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The conclusive macroeconomic variables of fuel imports in the face of the shortage of foreign currency in Bolivia

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Abstract

The objective of this research is to identify, analyze and determine which are the conclusive variables of the total import of fuels, this variable is dependent on the study variables such as GDP, inflation, public debt, fiscal balance, public spending, trade balance, exchange rate and net international reserves that will be studied. given the shortage of foreign currency in Bolivia, from a time series sample from 2006 to 2025, to analyze these data, we will first make the polynomial projections of each of the variables in relation to the total import of fuels. Subsequently, we developed a multiple regression, with the eight independent variables in correlation to fuel imports, the results obtained yielded five variables with positive coefficients and the most correlated the net international reserves and total public debt and three conclusive variables with negative coefficients but the most correlated the exchange rate, the regression of the econometric model reached a 90% multiple correlation.

Keywords: *fuel imports, public debt, reserves, exchange rate*

Literature review

Fuel import policy is one of the most profound problems in the global and Latin American political economy for countries that depend on the import of gasoline and diesel (Schaffitzel *et. al*., 2020, Carpio and Reategui, 2025, Cazares, 2025 and Vargas *et. al*., 2026b). The import of fuels in Bolivia has been a constant instrument of its fiscal policy, created to guarantee universal access to the vehicle fleet and affordable energy, stabilize domestic prices and mitigate inequalities in a context of high poverty and labor informality (ECLAC, 2020 and 2023). According to the International Monetary Fund (2023 and 2025), fuel import spending in Bolivia projected 2,000 billion dollars per year at around 3% of GDP and is conditioning many macroeconomic variables, mainly inflation and the exchange rate, as well as GDP, RIN, internal and external debt, and fiscal and trade balances (Vargas *et. al.* 2024b and 2026b).

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Due to the increase in international oil prices and informality in the liquid fuels market and its implications for energy security, converging in rising prices in countries and even more so in developing economies with inflationary periods that mismatch foreign exchange reserves and their macroeconomic variables, to acquire more fuel at a higher price and with a more devalued exchange rate and a more depreciated currency and the depend to a large extent on the import of fuels and their respective subsidy Vargas *et. al.* (2022a); (2023a and b), (2025b) and (2026b), you are aware that fuels are the blood that circulates through the veins of economic activity and are the organism of the productive apparatus.

In addition to the above, Bolivia in terms of hydrocarbons, especially fuels such as gasoline and diesel, encounters problems in self-sufficiency in its domestic market, either with production, with the import of fuels or with the free market offer with the international price of oil Carpio and Reategui (2025), Cazares (2025) and Vargas *et. al.* (2025b), you are aware that this last external variable leads to an eminent inflationary spiral by referring to studies such as the authors Medinaceli and Velázquez (2024).

It should be noted that in 2022 the authors Vargas, *et. al.* (2022a and b) point out that the economic, social, community and productive model was to depend excessively on the economic surplus sectors, mainly the export of natural gas without added value and productive for export, a non-renewable resource and to take the surpluses to savings and public investment mainly to the new strategic public companies that became a significant public expenditure in foreign currency and with little foreign exchange generation and so confirmed the authors Vargas, *et. al.* (2026a).

However, according to the authors Vargas *et. al.* (2024b and 2026b) deduce that the current economic crisis in Bolivia caused by the illiquidity of dollars and macroeconomic instability due to vicious and non-virtuous circularity, by the liberal economic model between "1985-2005" and the economic, social, community and productive model of "2006-2025" that was led by the author Arce (2020) both models point out by researchers Vargas *et. al.* (2026a) with the same characteristics, but different nuances, the fall in the reserves of raw materials such as natural gas, minerals and others, with greater external and internal indebtedness and growing labor informality.

All this led to the elimination of the fuel subsidy in 2025, in this scenario the authors Aliaga and Terrazas (2025) and Vargas *et. al.* (2026b) analyze the macroeconomic impact of the elimination of the hydrocarbon subsidy with abrupt and gradual reforms. At the international level we can mention the following research Plante (2014), Ezeoha & Uche (2017), Gelan (2018), Ofori (2023), Ayoola, (2024), Okorie *et. al.*, (2024) and Ginn (2024), all these investigations conclude that importing gasoline and diesel fuels among others and subsidizing these fuels by the government have more macroeconomic benefits as long as there are no evils of corruption, smuggling or overpricing that eliminates it and generates inflation, devaluation and a macroeconomic imbalance.

It is necessary to mention that computable general equilibrium models, such as those developed by Gelan (2018) and Li & Solaymani (2021), have been widely used to simulate the macroeconomic effects of these gradual policy reforms or shock of fuel imports and subsidies, with respect to all their macroeconomic variables such as GDP. consumption, investment, public spending, indebtedness and exports, incorporating sectoral productive efficiency analysis following methodologies by Kumbhakar et al. (2020).

According to the authors Vargas *et. al.* (2025b and 2026b) the historical statistical data of the Bolivian State policy, is successful because the import and subsidization of fuels stabilized prices or inflation for more than 30 years with the help of their respective macroeconomic variables, while there was liquidity of foreign currency, mainly dollars.

Similarly, the research of Vargas *et. al*. (2002a) (2003a), (2024b) and (2025a) agree that it was not possible to specialize in exploration or renewable energies, nor were they able to maintain and sustain the import and subsidization of gasoline and diesel oil with the generation of sources of foreign exchange income or dollars with "renewable resources" with a productive apparatus and formal employment, rather with extractivist public policies or "non-renewable resources" such as the export sale of raw materials such as natural gas, minerals, among others.

And the authors Vargas *et. al*. (2026a) analyze how macroeconomic variables were affected by the import and subsidization of fuels in the face of a high level of corruption, fuel prices and smuggling as Bolivia is a country that is located in the center of South America and now with the elimination of the fuel subsidy, the behavior of fuel imports and macroeconomic variables will be affected, knowing that the International Monetary Fund (2026) in its outlook report for 2026 puts Bolivia as the only country with a negative recession of -3.3 of its Gross Domestic Product growth rate added to an inflation of 26%.

Thus, the objective of this research is to identify, analyze and determine which are the conclusive variables of the total import of fuels and is dependent on the study variables, mainly GDP, inflation, public debt, fiscal balance, public spending, trade balance, exchange rate and net international reserves will be studied. From a time series sample from 2006 to 2025, we will develop a literature review and a regression analysis by individual variables and a linear regression to identify which variable correlates with the fuel subsidy.

Study variables and regression models

To analyze these data, we will first make the polynomial projections of the entire sample and individually for each of the study variables, the polynomial variables are mainly used in regression analysis to model nonlinear relationships between variables by creating a trend line or calculating a polynomial equation from a set of data. To identify cyclical patterns or complex curves with increasing and decreasing trends and to be able to compare which of the economic models is more accurate, the following equations by study variables were used, polynomial regression by degrees according to study variables:

Equation of the dependent variable of degree 6:

$$FIt = x\beta^6 + x\beta^5 + \beta^{x\,4} + x\beta^3 + x\beta^3 + x\beta^2 + x + u\beta_t$$

Equations of the independent variables of degree 3:

(1) $GDP_t = x\beta^3 + x\beta^2 + x + u\beta_t$

(2) $IN_t = x\beta^3 + x\beta^2 + x + u\beta_t$

(3) $PD_t = x\beta^3 + x\beta^2 + x + u\beta_t$

(4) $FB_t = x\beta^3 + x\beta^2 + x + u\ t\beta$

(5) $PS_t = x\beta^3 + x\beta^2 + x + u\beta_t$

(6) $BT_t = x\beta^3 + x\beta^2 + x + u\beta_t$

(7) $ER_t = x\beta^3 + x\beta^2 + x + u\beta_t$

(8) $NI_t = x\beta^3 + x\beta^2 + x + u\beta_t$

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Where:

FI: Fuel Import

βn: Regression coefficients

Xn: Degrees of Regression

GDP: Gross Domestic Product (GDP)

IN: Inflation (IN)

PD: Public Debt (PD)

FB: Fiscal Balance (FB)

PS: Public Expenditure (PS)

BT: Trade Balance (BT)

ER: Exchange Rate (ER)

NIR: Net INTERNATIONAL RESERVE (NIR)

u: Error term

t: Time

In addition, to estimate that the multivariate linear regression model, following the proposed methodology and the variables mentioned in the previous sections. In this way, we will apply this equation to the joint analysis of macroeconomic variables following the methodology (Vargas *et. al.* 2024a), the following equation, regression for economic models, was used

$$FSt = + \propto \beta_{1GDP} + \beta_{2IN} + \beta_{3PD} + \beta_{4FB} + \beta_{5PS+6}\beta BT + \beta_{7ER+8}\beta IR + u_t$$

Where:

FS: Fuel Subsidy

α: Constant

βn: Regression coefficients

GDP: Gross Domestic Product (GDP)

IN: Inflation (IN)

PD: Public Debt (PD)

FB: Fiscal Balance (FB)

PS: Public Expenditure (PS)

BT: Trade Balance (BT)

ER: Exchange Rate (ER)

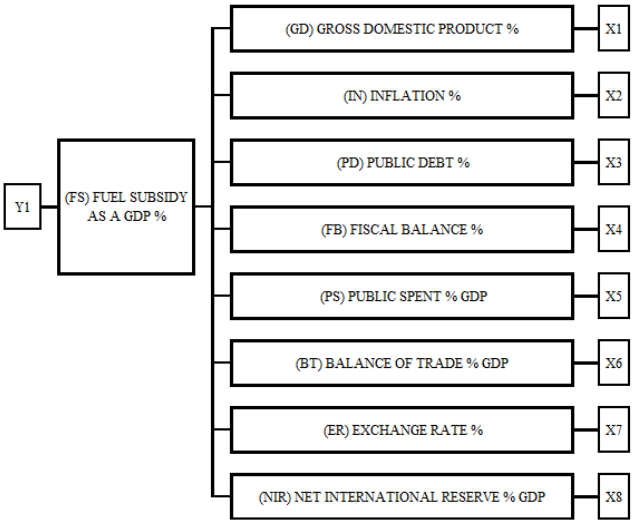
NIR: Net INTERNATIONAL RESERVE (NIR)

u: Error term

t: Time

To all of the above mentioned in the reference framework, we identify and focus on eight explanatory variables of the aforementioned research, with a survey of the information of the General Budget of the State of Bolivia, the study variables are: GDP, inflation, public debt, fiscal balance, public spending, trade balance, exchange rate and net international reserves, all of which explain the fuel subsidy, see Table 1.

Table 1. Explanatory economic variables



Source: Authors' elaboration based on Vargas *et. al. (2025)*

For better understanding and analysis, we will develop the study for the entire period of the twenty-year sample from 2006 to 2025 of each economic variable of study and separately. It should be noted that in order to have a sample comparability of twenty years, we consider all the data recorded and accounted for.

Table 2 shows the study variables, description, unit of measurement and data source for the respective regressions mentioned above.

Table 2: Summary of data of the study variables

Variable	Description	Unity	Data Source
FUEL IMPORTS	Measure for the import of fuels with and without subsidies with respect to the Gross Domestic Product (GDP) of Bolivia	Percent	Indicators of the General Budget of the State of Bolivia, published by the National Institute of Statistics (2025) and the Ministry of Economy and Finance (2025) and Bolivian Fiscal Oil Fields (2025)
ECONOMIC GROWTH	Measured by the Gross Domestic Product (GDP) of Bolivia	Percent	Indicators of the General Budget of the State of Bolivia, published by the National Institute of Statistics (2025) and the Ministry of Economy and Finance (2025)
INFLATION	Measured by Consumer Price Index prices	Percent	Indicators of the General Budget of the State of Bolivia, published by the National Institute of Statistics (2025)
TOTAL PUBLIC DEBT	Measured by external and internal credits to GDP	Percent	Indicators of the General Budget of the State of Bolivia, published by the Ministry of Economy and Finance (2025) and the Central Bank of Bolivia (2025)
SCALES TAX	Measured by the income and expenditure of the State generating a surplus or deficit with respect to GDP	Percent	Indicators of the General Budget of the State of Bolivia, published by the Ministry of Economy and Finance (2025)

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TOTAL PUBLIC EXPENDITURE	Measured by expenditure with respect to GDP	Percent	Indicators of the General Budget of the State of Bolivia, published by the Ministry of Economy and Finance (2025)
TRADE BALANCE	Measured by the results of exports and imports generating a surplus or deficit with respect to GDP	Percent	Indicators of the General Budget of the State of Bolivia, published by the National Institute of Statistics (2025), the Ministry of Economy and Finance (2025) and the Chamber of Exporters of Bolivia (2025)
EXCHANGE RATE	Measured by the rate or exchange rate between two currencies, the ratio of proportion that exists between the value of one currency and the other	By Hundred	Indicators of the General Budget of the State of Bolivia, published by the National Institute of Statistics (2025), the Ministry of Economy and Finance (2025) and Bolivia dollar today (2025)
RESERVATIONS INTERNATIONAL NETS	Measured by the gold reserves, foreign exchange and special drawing rights with respect to GDP	Percent	Data published by the Central Bank of Bolivia (2025)

Source: Own elaboration

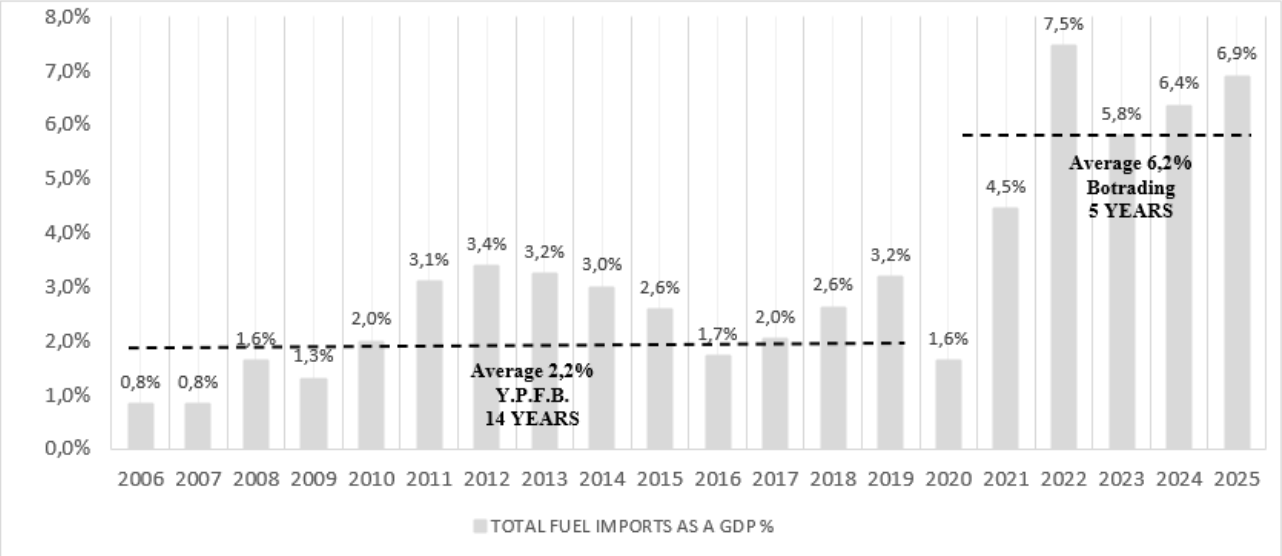
Analysis for each study variable

In addition to all that has been studied in the previous sections described, we will collect, interpret, compare and analyse the economic variables under study, first from the polynomial regression and later from the multiple regression.

Fuel imports in Bolivia

The total import of diesel and gasoline fuels with respect to GDP has had a significant growth in the twenty years, in 2006 it was imported in fuels by 0.8% of GDP and by 2025 it reaches 7% of GDP. It should be noted that in the period 2006 to 2019 in fourteen years, the average growth of fuel imports was 2.2% with the administration, logistics and marketing of Yacimientos Petrolíferos Fiscales Bolivianos (Y.P.F.B) (2025), mention that the year 2020 was not considered due to COVID and between the period 2021 to 2025 in five years the average growth of fuel imports was 6.2%, this is mainly due to the creation of a Bolivian Company created as Botrading (2025) based in the country of Paraguay, an intermediary company for the purchase of fuels which quadrupled from 2021 to 2025, going from 1.2 million dollars in 2018 to 3.7 million dollars by 2025, see Graph 1.

Graph 1. Total fuel imports on average and polynomial regression Period: 2006 to 2025 (In percentages)



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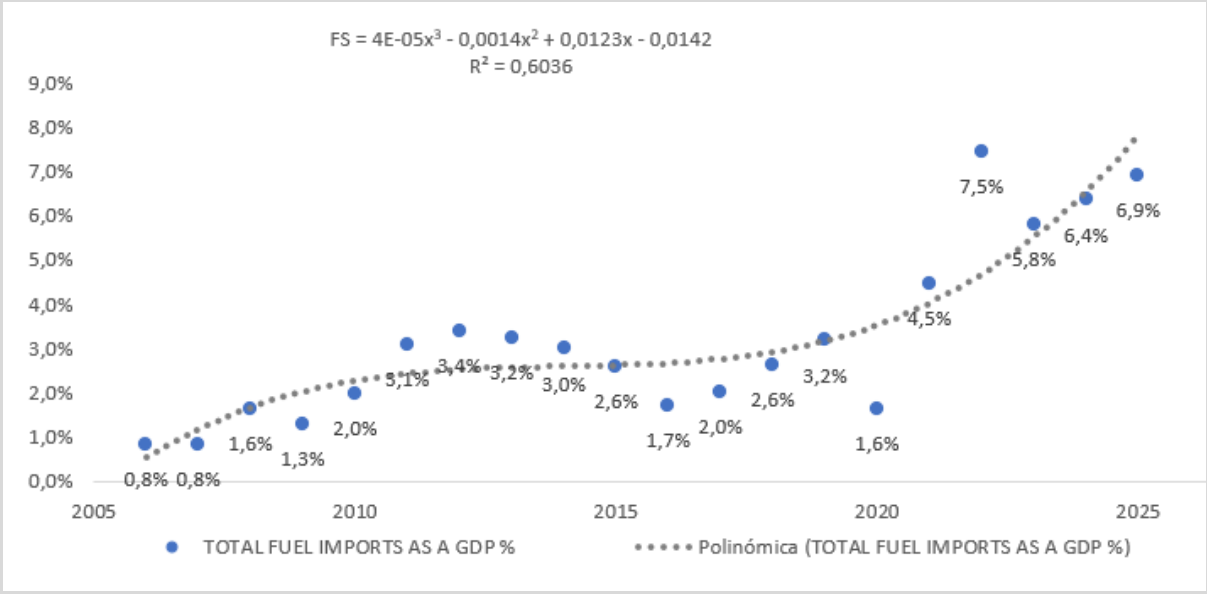

Source: From the INE (2023 and 2025) and the Ministry of Economy and Finance (2025)

The third-degree polynomial projection of the total fuel import variable was with an increasing trend and with an average growth in the twenty years of 3.2% in the last twenty years and with a significant square coefficient of determination R^2 of 0.60, see the equation in Graph 1.

Fuel imports and study variables

For a better understanding, we will explain and compare each independent variable of study with the total import of fuels, as can be seen in Graph 3.

Total fuel imports and Gross Domestic Product (GDP): if we compare separately the GDP variable and total fuel imports, with their respective third-degree polynomial projections, it shows us a moderate cyclical trend over the twenty years where GDP had a significant R^2 coefficient of determination 0.21 and total fuel imports were higher with a significant R^2 0.60 with moderate growth in fourteen years, but in the last five years it has had a growing and significant growth, see the equations in Graph 2.

Total fuel imports and inflation: if we compare separately the inflation variable and total fuel imports, with their respective third-degree polynomial projections, it shows us a moderate cyclical trend from 2026 to 2023, from this year inflation soared until it reached 10% inflation in 2024 and by 2025 it doubled to 20%, All this was due to the fact that we need more dollars to import fuels, leading to a shortage of foreign currency and leaving the exchange rate fixed and price variability. In this sense, inflation had a higher and significant R^2 coefficient of determination of 0.65 with respect to total fuel imports, but both moved at a significant R^2 of 0.60, see the equations in Graph 2.

Total fuel imports and public debt: Bolivia's public debt tends to increase year after year since 2006 it was 54.5% and by 2025 it increased to 95% according to official data from the International Monetary Fund report (2025). Their respective polynomial projections of the third degree show us an increasing trend: the total public debt, which is the sum of the external and internal debt, in the twenty years this debt had a very significant R^2 coefficient of determination of 0.96 with respect to the total import of fuels, which was lower with a significant R^2 0.78, this is because to import fuels and the subsidy, the total public debt had to be used, see the equations in Graph 3.

Total fuel imports and the fiscal balance: as can be seen in Graph 2, the fiscal balance shows between 2006 and 2025 deficits and surpluses, from 2006 to 20213 there is a surplus of the fiscal balance where there was the bonanza of natural gas exports, the highest peak was in 2006 with 4.5% and since that year the fiscal surplus has been falling until the year 2013, from 2014 the fiscal deficit begins from 2014 to 2025 this year was estimated (-9.5%) but closed the year 2025 with (-12%) having a fiscal deficit an average of (-4.4%) in the twenty years, see equation and Graph 2.

With their respective third-degree polynomial projections, it shows us a decreasing trend in the fiscal balance in the twenty years where this fiscal balance had a very significant R^2 coefficient of determination of 0.90 and the total import of fuels was lower with a significant R^2 0.60, this is because to cover the import of fuels and the subsidy, public expenditure had to be resorted to exceeding public revenues, generating a chronic fiscal deficit for eleven consecutive years, see the equations in Graph 2.

Total fuel imports and public spending: how can be seen Graph 2, according to sources from the Ministry of Economy and Finance (2025), the consolidated budget has grown considerably since 2006 from 3,377 to 45,565 billion dollars by 2023, 92.5%.

The polynomial projections of the third degree show us a moderate upward trend in public spending in the twenty years where such expenditure had a moderate R^2 coefficient of determination of 0.50 and the import of fuels was higher with a significant R^2 0.60, we can observe that public expenditure in national currency was not used so much in the last five years for the import of fuels since it depends on foreign currency dollars, but it should be mentioned that strategic public companies demanded national and foreign currency, generating inflation in the last years of the sample, see the equations in Graph 2.

Total fuel imports and trade balance: the trade balance is the difference between a country's exports and imports, Bolivia has maintained a positive trade surplus since 2006 with 9% reaching its highest peak in 2012 of 3,401 million dollars and with a surplus until 2015. but since then it has entered a trade deficit by 2023 it reached -697 million dollars, and by 2025 the trade balance was negative and deficit of (-1.4%), see Graph 2.

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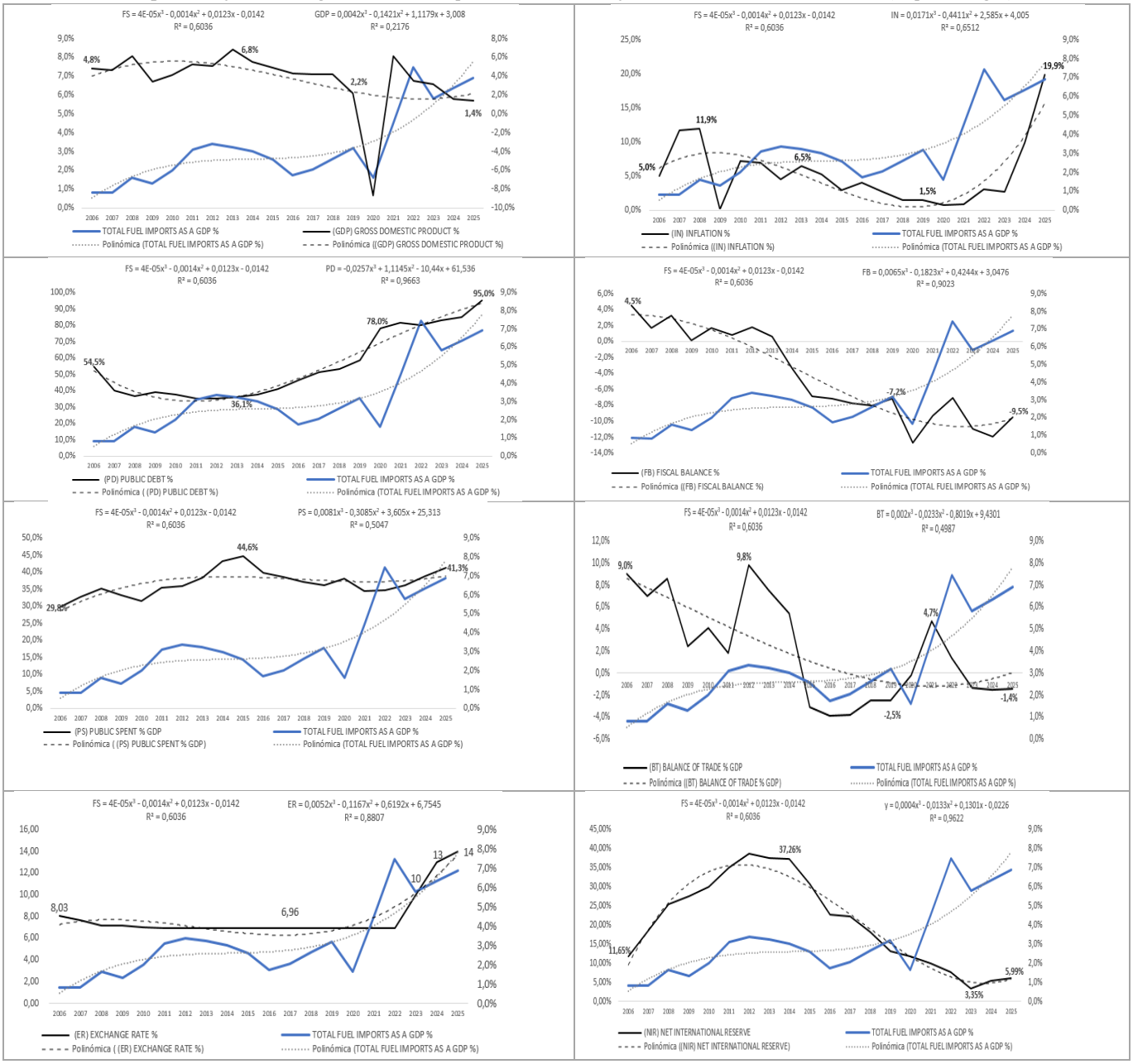
The respective polynomial projections of the third degree show us a decreasing trend in the trade balance in the twenty years where this trade balance had a moderate R^2 coefficient of determination of 0.49 and the total import of fuels was higher with a significant R^2 0.60, we can deduce that the export productive apparatus was not able to cover the import of fuels since this variable depends on the foreign currency dollars, see the equations in Graph 2.

Total fuel imports and the exchange rate: Bolivia has maintained a fixed exchange rate from 2011 to 2023 and from that year the exchange rate was devalued and began to rise from 8 bolivianos per dollar to almost 18 bolivianos per dollar by 2025, due to the shortage of foreign currency to cover the total import costs of fuel and the fall in exports of natural gas (Vargas *et. al.* 2002a). The respective projections of the third-degree polynomial exchange rate show us a moderate and then increasing and significant trend in recent years, where this exchange rate had a significant R^2 coefficient of determination of 0.88 and the fuel subsidy was lower with a significant R^2 0.60, see the equations in Graph 2.

Graph 2. Polynomial Regression: Fuel Imports and Their Study Variables Period: 2006 to 2025 (In percentages)



Source: From the INE (2025) and the Ministry of Economy and Finance (2025)

Total fuel imports and Net International Reserves: Bolivia for 2006 reached a reserve of 11.65% with respect to GDP and reached its highest peak in 2014 at 37.26% with 15 billion dollars, from that year it had a decreasing trend reaching the year 2023 only 3.35% with respect to GDP the lowest in the last thirty years and by 2025 to 5.9%. see Graph 2.

The polynomial projections of the third degree show us an increasing and then decreasing trend of the RIN in the twenty years, where these reserves reached a very significant coefficient of determination R^2 of 0.96 and the import of fuels was lower with a significant R^2 0.60, we can deduce that the total import of fuels has a direct relationship, to supply the automotive market with the import of gasoline and diesel fuels, the RIN was used since this variable depends on the foreign currency in dollars and in the face of this shortage of dollars, it was necessary to resort to savings in dollar reserves, see the equations in Graph 2.

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In addition to all that has been described in previous paragraphs, developing the study and analysis individually of each of the independent variables with respect to the dependent variable that is the total import of fuels, we were able to model the trends of each of the variables with their complex and non-linear data using a curve that adjusts to the fluctuating data through their respective third-degree polynomial projections. the results of the polynomial variables analyzed showed us the peaks and valleys and their adjusted R^2 shown in Table 3, the most significant independent variables of the eight analyzed greater than 0.60% and ranging from lowest to highest are the IN, ER, FB, PD and IR of these variables the most significant with a value of 0.96% are the IR and the PD. On the other hand, less than 0.60% of fuel imports are the least significant variables and are GDP, BT and PS and the most relevant are the BT and PS variables with 0.50%.

Table 3. Results of the studied variables of polynomial regression

Dependent variable	***R^2***		***Independent variables***	***R^2***
(FS) FUEL IMPORTS GO TO GDP %	< 0.60		(GD) GROSS DOMESTIC PRODUCT %	0,21
			(BT) BALANCE OF TRADE %	0,49
			(PS) PUBLIC SPENT %	0,50
			(IN) INFLATION %	0,65
	> 0.60		(ER) EXCHANGE RATE %	0,88
			(FB) FISCAL BALANCE %	0,90
			(PS) PUBLIC DEBT %	0,96
			(IR) NET INTERNATIONAL RESERVE %	0,96

Source: Own elaboration

Analysis and discussion of the results of multiple regression

Once the individual analysis of each independent variable in relation to fuel imports has been made, we apply the multiple regression estimates and their equation is as follows:

$$FS = + \propto \beta_{1GDP+2}\beta IN + \beta_{3PD+4}\beta FB + \beta_{5PS+6}\beta BT + \beta_{7ER+8}\beta IR + u$$

In Table 4, it can be seen in the model that the multiple correlation of total fuel imports has a multiple correlation with the independent variables, the multiple correlation coefficient is 90%, with a coefficient of determination R^2 is 81% and an adjusted coefficient of R^2 of 68%, the results show us five positive coefficients, these are GDP, IN, PD, FB and IR and the most explanatory variable is IR with a coefficient of 0.1690 and with the highest correlation in probability are the PD, GDP and IR, that means that fuel imports have a very high correlation with Net International Reserves, this is because to pay for fuel imports dollars are needed and savings in Bank vaults are used Central of Bolivia as well as the monetization of gold, providing collateral for loans abroad, in the same way it happens with the public debt, mainly the external debt, this can be explained that to cover the import of fuels it was forced to cover these obligations with the savings of IR and later with the PD indebtedness, generating an inflationary spiral with the rise in NI prices due to the illiquidity of foreign currency, reaching the highest inflation in thirty years in 2025 with 20% after the hyperinflation of 1985.

It is also worth mentioning that there are three negative coefficients BT, PS and ER, the most explanatory variable is ER with a negative coefficient of (-0.0580) and with a low probability correlation are the other two variables BT and PS, as can be seen in Table 4. Thatis to say, that the exchange rate has a very high correlation with the import of fuels, this is because to pay for the import of fuels, it is necessary to resort to the exchange rate to convert the national currency into foreign currency, considering the inflation that was generated since 2023 and the fixed exchange rate of 6.96 bolivianos for each dollar was left and we move to the reference exchange rate disclosed by the Central Bank of Bolivia (2026) with exchange rate devaluation of 9.63 bolivianos per dollar, i.e. a 38% valuation for the fourth month of 2026, unbalancing all macroeconomic variables and a national economic imbalance, see Table 4.

Table 4. Results of the variables studied in the multiple regression

Regression statistics				***Coefficients***	***Probability***
Multiple correlation coefficient	0,9047		Interception	-0,0874	0,2481
Coefficient of determination R^2	0,8185		(GDP) GROSS DOMESTIC PRODUCT %	*0,0026*	0,0225
R^2 Adjusted	0,6864		(IN) INFLATION %	0,0002	0,8600
Typical error	0,0112		(BT) BALANCE OF TRADE %	**-0,0009**	0,4466
Observations	20		(PS) PUBLIC DEBT %	*0,0018*	0,0058
			(FB) FISCAL BALANCE %	0,0006	0,7889
			(PS) PUBLIC SPENT %	**-0,0003**	0,8423
			(ER) EXCHANGE RATE %	**-0,0580**	0,8041
			(IR) NET INTERNATIONAL RESERVE %	*0,1690*	0,0315

Source: Own elaboration

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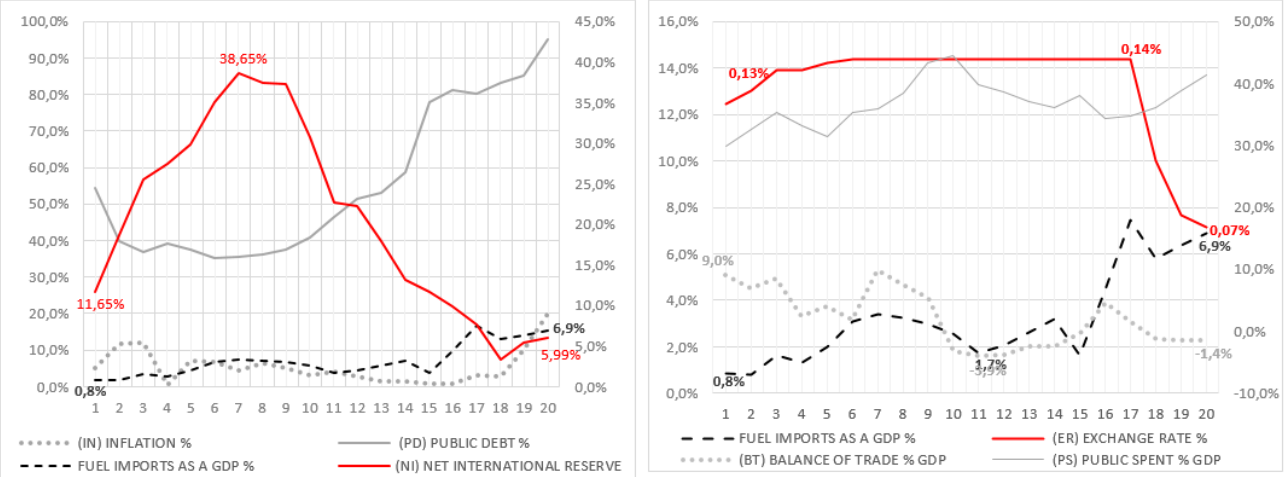
From all that has been studied, we can conclude that the determining factors of fuel imports according to the multiple regression in twenty years are the expected results, where the most explanatory and positive correlated variables are the Net International Reserves (IR), fiscal balance (FB), public debt (PD), inflation (IN) and the Gross Domestic Product (GDP) and the negative variables are the exchange rate (ER). the trade balance (BT) and public expenditure (PS) comparing their peak and valley trends with the analysis of polynomial variables, it is clearer that the exchange rate in the face of the scarcity of dollars is the most relevant determining factor of the study analysis, see Graph 3.

Graph 3. Fuel imports and the most correlated variables Period: 2006 to 2025 (In percentages)



Source: From the National Institute of Statistics (2025), Central Bank of Bolivia (2025), Ministry of Economy and Finance (2025)

In Graph 3, it can also be seen from the fifteenth year to the twentieth year, that is, from 2021 to 2025, fuel import spending rose from 2.2% to 7%, international reserves fell from 10% to 6% and public debt, both internal and external, grew from 81% to 95%, all of them with respect to GDP, and inflation rose from 0.9% to 20%. With respect to the other graph, the trade balance fell in the same period from 4.7% to negative (-1.4%) and public spending rose from 34% to 41% with respect to GDP, but the break can be seen in 2023 in mid-February due to the shortage of foreign currency. where the fixed exchange rate stood for eleven consecutive years at 0.14% and was devalued to 0.07% by 2025.

Conclusions

It is important to mention and conclude that in Bolivia with the creation of an intermediary company Botrading, a macroeconomic imbalance was generated, due to the increase in fuel imports in the period 2021 to 2025 in five years the average growth of fuel imports was 6.2%, the purchase of fuels quadrupled compared to GDP grew by four percentage points, It should be noted that in the period 2006 to 2019 in fourteen years, the average expenditure on fuel imports was 2.2% with the administration, logistics and marketing of Yacimientos Petrolíferos Fiscales Bolivianos (Y.P.F.B).

With respect to the results of the third-degree polynomial variables analyzed, they showed us the peaks and valleys and their adjusted R^2 with respect to the import of fuels, the most significant independent variables of the eight variables analyzed and greater than 0.60% and ranging from lower to higher are the NI, ER, FB, PD and IR of these variables, the most significant with a value of 0.96% are IR and PD. On the other hand, less than 0.60% of fuel imports are the least significant variables and are GDP, BT and PS and the most relevant are the BT and PS variables with 0.50%.

We can also conclude, from the multiple correlation model of total fuel imports with the independent variables, the multiple correlation coefficient is 90%, with a coefficient of determination R^2 is 81% and an adjusted coefficient of R^2 of 68%. The results show us five positive coefficients, these are GDP, IN, PD, FB and IR and the most explanatory variable is IR and with the highest correlation in probability are PD, GDP and IR, that means that fuel imports have a very high correlation with Net International Reserves, this is because to pay for fuel imports dollars are needed and savings are used in vaults of the Central Bank of Bolivia as well as the monetization of gold, providing collateral for loans abroad, in the same way it happens with the public debt, mainly the external debt, this can be explained that to cover the import of fuels it was forced to cover these obligations with the savings of IR and later with the PD indebtedness, generating an inflationary spiral with the rise in NI prices due to the illiquidity of foreign currency, reaching the highest inflation in thirty years in 2025 with 20% after the hyperinflation of 1985.

The three negative coefficients BT, PS and ER the most explanatory variable is ER followed by BT and PS. Inother words, the exchange rate has a very high correlation with fuel imports, the devaluation of the exchange rate reached 38% in the fourth month of 2026, unbalancing all macroeconomic variables and a national economic imbalance and a deeper economic crisis as pointed out by the International Monetary Fund in its outlook for 2026 that the GDP growth rate will be negative (-3.3%) and projected inflation for the same year is 26% with a high illiquidity of dollars.

Bibliography

1. Aliaga, J. L. & Terrazas, R. M. (2025). Macroeconomic impact of the elimination of the hydrocarbon subsidy in Bolivia: analysis of abrupt and gradual reforms. Institute for Advanced Studies in Development (INESAD). Development Working Paper Series. No. 6. https://www.inesad.edu.bo/2025/09/10/impacto-macroeconomico-de-la-eliminacion-del-subsidio-a-los-

DOI: 10.5281/zenodo.20405820

hidrocarburos-en-bolivia-analisis-de-reformas-abruptas-y-graduales/
2. Arce Catacora, Luis (2020). A fair and successful economic model. The Bolivian economy, 2006-2019, Mexico: Fondo de Cultura Económica. https://editorialestado.bo/EditorialNoticias/el-presidente-luis-arce-presenta-su-libro-un-modelo-economico-justo-y-exitoso-la-economia-boliviana-2006-2019/
3. Arévalo, G. (2016). "Economy and Politics of the Bolivian Model 2006-2014: Preliminary Evaluation", CENES, vol. 35, no. 61, pp. 147-174. http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0120-30532016000100006
4. Ayoola, T. J. (2024). Fuel subsidy removal and inflationary dynamics in Nigeria: A structural analysis. African Development Review, 36(1), 45-62. https://doi.org/10.1111/1467- 8268.12728
5. Central Bank of Bolivia (2025). Statistical Bulletins (2006-2025) https://www.bcb.gob.bo/
6. Central Bank of Bolivia (BCB) (2022a). Inflation and policies. BCB Publications. https://www.bcb.gob.bo/webdocs/publicacionesbcb/2023/05/28/CAP%202.pdf
7. World Bank (2025). Global Economic Outlook. October 2025 Report. https://www.bancomundial.org/es/country/bolivia
8. Botrading (2025): Creation information and services offered. https://www.botrading.com.py/
9. Carpio Escalante, E. A. and Reategui Vega, J. (2025). Informality in the liquid fuels market in Latin America and its implications for energy security. Impulso Magazine. Vol. 5, no. 11 pp. 108-128. http://doi.org/10.59659/impulso.v.5i11.133
10. Cazares, L. T. (2025). Elimination of the diesel subsidy in Ecuador: critical analysis of socioeconomic impacts and mitigation strategies in the context of Latin American energy policy. Multidisciplinary Journal of Epistemology of Sciences. Vol. 2, No 4, Dec.25 https://www.omniscens.com/index.php/rmec/article/view/291
11. Economic Commission for Latin America and the Caribbean (ECLAC). (2020). Building a new future: a transformative recovery with equality and sustainability. Summary (LC/SES.38/3-P/Rev.1). Economic Commission for Latin America and the Caribbean. https://repositorio.cepal.org/bitstream/handle/11362/46225/S2000667_es.pdf
12. Economic Commission for Latin America and the Caribbean (ECLAC) (2023). Economic and Social Development Plan (PDES) 2021-2025 of Bolivia. Regional Observatory for Development Planning in Latin America and the Caribbean. Ministry of Development Planning. https://observatorioplanificacion.cepal.org/sites/default/files/plan/files/PDES_2021-2025a_compressed_0.pdf
13. Ezeoha, A., & Uche, C. (2017). Fuel subsidy removal and trust deficit in Nigeria. African Journal of Economic and Management Studies, 8(4), 521-538. https://doi.org/10.1108/AJEMS-03-2017-0052
14. International Monetary Fund (IMF) (2023). The outlook is uncertain again, surrounded by turbulence in the financial sector, high inflation, the effects unleashed by the Russian invasion of Ukraine and three years of COVID-19, April 2023. https://www.imf.org/es/Publications/WEO/Issues/2023/04/11/world-economic-outlook-april-2023
15. International Monetary Fund (IMF) (2025). World Economic Outlook reports. Uneven and uncertain global growth. https://www.imf.org/es/Publications/WEO/Issues/2025/01/17/world-economic-outlook-update-january-2025
16. International Monetary Fund. (2020). Ecuador: Request for an Extended Arrangement Under the Extended Fund Facility—Press Release; Staff Report; Staff Supplement; and Statement by the Executive Director (IMF Country Report No. 20/286). International Monetary Fund. Retrieved from: https://www.finanzas.gob.ec/wp-content/uploads/2020/10/IMF-PAQUETE-ECUADOR-2020-1.pdf
17. Gelan, A. (2018). Economic and environmental impacts of electricity and fossil fuel Price increases in Kuwait: Inferences from a CGE model. Energy Policy, 123, 37-48. https://doi.org/10.1016/j.enpol.2018.08.014
18. Ginn, William (2024). The paradox of fossil fuel subsidies. Economic Analysis and Policy. Volume 83, September 2024, Pages 333-358. https://doi.org/10.1016/j.eap.2024.06.001
19. National Institute of Statistics of Bolivia (INE) (2025). Electronic statistics. https://www.ine.gob.bo/index.php/comunicacion/
20. Liu, W., & Li, H. (2018). Energy subsidy reform and sustainable development: Evidence from Asia.*Renewable and Sustainable Energy Reviews*, *82*, 2518-2531. https://doi.org/10.1016/j.rser.2017.09.009
21. Kumbhakar, S. C., Wang, H. J., & Horncastle, A. P. (2020). A practitioner's guide to stochastic frontier analysis using Stata. Cambridge University Press. https://doi.org/10.1017/9781139342070
22. Medinaceli Monrroy, S. M. & Velázquez Bilbao La Vieja, M. G. (2024). Prices and subsidies for hydrocarbons in Bolivia 1986 – 2025. Institute for Advanced Studies in Development (INESAD). Development Working Paper Series. No. 01. https://www.inesad.edu.bo/en/2024/01/11/precios-y-subsidios-a-los-hidrocarburos-en-bolivia-1986-2025/
23. Ministry of Economy and Finance (2025). Macroeconomic indicators. https://www.economiayfinanzas.gob.bo/
24. Ofori, E. K. (2023). Fuel subsidy reforms and distributional impacts in Ghana: A CGE analysis. Energy Economics, 119, 106548. https://doi.org/10.1016/j.eneco.2023.106548
25. Okorie, D. I., Lin, B., & Makanda, K. (2024). Fuel subsidy removal and energy security in developing economies. Renewable and Sustainable Energy Reviews, 189, 113965. https://doi.org/10.1016/j.rser.2023.113965
26. Plante, Michael (2014), "The Long-run Macroeconomic Impacts of Fuel Subsidies," *Journal of Development Economics* 107: 129-143. https://doi.org/10.1016/j.jdeveco.2013.11.008
27. Sisalima Shiña, S. A. (2024). Economic Analysis of the Impact of the Elimination of Subsidies in Ecuador Case:

DOI: 10.5281/zenodo.20405820

Gasoline, Diesel and LPG. *Academic Journal Management Decision*. Vol. 3, No. 7, pp. 51-76, July-December, 2024. https://dialnet.unirioja.es/descarga/articulo/9943150.pdf

28. Schaffitzel, F., Jakob, M., Soria, R., Vogt-Schilb, A., & Ward, H. (2020). Can government transfers make energy subsidy reform socially acceptable? A case study on Ecuador. Energy Policy, 137, 111120. https://doi.org/10.1016/j.enpol.2019.111120
29. Vargas Díaz, C. D., Delgadillo Dorado, H. D., Claure Fuentes, S. C. (2025a). The effect of the extractivist economic model on inflation and a proposal for virtuous circular growth in Bolivia. *Journal of Multidisciplinary Studies*. Vol. III, Issue. VII. July. https://isrgpublishers.com/wp-content/uploads/2025/07/ISRGJMS2302025.pdf
30. Vargas Diaz, C. D., Delgadillo Dorado, H. D., Dueri Méndez M. E. (2025b). The impact of inflation, indebtedness and public spending and Deficits on bolivia's economic growth. *Journal of Economics Business & Management*. Vol. III Issue. V October. https://isrgpublishers.com/isrgjebm-volume-iii-issue-v-september-october-2025/
31. Vargas Díaz, C. D., Delgadillo Dorado, H. D., Villca Copali, W. (2024a). The Economic Model of the Fixed Exchange Rate in Bolivia: Towards Price Stability and Economic Instability. *International Journal of Economy, Energy and Environment*, 9(1), 13-21. https://doi.org/10.11648/j.ijeee.20240901.12
32. Vargas Díaz, C., Delgadillo Dorado, H., & Vásquez De la Vega, A. R. (2024b). The factors of economic growth in virtuous and vicious circularity: applied to the case of Bolivia. *Journal of economics, business & management*. Vol. II, Issue III (May – June) 2024. DOI: 10.5281/zenode.11180208
33. Vargas Díaz, C. D., Delgadillo Dorado, H. D., Villca Copali, W. (2023a). The deterioration of economic growth and the lack of transparency in Bolivia: in the face of the fall in gas exports, net international reserves and the increase in external debt and fuel imports. *Newman Business Review*. Vol 9, No. 1, p. 04-23. http://dx.doi.org/10.22451/3002.nbr2023.vol9.1.10080
34. Vargas Díaz, C. D., Delgadillo Dorado, H. D., Villca Copali, W. (2023b). Inflation is a risk in Bolivia: given the decumulation of natural gas and RINs and the vulnerability of external debt and fiscal deficit. *Newman Business Review*. Vol 9 No. 2 | December 2023, p. 21-39 ISSN: 2412-3730 https://www.researchgate.net/publication/377318063_La_inflacion_un_riesgo_en_Bolivia_ante_la_desacumulacion_del_gas_natural_y_las_RIN_y_la_vulnerabilidad_de_la_deuda_externa_y_el_deficit_fiscal
35. Vargas Díaz, C. D., Delgadillo Dorado, H. D., Villca Copali, W. (2022a). The Fall in Gas Exports, International Reserves and Economic Growth in Bolivia. International *Journal of Economy, Energy and Environment* 8 (4), 91-98. https://www.researchgate.net/publication/373008067_The_Fall_in_Gas_Exports_International_Reserves_and_Economic_Growth_in_Bolivia
36. Vargas Díaz, C. D., Delgadillo Dorado, H. D., Villca Copali, W. (2022b). The fall in gas exports, international reserves and economic growth in Bolivia. *International Journal of Economics, Energy and Environment*. 8.91-98 https://www.researchgate.net/publication/373008067_The_Fall_in_Gas_Exports_International_Reserves_and_Economic_Growth_in_Bolivia
37. Vargas Díaz, César D., Delgadillo Dorado, Hernán and Rojas Ovando, Emerson (2026a). Analysis of the Determinants of Bolivia's Economic Growth Models. *World Economic Journal*. Vol. 26, No. 4, October–December 2025 https://world-economics-journal.com/Papers/Analysis-of-the-Determinants-of-Bolivias-Economic-Growth-Models.aspx?ID=966
38. Vargas Díaz, César Daniel, Delgadillo Dorado, Hernán and Gomez Soruco, Silvana. (2026b). Elimination of fuel subsidies and distortions in the energy market in bolivia. ISRG *Journal of Economics, Business & Management*, IV(II), 100–111. https://doi.org/10.5281/zenodo.19448682
39. Yacimientos Petrolíferos Fiscales Bolivianos (Y.P.F.B), (2025): Annual reports and accountability. https://www.ypfb.gob.bo/

DOI: 10.5281/zenodo.20405820