$$

³ Both imports and exports include the value of merchandise, freight, insurance, transportation, travel, royalties, license fees and other services, such as communication, construction, finance, information, business, personal and government services. Similarly, both exclude employee compensation, investment income (factor services) and transfer payments.

⁴ This variable is a transformation of the GDP per capita (TC) variable.

Where i represents the country, t represents time⁵ ($t = 1951, \dots, 2000$), α_i is the country-specific intercept and U_{it} is model errors. gY_{it} refers to the growth of real GDP per capita, the vector of variables (X_{it}) is made up of annual inflation rate, household consumption, gross capital formation, government spending and exports. Following the referencing of the previous models, the model of equation (7) is referenced as “Extended Model”.

Once the three models have been estimated, the significance of the fixed effects obtained is evaluated and tests for normality and homoskedasticity of the errors are carried out. The previous results are found respectively in Annex 2 and 3.

Results

The estimation with individual fixed effects of the basic model in levels is found in Table 1. Its results suggest that there is a significant and negative relationship between the capital stock and the per capita income of the sample countries. On the other hand, they suggest that there is a significant and positive relationship between the number of inhabitants of a country and their level of income.

The reported constant is an OLS constant, however, the use of the individual fixed effects of the model, individually each fixed effect allows controlling the unobservable heterogeneity of the sample countries. With this, consistent estimators are obtained without imposing additional assumptions. Furthermore, it is possible to observe how the growth of the sample countries occurred from a specific level that results from the complementarity between capital and labor. The above says that for all countries, growth took a quite different form, even though on average they all started with a real per capita income of \$2,220 dollars. Each country has historical and institutional differences, as shown by the fixed effects estimated in Table 4. Furthermore, according to the Lagrange multiplier test, individual effects of the estimated model are significant at 1%, which proves the importance of a starting point on the growth path of each country.

The Basic Model in Levels explains 38% of the variability of Latin American per capita income in the second half of the century and is globally significant at 1%. The model residuals meet the assumption of homoskedasticity but do not meet the normality assumption. However, working with a sample of 20 countries for 5 years makes the estimators obtained consistent and asymptotically normal.

Table 1: Results of the Basic Model in Levels.

Variables	Coefficient	T calculated	P-value
Constant (OLS)	5,089	12.541	0.0000000
Capital Stock	-0.002161	-2.4936	0.0150111
Population	0.0002343	3.8801	0.0002334
R-square		0.38248	
R-squared adjusted		0.21486	
P-value (F)		0.000	
Observations		90	
Included periods		5	

⁵ In this case, the entire sample is taken, unlike the previous two equations.

Basic model in growth rates is found in Table 2. Its results suggest that there is a significant and positive relationship between the growth of the capital stock and population growth with the growth of real income per capita. The model explains the growth of the sample countries in 32% and turns out to be significant at 1%. Residuals meet the assumptions of homoskedasticity and normality.

Table 4 shows the individual fixed effects of the Basic Model in Growth Rates. Unlike the basic tiered model, the individual fixed effects of this model show how the interaction between capital and labor determines this time not a starting point in the income of the economy, but a potential growth or long equilibrium economy term. The Lagrange multipliers test shows that the estimated fixed individual effects are not significant. This suggests that individual characteristics have a greater statistical weight when defining a country's per capita income than its growth. The historical and institutional particularities are captured by the joint significance of population growth and capital stock.

Table 2: Results of the Basic Model in Growth Rates.

Variables	Coefficient	T calculated	P-value
Constant (OLS)	-0.5574	-0.460	0.646557
Capital Stock Growth	0.48920	3.2001	0.002065
Population Growth	0.86116	1.4352	0.155674
R-square		0.15636	
R-squared adjusted		-0.072627	
P-value (F)		0.0026031	
Observations		90	
Included periods		5	

Finally, the Extended Model is found in Table 3. Its results suggest that the variables of final consumption of households, gross capital formation and volume of exports have a positive and significant relationship with the level of growth of per capita income of the sample countries. On the other hand, the final consumption expenditure of the general government and the level of inflation have a negative relationship with the variables of interest. Like the previous models, its overall significance is 1%; however, it only explains 14% of the variability of growth in the growth of real income of Latin American inhabitants.

Despite the foregoing, the signs obtained are correct and allow verifying the importance given in the theoretical framework to consumption, investment, and foreign trade. Similarly, it is observed that Latin American fiscal policy has not had a positive impact on the growth of the region, at least in a first approximation. As mentioned in the theoretical framework, fiscal policy has changing motivations, which makes it somewhat unpredictable, both in the short and long term. Due to the above, in future research it may be useful to analyze how the economic growth of the region behaved in moments of expansive and contractive fiscal policy and whether it was procyclical or countercyclical.

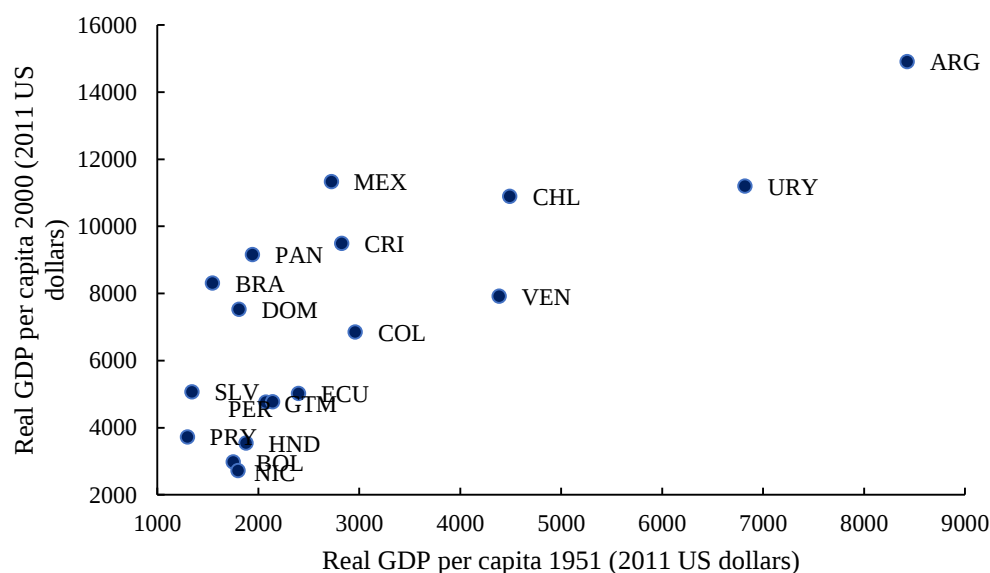
The individual effects of the estimated model are significant at 2% and the model residuals are homoscedastic but not normal. Again, non-compliance with the normality assumption does not invalidate the model since it is working with a large sample.

Table 3: Results of the Extended Model.

Variables	Coefficient	T calculated	P-value
Constant	-5.8501339	-3.887	0.000109
Final Household Consumption	0.04249751	2.2919	0.02215
Gross Capital Formation	0.21345085	8.0821	0.000
Final Consumption Expenditure of the General Government	-0.0464940	-1.3640	0.17292
Exports	0.04066311	1.8885	0.05929
Inflation	-0.0007685	-4.2535	0.000
R-square	0.11038		
R-squared adjusted	0.08806		
P-value (F)	0.000		
Observations	900		
Included periods	50		

The three estimated models are useful to explain the growth process shown in Graph 1. Process in which a typical Latin American inhabitant started the 20th century with an income of \$1,365 dollars and ended it with \$8,728 dollars, which represented annual growth average of 1.83%, lower than the 2.3% registered by world income. In contrast, the demographic growth of the region was greater than that of the world, the latter standing at 1.7% for the second half of the century, while Latin America registered 2.38% at the end of the century with just over 500 million of inhabitants.

Graph 1: Evolution of real income per inhabitant: 1951-2000.



Latin American countries registered relatively high population growth, and despite this, their per capita income increased. As exogenous and endogenous growth theories say, the increase in income was only possible thanks to the technological change that produced a growth in productivity per worker. The greatest determinant of a society's standard of living is its ability to generate technical change and to improve existing production processes.

There is no data series on productivity per inhabitant in Latin America that covers the entire 20th century. However, it can be concluded that productivity increased since its effects became visible. The number of Latin American inhabitants grew, they had more wealth and income at the end of the XX century, their education levels increased and in general: their quality of life improved. Furthermore, globalization made the world smaller and allowed the importation of ideas and processes that accelerated the economic and social development of the region.

Discussion

The works of Solow (1956), Romer (1990) and Lorente (2018) guided the theoretical explanations of the document. While the methodology was based on the works of Alesina et al. (1996) and Barro (2000) with the use of large data panels. The combination of both aspects allowed us to identify empirical regularities between levels of growth and capital accumulation, public spending, product distribution and specific institutional factors from each country or region.

The results obtained are aligned with those obtained by Barro (1999), Thornton (2001), Blyde, Daude and Fernández-Arias (2010) Rivera and Rivera (2019). They also complement the results obtained in Rivera and Rivera (2020) on the relationship between growth, inequality, and democracy.

Despite the importance of the work carried out, the results have methodological limitations, especially, the data panel approach limits the conclusions that can be obtained at the individual level, even with the use of fixed effects. Methodologies such as autoregressive vector models in the context of panel data could provide a better understanding of the causal channels of growth and the magnitudes of response to exogenous shocks. However, the challenge of time series models lies in ensuring the stability and stationarity of the series used.

Another limitation of the methodology carried out is the lack of calculation of sums of squares type 1, 2 and 3. With these it is possible to see the individual importance of each variable given the presence or absence of the other variables. In addition, with this methodology it is possible to make corrections to the test statistics of the models and to the confidence intervals and to perform lack of fit tests.

Concluding remarks

The article identified the determinants of economic growth in Latin America for the period 1951-2000. The analysis carried out is part of the empirical growth literature and provides an explanation for the income per Latin American inhabitant, taking elements from the exogenous, endogenous and institutional growth theories. Methodologically, the use of fixed effects models with panel data is used. In addition, perturbation tests of the error term and statistical significance of the estimated individual effects are performed.

The results showed that technology impacted the income of the average Latin American inhabitant through the growth of the capital stock. This provided more and better machines, supplies and processes to the workers of each country; increasing the product per capita as well as its income. The previous process allowed each household to gain access to more goods and

services, which in turn encouraged their massification, generating a growth circle like the one explained by Matsuyama.

The growth of mass consumption was accompanied by a demographic explosion, the total population increased throughout the 20th century, which led to a constant supply of labor and increased aggregate demand. The quality of life of the new inhabitants of the region improved significantly in the fifty years analyzed, furthermore, the process of Latin American insertion in the world economy was completed, providing the region with new goods, services, and especially information and knowledge.

Regarding the variables that have a negative relationship with income and its evolution, the final consumption of the general government and the level of inflation were identified. The negative impact of public spending occurred due to its natural variability and the increase in public debt, which generated defaults to most of the countries analyzed. While periods of high inflation destabilized the market incentive system and filled all activities with uncertainty and high levels of risk.

The results obtained reveal new research questions about the economic growth literature. First, evaluations of the impact of regulatory changes in access to technology, trade and larger markets on the growth and development of the area. Second, the development of a theory of complexity economics that incorporates the stylized facts found, that theory must be capable of incorporating positive and negative feedback processes, thereby breaking the macroeconomic model based on perfectly rational individuals. Third, taking advantage of the microdata currently available to analyze the growth paths of smaller economic units such as cities or departments within each country.

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Annex 1: fixed effects*Table 4: Individual Fixed Effects.*

Country	Basic Model in Levels	Basic Model in Growth Rates	Expanded Model
Argentina	7,512.712	-1.713979	-4.9179
Bolivia	855.316	-1.828366	-4.7290
Brazil	-13,977.843	-0.577883	-3.8040
Chile	5,284.319	-0.915732	-3.5685
Colombia	461.716	-1.785745	-6.0671
Costa Rica	6,531.435	-3.029753	-3.4999
Ecuador	2,939.649	-2.168990	-5.0336
Republic of El Salvador	1,981.538	-4.658291	-4.6787
Guatemala	1,994.872	-2.536041	-4.7664
Honduras	2,056.776	-4.518445	-5.5266
Mexico	-3,405.992	0.096354	-5.0455
Nicaragua	2,064.238	-5.423257	-6.0373
Panama	5,188.058	0.825022	-3.9527
Paraguay	2,119.558	-4.060758	-4.4617
Peru	-20.259	-1.275640	-4.3393
Dominican Republic	3,018.589	-2.951543	-5.5323
Uruguay	8,546.424	-0.336433	-4.9252
Venezuela	6,815.733	-2.971026	-7.9257

Annex 2: tests of significance of the individual effects of the estimated models*Table 5: Lagrange multiplier test for individual fixed effects.*

Model	Test statistic	P-value
Basic Model in Levels	91.16	0.000
Basic Model in Growth Rates	0.14	0.708
Expanded Model	4.84	0.028

Annex 3: behavioral tests of the error term of the estimated models*Table 6: Breush-Pagan test for homoscedasticity.*

Model	Test statistic	P-value
Basic Model in Levels	2.39	0.302
Basic Model in Growth Rates	1.51	0.469
Expanded Model	39.99	0.000

Table 7: Jarque Bera Test for Normality.

Model	Test statistic	P-value
Basic Model in Levels	6.78	0.034
Basic Model in Growth Rates	2.48	0.288
Expanded Model	423.93	0.000