# THE FACTORS OF ECONOMIC GROWTH IN VIRTUOUS AND VICIOUS CIRCULARITY: APPLIED TO THE CASE OF BOLIVIA

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## Abstract

*The paper discusses theories of economic growth, circularities in theories of economic growth and development, polarization and multidimensionality in global development, the virtuous and vicious circle. These will allow us to compare with the economic model that was established in Bolivia since 2006 and that is currently in force. In this sense, the objective is to evaluate the effect of the paradigm of economic growth of the Bolivian economy measured by the Gross Domestic Product (GDP) and the variables that sustain this virtuous and vicious circle such as public investment, external debt and debt with public enterprises and savings through net international reserves.  from the construction of historical data from the period 2006 to 2023 to apply regression estimates. The results of the model had significant effects on economic diversification, low investments, but with a high positive coefficient with respect to GDP, while external debt and the debt of public enterprises show a negative and significant correlation as well as external debt with respect to GDP, savings show a clear significance with respect to GDP despite the decrease in reserves in recent years. In this way, the ineffectiveness of the Bolivian economic, social, community and productive model was demonstrated with a vicious circularity; mainly, because of the study variables. Thus, this research will demonstrate the effects of this model over time.*

**Key Words:** *economic growth, factors, circularity, virtuous and vicious*

# Introduction

In neoclassical theory, economic growth is basically determined by the accumulation of productive factors of capital and labor by Adam Smith cited by Adelman (1974). In this sense, Furtado (1974) contemplates the so-called entrepreneur theory to the contributions of Shumpeter (1944) where economies grow in the long term investment and savings and require technical progress, that is, technologies that allow them to combine productive factors more efficiently, obtaining higher levels of production Sunkel and Paz (1973). The dynamization of Harrod (1939) and Domar (1946), who worked with Leontieff's production function, both dealt with problems of unemployment, instability, and income growth in mature capitalist economies, but approached them with different theories. However, according to this theory, the source of technical progress is exogenous, the result of the basic sciences, Solow (1956) argued. However, the predictions of the neoclassical model did not correlate with reality. In this sense, the author Kaldor (1961) found as a regularity of economic growth that GDP per capita grows over time and does not tend to decrease, and that the rate of return on capital does not register systematic declines.

The theory of endogenous growth assigns an important role to human capital as a source of increased productivity and economic growth. Likewise, the models of Romer (1986) and Barro (1989) established that, through externalities, or the introduction of human capital. Thus, knowledge becomes a new cumulative factor for growth, without which physical capital does not adjust to the requirements of the economic environment Sen (2000). convergences towards greater economic growth in the long term were generated, these circularities are interrelated and amplify each other, resulting in a very complex explanatory system of development processes Fontela and Guzmán (2003).

Fontela & Guzmán (2003) propose the development process in three dimensions, economic, political and social, whose relationships identify the cases of hyper and hypo development and these are accompanied by financial crises as mentioned by Dell'ariccia *et. al.* (2008). In addition to the above, international organizations such as the IMF, OECD, World Bank, UN and EU focus on structural analysis that allows the identification of virtuous and vicious circularities and their respective hierarchy for the solution of problems. In the case of Bolivia, we can mention some research such as Afcha *et. al.* (1992), Bandeira and García (2002), Jiménez and Mercado (2005), Morales (2007), Larrazábal (2021) and (Vargas *et.al,* 2024).

In addition to all of the above, to study the virtuous or vicious circularities of economic growth in the theoretical environment, such as investment, savings, and indebtedness, and how each of these variables affects employment based on productive human capital supported by science and technology, which are a fundamental part of growth, whether private or public. Subsequently, we will study economic growth through its economic model of Bolivia, then we will examine aspects related to multivariate regressions to the aforementioned factors and temporal changes and analyze the results focusing on structural factors, the macroeconomic context of economic growth in virtuous or vicious circularity.

### 1. Circularities in theories of economic growth

In addition to all of the above, the circularities of economic growth, whether virtuous or vicious of development, as proposed by the authors Fontela & Guzmán (2003) in three dimensions,

economic, political and social; these are interrelated and feed back to form a virtuous or vicious circle of development, whose relationships identify the cases of hyper and hypo development. accompanied by the financial crises Dell'ariccia *et. al.* (2008).

It should also be mentioned that international organizations, the OECD (2021) have focused on virtuous economic growth in their policies to support innovative start-ups and the financial systems capable of supporting them, under regulatory and institutional frameworks that facilitate the links between science, technology and industry, and efforts to train and obtain productive human capital, as well as public support for basic scientific research. Likewise, the International Monetary Fund (2023), World Bank (2006) and UN (2015) consider virtuous or vicious circles of economic growth in Latin America to be based on vicious circles where low growth generates high levels of poverty and where public policies for science, technology and innovation are scarce and how these instruments, if applied, can change into virtuous circles.

We can also mention Batrancea (2022) on the policies of the European Union, where savings or public sector borrowing to invest in small and medium-sized enterprises, is the best investment, as they are the main contributors to the increase in regional gross domestic product and the relationship between virtuous economic growth, imports and exports with respect to the activity of small and medium-sized enterprises within the European Union (EU-28) is straightforward. Also indicate Deni (2023) who examines, how public debt, foreign direct investment, foreign exchange reserves and exports can affect economic growth, the results of this research show that short-term public debt generates investment and more foreign direct investment has a positive and negligible relationship with economic growth,

On the other hand, exports have a positive and significant relationship with economic growth in the short term through innovative start-ups and the financial systems able to support them. From the above theories we can construct the virtuous circle of economic growth with the following Figure 1.

**Figure 1.** Virtuous Circle of Economic Growth
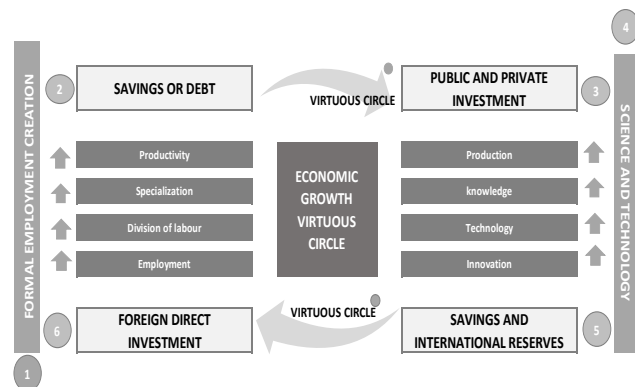


**Source:** Fontela & Guzmán (2003), OECD (2021), World Bank (2006) and others

### 2. Circularity of Bolivia's economic model

According to the Ministry of Economy and Finance of Bolivia (2014), the Bolivian Productive Community Social Economic Model identifies two pillars: first, the surplus-generating sector, the model identifies four strategic sectors that Bolivia has to generate economic surpluses for Bolivians: hydrocarbons, including natural gas; mining between gold, tin, lithium and others; Among the

sectors that generate income and employment are the manufacturing industry, tourism, housing, agricultural development and others that have not yet been revitalized, for a better understanding see Figure 2

**Figure 2.** Bolivia's Productive Economic, Social, Community, and Productive Model
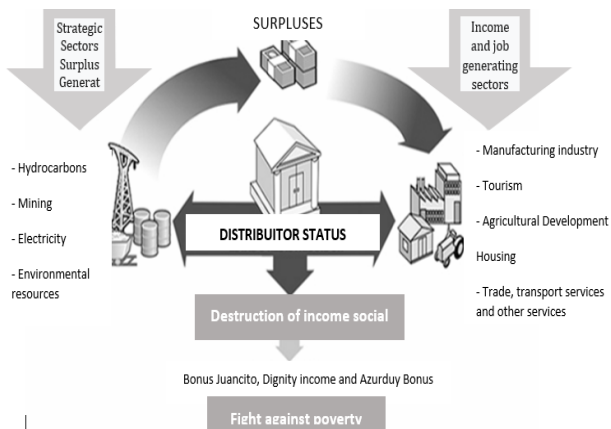


**Source:** From Ministry of Economy and Finance (2014)

According to the Ministry of Economy and Finance of Bolivia (2014) with the new Productive Community Social Economic Model, in order to develop a productive Bolivia with a virtuous circle and proposed to generate this productive transformation, modify the primary export model, for this, it is necessary to take the surpluses from the sale or export of the mining, hydrocarbons, Electricity revenues, which become savings and investment, towards the sectors where it is necessary to lay the cornerstone, the seed of a productive country, that is, in the manufacturing sector, industry, tourism and agricultural development, through strategic public enterprises.

According to the authors Vargas, *et. al.* (2022), the Bolivian economic model depended mainly on hydrocarbons, i.e. natural gas, selling or exporting this raw material for an inflow of foreign currency in foreign currency, a non-renewable resource, and bringing the surpluses to savings and public investment, mainly to new strategic public companies. These public companies did not contemplate qualified human capital and did not consider cutting-edge technology, generating losses in these public companies and a great significant burden for the state department, turning that public investment into expenses and savings were decreasing to almost zero levels to cover the expense, mainly to cover the subsidy of diesel and gasoline fuels that is in foreign currency (Vargas, *et. al.* 2023).

According to the Ministry of Economy and Finance of Bolivia (2023) the State is the redistributor, the one that must have the capacity to transfer resources from the surplus sectors to the generators of employment and income, but in reality in Bolivia it is that strategic public companies did not create large formal jobs and much less income in foreign currency for the Bolivian population and according to the World Bank and OECD (2020) a rate was generated Informal employment is growing with 85% of Bolivia's economically active population, compared to other countries in the region, see Figure 3.

**Figure 3.** The Informal Employment Rate by Country and the Average (Percentages)
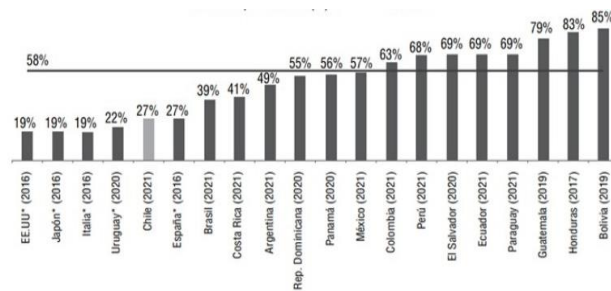


**Source:** From OECD World Bank (2020)

In other words, what the Bolivian economic model was looking for, according to authors Vargas *et al.* (2023) is to free Bolivia from dependence on the export of raw materials to abandon the primary export model and build an industrialized and productive Bolivia, but the result was a shortage of foreign currency dollars, which caused a macroeconomic imbalance in the significant fall of net international reserves, i.e. savings, also a decrease in investment and a significant increase in internal and external public debt Vargas *et. al.* (2024b).

This Bolivian economic model did not have the success expected by the state administration, while there was a surplus-generating sector, mainly the export of gas and depending on this resource, there was economic growth because the revenues from the export of gas covered the traditional expenses plus the extraordinary expenses of the strategic public companies and at the same time generated savings in dollars in the Net International Reserves and low indebtedness and an investment But once the gas reserves were depleted, the entire economic growth model of virtuous circularity became vicious (Vargas *et. al.* 2024a), for a better understanding of these macroeconomic variables, we will study these macroeconomic variables.

According to the authors (Vargas *et. al.* 2024a) it will be a challenge to get out of this economic situation while keeping inflation low and no longer depending on a non-renewable good such as natural gas and not relying on formal work and productivity and on science, research, development and technological innovation, such as the globalization of e-government, as proposed by the authors (Vargas *et. al.* 2024a and 2011). In any case, continuing with the model of strategic surplus-generating sectors, such as hydrocarbons, mining, electricity and environmental resources, mainly natural gas, added to labor informality and ignorance, that is, the lack of knowledge, where dynamism and vicious economic growth are ratified and promoted, see Figure 4.

**Figure 4.** Vicious Circle of Economic Growth in Bolivia
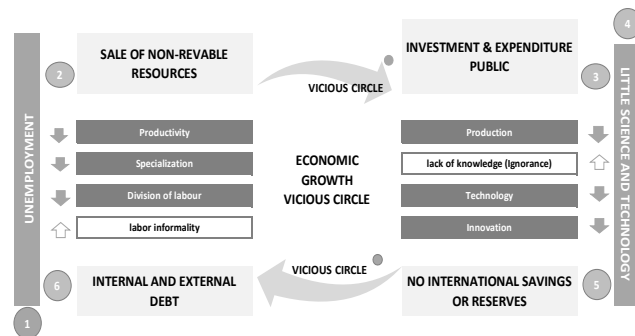


**Source:** Authors' own creation

The Ministry of Economy and Finance of Bolivia (2023), considers that Bolivia's economic model should follow its essence of depending on the surplus-generating sector through non-renewable resources and the expected performance resulting from several industrialization projects with import substitution in the process of implementation, replacing the export of Natural Gas, such as the Zinc Separation Plant, the Mutún Project, the new NPK Fertilizer Plant, the start-up of the Biodiesel Plant, the latter to beat the fuel subsidy, in addition to the entry into larger-scale production of lithium carbonate and its concentrates, accompanied by actions aimed at making efficient use of spending in the public administration. It is evident that Bolivia's economic growth model is vicious, because it does not depend on the business sector and bets on public enterprise, without considering the contributions of existing theories of virtuous circularity, for this, it is necessary to consider the multiple regression model to demonstrate circularity.

### 3. Regression model of the Bolivian case

In this section, the analysis of the multiple linear regression model according to the author (Vargas *et. al.*, 2012 and Montero, 2016) on economic growth, the analysis of the economic variables of interest with a view to the construction and formulation of an econometric model, analyzing the correlation between the dependent variable and each of the independent variables, an analytical tool that is widely used in this type of studies; In addition, to estimate the multivariate linear regression model, following the proposed methodology the following equation:

$$PIB = \beta1 * INV + \beta2 * DEX + \beta3 * DEP + \beta4 * RIN + u$$

#### 3.1. Macroeconomic study variables

After reviewing the literature in the previous sections, theories of economic growth, circularities in theories of economic growth and development, polarization and multidimensionality in world development, the virtuous and vicious circle. These will allow us to compare with the economic model that was established in Bolivia since 2006 and that is currently in force Afcha *et. al* (1992),

Bandeira and García (2002), Jiménez and Mercado (2005), Morales (2007), Humérez (2014), Larrazábal (2021) and (Vargas *et.al,* 2024). In this sense, the objective is to evaluate the effect of the paradigm of economic growth of the Bolivian economy measured by the Gross Domestic Product (GDP) and the variables that sustain this virtuous and vicious circle such as Public Investment, External Debt and Debt with Public Enterprises and savings through Net International Reserves. Historical data from 2006 to 2023 were constructed to apply estimates and regressions, which we explain below.

In this way, we will apply this equation to the joint analysis of macroeconomic variables following the methodology (Vargas *et. al.* 2012) where economic growth is reflected by Gross Domestic Product (GDP) as a dependent variable and the independent variables that support the theory seen in previous sections of the circularity of virtuous and vicious economic growth such as Public Investment (INV), External Debt (DEX) and Debt to Public Enterprises (DEP) and savings through Net International Reserves (NIR) and the coefficient (u), From the variables of the studies explained, historical data from the period 2006 to 2023 were constructed to apply regression estimates. The multivariate linear regression equation of economic growth for the Bolivian economy is as follows:

$$GDP = 1.18 * INV - 0.13 * DEP - 1.8 * DEX + 0.53 * RIN + u$$

#### 3.2. Economic GDP growth rate

We can see in Figure 5 that Bolivia's GDP, despite the efforts to maintain an average stationary growth rate of 4.92% in the period 2021 to 2023 based on sources from the Central Bank of Bolivia (2024), National Statistics Institute (2023 and 2024) and the Ministry of Economy and Finance (2023), We see that the execution of the growth rate was decreasing at the level of a recession from 6.1% in 2021 to 2.7% in 2023, this was mainly due to the following variables to be explained in the following sections.

**Figure 5:** The growth rate of the Gross Domestic Product Period: 2006 to 2023 (Percentages
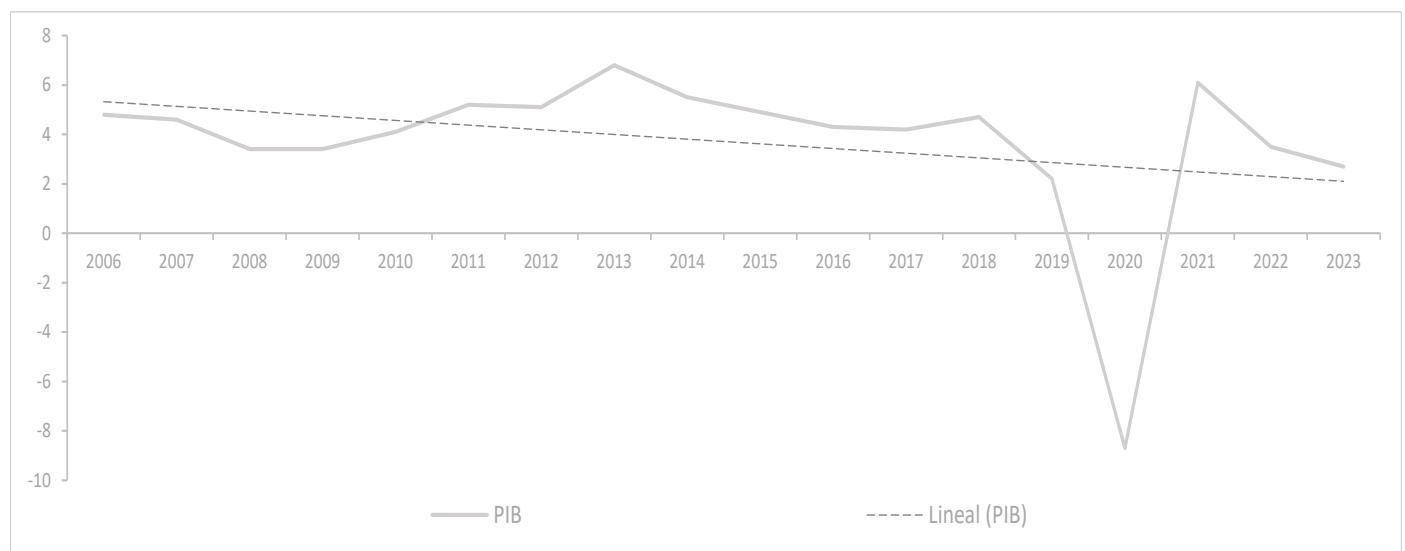
**Source:** Central Bank of Bolivia (2023) and Ministry of Economy and Finance (2023)

#### 3.3. Investment and Net International Reserve Savings

According to the Central Bank of Bolivia (2024), Ministry of Economy and Finance (2022, 2023 and 2024) and Jubilee Foundation (2023), public investment increased significantly during the period from 2006 to 2018, a time of economic well-being due to the export of natural gas until 2018, but then had a notable decrease in recent years. From that year until 2023, public investment was reduced by almost half. For 2023,

public investment was budgeted at 4,006 million dollars, this amount is less than 20% less than what was programmed in the 2022 budget, see Figure 6.

**Figure 6.** Public Investment and Savings from Net International Reserves Period: 2006 to 2023 (Millions of dollars)
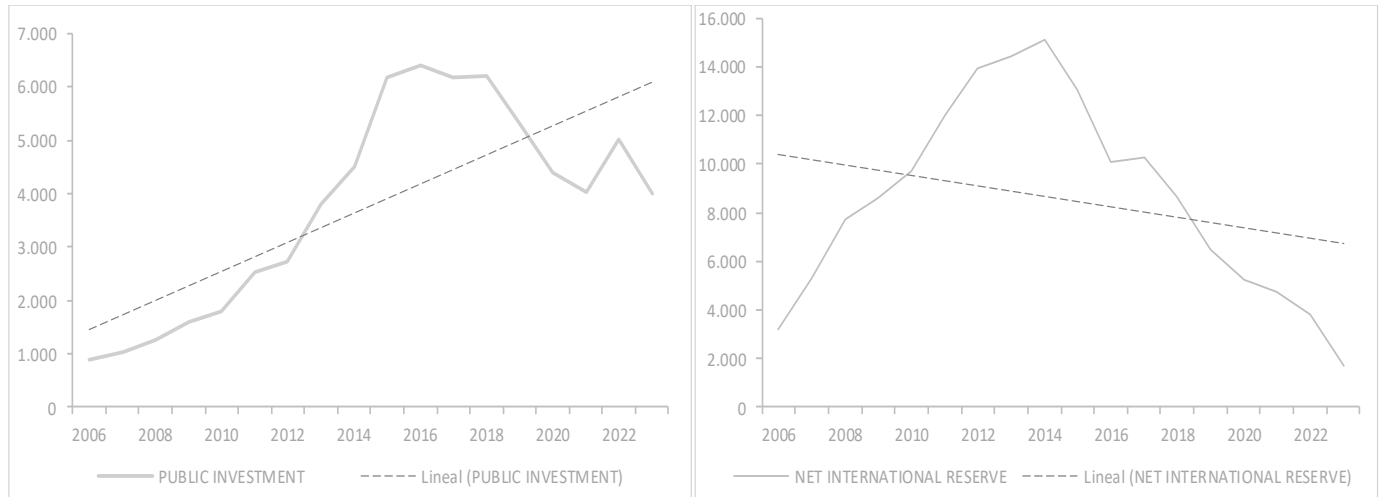


**Source:** From the Central Bank of Bolivia (2024), Ministry of Economy and Finance (2023) and Jubilee Foundation (2023)

With respect to savings measured through Net International Reserves, we can see in Figure 6, from 2006 from 3,800 million dollars to 2014 to 15,000 million dollars, reserves had an increasing trend in the same way due to the greater export of natural gas and minerals, from that year the reserves had a significant decrease reaching 1,709 million dollars by 2023, This is mainly due to the fall in gas exports and the significant expenditure and subsidy import of diesel and gasoline fuels, both in foreign currency, causing a vicious circle of economic growth.

### 3.4. External debt and the debt of public enterprises

In the recent report of the Central Bank of Bolivia (2023) on the external debt during the last ten years, it is growing and amounts to 12,000 billion dollars, as can be seen in Figure 7, Bolivia's external debt tends to rise year after year in 2022 it reached 12,664 million dollars 3.5% more than in 2020, according to official data from the Central Bank of Bolivia (2022a and 2022b). In addition, financing costs could continue to rise in the face of a greater risk of default on the external debt, due to lower revenues and the increase in interest and amortization payments.

The Andean Community establishes a healthy threshold for public debt that it be below 50% of GDP. However, this is true without considering the domestic debt, which reached some 19,686 million dollars as of October 2023, only considering the debt of the TGN and not of public companies (Central Bank of Bolivia, 2023). This figure reaches 71%, exceeding the thresholds of international organizations. With respect to the debt with public companies, we can see in Figure 7, an accelerated growth since 2011 from 8,203 million dollars to 29,617 million dollars and if we compare it with the total debt for the year 2023, the debt of companies with respect to the total debt represents 81% and with respect to the PGE it is 65%.

**Figure 7. External** debt and public enterprise debt Period: 2006 to 2023 (Millions of dollars)
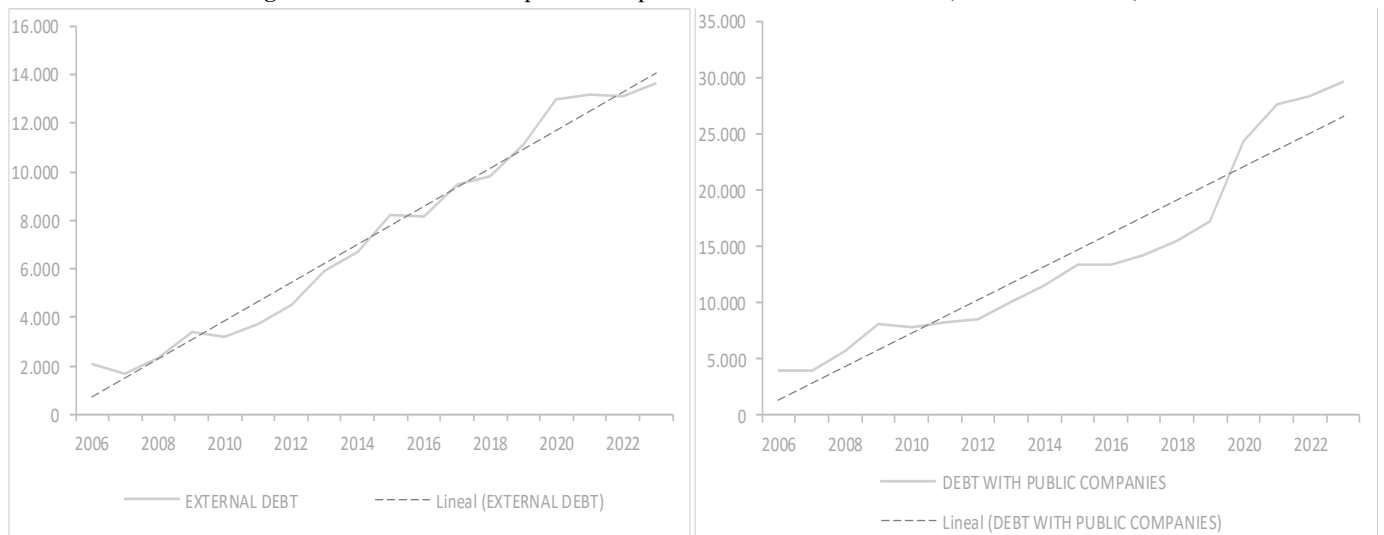


**Source:** From the Central Bank of Bolivia (2024)

### 4. Results of the estimates

Applying the multivariate linear regression test for the economic determinants of the circularity of economic growth for the case of the Bolivian economy. The results of the adjustment to a multivariate regression model to describe the relationship between

GDP and the four independent economic variables INV, DEX, DEP and RIN are presented in Table 1. It can be observed that the model is significant with adjusted R2 of 95% and significant and non-null positive and negative coefficients.

**Table 1.** Results of the variables studied

| Regression Statistics | |
|---|---|
| Multiple Correlation Coefficient | 0,98443258 |
| Coefficient of determination R^2 | 0,96910751 |
| R^2 adjusted | 0,95960212 |
| Typical Error | 2129,50699 |
| Remarks | 18 |
| | Coefficients |
| Interception | 5319,24556 |
| (INV) Public Investment USD MM | 1,18244285 |
| (DEP) Debt Public Enterprises USD MM | -0,13748278 |
| (DEX) External Debt USD MM | -1,8775877 |
| (RIN) Reservas Inter. Net USD MM | 0,53733026 |

**Source:** Authors' own creation

The output shows the results of the adjustment to a linear regression model, there is a statistically significant relationship between the variables investment 1.18 and savings through Net International Reserves 0.53 their coefficients are positive and the most significant is investment, therefore, as the circularity theory tells us, investment is a key determinant of economic growth despite the fact that public investment in Bolivia with respect to GDP is only 8% on average and savings in Bolivia decreased from 2014 to 2023 to 3.9%. The variables of indebtedness with respect to GDP also have a statistically significant relationship, the variable external debt reaches -1.8 and the debt of public enterprises -0.13, both with negative coefficients, although the two variables have increasing tendencies, the external debt is statistically more significant.

It should be noted that the projections of circular economic growth according to international organizations such as the International Monetary Fund (2023), the World Bank (2023) and the Economic Commission for Latin America (ECLAC) (2023) established that GDP will grow in a lower proportion in 2024 and 2025 that, in 2026, inclusive, the increase in national real GDP will not exceed 2% per year and that external debt is increasing considering that public spending it is increasing year after year.

## Conclusions

The circularity of Bolivia's economic growth is mainly based on the export sale of non-renewable resources of raw materials such as natural gas, while there were exports in large volumes, economic growth was virtuous, but once the natural gas reserve that was the generator of foreign currency was exhausted, economic growth became vicious, added to the fall in the international price of gas, foreign exchange significantly decreased, affecting macroeconomic variables, leading to a negative decrease in savings and a decreasing trend in savings through the RINs as well as the inflow of foreign currency or foreign currency, to the point of a shortage

of dollars throughout the Bolivian economy. the significant increase in external and internal debt to cover the expenses of strategic public enterprises that are loss-making in most cases, as well as fuel subsidies, thus affecting the rate of economic growth.

As shown by the results of the adjustment of the linear regression model, there is a statistically significant relationship between the variables investment and savings with respect to GDP in the period 2006 to 2023, the coefficients are positive and the most significant is investment, therefore, as the circularity theory tells us, investment is a key determinant of economic growth despite the fact that public investment in Bolivia with respect to GDP is only 8% on average and savings also decreased over time to 3.9% of GDP. There is a negative and statistically significant relationship between the variables: external debt and the debt of public enterprises, although both variables have increasing trends: external debt is statistically more significant than the debt of public enterprises.

It should also be concluded that the projections of the macroeconomic indicators studied for 2025 and 2026 according to international organizations, show that GDP will be below 2% according to the World Bank and external debt will continue to rise and savings will fall through NIRs and investments will depend mainly on policies such as the gold law and other non-renewable resources such as lithium, urea among others, but not formal employment, qualified human capital, productivity and much less research, development and technological innovation, therefore, Bolivia's economic, social, community and productive model deteriorates at a very slow pace and will depend on a change of direction from vicious circularity to virtuous circularity.

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