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Growth in Public Spending and Economic Activity in Cameroon: Keynes versus Wagner

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Abstract **Original Research Article**

Economic literature postulates that there are two opposed traditional approaches to the relationship between public spending and economic activity. The Keynesian hypothesis posts that public spending is an exogenous instrument of economic policy that can boost economic activity, while Wagner's, equally known as "Wagner's law", considers them rather as an endogenous factor resulting from the process of economic development. This paper empirically tests these two hypotheses in the case of Cameroon over the period 1977-2016. The empirical analysis makes use of the Bounds Test approach of co-integration proposed by Pesaran *et al.*, (2001) applied to an error-correcting model and causality tests by Toda and Yamamoto (1995). The main results indicate that there exists a long-term relationship between public spending and economic activity and, a causality moving from economic activity to public spending, thus validating Wagner's law in the case of Cameroon.

Keywords: Public spending; Economic activity; Keynesian hypothesis; Wagner's law, Error Correction Model, Bounds Tests, Causality Tests, Cameroon.
JEL Classification: C32, H10, H50, O40.

INTRODUCTION

Before the deep economic recession of the 1930s, the ultimate goal of public finances was to ensure the government's sovereign activities, which limited the possibilities of an evaluation of their effectiveness. While many economists considered government intervention in the economy to be harmful, the mass unemployment observed in the aftermath of the 1929 crisis significantly change the perception of the role of the state. It was in this background of the crisis that Keynes (1936) demonstrated that increased public spending could have the effect of reviving economic activities by compensating for the lack of aggregate demand. This Keynesian vision prevailed for a long time until Wagner's (1883) pioneer work was translated into the English language in the late 1950s. Indeed, the conventional view adopted by the latter establishes that increased public spending is a result of the economic development process. Wagner's original approach opines from the observation that in the 19th century, public spending grew faster than economic activity in industrializing countries. The relationship he postulated between public spending and national income at the end of that century came to be known as the "Wagner's law". This law stipulates that an increase in per capita income is accompanied by increasing importance in the public sector. To this end, Wagner proposes three reasons why public spending would increase with economic development.

The first relies on the increasing nature of current public expenditure in national income. It shows that a country's industrialization is accompanied by a rapid increase in public sector activities, which replace private sector activities due to the increase in administrative and state protection functions during the industrialization process. The second justification alludes to the need for collective services necessary for the accumulation of human capital. It stresses that the role of the state in the maintenance of public order and regulating economic activities is likely to increase due to the increasing complexity of economic life and urbanization that occur during the process of industrialization. The third reason is that technological change and the increasing scale of enterprises during the industrialization process would tend to create monopolies under the authority of the government. Moreover, Wagner points out that public spending on cultural and social protection services (including education and income redistribution) also increases with

the industrialization of a country, as the income elasticity for demand for these services increases.

Thus, between the Keynesian and Wagner approach, there is a fundamental methodological difference. For one, an increase in public spending explains economic growth, while on the other, economic growth justifies the increase in public spending. These antagonisms over the causality between public spending and economic activity have given rise to a plethora of studies in recent years, which unfortunately remain far from closing the debate. While some of them reinforce the Keynesian position (Ebaidalla, 2013; Kumar *et al*., 2012; Magazzino, 2012b; Babatunde, 2011; Chimobi 2008, Holmes and Hutton, 1990), others instead join Wagner's position (Narayan *et al.*, 2012; Chow *et al*., 2002; Chang, 2002), or remain indifferent (Samudram *et al*., 2009; Ziramba, 2008).

Faced with all these discrepancies, this study aims to empirically test the Keynesian hypothesis and Wagner's law on the relationship that may exist between public spending and economic activity in the case of Cameroon. This is justified, on the one hand, by the scarcity of empirical work of this nature for Cameroon, and on the other hand, by the existence of some methodological weaknesses in the vast majority of empirical studies. Indeed, four main findings can be made when carefully examining the immense literature on the empirical analysis of Wagner's law: Firstly, a quasi-totality of studies use a single unit root test; secondly, the vast majority of them use either the techniques of co-integration of Engle and Granger (1987) or that of Johansen (1988); thirdly, these studies most often use causal tests in the sense of Granger (1969, 1988); finally, empirical analysis in these studies is mostly based on the estimation of a single equation corresponding to any version of Wagner's law.

However, be it the Engle and Granger (1987) cointegration tests or Johansen's (1988), Granger's causality tests (1969, 1988), or even those of Toda and Yamamoto (1995) (as we will see later), their implementation is based on an order of integration of the series, implying that a bad conclusion about this order for a given series inevitably skews the results of other underlying tests. In effect, the realization of the Engle and Granger (1987) and Johansen (1988) cointegration tests requires that all series studied be integrated in order 1 (I (1)), a precaution that is most often not considered by many practitioners (Pesaran *et al*., 2001). However, when there is a mixture of different sets of integration orders, the standard statistical inference based on standard likelihood ratio tests is no longer valid (Babatunde, 2011). Concerning Granger's causality tests, many studies show that they are biased as long as the series studied are I (1) and cointegrated because the differentiation of the series leads to a loss of information (Engle and Granger, 1987; Toda and Yamamoto, 1995).

Given the above, this study uses robust econometric techniques based on a rigorous study of the stationarity of the series used, and on the in-depth analysis of co-integration and causality through the bound tests of Pesaran *et al*., (2001) and the causal tests of Toda and Yamamoto (1995) respectively. Moreover, unlike most empirical studies that simply test a single version of Wagner's law, in this study, we will test six different versions of this law. The rest of this paper is organized into four sections: the first section is devoted to some stylized facts; the second section is dedicated to empirical work; the third section presents the methodology; the fourth section explores the results.

1. A few stylized facts

In Cameroon, as in many developing countries, economic activity and the weight of public spending as a proportion of gross domestic product (GDP) have swiftly changed in recent decades. After its independence in 1960, Cameroon experienced a period of sustained growth with an average rate of 5% until 1978 thanks to agricultural exports (African Development Bank: AfDB, 2002, 1). With the advent of oil shocks and the discovery of oil in the 1970s, economic growth accelerated to an average of 8.8% [1] over the period 1978-1986 thanks to an increase in oil revenues. The latter accounted for about 44% of total government revenues (ADB, 2002, 1). Throughout this phase of economic expansion, the rapid growth of real GDP per capita makes Cameroon a middle-income country according to the World Bank classification (Aerts *et al.*, 2000). At the same time, the trend in public spending has followed the same trend as that of economic activity. During this period, public spending averaged 15.2% of GDP, with a strong predominance of public consumer spending (9.5%).

At the end of 1986, the Cameroonian economy encountered a crisis due to a combined decline in oil production and the price of major commodities, and an appreciation of about 40% of the real effective exchange rate of the local currency, the CFA franc. This led to a fall in real output per capita of more than 40%, the breakdown of major macroeconomic balances, and the use of external debt (AfDB, 2002, 1). To reverse this trend, the Cameroonian authorities, supported by donors (World Bank and International Monetary Fund) implemented structural adjustment programs (SSPs) as early as 1988. These programs focused mainly on reducing the state's lifestyle through, among other things, raising tax rates, reducing wages and freezing recruitment in the civil service (in 1993 and 1994), and

[1] Any unseen statistics provided in this section come either directly from the World Development Indicators (WDI, 2017) database of the World Bank or our calculations from the data from the same database.

reducing subsidies to state-owned enterprises. Thus, the share of public expenditure in GDP will fall from 23.5% in 1987 to 12.6% in 1994 (the date of the devaluation of the CFA franc), for an average of 17.5% over this period.

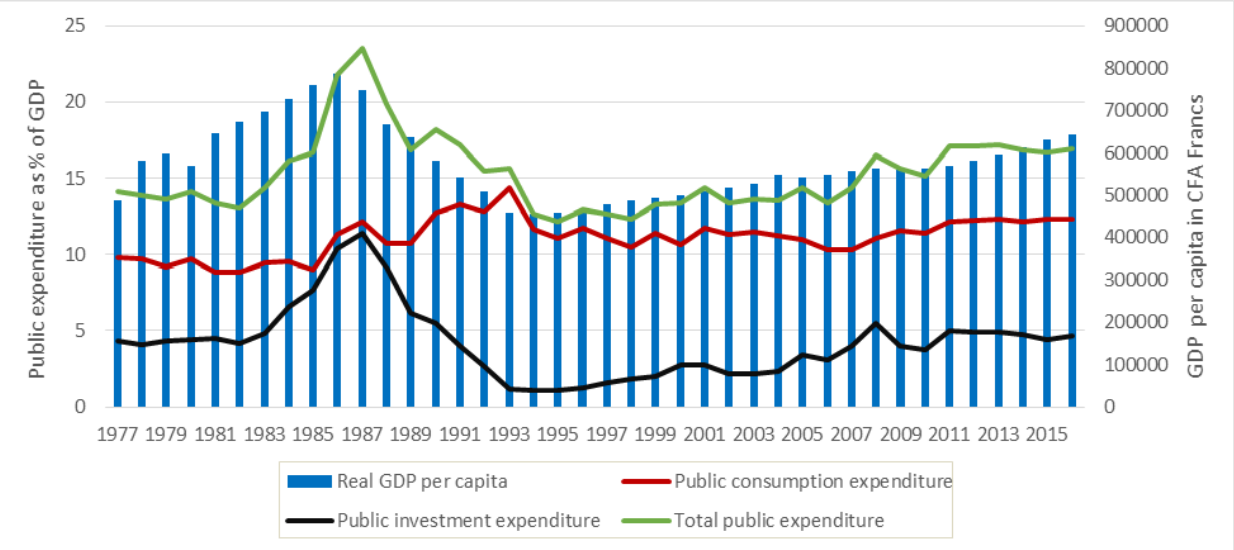

Figure 1: Changes in public spending and economic activity in Cameroon

After the devaluation, the structural reforms undertaken by the Cameroonian government with the support of donors helped to reduce budget deficits and revive economic activity. As a result, Cameroon reached the decision point in October 2000 through the cancellation of its US$1.26 billion (USD) debt in net present value, which will enable it to reach the completion point of the Highly Indebted Poor Country (HIPC) initiative in April 2006. Over the period 1995-2008, public expenditure averaged 13.6% of GDP, while real economic growth averaged around 4%. This recovery in economic activity can be explained, by the rising trend in commodity prices, particularly that of oil [2] observed during this period.

With the advent of the global economic and financial crisis of 2008, and in the face of the magnitude of the global economic and financial crisis, Cameroon, like many developing countries, has implemented countercyclical fiscal policies that have mainly resulted in increased public spending, resulting in huge public deficits that today give rise to fiscal consolidation plans. Indeed, the share of public expenditure in GDP rose from 14.3% in 2007 to about 17% in 2016, for an average of 16.6% over the period 2008-2016. This increase in public spending during this period can be mainly explained by the implementation of many development programs that require massive investments. At the same time, the pace of economic activity has remained relatively stable (4.3% on average), but still insufficient compared to the required level (5.5% on average annually over the period 2010-2020) which would make Cameroon an emerging country in 2035 as covered by the Strategy Document for Growth and Employment (DSCE), which was the main roadmap of the Cameroonian government.

2. LITERATURE REVIEW

Empirically, the relationship between public spending and economic growth has been the subject of rich and diverse literature. A section of this literature has devoted itself mainly in recent years to empirically testing the Keynesian hypothesis and Wagner's law. The results remain controversial, depending on the country samples and time horizons considered. While some studies support Wagner's law (the existence of causality moving from economic activity to public spending), others tend to favor the Keynesian hypothesis (existence of causality moving from public expenditure to economic activity), and some remain indifferent (existence of double causality or lack of causality).

In the first category of studies, Islam (2001) uses the techniques of cointegration of Johansen and Juselius (1990) and Granger's causality (1969) to empirically test Wagner's law in the United States over the period 1929-1996. From his analyses, he finds a strong causality moving from economic growth to public spending, thus validating Wagner's law for this country. In its wake, solid evidence of Wagner's law was also tested by Tang (2001) for Malaysia over the period 1960-1998, Chow *et al.*, (2002) for the United Kingdom 1948-1997, Chang (2002) for the United States, Japan, the United Kingdom, South Korea, and Taiwan over the period 1951-1996, Kumar *et al.*,

[2] According to statistics from the Bank of Central African States (BEAC), the average annual price of crude oil rose from US$17 in 1995 to about US$97 in 2008.

(2012) for New Zealand over the period 1960-2007, Narayan *et al*., (2012) for India over the period 1986-2009. Ihensekhien and Mayuku (2019) for Nigeria and recently by Mama *et al*., (2022) in the case of Cameroon. However, as in most empirical studies, the latter study did not conduct a careful study of the stationarity of the variables used in the model. Yet, as we will see later, the proper implementation of the cointegration and causality tests, which are essential for testing Wagner's law, depends essentially on the order of integration of the variables. Therefore, a wrong conclusion about the order of integration of the variables affects to some extent the results obtained.

Concerning the second category of studies, Chimobi (2008) uses Johansen's (1988) and Granger's causality (1969) techniques to empirically confront the Keynesian hypothesis with Wagner's law in Nigeria over the period 1970-2005. At the end of his analyses, he concludes that there is no long-term relationship between public spending and economic activity in Nigeria. Nevertheless, it finds a causality moving from public spending to economic growth, thus validating the Keynesian hypothesis for this country. Subsequently, Babatunde (2011) tests Wagner's law for the same country using annual data from 1970-2006. By adopting the approach of the bound tests of Pesaran *et al.,* (2001) and the causal tests of Toda and Yamamoto (1995), he found, like his predecessor, that public spending and economic activity were not linked in the long term in Nigeria. Moreover, he points out that it is the Keynesian hypothesis that is slightly supported by this country. Likewise, Magazzino (2012b) studied the relationship between disaggregated public spending and economic activity in Italy to examine Wagner's law. Using annual data from 1960-2008 and Granger's causal tests, he concluded that the Keynesian hypothesis is verified for final consumer spending, wages, and gross public investment. Equally interested in the relationship between public spending and economic growth in Sudan, (Ebaidalla, 2013) concludes that the Keynesian hypothesis is verified for the Sudanese economy over the period 1970-2008.

Regarding the third category of studies, Singh and Sahni (1984) were interested in the causal relationship between disaggregated public spending and economic activity in India. They use Granger's causality test and annual data over the period 1950-1981. From their study, it appears that there is no causal relationship between the two variables, thus not confirming either the Keynesian hypothesis or Wagner's law. This causality between public spending and economic growth was noticed a few decades later by Ziramba (2008) and Huang (2006) for South Africa and China respectively, to name but a few. Samudram *et al.,* (2009) test the Keynesian hypothesis and Wagner's hypothesis for Malaysia. Using an Auto regressive distribution lag model (ARDL), their study validates both assumptions. This dual causal relationship between public spending and economic activity has recently been observed by Paparas *et al.,* (2019) in the case of the United Kingdom over the period 1850-2010, thus corroborating the results obtained a few years rather by Chow *et al.,* (2002) for the same country over the period 1948-1997. Similar results were recently obtained by Samuel and Oruta (2021) for disaggregated government spending in Nigeria over the period 1981-2020.

Another category of studies listed in the literature focuses on a larger or smaller sample of countries. They support either of the two hypotheses and sometimes none of them, thus revealing a causal heterogeneity between public spending and economic activity. The work of Ansari *et al.,* (1997) falls into this category. These authors analyze the causal relationship between public spending and economic activity in three African countries, namely South Africa, Ghana, and Kenya. Using annual data from 1957-1990, there is no relationship between public spending and long-term economic activity in these countries. Moreover, they do not find a causal relationship between the two variables for Kenya and South Africa, although Wagner's law has been validated for Ghana in the short term. In the same path, lies another category of study, Karagianni *et al.,* (2011). In the case of the European Union, these authors find from the period 1949-1998 that Wagner's law is verified only for Finland and Italy, unlike other countries where it has been difficult for them to pronounce. This causality between public spending and economic activity in a sample of several countries is also highlighted by Magazzino (2012a) for the countries of the European Union, Ahishakiye (2012) for the countries of the East African Community (EAC) over the period 1976-2008; Hounkpodote and Bationo (2010) for the countries of the West African Economic and Monetary Union (UEMOA) over the period 1967-2007; and Ergun and Tuck (2006) on a sample of countries consisting of Indonesia, Malaysia, the Philippines, Singapore, and Thailand over the period 1960-2002.

In all proportion, the empirical studies thus presented show that the debate is still far from over with regard to the relationship between public spending and economic activity. This study not only contributes to the empirical debate by filling this void in the Cameroonian context but also attempts to remedy some of the methodological shortcomings most often observed in the literature.

3. METHODOLOGY

3.1. Model specification

Practically, the confrontation of the Keynesian hypothesis with Wagner's law has led to dissimilar research among researchers on the formulation of the most appropriate equation to estimate. Theoretically, this research gave rise to what was called in the literature a few years later the "six versions" of

Wagner's law. These versions materialize the most popular functional forms of estimated equations. These consist among others, Peacock and Wiseman (1967), Goffman (1968), Musgrave (1969), Pryor (1969), Gupta (1967) /Michas (1975), and of Mann (1980). Table 1 below summarizes the functional shapes of the models used in these different versions.

Table 1: Functional Forms of the "Six Versions" of Wagner's Law

Model	Functional form	Version
1	$Ln(G)_t = \alpha + \beta Ln(PIB)_t + \varepsilon_t$	Peacock and Wiseman (1967)
2	$Ln(G)_t = \alpha + \beta Ln(PIB / Pop)_t + \varepsilon_t$	Goffman (1968)
3	$Ln(G / PIB)_t = \alpha + \beta Ln(PIB / Pop)_t + \varepsilon_t$	Musgrave (1969)
4	$Ln(G_{cf})_t = \alpha + \beta Ln(PIB)_t + \varepsilon_t$	Pryor (1969)
5	$Ln(G / Pop)_t = \alpha + \beta Ln(PIB / Pop)_t + \varepsilon_t$	Gupta (1967) / Michas (1975)
6	$Ln(G / PIB)_t = \alpha + \beta Ln(PIB)_t + \varepsilon_t$	Mann (1980)

Notes: In this painting, *"Ln"* depicts the Neperian logarithm; *"G"* real public spending; *"GDP"* real gross domestic product; "G_{cf}" actual final consumer spending, and *"Pop"* the total population.

3.2. Estimation procedure

The empirical analysis carried out in this study is in three main phases: In the first phase, the order of integration of the different series used in our study; In the second phase, analyses of the co-integration of the series used; Finally, in the third phase, causality tests are carried out, after having previously estimated the appropriate model.

3.2.1. Stationarity tests

In this study, the series stationarity study is conducted using several tests, namely: Augmented Dickey-Fuller Test (ADF), the Phillips-Perron Test (PP), and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. The choice of several tests is a result of the fact that each of these tests has [3] some level of biases, which suggests that it would be somewhat risky to decide on the order of integration of the series from a single test. The ADF test considers the presence of positive and negative self-correction in the study series, while the PP test considers heteroscedasticity and only positive autocorrelation. These two tests postulate as a null hypothesis the presence of a unit root (non-stationary series). The KPSS test is based on the decomposition of the study series into a deterministic trend, a random walk, and a normally distributed error. Unlike the ADF and PP tests, the null hypothesis of this test states that the studied series is stationary.

3.2.2. Co-integration tests

The co-integration tests are used to detect whether or not there is a long-term equilibrium relationship between the series studied. In the literature, there exist some such studies in time series, the most common of these are, Engle and Granger (1987) and Johansen (1988). However, the realization of these two tests requires that all series be I(1), a condition to which certain economic series do not obey. It is with this in mind that Pesaran *et al.*, (2001) proposed the “bounds tests" of cointegration which have the advantage that they can be easily implemented in the presence of different sets of integration orders. In addition to this, the bound test also has as advantage that they solve the endogenous problems associated with the two-step method of Engle and Granger (Babatunde, 2011).

The realization of the bound test is based on the estimation of an Auto-Regression Distributed Lag model (ARDL). In the presence of two variables X_t and Y_t, the basic model used to perform these tests is error correction. It is presented as follows:

[3] As an illustration, ADF and PP tests are based on the assumption that the deterministic component of the series studied follows a linear deterministic trend, which is not the case in all economic series, because many of them have a deterministic tendency that follows a non-linear trend.

$$\Delta Y_t = \lambda_1 Y_{t-1} + \lambda_2 X_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + \sum_{j=0}^{q-1} \beta_i \Delta X_{t-j} + \pi_0 + \pi_t + \varepsilon_t \quad \text{..... (7)}$$

Equation (7) represents the ARDL model. It can still be rewritten as follows:

$$\Delta Y_t = \pi_0 + \pi_t + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + \sum_{j=0}^{q-1} \beta_i \Delta X_{t-j} + \psi u_{t-1} + \varepsilon_t \quad \text{..... (8)}$$

Where *Ψ is* the error correction term. Its coefficient reflects a booster force towards long-term equilibrium and must be significantly negative.

Based on equation (7), the existence of a cointegration relationship between the variables X_t et Y_t is tested by applying the Fisher test to the first lag of the two variables at the level. The null hypothesis of the test states that there is a cointegration relationship, i.e. $H_0 : \lambda_1 = \lambda_2 = 0$. The alternative hypothesis assumes that the variables are not co-integrated $H_1 : \lambda_1 \neq \lambda_2 \neq 0$.

The procedure of testing consists to compare Fisher's statistics of the two critical tabulated values (bounded) proposed by Pesaran *et al.*, (2001) for different thresholds. The first bound is the critical value when the variables are stationary at level, and the second bound at the critical value when the variables are stationary at the first difference. If Fisher's calculated statistic is less than the lower bound, there is no co-integration relationship between the series studied. If it's between the two terminals, we're indifferent. But if, on the other hand, Fisher's calculated statistic is higher than the upper bound, then we conclude that the series studied are cointegrated.

3.2.3 Causality tests

Theoretically, the concept of causality dates back to the work of Granger (1969). In Granger's view, X_t cause Y_t if the previous values of X_t render the prediction of Y_t in relation to the past value of Y_t alone. The meaning of causality between the two variables can be tested either from an error-correction (or vector error-correction model: VECM) for a co-integrated series, or from an autoregressive (or vector auto-regressive: VAR) model for non-cointegrated series.

At the empirical level, there is a great deal of criticism of Granger's causality tests. One of the criticisms is the procedure for their implementation. Indeed, it is based on preliminary tests (stationarity and co-integration) that involve potential biases, so Granger's causal tests still have the potential to lead to an incorrect causal inference (Toda and Phillips, 1993; Toda and Yamamoto, 1995). Another criticism advanced in the literature is that they suffer from an asymptomatic dependence on nuisance parameters in some cases, implying that their results are unreliable (Babatunde, 2011). To remedy all these econometric problems, Toda and Yamamoto (1995) proposed an alternative approach to Granger's causality test.

For these authors, we can do without the co-integration tests as a prerequisite for the implementation of the causality test. To do this, they suggest non-sequential procedures for causality tests. These procedures focus on estimating an "enhanced" VAR model to implicitly account for a possible cointegration relationship between the series. This procedure is done in three stages: In the first step, we determine the maximum order of integration *(dmax)* of the series studied using unit root tests; In the second stage, the optimal number of lags (*k)* of the VAR model at level is determined based on the Akaike information criteria (AIC), Schwarz (SIC) and Hannah and Quinn (HQ). Finally, in the third stage, we estimate the VAR model at the level "increased" of order *df = k+dmax.*

For example, if one proposes to test the causality between two variables X_t and Y_t following of Toda and Yamamoto's (1995) causality approach, the basic model to be used for its implementation is as follows:

$$X_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} X_{t-i} + \sum_{j=k+1}^{k+d\max} \alpha_{2j} X_{t-j} + \sum_{i=1}^{k} \varphi_{1i} Y_{t-i} + \sum_{j=k+1}^{k+d\max} \varphi_{2j} Y_{t-j} + \mu_{1t} \quad \text{..... (9)}$$

$$Y_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} Y_{t-i} + \sum_{j=k+1}^{k+d\max} \beta_{2j} Y_{t-j} + \sum_{i=1}^{k} \gamma_{1i} X_{t-i} + \sum_{j=k+1}^{k+d\max} \gamma_{2j} X_{t-j} + \mu_{2t} \quad \text{..... (10)}$$

Based on the "enhanced" VAR model above, the causality test is carried out by testing the restrictions on the first *k* coefficients, the other coefficients being zero due to the voluntary over-parameterization of the VAR. Thus, Granger's causality test in the sense of Toda and Yamamoto from the equations (9) and (10) is actually to test the non-causality between the variables X_t and Y_t, and is based on the following hypotheses: $H_0 : \varphi_{1i} = 0$ (Y_t does not cause X_t) et $H_{0:} \gamma_{1i} = 0$ (X_t does not cause Y_t). The test statistic asymptotically follows the Chi-two law regardless of the order of integration of the variables.

3.3 Nature and source of data

The data on which the empirical analyses of this study are based are annual and cover the period 1977-2016. They all come from the World Bank's WDI (2017) database and cover real GDP, real GDP per capita, public spending, and total population. Total public expenditure is achieved by summing up final consumer spending by public administrations and public gross fixed capital formation (FBCF), which is itself obtained by subtracting the FBCF from the private sector of the total FBCF. Public spending is also being transformed into real terms using the Consumer Price Index (base 2010).

4. EMPIRICAL RESULTS

This section aims to empirically test the Keynesian hypothesis and Wagner's law for Cameroon. For this purpose, the empirical analysis is based on the estimation of each equation corresponding to the "six versions" of Wagner's law recorded in Table 1.

4.1 Results of stationarity tests

The results of the ADF, PP, and KPSS tests applied to the different series used in this study are reported in Table 2. These results show that not all series have the same order of integration. While some series are stationary at level *(G* and *G/Pop)*, others are integrated at order 1 (GDP, *PIP/Pop, G/GDP, Gcf).* The combination of variables I(0) and I(1) therefore disqualifies the co-integration procedures of Engle and Granger (1987) and Johansen (1988), and at the same time opens the way to the procedure of Pesaran *et al.*, (2001), which happens to be more appropriate in such circumstances.

In addition, it can be noted from these different results that unit root tests are not always unanimous on the order of integration of the series. This is the case, for example, for the logarithms of real GDP *(Ln(GDP))* and real GDP per capita *(Ln(GDP/Pop))* where the ADF and PP tests indicate that they are I(1), whereas, on the other hand, the KPSS test indicates that they are I(0). This lack of unanimity on the order of integration is also observed for all other variables. Thus, based on a single stationarity test, as is the case in the vast majority of empirical studies, the risk that researchers face would be to err on the exact order of integration of certain series, and therefore they could subsequently resort to inappropriate cointegration and causality tests that will inevitably lead to biased results. It would therefore be necessary to focus studies on the stationarity of a series of several tests to conclude globally on the order of integration from the simple majority of the individual conclusions of each test.

Table 2: Stationarity Test Results

Variables	Level			In first difference			Conclusion
	ADF	PP	KPSS	ADF	PP	KPSS	
$Ln\ (GDP)_t$	-1.265 (0.881)	-2.094 (0.532)	0.113** (0.146)	-4.632*** (0.000)	-4.572*** (0.004)	/	I (1)
$Ln\ (GDP/Pop)_t$	-1.223 (0.891)	-1.961 (0.603)	0.173** (0.463)	-4.592* (0.000)	-4.572*** (0.004)	/	I (1)
$Ln\ (G)_t$	-4.556*** (0.004)	-2.720 (0.234)	0.109** (0.146)	/	-3.206 (0.027)	/	I (0)
$Ln(G/GDP)_t$	-3.447 (0.060)	-4.997*** (0.000)	0.163 (0.146)	-2.957*** (0.004)	/	0.073** (0.146)	I (1)
$Ln(G/Pop)_t$	-4.582*** (0.004)	-2.449 (0.135)	0.106** (0.146)	/	-2.700*** (0.008)	/	I (0)
$Ln(G_{cf})_t$	-3.708** (0.034)	-2.981 (0.150)	0.167 (0.146)	/	-4.352*** (0.007)	0.113** (0.146)	I (1)

Notes: In parentheses are critical probabilities (p-values) for ADF and PP tests, and asymptomatic critical values at the 5% threshold for the KPSS test. *** Significant levels at 1%; ** Significant levels at 5%.

4.2 Results of co-integration tests

The results of the bounds test of Pesaran *et al.*, (2001) are represented in Table 3. In this table, we see that Fisher's statistics calculated for the models associated with the different versions of Wagner's law are all higher than the lower and upper limits of the critical values at the 5% threshold. This shows that there is a long-term balance between public spending and real economic activity in Cameroon. Following the logic of Wagner's law, which establishes a long-term relationship between public spending and economic activity, this law could be considered valid. This is indeed the case in some empirical work (Srinivasan, 2013; Samudram *et al.*, 2009). However, the existence of a co-integration relationship between public spending and economic activity can be associated either with a causality moving from public spending to economic activity (Keynesian hypothesis), or to a causality moving from economic activity to public spending (Wagner's law), or a double causality. Thus, once the long-term equilibrium relationship is established, one should make a definitive decision based on the results of the causality tests. However, before reaching causality tests, an intermediate step is to analyze short-term and long-term dynamics from the estimation of an error-correction model.

Table 3: Pesaran *et al.*, (2001) Bounds Test Results

Model	Variables		Lags *(k)*	Fisher's statistics	5% Critical bounds	1% Critical bounds
	Explained	Explanatory				
1	$Ln(G)_t$	$Ln\ (GDP)_t$	1	5.24	3.62 - 4.16	4.94 - 5.58
2	$Ln(G)_t$	$Ln\ (GDP/Pop)_t$	1	17.06	3.62 - 4.16	4.94 - 5.58
3	$Ln(G/GDP)_t$	$Ln\ (GDP/Pop)_t$	1	11. 36	3.62 - 4.16	4.94 - 5.58
4	$Ln(G_{cf})_t$	$Ln\ (GDP)_t$	1	14.38	3.62 - 4.16	4.94 - 5.58
5	$Ln(G/Pop)_t$	$Ln\ (GDP/Pop)_t$	1	11.36	3.62 - 4.16	4.94 - 5.58
6	$Ln(G/GDP)_t$	$Ln\ (GDP)_t$	1	5.24	3.62 - 4.16	4.94 - 5.58

Notes: The optimal number of lags *k* was selected based on the Schwartz criterion (SIC). The critical values of the bound tests are those proposed by Pesaran *et al*., (2001).

4.3 Results of error-correcting model estimates

Table 4 provides short- and long-term elasticities from the error-correction models for each equation in Table 1. The error correction terms from these estimates are all negative and significant at the 1% threshold for the six versions of Wagner's law examined, confirming the existence of a long-term balance between public spending and economic activity in Cameroon.

Table 4: Results of Error Correction Model Estimates

Model	Variables		Constant term	Short-term elasticity	Long-term elasticity	Error correction term
	Explained	Explanatory				
1	$Ln(G)_t$	$Ln\ (GDP)_t$	-27.660 (0.561)	1.349*** (0.002)	1.870 (0.243)	-0.069*** (0.000)
2	$Ln(G)_t$	$Ln\ (GDP/Pop)_t$	8.983 (0.837)	1.354*** (0.004)	1.567 (0.638)	-0.042*** (0.000)
3	$Ln(G/GDP)_t$	$Ln\ (GDP/Pop)_t$	-5.863 (0.862)	0.339 (0.444)	0.361 (0.887)	-0.054*** (0.000)
4	$Ln(G_{cf})_t$	$Ln\ (GDP)_t$	-37.337 (0.131)	1.317*** (0.003)	2.190** (0.010)	-0.101*** (0.000)
5	$Ln(G/Pop)_t$	$Ln\ (GDP/Pop)_t$	-5.863 (0.862)	1.339*** (0.004)	1.361 (0.595)	-0.054*** (0.000)
6	$Ln(G/GDP)_t$	$Ln\ (GDP)_t$	-27.660 (0.561)	0.349 (0.411)	0.870 (0.584)	-0.069*** (0.000)

Notes: Critical probabilities (p-values) are in parentheses. *** Significant levels at 1%; ** Significant levels at 5%.

These results indicate overall that, economic activity positively influences public spending in Cameroon in the short term, thus contradicting the results of Ndam Mama et al. These contradictory results are due to the fact that the latter, in their study, do not carry out an in-depth study of the stationarity of the series used.. This results in the use of an erroneous order $df = k+dmax$ in the estimated VAR, which inevitably affects the results obtained. Thus, in the short term, a 1% increase in real GDP leads to a 1.349% increase in total government spending in Cameroon (see model 1), and a 1.317% increase in government final consumption expenditure (see model 4). At the same time, a 1% increase in real GDP per capita leads to an increase in public spending of 1.354% (see Model 2), and an increase in public expenditure per capita of 1.339% (see Model 5). These results can be explained in part by the relatively large public-sector weight in the Cameroonian economy.

In the long term, however, overall economic activity appears to not influence public spending. Indeed, long-term elasticities, although still positive, were not significant at conventional thresholds for almost all estimated models. However, in the long run, a 1% increase in economic activity leads to an increase in final consumer spending by public administrations of 2.19%. This result is understandable in the case of Cameroon, as the state tends to divert more to the civil service over time. According to statistics from Cameroon's Ministry of Finance, the number of public employees increased from 163,000 in 2006 to 320,000 in 2017. At the same time, the payroll dedicated to these agents increased from 393 billion CFA francs to 945 billion CFA francs during the same period, from single to triple in just ten years [4].

4.4 Results of causality tests

Table 5 presents the results of the Toda and Yamamoto (1995) causality tests between public spending and economic activity in Cameroon. These results indicate for each of the estimated models a one-

[4] During this period, the Cameroonian Public Service equally experienced a pay rise, particularly in 2014 by presidential decree n° 2014/253 of 07 July 2014.

way causality moving from economic activity to public spending, thus validating Wagner's law for Cameroon. These results corroborate those of Narayan *et al.*, (2012) in India, Kumar *et al.*, (2012) in the case of New Zealand, Tang (2001) in the case of Malaysia, and Ansari *et al.*, (1997) in the case of Ghana.

Table 5: Toda and Yamamoto Causality Test Results

Model	*Df*	Null hypothesis	Wald statistics	Critical probability *(p-value)*)
1	3	*GDP* does not cause *G*	10.529**	0.014
		G does not cause GDP	3.554	0.313
2	3	*GDP/Pop* doesn't cause *G*	10.517**	0.014
		G does not cause *GDP/Pop*	4.445	0.217
3	3	*GDP/Pop* does not cause *G/GDP*	12.009***	0.007
		G/GDP does not cause *GDP/Pop*	4.302	0.230
4	3	*GDP* does not cause *Gcf*	8.849**	0.031
		G_{cf} does not cause *GDP*	3.818	0.281
5	3	*GDP/Pop* doesn't cause *G/Pop*	10.471**	0.015
		G/Pop does not cause *GDP/Pop*	4.302	0.23
6	3	*GDP* does not cause *G/GDP*	12.241***	0.006
		G/GDP does not cause *GDP*	3.554	0.313

Notes: *** Significant levels at 1%; ** Significant levels at 5%.

The validation of Wagner's law for Cameroon thus suggests that the more Cameroonian society develops, the more expensive the Cameroonian state is. In other words, public spending increases with economic activity in Cameroon. According to Wagner, this increase in public spending is due to the emergence of new needs as the economy develops. It categorizes these needs into two main groups: the need for public infrastructure, and the consumption needs for higher goods [5] by certain segments of the population as a result of an increase in their standard of living originating from an economic expansion.

CONCLUSION

The objective of this article was to empirically test the Keynesian hypothesis and Wagner's law on the relationship that could exist between public spending and economic activity in Cameroon. Using the bound co-integration tests of Pesaran *et al*., (2001) and the Toda and Yamamoto (1995) causality tests, results identify a long-term equilibrium relationship between public spending and economic activity, and a causality moving from economic activity to public spending for the six versions of Wagner's law tested. These results thus support the conclusion that Wagner's law is valid in the case of Cameroon and suggest that the current management of public spending in the country is ineffective in reviving economic activity. Thus, the Cameroonian government should make significant efforts in the management of public finances to improve the productivity of public spending as advocated by the theories of endogenous growth. This could include better public resource planning, a transparent management mechanism for public finances, and a strengthening capacity to absorb public resources.

[5] These are goods with an income elasticity greater than one such as culture, recreation, health, etc.

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