The Relationship Between Public Spending and National Income: Empirical Evidence from Brazil from 1997 to 2019

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Abstract: This paper investigates the existence of a causal relationship between public spending and national income, based on empirical evidence from Brazil, between 1997 and 2019. For this purpose, data on GDP and federal public expenditures were used. Initially, the ADF, Ng Perron and Perrontests were applied to measure the occurrence of unit roots, in I(0), no unitary roots were found, being stationary series. The Causality Test of Granger was then carried out to examine the occurrence of a causal relationship between expenditure and GDP, establishing the temporal precedence between the variables. It was concluded that there is a causal relationship between federal public expenditures and GDP. Thus, depending on the meaning, positive or negative, of this causal link, the approaches that deal with the dynamics of public spending and its causal link with income can be proven by Wagner's Law, Keynesian hypotheses and non-Keynesian hypotheses.

Keywords: Public Spending, GDP, National Income, Causal relationship.
JEL Classification: H60, H62, H10, H20.

1. INTRODUCTION

The causal relationship between public spending and national income is the subject of academic investigations and political debates in different countries, which result in disagreements among them most of the time. In Brazil, notedly, this discussion is quite intense in contrasting different theoretical currents. This lack of consensus causes different forms of action of governments in the conduct of their fiscal policies, especially, given the need for actions to promote national income. Thus, this subject is extremely important to Academy and fundamental for the elaboration of economic policies.

This theme has been explored by researchers from different perspectives. It is important to emphasize that the expansion of public spending is a controversial issue, especially when discussing its connection with growth and its effects (BENDER FILHO, 2019). Then there is no uniqueness in its understanding. And, for this reason, it is necessary to look at the subject to support the elaboration of economic policies, as well as the academic discussion on this subject (GADELHA, 2011).

It is important to observe that in times of severe economic crises, mainly, this discussion gains strength among critics and advocates of the adoption of countercyclical policies. On the one hand, orthodox thinking argues that the goals of fiscal surpluses are not to be corrupted, either in whole or in part, because their rupture through demand pressure can trigger an inflationary process, with an unsustainable development of the country's economy at the post-crisis moment.

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Thus, it can be seen that an expansionary fiscal policy, through increased spending, can cause a positive short-term effect on national income, however, undermining growth in the long term. On the other hand, some heterodox schools, such as Keynesian, advocate for state interference in the economy.

Given this discussion, the two traditional hypotheses of the dynamics of public spending, Keynesian and Wagnerian, will be tested. The Keynesian Theory understands that the increase in aggregate demand, caused by the relaxation of monetary and fiscal policies, can reverse recessive periods. Because of this, the expected result is the resumption of economic activity. Thus, the increase in public spending, through its multiplier effect, presents a positive causality about national income, establishing the conditions for the continuity of growth. Wagner's Law advocates that there is a positive causal relationship between GDP and public spending so that the increase in GDP leads to a higher demand for public goods and services, which leads to an increase in expenditure.

Also, the so-called non-Keynesian effects of fiscal policy on the growth of national income were analyzed. These impacts have been observed by recent studies, the results of which show that economies that have a fiscal policy that seeks balance through cuts in public spending, transmit confidence and positive future expectations to the private market, increasing consumption and investments, and consequently also GDP.

That said, the question is: what are the expenditure items that need to have their growth path controlled in so that the fiscal consolidation process contributes to sustainable economic growth?

This study has, as a general objective, to analyze the causal relationship between public spending and economic growth in the period between 1997 and 2019 in Brazil. To achieve this goal, the specific objective is to apply the Granger causality test between GDP and certain public expenditure items contained in the national treasury result.

The justification for the development of this research lies precisely in the actions of the Brazilian federal government to face the "swelling" of the State, especially in the period evaluated by this study. The entry into force of the constitutional amendment of the public spending ceiling – Constitutional Amendment No. 95/2016 – set a limit on these expenses, depending on the need to make the fiscal adjustment, so that the country could, over time, establish sustainable growth.

The pension reform, enacted in 2019, providing for an economy of more than R$ 800 billion for the Union in the first ten years of its validity, also demonstrates the impact that public expenditures produce on the economy, and the consequent need for control.

Thus, it is vitally important to analyze the causal relations between public spending and GDP, from the perspective of temporal precedence between them. Thus, itis pertinent to undertake work that aims to contribute to the results of investigations of the aforementioned causal relationship between the variables that define fiscal policy and the growth of the Brazilian economy.

This way is possible to know, even partially, its effects on the national economy, confirming one or more of the hypotheses cited – Wagnerian, Keynesian, non-Keynesian – foreseeing the nature of the instruments to be used by economic policy and, thus, the necessary measures to restrain the recessionary movement and impress the resumption of economic growth.

Thus, the investigation of empirical data, from a certain time, seeks to verify the presence of orthodox or heterodox results in the application of anticyclical policies, through increased public spending. Thus, we seek to answer the proposed question, collaborating to clarify this theoretical divergence, pointing out paths in the conduct of fiscal policies.

The Brazilian economy will provide the empirical evidence that will be analyzed in this work, covering the period from 1997 to 2019, that is, the post real plan. Thus, in terms of delimitation of the scope of this study, the following stand out: 1) although it is a subject discussed in the various world economies, this work is delimited to the study of causal relations between these two variables in Brazil: public spending and national income; 2) the items considered in the National Treasury Results Bulletins - RTN; 3) this work focuses on the relationships after the real plan; and, 4) the focus of this study is to purely analyze the causal relationship, in the sense of temporal precedence, among the variables commented here.

The data will be analyzed in two groups: national income and public expenditure. In the first group, GDP will be examined; the historical series used will be from 1997 to 2019, available by the Institute of Applied Economic Research (IPEA). In the second group, the federal public spending data will be explored, through current expenditures and capital expenditures, whose sources of the historical series were the reports of the National Treasury - RTN.

This article is structured in five parts: this is the first introduction; the second part provides a review of the literature used; the third part presents the methodology and the database; the fourth part demonstrates the results obtained; and, finally, the conclusion of the work is concluded.

2. THEORETICAL REFERENCE

The expansion of public spending, from the last century, especially during the periods of the two great wars and the crisis of 1929, has been the subject of studies and divergences on its causes and its effects on the economy. This increase was recorded in early capitalist countries and not only in economies where state control predominates.

Countries such as the United States, Germany and the United Kingdom, for example, have had this historicaltr end of spending growth since the end of the 19th century.

As a result, the discussion on the relationship between the growth of the economy and the expenditures of the State came to the agenda, and its understanding was a beacon for the elaboration of economic policies (GADELHA, 2011). It is important to consider the classification of public expenditures, for this, it is necessary to disaggregate them, differentiating between productive and unproductive expenditures (BLEANEY, GEMMELL, E KNELLER, 2001).

By making this distinction and grouping expenditures into economic, current and capital categories, and by groups of an expense nature, it is possible to investigate the causal relationship of each item dissociated with the respective incentive in the economy, through a conception that covers the entire spectrum of expenditure, indicating the possibility of a tax multiplier for each of them (PIRES, 2014).

Thus, the dimension of the State, defined by its direct action in the economy, is explained by different aspects. Adolph Wagner, already at the end of the 19th century, stated that there is a positive relationship between public spending and national income (DA SILVA and SIQUEIRA, 2014). In this preposition, known as Wagner's Law, the increase in public expenditures is fostered by the increase in national income, which demands more goods and services from the State, while maintaining the fiscal balance (PRADO and DA SILVA, 2018).

Wagner did not elaborate on a mathematical model for his theory. Over time several models have been presented to test the validity of their propositions (BENDER FILHO, 2019). Empirically, the first form of the investigation was elaborated with the following ordering: $Ln\ (GE) = a + bLn\ (GDP)$, *where GE represents* total public expenditure and *GDP gross* domestic product (PEACOCK and WISEMAN, 1961).

Surprisingly, population growth was considered, verifying *the per capita relationships:* $Ln\ (EG/P) = a + bLn\ (GDP/P)$, (GUPTA, 1967). Wagner's Law was also tested with the following formulation: $Ln\ (EG) = a + bLn\ (GDP/P)$, (GOFFMAN, 1968). Another test was conducted, considering government spending as a dependent variable: $Ln(GCE) = a + bLn\ (GDP)$, (PRYOR, 1969).

Empirical studies, through the application of the econometric models described above in the Brazilian economy, do not confirm the propositions of Wagner's Law in the correlation between public spending and growth (BENDER FILHO, 2019). However, using the concept of causality of Granger (GRANGER, 1969), by estimating an autoregressive vector model (VAR), it is verified that there is a positive causal relationship, in the short term, between real GDP and current government expenditures, regarding their transfers, that is, the growth of national income motivates federal transfers to states, municipalities and federal district (GADELHA, 2011).

The Fiscal Illusion theory is another focus to investigate the dynamics of government expenditure. It induces governments to use subterfuge so that individuals have a partial notion of the amount of payment of taxes charged to them. As a result, they are driven to an undersized perception of the cost of goods and services provided by the State, accepting and, at the same time, stimulating the increase in public expenditure (REZENDE, 2008).

In the Brazilian case, with data collected from 1994 to 2014, there is evidence that fiscal illusion influenced the increase in public spending (DA SILVA, 2014). It has also been shown that indirect taxation produces the effects of tax illusion (PRADO and DA SILVA, 2018).

The traditional Keynesian theory advocates, on the other hand, that governments must intervene in the economy, through fiscal and monetary policies to face adverse economic cycles. In its conceptual perspective, the effect resulting from the increase in public spending is the growth of the economy, through the multiplier of expenditures, due to the ratio between investment and income (KEYNES, 2019).

Some results of empirical investigations point to confirmation of the Keynesian hypothesis when it comes to capital expenditure, whose disbursements have the nature of the public investment group, its increase promotes long-term economic growth (GADELHA, 2011).

Furthermore, in a seminal work carried out with empirical evidence from 98 countries, between the years 1960 and 1985, there was a negative correlation between fiscal policy, through unproductive spending, and the growth of the economy, so the need to disaggregate spending to investigate the effect of each nature (BARRO, 1991).

In Brazil, there is evidence that productive expenditures, being: capital, transportation, education and health; have a positive and representative relationship between causality and growth. However, consumption expenditures, even with positive effects, present nonlinear growth when observed in the long term, with a limit for this type of expenditure (GIUBERTI and ROCHA, 2007).

It stands out that the analysis of data on public investments in infrastructure activity also suggests positive effects (DA SILVA and TRICHES, 2014). Empirical impressions collected in the Brazilian economy corroborate these conclusions by indicating that the decrease in government consumption, concomitant with the forwarding of resources for infrastructure investments, and an increase in national income in the long term (BEZERRA, GOMES and PEREIRA, 2019). Also, through analysis of the input-product matrix, the results point to infrastructure investments as a more efficient way to stimulate growth, *presenting a positive trade-off* in this relationship (GILHOTO, MOLLO and TAKASAGO, 2017).

In this sense, through the application of a dynamic general equilibrium model, some results show that the decrease in state spending, of a consumption nature, simultaneous to the reduction of the income tax rate on capital and the maximization of investments lead to an increase in income (BRUM and TOURINHO, 2020).

Research also confirms evidence that, in some periods, the Brazilian economy showed significant growth mainly encouraged by private investments and world GDP. Nevertheless, productive public spending was also positively responsible for the increase in per capita income in the long term, while unproductive expenditures (social assistance and social security, work, citizenship law, agrarian organization, environmental management, sports and leisure) did not demonstrate a causal relationship with the expansion of the economy (DINIZ, KANNEBLEY JÚNIOR and SOUZA, 2010).

Results of studies, whose investigation of tax multipliers through the Bayesian Structural VAR methodology with the change of Markovian regimes (MS-SBVAR), indicate that expenditures in the gross constitution of fixed capital of the government have a positive causality in the expansion of the level of economic performance, temporary or definitive, given the potential is of its multiplier effects (CASTELO-BRANCO, LIMA and PAULA, 2017).

It should be considered that research suggests solutions to the product gap, bringing real GDP closer to potential GDP, depending on a combination of fiscal and monetary policies, given that an unanticipated fiscal shock causes an even greater distance between them. Thus, the increase in government spending alone would hurt growth (BARROS and LIMA, 2018).

Thus, there are the non-Keynesian effects of fiscal policy, which has as parameters the confidence and expectation of private agents, confirmed by expansionary tax contractions and contract tax expansions (GADELHA, 2011).

It should also be considered that the fiscal balance is an indicator of extreme economic importance since it raises the credibility of the market, national and international, for the country. Thus, the correspondence between revenues, expenses and debts provides a positive or negative signal to economic agents. Thus, countercyclical policies, through increased spending, *used per se,* may trigger a worsening of budget deficits and, therefore, cause negative consequences to the sustainability of the national economy (BERTUSSI and TRICHES, 2017).

However, it is also necessary to investigate the most recent empirical evidence related to other developing countries. The findings of Olonite *et. Al.* (2021) suggest that public income transfer expenditures will not drive economic growth because they are intended for consumption, while capital expenditures are public investments and drive economic growth. For Romania, the findings of Porpescu and Diaconu (2021) state that there is no long-term balance between pub-

lic spending and economic growth, even though there is bidirectional causality between the two variables in the short term.

The work of Miftari et. al (2021) found, through the ordinary least squares method, that public expenditures are not statistically significant to explain economic growth in the Republic of Kosovo, Hamad and Abdullah (2022) showed that even with large public expenditures, Iraq failed to achieve high rates of economic growth and social balance, while Ansari et. al (2021) obtained results that support the Keynesian hypothesis that public spending promotes economic growth for the set of countries that make up the BRICS, ASEAN and SAARC.

Seung-Joon (2022) analyzed the 38 OECD countries and found that, despite the dynamics varying from country to country in different periods, many countries suggest that there is causality from economic growth to government expansion. Coayla (2021) identified countries with low public spending and high GDP per capita, such as the Macau Special Administrative Region in China and Inchauspe et. al (2022) found the validity of Wagner's law for Indonesia, with unidirectional causality going from GDP growth to public spending.

Thus, this study differs from other studies conducted for Brazil by obtaining the following results: 1) there is a bi causality relationship between current expenditures formed by personnel expenses, social charges, security benefits and GDP in the first three lags, and a one-way causal relationship between these expenses and GDP, in the fourth and fifth lags; 2) there is a relationship of bi causality between other current expenditures and GDP in the first four lags, and a one-way causal relationship between GDP and this expenditure in the fifth lag; and, 3) there is a bi causal relationship between expenditure formed by costing and investment and GDP throughout the period.

3. METHODOLOGY

3.1. Data

The databases are composed of quarterly series of Brazilian gross domestic product - GDP, obtained from the Institute of Applied Economic Research - IPEA[1], and Brazilian public spending, made available by the National Treasury Results bulletins - RTN[2] - that present the primary result of the Central Government composed of the National Treasury, Social Security and the Central Bank. The series were transformed into logarithms for the adjustment of the model, so that the relationships between the variables can be interpreted as elasticity.

For this investigation, 1) the Spending of Personnel and Social Charges were considered; 2) Social Security Benefits;3) Other Mandatory Expenses; and, 4) Expenses Subject to the Financial Programming of the Executive Branch, consisting of mandatory expenses with flow control and discretionary. Being that, the discretionary is costing (current expenditure) and investment (capital expenditure).

We chose to work with quarterly series, for greater robustness of the data. The period between 1997 and2019wasused post real plan. Thus, the analyzed period consists of ninety-two quarters. All series values are in real terms, presented as current values, in addition, the series is in natural logarithms, which allows for interpreting the coefficients estimated as long-term elasticity.

3.2. Econometric Model

Three tests were used to identify the unit root: ADF, Ng Perron and Perron, whose date of the break is unknown. The results were considered at level - I(0) and in the first difference.

Modifications to the unit root test by Dickey and Fuller (1979, 1981) and by Said and Dickey (1984) are based on two central aspects: (a) extracting trends in time series using ordinary least squares (OLS) is inefficient, and; (b) the importance of a selection appropriate to the lag order of the augmented term, to obtain a better approximation to the actual data generating process.

For the first case, Elliot, Rottem berg and Stock (1996) propose to use generalized least squares (GLS) to extract the stochastic trend of the series. For this, the standard procedure is used to estimate the statistic ADF^{GLS} as being the statistic to test the null hypothesis H_0: $\beta_0 = 0$, of the presence of a unit root against the alternative hypothesis H_A : $\beta_0 < 0$ that the series is stationary. The regression estimated by ordinary least squares is determined by:

$$\Delta\tilde{y}_t = \beta_0\tilde{y}_{t-1} + \sum_{j=1}^{k}\beta_j\Delta\tilde{y}_{t-j} + e_{tk} \quad (1)$$

In Equation (1), $\tilde{y}_t$defines the series with trend removed by generalized least squares, Δ the first difference operator and e_{tk} the non-autocorrelated and homoscedastic residue.

Regarding the second aspect, Ng and Perron (2001) demonstrate that the Akaike (AIC) and Schwarz (SIC) information criteria tend to select low values for the lag.k, when there is a large negative root (close to -1) in the series' moving average polynomial, leading the unit root tests to important distortions.

This situation motivated the development of the modified Akaike information criterion (MAIC) for the selection of the autoregressive lag, to minimize the distortions caused by inadequate lag selection in Equation (1). The MAIC is designed to select a relatively long lag length in the presence of a moving-average root close to unity, to avoid distortion, and a shorter lag length in the absence of such a root, so that the power of the test is not gets compromised. The test ADF^{GLS} uses the t (ordinary least squares) statistic corresponding to β_0 in the aforementioned Equation.

Ng and Perron (2001) suggested that the same proposed modifications also be applied to the traditional test by Phillips and Perron (1988), giving rise to the test $\underline{MZ}_{\alpha}^{GLS}$. In

[1]Available in: <http://www.ipeadata.gov.br>.

[2] Public expenditure data are available at: <https://www.tesourotransparente.gov.br/>, the source of which is the National Treasury.

particular, modified versions define tests $\underline{MZ_{\alpha}^{GLS}}$, $\underline{MSB}$ and $\underline{MZ_{t}^{GLS}}$, which are based on:

$$\underline{MZ_{\alpha}^{GLS}} = (T^{-1}y_T^d - \hat{\lambda}^2)\left(2T^{-2}\sum_{t=1}^{T} y_{t-1}^d\right)^{-1} \quad (2)$$

$$\underline{MSB} = \left(T^{-2}\sum_{t=1}^{T} y_{t-1}^d/\hat{\lambda}^2\right)^{1/2} \quad (3)$$

$$\underline{MZ_{t}^{GLS}} = \underline{MZ_{\alpha}^{GLS}} x \underline{MSB} \quad (4)$$

Through simulations, Ng and Perron (2001) showed that the joint application of GLS to extract the deterministic trend and the MAIC lag selection criterion produce tests with greater power, but smaller statistical size distortions when compared to traditional Augmented tests. Dickey and Fuller and Phillips-Perron.

However, even modified tests ADF^{GLS} and $\underline{MZ_{\alpha}^{GLS}}$,$\underline{MSB}$ and $\underline{MZ_{t}^{GLS}}$have low power in the presence of structural breaks, becoming biased in the sense of not rejecting the null hypothesis of the existence of a unit root when the series is stationary. When dealing with time series data, researchers must be aware of possible structural breaks. A structural break occurs when the behavior of a series changes abruptly at a given point in time. These breaks usually result from exogenous shocks, for example, commodity price shocks, conflicts, policy changes and exchange rate and/or monetary regime changes.

In econometric analysis, one of the main assumptions is that descriptive statistics (parameters), such as the mean and standard deviation, are relatively stable over time. However, structural breaks often skew these statistics. As a result, parameters may no longer accurately characterize the properties of the series and econometric methods may generate biased and inconsistent estimates and, as a result, poor forecasts and estimates. Furthermore, Maddala and Kim (1999) explain that structural changes affect the results of unit roots, cointegration and causality tests. Given this, in the stationarity analysis, two unit root tests will be considered that consider the presence of structural break. Perron's (1989) study illustrates the importance of including a structural break in traditional unit root tests by showing that a bias exists against rejecting the null hypothesis of a unit root when the time series under investigation is stationary over time. around a structural break. Initially, three models of structural breakage were considered. Model A, which is known as the crash model, allows for one period of change in the level. Model B allows for a break in the time series trend. And Model C, which is known as the changing growth path model, includes a one-period change at both level and trend.

Specifically, the structural break is treated as an exogenous event, knowing its date of occurrence. Be$\tau$the period before the structural break, so the null hypothesis is that the series$y_t$follows a unit root process with a structural break in the period$t = \tau + 1$, against the alternative hypothesis that$y_t$is stationary. In its general form, the so-called model (C) considers intercept and trend breaks and is expressed by:

$$y_t = a_0 + a_1 y_{t-1} + a_2 t + \mu_1 D_L + \mu_2 D_P + \mu_3 D_T + \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + \varepsilon_t \quad (5)$$

where the impulse dummy variable $D_p = 1$ if $t = \tau + 1$and zero, otherwise; variable *dummy* of level $D_L = 1$ if $t > \tau$ and zero, otherwise; and a variable *dummy* of trend$D_T = t - \tau$if$t > \tau$and zero, otherwise; $a_0$is the intercept; $a_2$is the coefficient of the deterministic trend *t*; the residual term is non-autocorrelated and homoscedastic white noise, $\varepsilon_t \sim i.i.d.(0, \sigma^2)$; k is the number of lags chosen according to the usual lag selection criteria.μ_1, μ_2, $\mu_3$and$\beta$are parameters to be estimated. The residuals obtained in the equation in (5) are used to estimate the equation using ordinary least squares:

$$e_t = a_1 e_{t-1} + u_t (6)$$

Under the null hypothesis of unit root, the theoretical value of a_1 is unitary. Since the residuals are independent and identically distributed, the distribution of$a_1$will depend on the pre-breakage sample size/total sample size ratio, denoted by$\lambda = \tau/T$, where *T*is the total number of observations. Therefore, the term "λ" determines the fraction of break in the test of Perron (1989), representing the proportion of observations that occurred before the structural break, of the total number of observations.

If the residuals are correlated, then Equation (6) must be estimated in the form of the Augmented Dickey-Fuller (ADF) test with an appropriate selection of lags to correct the autocorrelation. For this purpose, the general-to-specific approach is used, as suggested by Campbell and Perron (1991), where a maximum number of lags is chosen a priori.$(p_{máximo})$, which are eliminated one by one, in case the coefficient of the last lag is not significant.

To explore the causal relationship, in the sense of temporal precedence, among the variables already described, granger causality verification (1969) was used.

The Granger causality test is represented by the following regressions when the variables are stationary:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \ldots + \alpha_t y_{t-L} + \beta_1 y_{t-1} + \ldots + \beta_L y_{t-L} + \xi_t (7)$$

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \ldots + \alpha_t x_{t-L} + \beta_1 x_{t-1} + \ldots + \beta_L x_{t-L} + \mu_t (8)$$

This Granger causality model is predictive; it presupposes the improvement of the variance of the prediction caused by the use of a lagging exogenous variable in the regression equation. Thus, if the variable Granger Cause, expresses that

the lagged values of the variable help to predict (GALDI and LOPES, 2008), that is, if the variable X Granger-causes the variable Y, variations in X should precede variations in $y_1 y_2 y_1 y_2$ Y. Therefore, in a regression of Y over other variables, including its values passed, if we include the past or out-of-the-line values of X and it improves the prediction of Y, we can say that X Granger-cause Y. Thus, it is observed the relationship in the same way, if Y Granger-cause X(GUJARATI and PORTER, 2011).

4. RESULTS

4.1. Unit root test

The results of the Unit root tests, level - I(0), presented in the ADF Test, Ng Perron and Perron are described in Table **1**, below. If there was disagreement between the first two tests, the third was used to mark the understanding of the results. Thus, in I(0), no unitary roots were found, and the series were stationary, ready for application of the Granger causality test.

Table 1. Results of Unit root tests.[3]

Variables	Model	ADF^{GLS}	$\overline{MZ}_{\alpha}^{GLS}$	*Lags*	Perron (1998) *Date of Break is Unknown*			
					Type of Break	Date of Break	Statistics Test	*Lags*
LNPIB	C	-0.587313	-13.1300[(a)]	9	*Innovational outlier*	2000:01	-1,91	-
LNPIB	C,T	-1.244515	-3.93912[(a)]	9	*Innovational outlier*	2012:04	-4,44	9
LNDESP_BENPREV	C	-0,624554	-20,7512[(a)]	9	*Innovational outlier*	1999:03	-7,92[(a)]	-
LNDESP_BENPREV	C,T	-0,681131	-1,06016	11	*Innovational outlier*	2000:02	-8,15[(a)]	-
LNDESP_PESSOAL	C	-0,359659	-2,94573[(a)]	9	*Innovational outlier*	1999:03	-5,85[(a)]	-
LNDESP_PESSOAL	C,T	-0,901624	-1,15922	8	*Innovational outlier*	2000:02	-6,02[(a)]	-
LNDESP_OUTRAS	C	0,275698	0,38150	9	*Innovational outlier*	1998:02	-5,00[(b)]	-
LNDESP_OUTRAS	C,T	-0,419074	0,07810	3	*Innovational outlier*	1998:03	-4,95[(c)]	-
LNDESP_CUSTEIO	C	0,826146	1,91953	9	*Innovational outlier*	1998:04	-7,51[(a)]	-
LNDESP_CUSTEIO	C,T	-1,030551	-0,68011	7	*Innovational outlier*	2000:02	-7,53[(a)]	-

Notes:

1 - $\Delta$is the operator of first differences. "C" means constant. "T" means deterministic tendency. (a) significance at 1%; (b) significance at 5%; (c) significance at 10%. The maximum initial count of 12 lags.

2 - The critical values of the *GLS ADF*^{test} are (Elliot, Rothenberg and Stock, 1996): (i) model with constant: -2.60 (1%); -1.95 (5%) and -1.61 (10%). (ii) model with constant and deterministic tendency: -3.70 (1%); -3.13 (5%) and -2.84 (10%). The asymptotic critical values of the test are (Ng and Perron, 2001, Table 1): (i) model with constant: -2.58 (1%); -1.98 (5%) and -1.62 (10%). (ii) model with constant and deterministic tendency: -3.42 (1%); -2.91 (5%) and -2.62 (10%).$\overline{MZ}_{\alpha}^{GLS}$

3 - The critical values of the Perron test (PERRON, 1989, p. 1376-1377) are as follows considering the break fraction. (i) Model A: -4.42 (1%); -3.80 (5%); and -3.51 (10%); (ii) Model B: -4.51 (1%); -3.85 (5%); and -3.57 (10%); (iii) Model C: -4.75 (1%); -4.18 (5%); and -3.86 (10%).$\lambda = 0{,}7$.

4.2. Granger's Causality

The causality of Granger was tested, with the scope of analyzing the causal relationship, in the sense of temporal precedence, between expenditure and GDP, avoiding the simple correlation between them. Thus, the relations between the variables of public spending and GDP were experienced. Inversely among the variables, the precedence of GDP over public spending was also tested. The results are described below in Table **2**.

The trials were distributed and organized as follows, analyzing the period of five lags, each representing one quarter:

Personnel Expenditures and Social Charges Granger-cause GDP; Granger-cause PIB Social Security Benefits; Other Current Expenditure Granger-cause GDP; and, finally, Expenditure subject to the Financial Programming of the Granger-cause GDP Executive Power; and, GDP Granger-cause Personnel Expenditures and Social Charges; GDP Granger-cause Social Security Benefits; GDP Granger-cause Other Current Expenditure; and, finally, GDP Granger-cause Expenditure son of expenses subject to the financial programming of the executive branch.

[3]Subtitles in the tables: Personnel Expenses and Social Charges (LNDESP_PESSOAL); Social Security Benefits (LNDESP_BENPREV); Other Compulsory Expenses (LNDESP_OUTRAS); Expenses Subject to the Financial Programming of the Executive Branch (LNDESP_CUSTEIO); and, GDP (LNPIB).

Table 2 - Granger Causality Test Results.

	Lags: 1			Lags: 2			Lags: 3			Lags: 4			Lags: 5		
NullHypothesis:	**Obs**	**F-Statistic**	**Prob.**	**Obs**	**F-Statist**	**Prob.**	**Obs**	**F-Statistic**	**Prob.**	**Obs**	**F-Statistic**	**Prob.**	**Obs**	**F-Statistic**	**Prob.**
LNDESP_PESSOAL does not Granger Cause LNPIB	91	332.675[(c)]	0.0716	90	15.8361[(a)]	1.E-06	89	24.2607[(a)]	2.E-11	88	8.96173[(a)]	5.E-06	87	2.61097[(b)]	0.0311
LNPIB does not Granger Cause LNDESP_PESSOAL		559.266[(a)]	5.E-11		37.9969[(a)]	2.E-12		6.74043[(a)]	0.0004		2.32251[(c)]	0.0638		2.16338[(c)]	0.0669
LNDESP_BENPREV does not Granger Cause LNPIB	91	187.631[(a)]	4.E-05	90	11.4125[(a)]	4.E-05	89	13.0456[(a)]	5.E-07	88	9.51594[(a)]	2.E-06	87	2.62039[(b)]	0.0306
LNPIB does not Granger Cause LNDESP_BENPREV		507.759[(a)]	3.E-10		17.9100[(a)]	3.E-07		8.61450[(a)]	5.E-05		0.40727	0.8029		0.42765	0.8280
LNDESP_OUTRAS does not Granger Cause LNPIB	91	862.254[(a)]	0.0042	90	4.73149[(b)]	0.0113	89	4.89097[(a)]	0.0035	88	3.02337[(b)]	0.0225	87	1.54839	0.1850
LNPIB does not Granger Cause LNDESP_OUTRAS		470.432[(a)]	9.E-10		23.5506[(a)]	7.E-09		4.69204[(a)]	0.0045		2.57668[(b)]	0.0438		2.43250[(b)]	0.0423
LNDESP_CUSTEIO does not Granger Cause LNPIB	91	312.955[(a)]	2.E-07	90	11.8518[(a)]	3.E-05	89	7.17378[(a)]	0.0002	88	4.21121[(a)]	0.0038	87	2.34693[(b)]	0.0490
LNPIB does not Granger Cause LNDESP_CUSTEIO		816.510[(a)]	3.E-14		22.7329[(a)]	1.E-08		12.5815[(a)]	8.E-07		3.36807[(b)]	0.0134		4.48697[(a)]	0.0012

Notes:
1 - Meanings: (a) significance to 1%; (b) significance at 5%; (c) significance at 10%.

Furthermore, it should be emphasized that the Granger causality test is a statistical indication, whose interpretation of the results should take into account the nature and relationship between the variables studied in the light of the context in which they are inserted (CAVALCANTI, 2010). [4]

The results, based on the analysis of the causal relationship between expenditure and GDP, show a relationship of bi causality of Granger, rejecting the null hypothesis to 1% significance, i.e., Granger-cause, in the first three lags, between Personnel Expenditures -Social Charges and GDP and between Social Security Benefits and GDP. However, on the fourth and fifth lags, they indicate that these Granger-cause expenditures cause GDP one-way.

Thus, these data suggest that in the first quarters there is a relationship of bi causality between these public expenditures and GDP, and there is effectively an impact between them. However, these relationships are not visualized in the last periods.

In recent years, there has been an increase in the degree of commitment of the budget to the payment of workers, which combined with the drop in revenue, represents a significant fiscal impact, so much so that the government works on administrative reform to reduce these costs. Thus, even if, in the first periods studied, a wage increase may represent an increase in the economy, in the last two periods, a one-way causality is evidenced. It is clear that this heading Granger-causes GDP negatively, if the non-Keynesian effects on the economy, so that, if there was a fiscal contraction, there sult would be the expansion of GDP.

In the relationship between Social Security Benefits and GDP, as in the previous case, the results suggest bi causality in the firs three lags and a one-way Granger causality in the fourth and fifth lags, with the corresponding effects mentioned in the preceding item.

It is important to emphasize that social security is an item with an extremely relevant weight in public accounts. Pension reform has managed to reduce this liability for the coming years, however, there is still more to be controlled to ensure a fiscal balance that is the basis for economic growth.

[4]Subtitles in the tables: Personnel Expenses and Social Charges (LNDESP_PESSOAL); Social Security Benefits (LNDESP_BENPREV); Other Compulsory Expenses (LNDESP_OUTRAS); Expenses Subject to the Financial Programming of the Executive Branch (LNDESP_CUSTEIO); and, GDP (LNPIB).

Thus, similar to the previous item, in the first three lags, an increase in social security benefits represents the increase in the circulation of values in the economy, however, in the last two periods, there is a one-way causality between expenditure and GDP. From the arguments put forward, it appears that this Granger-expenditure causes GDP negatively, showing the non-Keynesian effects.

Among Other Compulsory Expenses (such as expenditure on Fundeb, FIES, Proagro) and GDP in this relationship, it was found that there is a relationship of bi causality in the first four lags, however, in the fifth lags, the GDP Granger-cause positively Other Compulsory Expenditures, which evidences the Wagnerian effects, in which the increase in national income drives the demand for more public goods and services, in this case, GDP is the explanatory variable and expenditure is dependent; and Finally, in the causal relationship between the item Expenditure subject to the Financial Programming of the Executive Branch and GDP, there was a balanced relationship throughout the period studied, with a relationship of bi causality of Granger between them, being at the level of1% of significance in the first three periods and 5% in the last two years. In this heading, some notes are important:

First, the discretionary expenses that make up this title are costs and investments. On the one hand, the costs are the expenses necessary for the operation of the public machine, it is in the current expenditure category, its growth negatively impacts GDP, because in addition to consuming resources that could be used in structuring investments, contribute to the fiscal imbalance; and Then, productive investments, especially in infrastructure, on the other hand, positively impact the economy, providing the conditions for increasing private productive activity, generating employment and income and thus adding more value to GDP.

Thus, it can begiven that, by demonstrating this expenditure item Granger-causes GDP, when it comes to the portion of amounts related to cost, the relationship is negative, it produces non-Keynesian effects on the economy, so that its increase brings to a greater level of distrust to private agents, creating negative expectations and a shrinking in their enterprises. However, it is understood that the percentage of values related to investment generates positive effects, providing Keynesian effects on the economy, confirming its hypothesis of growth through public spending.

On the other hand, because there is a relationship of bi causality of Granger, when the GDP Granger-causes the Expenses Subject to the financial programming of the executive branch, the effects of Wagner's Theory are presented, where the increase in national income demands greater benefits by the State.

5. CONCLUSIONS

The Brazilian economy has advanced in the control of public spending in recent years through reforms and structuring policies. The Constitutional Amendment of the Spending Ceiling, the pension reform and the processing of administrative reform are examples of this evolution in the control of expenditures with a view to economic growth. To support this discussion, investigating the causal relationship between public spending and GDP is relevant.

In this research, we used the four main items of primary expenses of the Brazilian central government: the Spending of Personnel and Social Charges, Social Security Benefits, Other Mandatory Expenses and Expenses Subject to the Financial Programming of the Executive Branch. The causality between them and the national GDP was analyzed.

The empirical investigation showed the existence of causal relationships manifested by the temporal precedence between public expenditure and national GDP by the application of the Granger causality test.

It was found that: first, there is a relationship of bi causality between expenditures formed by personnel expenses and social charges, social security benefits and GDP, in the first three lags, and a one-way causal relationship between these expenditures and GDP, in the fourth and fifth lags; second, there is a relationship of bi causality between other compulsory expenditure and GDP, in the first four lags, and a one-way causal relationship between GDP and that expenditure in the fifth lag; third, there is a bi causal relationship between GDP and expenditure subject to the financial programming of the executive branch throughout the periodanalyzed.

Once it was found that there is this causal relationship marked by the temporal precedence between expenditure and GDP, as described in the previous paragraph, the verification of Wagnerian, Keynesian or non-Keynesian effects was presented, according to the meaning of these relationships, whether positive or negative.

Itis concluded that the results of this study suggest that the increase in public spending generally impacts GDP, except for expenditure en productive investments. Thus, the control of non-productive expenditures is fundamental, because the government necessarily needs to meet the ceiling of expenditures. Thus, as the costs of compulsory expenditure consume the budget, discretionary expenditure will be negatively affected, reducing the investment that should contribute to economic growth.

Therefore, considering the decrease in revenue, due to the cooling of economic activity and the exemptions granted to help the most impacted sectors of the economy, in this period, when a health crisis plagues the world, the importance of calibrated management of public accounts to contribute to fiscal consolidation and, thus, a sustainable economic recovery is highlighted.

It is suggested for research to perform the tests of the hypotheses presented here, using as a reference to the accounting items of public expenditures composed of economic categories and groups of expenditure natures.

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