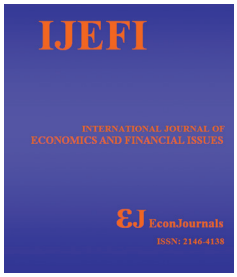

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Dynamic Relationship between Government Spending and Private Consumption: Evidence from Cote d'Ivoire

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ABSTRACT

This study tests the dynamic relationship between government and household consumption in Cote d'Ivoire. The autoregressive distributed lag bounds test and Johansen approach are employed to annual data covering the period 1970-2016. The results reveal a long run relationship between household consumption, real gross domestic product and government consumption. In the long run, private consumption and per capita income have positive effects on government consumption. However, in the short run there is no causal relationship between the variables.

Keywords: Government Spending, Private Consumption, Gross Domestic Product
JEL Classifications: C22, E21, E62, H31

1. INTRODUCTION

The relationship between government spending and household consumption is one of the controversial issues in both macroeconomics and applied economics. On the theoretical ground, the Keynesian view advocates that an increase in government spending leads, by the working of the multiplier, to an increase in output and employment, which further increases private consumption (Mankiw, 2000; Galí et al., 2007; Coenen and Straub, 2005). Conversely, the neoclassical theory supports that expansionary fiscal policies are ineffective to stimulate aggregate demand because of the substitution effects between government spending and private consumption (Aiyagari et al., 1992; Baxter and King, 1993; Christiano and Eichenbaum, 1992). These contrasting views have made less attractive the use of public spending for stimulating economic activity. Today, the popular wisdom seems to be that government spending is to be under control because of its adverse macroeconomic effects. On the empirical level, studies regarding the relationship between government and household consumption provide opposing results. Some empirical studies have found that there is positive correlation between government spending and private consumption (Karras, 1994; Blanchard and Perotti, 2002; Nieh and Ho, 2006; Galí et al., 2007; Tagkalakis, 2008; Onodje, 2009; D'Alessandro, 2010; Khalid et al., 2015). On the other hand, there are also other empirical studies that have reported a negative correlation between government spending and private consumption (Kormendi, 1983; Aschauer, 1985; Ahmed, 1986; Ho, 2001; Auteri and Costantini, 2010; Dawood and Francois, 2018).

From the empirical literature, we can see that the dynamic relationship between government spending and private consumption has not been widely explored in the empirical literature. In addition, there is a paucity of study on this issue for the case of Cote d'Ivoire. Therefore, it is the intention of this study to fill the gap in the empirical literature. As empirical methodology, the paper employs the autoregressive distributed lag (ARDL) approach proposed by Pesaran et al. (2001), which gained popularity recently and proved to perform better in small sample sizes. This method allows us to estimate the long and short run relationships between government

and private consumption over the period covering from 1970 to 2016. Besides that, this study is also interested to find out the direction of causality between the two variables.

The remaining of the study is organized as follows. Section 2 discusses methodology and data. Section 3 presents and discusses the empirical results while Section 4 offers conclusion.

2. ECONOMETRIC METHODOLOGY AND DATA

2.1. Model Specification

In this study, our purpose is to test the dynamic relationship between government consumption and household consumption. Thus, to test the effect of government consumption on private consumption, the following model was estimated:

$$\ln C_t = \alpha_1 + \beta_1 \ln G_t + \mu_{1t} \quad (1)$$

Where C_t represents real per capita private consumption, G_t is real per capita government consumption, and μ_{1t} is a stochastic disturbance term assumed to follow a normal distribution.

It has been shown that the robustness of the relationship between government spending and private consumption may be weakened when income is excluded from the model (Graham, 1993; Ho, 2001). Therefore, we also estimate the augmented model specified as follows:

$$\ln C_t = \alpha_2 + \beta_2 \ln G_t + \gamma \ln Y_t + \mu_{2t} \quad (2)$$

where Y_t is real per capita income. The coefficient on income is expected to be positive and lower than one. That on government consumption is ambiguous. A positive (negative) coefficient represents complementary (substitution) relationship between government spending and private consumption.

2.2. Methodology

Our empirical analysis follows three steps. Firstly, we test for the stationarity of all variables. Secondly, we test for the presence of a long-run relationship among the variables using the ARDL bounds test developed by Pesaran et al. (2001). This approach has many advantages over other traditional alternative methods such as Engle and Granger (1987) and Johansen (1988). It has been shown to have better properties in small sample sizes. Another reason for preferring the ARDL approach is that it is applicable irrespective of whether the regressors are stationary at level or stationary at first difference. The ARDL bounds testing approach to cointegration is based on the following equation:

$$\Delta \ln C_t = \theta_0 + \theta_1 \ln C_{t-1} + \theta_2 \ln G_{t-1} + \theta_3 \ln Y_{t-1} + \sum_{i=1}^{m1} \gamma_{1i} \Delta \ln C_{t-i} + \sum_{i=0}^{m2} \gamma_{2i} \Delta \ln G_{t-i} + \sum_{i=0}^{m3} \gamma_{3i} \Delta \ln Y_{t-i} + \mu_t \quad (3)$$

In order to investigate the long-run relationship among the variables, we use the F-test statistic to test the joint significance of the coefficients on one-period lagged levels of the variables. That is, the null hypothesis of no long-run relationship is H_0: $\theta1=\theta2=\theta3=0$. The optimal lag structure (m1, m2, m3) was selected using the Akaike information criterion (AIC) with maximum lag length on each variable set to five. The model has been tested by the diagnostic tests that are serial correlation, normality and heteroskedasticity tests. Stability tests were also used to test the goodness of fit of the models.

Thirdly, in order to ascertain the direction of causality among the variables, we perform the ECM-based Granger causality test by estimating the following system:

$$\begin{bmatrix} \Delta \ln C_t \\ \Delta \ln G_t \\ \Delta \ln Y_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{bmatrix} + \sum_{i=1}^{p} \begin{bmatrix} \beta_{1i} & \gamma_{1i} & \delta_{1i} \\ \beta_{2i} & \gamma_{2i} & \delta_{2i} \\ \beta_{3i} & \gamma_{3i} & \delta_{3i} \end{bmatrix} \times \begin{bmatrix} \Delta \ln C_{t-i} \\ \Delta \ln G_{t-i} \\ \Delta \ln Y_{t-i} \end{bmatrix} + \begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \end{bmatrix} ECT_{t-1} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \end{bmatrix} \quad (4)$$

Where ECT_{t-1} denotes the lagged residuals of the long-run relationship. We employ the AIC to choose the optimal lag length p. The advantage of this specification is that it can identify both the long run and short run causality. The significance of the coefficients on the first difference of the variables provides indication about short run causality. The significance of coefficients on ECT_{t-1} indicates long run causality. For example, government consumption does not cause private consumption in the short run if $\gamma_{11}=\gamma_{12}=\ldots=\gamma_{1p}=0$. Similarly, private consumption does not cause government consumption if none of β_{2i} is statistically different from zero.

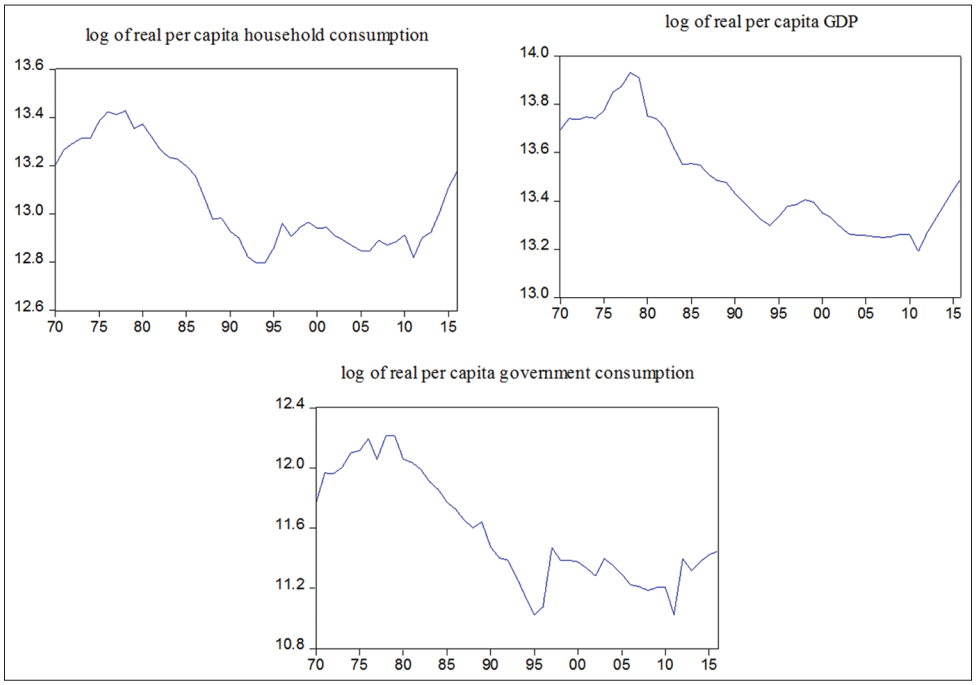
2.3. Data

The study uses annual data covering the period from 1970 to 2016. The variables under study are: Real per capita household consumption expenditure (Ct), real per capita gross domestic product (GDP) used as a proxy for income (GDP_t) and real per capita government final consumption expenditure (G_t). All the data used are in constant local currency units and collected from the World Development Indicators of the World Bank.

We plotted the evolution of the variables over the sample period. We can see from Figure 1 that the variables exhibit a general downward trend from 1978 to 2011, the date of Ivorian political crisis. After 2011, we observe an upward trend in the variables. We can presume from this time lines that the variables may contain unit root.

Table 1 shows descriptive statistics and correlations of the variables. The averages of log of real per capita consumption, real per capita GDP and log of real per capita government consumption are 13.060, 13.484 and 11.572, respectively. This implies that household consumption and government consumption represent about 66% and 14% of GDP, respectively. The correlation matrix indicates a positive relationship between private consumption and government consumption. Also, there exists a positive correlation between income and government consumption; this may cause a problem of colinearity in model 2.

Figure 1: Household consumption, gross domestic product and government consumption over time, 1970-2016



3. EMPIRICAL RESULTS AND DISCUSSION

Before proceeding to model estimation, we check the series for unit root. This step is necessary to be sure that none of our variables are I(2). To this end, we conduct the PP test of Phillips and Perron (1988) and the KPSS test of Kwiatkowski et al. (1992). The results displayed in Table 2 show that all the three variables are stationary at first difference. Now, we can proceed to the application of the ARDL bounds test to check if there is a long-run cointegration relationship among private consumption, government spending and GDP. We apply the ARDL approach taking each of the variables in turn as a dependent variable.

As seen from Table 3, when private consumption is used as the dependent variable, the computed F-statistics are smaller than the lower critical value at the 5% level of significance. However, when government consumption is used as the dependent variable, the F-statistic is greater than the upper bound values at the 1% and 5% levels of significance. Therefore, we can conclude that there is a long run relationship among variables.

To crosscheck our results we also applied the Johansen (1988) maximum likelihood test. This method is well documented in the empirical literature and will not be developed here. The procedure is a multivariate generalization of the Dickey-Fuller unit root test. Unlike the ARDL test which is sensitive to the choice of the dependent variable, Johansen (1988) test assumes all variables to be endogenous. The estimation procedure includes a constant term in both the cointegrating equation and the VAR. The results are provided in Table 4. They show that both the maximum eigenvalue and trace statistics support the existence of one cointegrating relationship among the variables.

After the existence of a long run relationship among variables, we move to next step, to estimate the long run coefficients of the variables. To that end, we use the ARDL approach along with the Johansen (1988) multivariate approach, the Fully Modified OLS method proposed by Phillips and Hansen (1990) and the Dynamic OLS technique suggested by Stock and Watson (1993). The results are displayed in Table 5. The estimated coefficients on private consumption and income are positive and significant in both models. This suggests that greater household consumption

Table 1: Descriptive statistics and correlation matrix

Variables	lnC_t	lnY_t	lnG_t
Panel A: Univariate statistics			
Mean	13.060	13.484	11.572
Median	12.966	13.404	11.422
Maximum	13.427	13.932	12.214
Minimum	12.795	13.190	11.023
Standard deviation	0.204	0.213	0.358
Skewness	0.459	0.581	0.387
Kurtosis	1.698	2.047	1.827
Jarque-Bera	4.969	4.426	3.870
Probability	0.083	0.109	0.144
Panel B: Correlation matrix			
lnC_t	1.000		
lnY_t	0.960*	1.000	
lnG_t	0.942*	0.956*	1.000

C: Real per capita household final consumption, Y: Real per capita GDP, G: Real per capita government final consumption. The asterisks *and **denote statistical significance at the 5% and 10% levels, respectively. GDP: Gross domestic product

Table 2: Results of unit root tests

Series	Level		First difference		Order of integration
	PP	KPSS	PP	KPSS	
lnC_t	−1.209	0.594*	−5.054*	0.244	I (1)
lnY_t	−1.250	0.701*	−4.229*	0.215	I (1)
lnG_t	−1.098	0.683*	−7.792*	0.159	I (1)

C: Real per capita household final consumption, Y: Real per capita GDP, G: Real per capita government final consumption. *(**) denotes the rejection of the null hypothesis at the 5% (10%) level. GDP: Gross domestic product

Table 3: Results of the ARDL cointegration test

Models	F-stat.	Diagnostic tests		
		Normality[1]	Heteroscedasticity[2]	Correlation[3]
Model 1				
C_t=f (G_t)	1.063	1.248 [0.535]	7.901 [0.118]	0.789 [0.374]
G_t=f (C_t)	9.774*	3.411 [0.181]	3.979 [0.212]	0.007 [0.929]
Model 2				
C_t=f (Yt, G_t)	1.036	1.283 [0.26]	10.096 [0.081]	0.096 [0.756]
G_t=f (Yt, C_t)	7.811*	2.060 [0.356]	8.635 [0.143]	0.055 [0.814]
Y_t=f (Ct, G_t)	1.337	14.094 [0.000]	7.400 [0.102]	1.833 [0.112]
Critical values	**Lower bound value**		**Upper bound value**	
k=1	5%	3.62	4.16	
	10%	3.02	3.51	
k=2	5%	3.10	3.87	
	10%	2.63	3.35	

C: Real per capita household final consumption, Y: Real per capita GDP, G: Real per capita government final consumption. (1) Jarque-Bera normality test, (2) Breusch-Pagan-Godfrey heteroscedasticity test, (3) Breusch-Godfrey Serial Correlation LM Test. Lag structure of the ARDL model is selected using the AIC criterion with maximum lag set to 5. Models are estimated under restricted constant. Figures in [.] are p values. (*) indicates the rejection of the null hypothesis of no cointegration at 5% level of significance. GDP: Gross domestic product, ARDL: Autoregressive distributed lag

Table 4: Results of the Johansen tests for cointegration

H_0	H_1	Model 1		Model 2	
		Statistic	5% critical value	Statistic	5% critical value
Maximum eigenvalue test					
r=0	r=1	17.244*	14.264	26.680*	21.131
r≤1	r=2	3.547	3.841	6.284	14.264
r≤2	r=3	-	-	1.765	3.841
Trace test					
r=0	r=1	20.792*	15.494	34.729*	29.797
r≤1	r=2	3.547	3.841	8.049	15.494
r≤2	r=3	-	-	1.765	3.841

r: Indicates the number of cointegrating vectors. The Akaike information criterion was used to select the number of lags required in the cointegrating test. *Indicates the rejection of the null hypothesis of no-cointegration at the 5% level

Table 5: Long run results

Regressor	Dependent variable: Log of government consumption (lnGt)							
	ARDL		Johansen		FMOLS		DOLS	
	Coefficient	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Model 1								
lnC_t	1.723*	18.525	1.729*	24.790	1.721*	22.387	1.719*	23.733
Constant	−10.943*	−8.961	−11.004*	−8.945	−10.906*	−10.863	−10.880*	−11.507
Model 2								
lnC_t	1.151*	3.752	1.118*	4.457	0.810*	3.061	1.084*	4.002
lnY_t	0.576**	1.966	0.596*	2.488	0.889*	3.484	0.636*	2.437
Constant	−11.243*	−11.535	−11.069*	−12.078	−11.00*	−11.454	−11.170*	−13.485

C: Real per capita household final consumption, Y: Real per capita GDP, G: Real per capita government final consumption. The asterisks *and **denote statistical significance at the 5% and 10% levels, respectively. ARDL: Autoregressive distributed lag

leads to greater government consumption. This positive effect may work through higher indirect taxes generated by household consumption of goods and services. Furthermore, economic growth exerts a positive effect on government consumption, which goes with Wagner law and confirms the finding of Keho (2016).

The short run results from ARDL model are reported in Table 6. In both models, the coefficient on the error correction term is negative and statistically significant, which confirms the existence of a long run relationship among the variables. Also, the coefficient on private consumption is not significant. This implies that in the short run, private and government consumption are not related. However, real GDP has a positive effect on government consumption expenditure.

We now examine the issue of causality. The results of the Granger-causality tests are presented in Table 7. The estimates of the error correction terms show that both private consumption and real GDP Granger-cause government consumption expenditure in the long run. However, there is no short run causality among the three variables. Overall, the results from both models provide the same conclusion regarding the dynamic relationship between government consumption and household consumption. The results showed that there is a positive causality running from

Table 6: Short run estimation results from ARDL model

Regressors	Dependent variable: Growth rate of government consumption (ΔlnG)			
	Model 1		Model 2	
	Coef.	t-stat.	Coef.	t-stat.
ΔlnC	0.412	1.121	−0.040	−0.129
ΔlnGDP	-	-	0.829*	3.427
Constant	−0.001	−0.106	−0.001	−0.117
ECT(-1)	−0.593*	−2.967	−0.606*	−2.964
R^2	0.421		0.498	
Diagnostic tests				
Serial correlation	1.492 [0.221]		2.412 [0.120]	
Heteroscedasticity	1.387 [0.203]		2.784 [0.175]	
Normality	3.278 [0.194]		0.258 [0.878]	

The short-run equations were estimated using the Huber-White method. The asterisks *denotes statistical significance at the 5% level. ARDL: Autoregressive distributed lag

Table 7: Results of granger causality tests

Model and dependent variable	Source of short-run causality			Long-run causality ECT_{t-1}=0
	ΔlnC_t	ΔlnG_t	ΔlnY_t	
Model 1				
ΔlnC_t	-	2.303 (0.316)	-	0.067 (0.558)
ΔlnG_t	3.753 (0.153)	-	-	−0.882* (−3.870)
Model 2				
ΔlnC_t	-	0.385 (0.534)	2.192 (0.138)	−0.014 (−0.140)
ΔlnG_t	2.309 (0.128)	-	0.041 (0.839)	−0.939* (−5.034)
ΔlnY_t	1.838 (0.175)	0.195 (0.658)	-	−0.039 (−0.451)

C: Real per capita household final consumption, Y: Real per capita GDP, G: Real per capita government final consumption. Statistics for Short-run causality are Chi-square statistics with P values in parentheses. Statistics for long-run causality are coefficients on ECT_{t-1} with t-statistics in brackets. The asterisk *denotes statistical significance at the 5% levels

household consumption to government consumption. But this causal relationship holds only in the long run.

4. CONCLUSION

In this study, we tested the dynamic relationship between government and household consumption in Cote d'Ivoire. To overcome the danger of spurious regression while dealing with non-stationary time series data, the ARDL bounds test and Johansen procedure have been employed. In every case we found a valid long run relationship between household consumption, real GDP and government consumption. However the long run relation exists when government consumption is used as the dependent variable. In the long run, private consumption and per capita income exert positive effects on government consumption. Tests for causality applied to error correction models suggest that both household consumption and real GDP Granger cause government consumption in the long run, but in the short run there is no causal relationship between the variables. The long run positive effect of household consumption on government consumption originates from the fact that greater consumption generates higher government revenue from indirect taxes.

The results of this study are obtained using aggregate government consumption. Future research would be more informative if individual components of government spending were considered in order to investigate their different relationships with household consumption. The composition of the government spending may determine the nature of its impact on household consumption. We intend to examine this line of research in a future work.

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