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PUBLIC EXPENDITURES AND AGRICULTURAL TOTAL FACTOR PRODUCTIVITY GROWTH: EVIDENCE FROM TOGO

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ABSTRACT
Over the past two decades, the relationship between public expenditures and economic growth has drawn the attention of many economists. Most of studies revealed that government expenditures play an important role in the TPF growth. However, the link between public expenditures and TFP growth in agriculture has been addressed very little despite the importance of this sector in the economy. This study examines the effect of public expenditures on agricultural total factor productivity (TFP) growth in Togo. An ARDL modeling approach was applied to time series over the period 1987 to 2019. The analysis of the composition of public expenditures reveals that public consumption has a negative effect on TFP growth, whereas investment expenditures have a positive effect in the short and long term. The effect of investment seems to be enhanced by the control of corruption, which has a positive effect on TFP growth. In light of these results, it is essential that government continue to enhance total factor productivity growth through public expenditures increase. However, the efficiency of public expenditures will depend on the effectiveness of the control of institutional corruption and on the efficiency of the trade-off between investment and consumption.

KEY WORDS
Public expenditures, Investments, consumption, agricultural growth, total factor productivity, control of corruption, ARDL model.

It is now agreed that there is a positive link between investment and agricultural Total Factors Productivity (TFP) especially in developing countries where agriculture accounts a large share of national income and trade (Khan *et al.* 2017; Liu *et al.* 2020). According to economic theory, innovation is a major source of agricultural production growth, which occurs essentially through technical and organizational innovations (Mounier 1992). For these innovations to have an impact on TFP, they must be adopted on a large scale by agricultural producers through public or private advisory services. Their capacity to adopt the new technologies depends on their education level, financial means, public aid, etc. In addition, mechanization is recognized as a vector for increasing agricultural TFP (Mazoyer and Roudart 2009). Finally, public policies also play a key role in agricultural growth and have diverse effects, depending on their content. For example, public investment policies in advisory support, education, and vocational training schemes are equally important in order to improve agricultural TFP (Douillet and Girard 2013).

As the agricultural sector is considered the backbone of most West African economies with about 40% of gross domestic product (GDP) and about 60% of the workforce (OECD and FAO 2016), enhancing agricultural production remains a critical challenge (World Bank 2010). It is therefore important to create favorable economic conditions, improve public facilities and address market failures to increase agricultural TFP, production and create jobs. Some studies revealed that the fragile state of agriculture in Sub-Saharan Africa (SSA) is the result of low levels of public investment in the sector (World Bank 2010). Indeed, for SSA as a whole, agricultural spending represented only 2.8% of total public spending in 2004, which is far from the goals of the 2003 Maputo Declaration. This share was 3.2% in 1994. Moreover, the gap between Africa and other parts of the developing world was even wider when considering the ratio of agricultural expenditure to agricultural GDP. This ratio

was 5.3% for Africa as a whole in 2004, while it was 11.2% and 6.2% respectively in Asia and Latino America (Diao *et al.* 2007).

In the specific case of Togo, the general concern raised is the agricultural growth does not follow the investment growth rate. In fact, Togo was the first country in West Africa and the second in Sub-Saharan Africa (after Rwanda) who signs its Comprehensive Africa Agriculture Development Program CAADP in July 2009. The implementation of this CAADP was based on the National Agricultural Investment and Food Security Program (PNIASA) with a financial envelope of more than 1billion US dollars. From 2000 to 2016, national spending on agriculture increased from 0.4% to 9%, an average of 6.3% per year in real terms. This is the result of large budget increases and a sharp rise in spending in all sectors, with larger amounts for agriculture. Between 2002 and 2011, the real budget of the Ministry of Agriculture excluding rural tracks increased by 3.5 points in current terms, from 13 million to 45.5 million US dollars. Spending on rural roads increased fivefold, from 3 million to 15 million US dollars. Agricultural expenditures have indeed increased more rapidly than the country's overall budget (MAEP 2012). Indeed, it can be noted that agricultural growth is rampant and the impact of public expenditures on agriculture has so far been low (MAEP 2012). Unfortunately, it is observed that the objective of agricultural growth of at least 6% has not yet been achieved and that the incidence of poverty in rural areas (58.7%) is still very high compared to a national average of 45.1% (INSEED 2016). It is therefore paradoxical that despite the increase in public agricultural spending, the real effect of this increase is not felt. At the same time, corruption plagues government institutions managing agriculture sector and seems to affect the efficiency of agricultural investment (Yovo, 2018). Therefore, it is worthwhile to examine the effect of public expenditures on agricultural productivity and how corruption control affects the efficiency of agricultural investments.

The problematic of this paper can be summarized in the following main question: What is the effect of public expenditures on the growth of agricultural TFP in Togo? This leads to the following specific research questions: What is the effect of investment expenditures on the growth of agricultural TFP? What is the effect of consumption expenditures on the growth of agricultural TFP? What is the role of corruption control on the efficiency of agricultural public investment?

The objective of this research is to study the macroeconomic effects of public expenditures on agricultural TFP. More specifically, the study aims to (i) measure the effect of public investments on TFP growth; (ii) analyze the effect of consumption on TFP growth; and (iii) determine the role of corruption control in the relationship between public expenditures and TFP growth in Togo. The analysis of public expenditures is one of the subjects that generate debate in academic and political circles as well as in international organizations working for the economic development of developing countries. However, it is inquisitive to note that despite the availability of theoretical arguments of the effect of public expenditures on the growth of TFP in agriculture in developing countries, only a few studies have attempted to test these arguments empirically in Africa and particularly in Togo (Mounier 1992; Mason-D'Croz *et al.* 2019). This research will provide an understanding of the relationship between public expenditures and agricultural TFP growth in Togo with a focus on the role of corruption control. Furthermore, the results of the research will help guide policies in terms of actions that could be taken in the agricultural sector to improve the efficiency of public expenditures in agriculture, stimulate agricultural growth and, in turn, economic growth in Togo.

The paper is structured around three sections. The first section presents the role of public expenditures in agricultural TFP growth. The second describes the methodology of the study. The third discusses the empirical results. A conclusion and an implication for public policy end the article.

Consistent with Solow's (1957) growth theory, the three factors that affect the growth rate of output are the volume of labor, the volume of capital, and total factor productivity. A fundamental theoretical question has often been whether growth is due to increases in the volume of factors or to TFP. As Mounier (1992) points it out, TFP has played a major role, while factor volume has played a minor role, in the dynamism of the agriculture in many

developed countries. The growth of TFP, often referred to as the "third factor of production", would become the main explanatory factor of this agricultural economic growth. According to Schumpeter's vision, technological progress is the main engine for the economic growth process in modern capitalist economies (Nkamleu 2004). Thus, production results not only from the combination of capital and labor but also from the shift in the production frontier over time (technological progress). According to Fuglie and Rada (2013), there are several levers that can be used to increase agricultural growth. These include expenditures on research and development, innovation, mechanization, and agricultural public policy.

Based on an economic theory, empirical work has shown the role of public expenditures on agriculture total factor productivity (TFP) growth. Using data on agricultural production and public expenditures at the regional level, Benin *et al.* (2009) estimated agricultural productivity on different types of expenditure in various agro-ecological zones of Ghana. The results indicate that, the provision of various public goods and services in the agriculture and rural roads sectors have a significant effect on agricultural productivity. An increase for 1% in public expenditures on agriculture is associated with a 0.15% increase in agricultural labor productivity.

The study of Zhan *et al.* (2017) measures and compares the effects of public spending on total agricultural factor productivity growth for 29 Chinese provinces from 1986 to 2011. The study finds clear evidence of convergence in agricultural total factor productivity growth as well as a positive correlation between this growth and public investment. Agricultural spending on research and development is thus considered to be statistically and economically more important in technological catch-up than innovation. The strong positive spillover effects across regions suggest that growing cooperation in public agricultural research across regions is more effective, and that training improves TFP, especially in less productive regions.

Khan *et al.* (2017) used time series data from 1953 to 2009 to analyze the relationship between public spending and agricultural productivity growth in Australia. The results reveal that increased public spending on agricultural research and development leads to better agricultural productivity of large areas. The results also show a unidirectional causal relationship between agricultural research spending and total factor productivity. Since agricultural development depends on improving agricultural production efficiency and productivity growth, Liu *et al.* (2020) estimated the indexes of agricultural technical efficiency scores, TFP, using panel data at the level of 30 provinces in China from 2002 to 2017 by applying a stochastic frontier approach. The results reveal that farm labor, machinery, and pesticides are the main drivers of agricultural productivity, with no significant role of cultivated area. Among the determinants, government investment in agricultural development projects significantly boosts technological progress and agricultural technical efficiency, while experienced labor significantly increases agricultural technical efficiency. Literacy rates improve technological progress and TFP. However, public consumption expenditures in agriculture, forestry and water significantly reduce agricultural technical efficiency and TFP.

Chen *et al.* (2008) revealed that the main source of growth in Chinese agriculture remains TFP growth, which is itself affected by agricultural fiscal policy, expenditure on rural education, Infrastructure and R&D expenditures.

For Goyal and Nash (2016), investments in rural public goods, coupled with better policies and institutions promote gains in agricultural TFP worldwide. The benefits from investments to consolidate markets, expand irrigation, develop and adopt improved technologies can be enormous. Similarly, improving the policy framework through trade and regulatory policy reforms complements these expenditures by improving agricultural TFP.

METHODS OF RESEARCH

The Solow (1956) model is considered to be the reference for modern growth models. The basis of Solow's model is the Cobb-Douglas type production function. However, according to Barro (1990), the endogenous growth models developed by Romer (1986) and Lucas (1988) are more useful for understanding why developed countries have grown

continuously in the long run, despite the diminishing returns to physical and human capital. Building on the work of Barro (1990) and Mounier (1992), growth is closely related to the types of public expenditures used for capital endowment (K) and labor (L). The starting production function is written as follows:

$$Y = F\,(\mathrm{K}, \mathrm{L})\ (1)$$

Considering a Cobb-Douglas type production function, the theoretical model becomes:

$$Y = AK^{\alpha}L^{\beta}\ (2)$$

The parameter A captures total factor productivity. Considering the logarithm of the production function, equation (2) can be rewritten in linear form as follows:

$$lnY = lnA + \alpha lnK + \beta lnL\ (3)$$

We can specify the model using equation (3). According to Mounier (1992), agricultural growth is a function of public agricultural expenditure, labor force (Labor), agricultural area (Land) and other control variables such as the Harmonized Index of Consumer Prices (HICP) and the Control of Corruption (CC). In this study, the composition of public expenditures is considered through consumption expenditures (CEXP) and public investment in agriculture (PINV). In this way, it is possible to show the effect of public investment and consumption expenditures on the growth of total agricultural factor productivity. The model can therefore be formulated as follows: To capture the effect of the composition of public expenditures on total factor productivity in agricultural.

$$LnTFP_t = \alpha_0 + \alpha_1 LnPINV_t + \alpha_2 LnCEXP_t + \alpha_3 LnLabor_t + \alpha_4 LnLand_t + \alpha_5 LnHICP_t + \alpha_5 LnCC_t + \varepsilon_t\ (4)$$

Several techniques can be used to estimate equation (4) taking into account the total effect of public agricultural expenditures. In the present case, we opt for the auto-regressive distributed lag model (ARDL) of Pesaran *et al.* (2001) for several reasons. First, it allows us to analyze time series with different orders of integration, I (1) and I (0). Second, it allows studying both the short term and the long term effect. Finally, it gives better estimates of small sample sizes, as this is the case for our sample (33 observations). The empirical specification of the model is as follows:

$$\begin{aligned}\Delta LnTFP_t = \alpha_0 &+ \sum_{i=1}^{p} \alpha_{1i}\,\Delta LnTFP_{t-i} + \sum_{i=0}^{q} \alpha_{2i}\,\Delta LnPINV_{t-i} + \sum_{i=0}^{r} \alpha_{3i}\,\Delta LnCEXP_{t-i} + \sum_{i=0}^{s} \alpha_{4i}\,\Delta LnLabor_{t-i} + \sum_{i=0}^{m} \alpha_{5i}\,\Delta LnLand_{t-i} \\ &+ \sum_{i=0}^{n} \alpha_{6i}\,\Delta LnHICP_{t-i} + \sum_{i=0}^{k} \alpha_{7i}\,\Delta LnCC_{t-i} + \beta_1 LnTFP_{t-1} + \beta_2 LnPINV_{t-1} + \beta_3 LnCEXP_{t-1} + \beta_4 Labor_{t-1} \\ &+ \beta_5 LnLand_{t-1} + \beta_6 LnHICP_{t-1} + \beta_7 LnCC_{t-1} + \varepsilon_t\ (5)\end{aligned}$$

In this expression, the coefficients α_{1i} to α_{7i} c capture the short-run dynamics, while the coefficients β_1 to β_7, characterize the long-run equilibrium. Δ is the first difference α_0 is the constant; ε_t is the error term.

The data used in this study is time series from 1987 to 2019, corresponding to 33 observations. Agriculture total factor productivity data are extracted from the United States Department of Agriculture database. The data on agricultural labor, control of corruption, and the harmonized price index come from the World Bank (2020). The variable of corruption control is an indicator ranging from -2.5 (bad) to 2.5 (good) is also extracted from World Bank. The variables agricultural public expenditures are from the Direction of Finance, Public Debt and Financing of the Ministry of Economy and Finance. To improve its economic interpretation, the scale was modified to place the indicator between 0 (bad) and 5 (good) by adding 2.5 to each reported value of the indicator (Egbendewe 2018).

Agricultural Total Factor Productivity (TFP): According to the United States Department of Agriculture (USDA), total factor productivity in agriculture in low-income countries, including most sub-Saharan African states, is failing to take off. Its increase is grossly insufficient to meet the rapidly expanding food needs (USDA 2018). Agricultural TFP is a crucial indicator of the efficiency of the production system, and in order to understand this concept, it is necessary to start from the fact that the increase in agricultural production in a country can come from an expansion of the area farmed or from an increase in gross product per hectare. TFP growth is therefore what explains the increase in agricultural production once the change in the volume of factors of production used has been taken into account. Moreover, the change in TFP depends the ability of the productive system to increase farmers' income while reducing food prices for consumers (USDA 2018).

Agricultural public investment (PINV) aims to renew or increase public capital in the form of agricultural infrastructures (agricultural research and development, rural tracks, agricultural watershed development, development of agricultural finance institutions, governance and securing rural land). Economists have long recognized that investment is an important source of productivity and economic growth. Investment in human capital can lead to economic growth effects because it promotes the adoption and assimilation of new technologies and thus increases productivity. By making more capital available to workers and thereby improving labor productivity, investment contributes to increased output (Barro 1990; Howitt *et al.* 1998). In a series of studies, Aschauer (1989) argues that basic infrastructure is an important source of productivity growth. The expected sign of this variable is positive because, as long as the economy is not yet in a steady state, additional investment always generates economic growth. Agricultural consumption expenditures (CEXP) are used to ensure the proper functioning of agricultural public services (personnel expenses, current expenses and transfers). According to anti-Keynesian theory, public consumption expenditures negatively affect economic growth through taxation, crowding out of private sector investment and production, and rent-seeking (Barro 1990; Bergh and Henrekson 2010).

Agricultural labor (Labor): is the amount of labor provided. It is proportional to the labor force, which is assumed to have a positive impact on production, with a threshold effect, due to diminishing marginal returns. For reasons of simplification, we will consider the rural population as the labor force in the agricultural sector.

Agricultural Land (Land) is the total land allocated to agriculture. This variable is taken into account in the modeling because Togolese agriculture is extensive and therefore an increase in agricultural land is likely to influence the growth of agricultural output.

Table 1 – Variables of the study

Variables	Definitions	Unit of measure	Sources
$LnTFP_t$	Agricultural Total Factor Productivity	% Annual	USDA (2018)
$LnPINV_t$	Public investment in agriculture	% Agricultural GDP	MAEP (2012), MEF (2020)
$LnCEXP_t$	Consumption expenditures	% Agricultural GDP	MAEP (2012), MEF (2020)
$LnLabor_t$	Agricultural labor	% Active Population	World Bank (2020)
$LnLand_t$	Agricultural Land	% Total land	World Bank (2020)
$LnHICP_t$	Harmonized Index of Consumer Prices	% Annual	World Bank (2020)
$LnCC_t$	Control of corruption	Index (0-5)	World Bank (2020)

The Harmonized Index of Consumer Prices (HICP): captures the rise in the general price level, leading to a sustained decline in the purchasing power of money. It is the rise in the general price level, resulting in a sustained decline in the purchasing power of money. Inflation is an indicator of macroeconomic instability that affects economic growth (Barro 1996). High inflation is a structural factor that negatively affects economic growth through the reduction of investor incentives. However, it should be noted that the work of López-Villavicencio and Mignon (2011) shows that there is a threshold level of inflation beyond which the impact would be negative and below which the impact would be positive. In short, the expected sign of this variable is indeterminate.

The quality of institutions is an important factor in endogenous growth. Corruption is a major threat to countries around the world; it weakens democratic institutions, undermines trust, and discourages investment. In the absence of good institutions, poor governance, corruption block growth (Bergh and Henrekson 2010; Acemoglu *et al.* 2012). This study considers the variable control of corruption (CC) and according to the theory increasing the level of control of corruption has a positive impact on growth.

Table 2 – Summary statistics

	LnTFP	LnPINV	LnCEXP	LnLand	LnLabor	LnHICP	LnCC
Mean	2.021	0.144	0.073	1.808	6.090	3.487	0.205
Median	2.026	0.175	0.023	1.808	6.550	1.394	0.199
Maximum	2.069	0.841	0.621	1.850	6.671	39.163	0.261
Minimum	1.965	-1.181	-0.265	1.757	4.402	-1.007	0.164
Std. Dev	0.027	0.502	0.207	0.030	0.782	7.298	0.026
Observations	33	33	33	33	33	33	33

Source: Data from MAEP (2012), USDA (2018), MEF (2020) and World Bank (2020).

It emerges from the table 2 that the variable $LnHICP_t$ is more volatile (looking at the standard deviation) than the others, with a serious increase attributable to the food insecurity crisis that the country experienced between 2007 and 2008. Because of this volatility Phillips and Perron stationarity test will be preferred over ADF's test to verify the unit root in the variable $LnHICP_t$ which is victim of regime change.

RESULTS OF STUDY

In this section, we proceeded first to specification tests before the economic analysis. The specification tests that are performed concern: unit root test, cointegration tests and diagnostic tests. To examine time series as it is the case here, it is required to check the stationarity in order to take it into account in the estimation method of the model. In this work, the test of Phillips and Perron (PP), were used for the aforementioned reason. The results presented in table 3 show that some series are stationary at level and others at first difference. None of the series considered is integrated in order 2 and this confirms the choice of using the ARDL model.

Table 3 – Phillips and Perron (PP) test result

Variables	p-value PP at level	p-value PP at first difference	Integrated Order
LnTFP	0.00	_	I(0)
LnPINV	0.06	_	I(0)
LnCEXP	0.00	_	I(0)
LnLabor	0.99	0.033	I(1)
LnLand	0.30	0.000	I(1)
LnHICP	0.00	_	I(0)
LnCC	0.80	0.06	I(1)

Source: Data from MAEP (2012), USDA (2018), MEF (2020) and World Bank (2020).

The determination of the number of lags in the ARDL model is an important step in order to avoid any misspecification of the model dimension. To this end, the number of lags that minimizes the Akaike information criteria (AIC) is used. Indeed, the Eviews software, used as a data processing tool, allowed to retain the ARDL model (1,3,0,3,0,3,2) as the optimal model (figure 1). This result is given by the Eviews software after the automatic estimation of the different possible models by setting the maximum delay. Similarly, figure 1 allows visualizing the 20 best models.

The purpose of the bounds test is to verify the existence of a long-term relationship between the variables of the specified model. In this respect, the bounds test of Pesaran *et al.* (2001) is applied to test the cointegration between variables of different order of integration (I (0) or I (1)). The principle of this test is based on the comparison of the value of

the Fisher statistic with the value of the lower and upper bounds for the different significance levels. Cointegration exists when the value of the F-statistic is greater than the value of the upper bound. Table 4 shows that the Fisher statistic is greater than the upper bound at the 1% significance level. Thus, we reject the H_0 hypothesis of the absence of a long term relationship and we conclude that there is a long term relationship between the different variables of the model. As a result, we can estimate the short run and long run relationship.

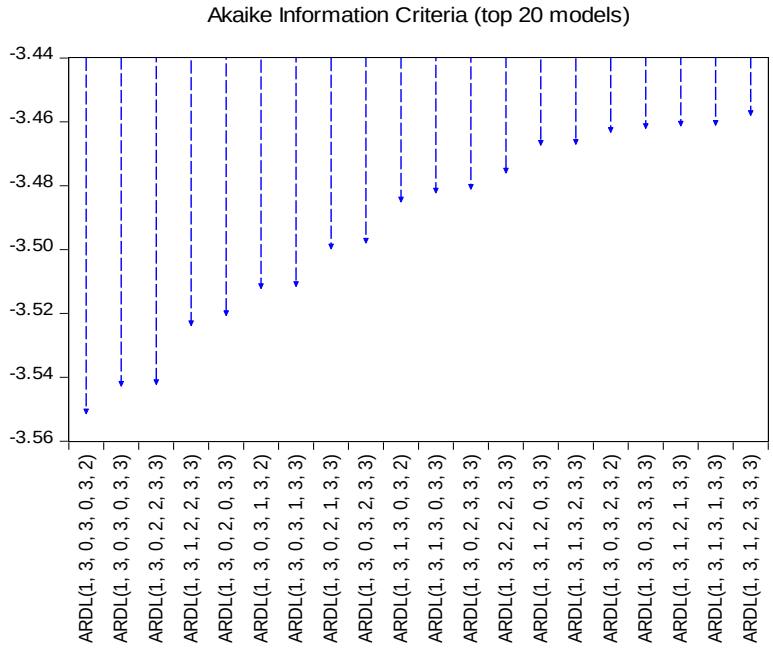

Figure 1 – Akaike information criteria values for the top 20 ARDL models.
Source: Data from MAEP (2012), USDA (2018), MEF (2020) and World Bank (2020).

Table 4 – Bounds test

F-Statistic	k	Significant level	I(0)	I(1)
11,78	6	10%	2.12	3.21
		5%	2.45	3.61
		2.5%	2.75	3.99
		1%	3.15	4.43

Source: Data from MAEP (2012), USDA (2018), MEF (2020) and World Bank (2020).

In order to assess the robustness of the model, the usual diagnostic tests on the estimated ARDL model were performed; they are the Ramsey functional form (RESET), the normality of the residuals and the heteroscedasticity. All these tests have the desired properties at 5% threshold. Indeed, the tests presented in table 5 below show that the probability of the statistic for each test is greater than 5%. The hypothesis H_0 is accepted in all these tests. The errors are therefore not homoscedastic, their distribution follows a normal distribution and the model is well specified. In addition, the stability tests of the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) have been applied to the estimated model. As shown in figure 2, the plots of the CUSUM and CUSUMSQ statistics are well within the critical limits, implying that all model coefficients are stable during the estimation period.

Table 5 – Diagnostics tests results

Diagnostic tests	Tests	Statistics	Probabilities
Heteroscedasticity	Breusch-Pagan-Godfrey	13.056	0.788
Heteroscedasticity	Arch	2.255	0.133
Normality	Jarque-Bera	1.058	0.589
Functional Form	Ramsey (RESET)	0.092	0.767

Source: Data from MAEP (2012), USDA (2018), MEF (2020) and World Bank (2020).

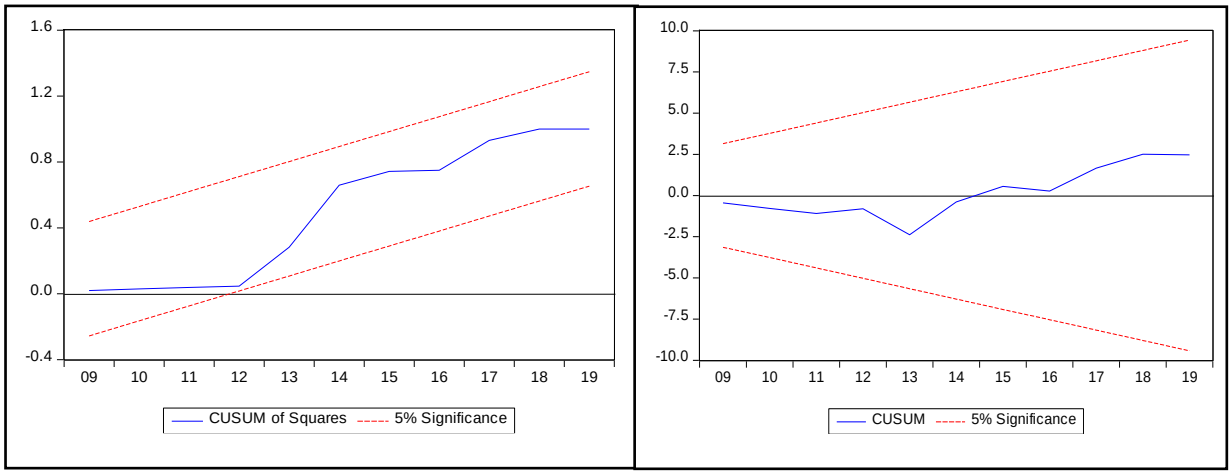

Figure 2 – CUSUM graphs. Source: Data from MAEP (2012), USDA (2018), MEF (2020) and World Bank (2020).

The estimation results (table 6) show that the adjustment coefficient or recall force is statistically significant (P=0.000), it is negative and lies between zero and one in absolute value (-0.71), which guarantees an error correction mechanism, and therefore the existence of a long-term relationship (cointegration) between variables. In addition, the coefficient of determination, the Adjusted R-squared of 0.54 confirms the good fit of the model. This means that the explanatory variables in our econometric model contribute to the explanation of the dependent variable (TFP) to the order of 54%.

Table 6 – Results estimation of the effect of public expenditures in short run

Variables	Coefficients	p-value
D(LnPINV)	0.002	0.918
D(LnPINV(-1))	0.197***	0.000
D(LnPINV(-2))	0.013	0.704
D(LnPINV(-3))	0.091***	0.006
D(LnCEXP)	-0.189**	0.013
D(LnLand)	-0.722	0.526
D(LnLand(-1))	-0.708**	0.026
D(LnLand(-2))	1.368	0.264
D(LnLand(-3))	1.515	0.139
D(LnLabor)	0.066	0.121
D(LnHICP)	0.005***	0.003
D(LnHICP(-1))	0.001	0.352
D(LnHICP(-2))	0.000	0.966
D(LnHICP(-3))	0.002	0.047
D(LnCC)	0.472*	0.067
D(LnCC(-1))	-0.135	0.808
D(LnCC(-2))	-1.016	0.364
CoinEq(-1)	-0.710***	0.000
R-squared	0.825	D-W = 2.130
Adjusted R-squared	0.540	AIC= -3.550
F statistic	2.890	SC = -2.663
Probability (F-statistic)	0.003	Log likelihood 72.25

Source: Data from MAEP (2012), USDA (2018), MEF (2020) and World Bank (2020).
*NB: Ln stands for natural Logarithm. ***= P< 1%, ** = P< 5%, * = P< 10%.*

Public investment has a positive effect on total factor productivity growth in the short run, which is less proportional: an increase in public investment of 1% of GDP accelerates TFP growth by 0.19% in the short run. However, the time dimension is an important variable that should not be ignored. At least one year must pass before investment can be expected to boost TFP growth. In contrast, consumption expenditures have a negative effect on TFP growth, indicating a misallocation or misuse of consumption expenditures in the Togolese agricultural sector. The other control variables did not show the expected (positive) effects in

the short term, acting as a brake on agricultural productivity growth, except for the harmonized consumer price index and the control of corruption, whose instantaneous effect on growth remains positive in the short term. Agricultural labor was found to be insignificant. The area of agricultural land sown has a negative effect on agricultural productivity, which is evidence of the extensive nature of the Togolese agriculture.

Table 7 below provides the coefficients or elasticities of the effect of the composition of government expenditures on agricultural productivity growth in the long run. These long-run results remain almost identical to those in the short run, with effects of relatively greater magnitude. The effect of investment spending remains positive as in the short run, while the effect of consumption expenditures on TFP growth remains negative in the long run. An increase in public investment of 1% leads to a growth in agricultural productivity of 0.47% in the long run. Moreover, introducing the interactive term of corruption control with investment spending (LnPINV*LnCC) to the long-run equation shows that the interactive term investment*corruption control has a positive effect on total productivity growth in the long run. This result, which seems to highlight the positive role of the practice of controlling corruption on agricultural productivity, rings as a calls for the public authorities to effectively control corruption in the management of public agricultural investment expenditures.

Table 7 – Results of the effect of public expenditures in the long run

Variables	Coefficients	p-value
LnPINV	0.467***	0.001
LnCEXP	-0.110**	0.017
LnLand	-0.902*	0.095
LnLabor	0.038	0.103
LnHICP	0.005**	0.004
LnCC	0.240	0.110
LnCEXP*LnCC	0.330	0.126
LnPINV*LnCC	0.495***	0.010

Source: Data from MAEP (2012), USDA (2018), MEF (2020) and World Bank (2020).
**** = P< 1%, ** = P< 5%, * = P< 10%.*

DISCUSSION OF RESULTS

The results of the estimation of the short- and long-run relationship show that public investment has a positive effect, while consumption expenditures have a negative effect on Togo's agricultural productivity growth. The short-run spillover effect of investment is weaker than the long-run spillover effect. Indeed, 1% increase in investment expenditures leads to a 0.47% increase in agricultural productivity growth in the long run, compared to a 0.20% increase in the short run, one year after the investment occurred. While these results may seem contradictory to those of Devarajan *et al.* (1996) who found a positive effect of public consumption on economic growth, they are consistent with the finding of Liu *et al.* (2020); Goyal and Nash (2016); Benin et al. (2009) who found the positive role of public investments on agricultural factor productivity. For these authors, investment increases the productivity of firms, due to the positive technological externalities it generates. This is in line with Mounier (1992) who pointed out that investments such as infrastructures are necessary to revitalize agricultural development. Thus, agricultural infrastructures and others facilities such as rural tracks, development of agricultural finance institutions, agricultural research and development, good governance, land security are beneficial to the agricultural sector and represents a source of agricultural productivity growth (Douillet and Girard 2013).

The institutional variable (control of corruption) has a positive effect on agricultural productivity and the interaction of this variable with investment (LnPINV*LnCC) shows the positive role of a high level of control of corruption in the investment and agricultural productivity relationship. The result highlights the fact that high levels of corruption control, is correlated with high spillover effect. This result corroborates the institutionalists' thesis (Acemoglu *et al*., 2012) that the level of corruption control remains a fundamental condition to any economic development. The result also corroborates the case studied by Ziadi and

Bhibah (2016) which shows that the good quality of institutions has an influence on economic growth in WAEMU countries. Finally, the negative effect of the area of agricultural land sown on productivity confirms the extensive nature of the agricultural production system in Togo. The lesson from this result is that Togolese agriculture must innovate in order to stimulate TFP growth.

CONCLUSION

The relationship between public expenditures and economic growth has drawn the attention of many economists over the past two decades. Even though many studies has examined the role of government expenditures in the TPF growth en general, the link between public expenditures and TFP growth in agriculture has been explored very little. In this study, the results highlighted that public consumption has a negative effect on TFP growth, whereas investment expenditures has a positive effect in the short and long term. The effect of investment seems to be enhanced by the control of corruption, which has a positive effect on TFP growth.

In other words, the study revealed that public expenditures stimulate the agricultural TFP growth, especially when it is directed towards investments, but slow it down when it is directed towards consumption. Moreover, the control of corruption plays a key role in the relationship between agricultural investment and agricultural productivity growth. These results raise two important questions: the quality of public spending and the exploration of alternative sources of financing. The quality of spending relates to the allocation of public resources in the agricultural sector and the State should give priority to investment over consumption, which is recognized as having a negative effect on growth. In addition, the Togolese government must intensify the promotion of good governance through the control of corruption, which contributes to increase the effect of public investment on the growth of agricultural production. In the context of scarce government resources and the inability to increase spending on agriculture consistently, it is imperative to explore alternative sources of funding for the agricultural sector.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests.

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