African Journal of
Agricultural and Resource Economics
Volume 17, Number 2 (2022), pp 106–114

Effect of economic policy uncertainty on agricultural growth in Nigeria

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Received: November 2021
Accepted: July 2022

DOI: https://doi.org/10.53936/afjare.2022.17(2).7

Abstract

This study analysed the long- and short-run effect of economic policy uncertainty on agricultural growth in Nigeria. Annual data was collected from secondary sources and analysed using the autoregressive distributed lag (ARDL) model and the associated bounds test. The highest volatility was exhibited by monetary policy uncertainty (MPU) (2.522), followed by consumer price index (CPI) (1.968). The fiscal policy uncertainty had the lowest volatility (0.179). The result of the bounds test showed that economic policy uncertainty shares a long-run relationship with agricultural growth. The effect of economic policy uncertainty on agricultural growth in the long run is negative, with the coefficient of MPU, FPU and TPU being -0.004, -0.218 and -0.507 respectively. In the short run, the effects of all the economic policy uncertainty variables on agricultural growth and welfare are negative and significant, both in contemporary (current) and in lags. A stable economic policy encourages agricultural growth.

Key words: agricultural growth; fiscal; monetary; trade policies; uncertainty

1. Introduction

Agricultural activities are prone to various risks and uncertainties, which could be biophysical, abiotic, biotic, climatic, environmental or economic (Gitz & Meybeck 2012; Fitton *et al*. 2019). The uncertainties inherent in weather, yields, prices, government policies, global markets and other factors that affect farming could cause wide swings in farm income (USDA 2020). According to Aroriode and Ogunbadejo (2014), farmers are closely monitoring changing weather patterns, farm programmes, prices, sales, etc. to reduce their exposure to uncertainty. However, many farmers are less familiar with the fact that government policy also can significantly affect their business operations. Although policymakers try to design policies to improve the national economy, these policies often have unintended and harmful effects on the agricultural economy (Aroriode & Ogunbadejo 2014). Changing economic policies affect national income, prices, interest rates and

exchange rates, all of which influence the agricultural economy. The capacity to implement policies is often weak, and this results in policy uncertainty (Adebayo *et al*. 2009).

Udah *et al*. (2015) analysed the contribution of some agricultural subsectors to growth in Nigerian agriculture. Among the facts in the results of the trend analysis are that some agricultural subsectors contributed to the dismal performance of the agricultural sector GDP in Nigeria. The result of the percentage analysis showed that the crop subsector contributed almost 86% to total agricultural GDP growth, reflecting a lopsided pattern of growth in the Nigerian economy, which advocated for a policy of fair distribution of resources toward the growth of the individual subsectors.

Despite great progress in agricultural productivity in the past half century, with crop and livestock productivity strongly driven by the increased use of fertilisers, irrigation water, agricultural machinery, pesticides and land, it would be over-optimistic to assume that these relationships will remain positive in the future. Agriculture contributes to the growth and development of an economy in four main ways – products, factors, markets and foreign exchange. West African agriculture is at a turning point after long periods of limited attention being paid to the sector. West African countries and their development partners recognised the sector's vital importance for broad-based growth, food security, nutrition and poverty reduction (Odior 2014.). This renewed attention being paid to agriculture has crystallised around the Comprehensive African Agriculture Development Programme (CAADP), which in West Africa is implemented by the Economic Community of West African States (ECOWAS) and its member states as part of the ECOWAS Regional Agricultural Policy (ECOWAP) (Hollinger & Staatz 2015).

According to Montes (2010), uncertainty is a feature of the real world that influences the decision-making process of economic agents and undermines the effectiveness of policy. Insufficient knowledge of the economic system could prevent policy actions from having the desired effects, while a poor understanding of the consequences of monetary policy would lead to misjudgement and increase the costs of achieving policy goals extremely (Ononugbo 2012). The inconsistencies in economic policy formulation and implementation, as well as the persistence of the influence of its uncertainties over time, are measured in the extent of the regression this economy has suffered in recent times. Economic policy uncertainty is responsible for the slow recovery from recession. This economic policy uncertainty may be seen in the ways government has unsuccessfully tried to fix the decline in economic growth and the follow-up consequences of government actions and, sometimes, inactions (Anueyiagu 2018). Economic policy uncertainty and its role in economic performance have been widely covered in recent years, following on the work of Bloom *et al*. (2007). The observed slow recovery of the economy can be attributed to heightened economic policy uncertainty.

There are many reasons why uncertainty could influence growth. One of the earliest papers in the economics literature pointed out that increases in uncertainty lead firms to defer investment, thereby creating short, sharp recessions (Bloom *et al*. 2007). Recently, Bloom (2014) has shown large uncertainty shocks that lead to sharp recessions as firms and consumers put spending plans on hold. This occurs because uncertainty makes firms more cautious about investing and hiring, and it makes it harder to raise finance (Scotti 2016). Banks are less willing to lend to firms in uncertain periods, squeezing the ability of companies to invest. Similar findings from empirical research include Bachman *et al*. (2013), with a review in Bloom (2014). In other, related, work, Brogaard and Detzel (2015) found that policy uncertainty reduces returns to assets.

There are an increasing number of studies relating economic uncertainty in general, and economic policy uncertainty in particular, to different macroeconomic outcomes. For instance, Baker *et al.* (2016) used probit regression forecasting models to assess the ability of economic policy uncertainty indexes to predict future US recessions. Chi and Li (2017) examined the effects of economic policy

uncertainty (EPU) on banks' credit risks and lending decisions. Anoruo *et al*. (2017) examined dynamic interactions between economic policy uncertainty and housing market returns for Japan. Dima *et al*. (2017) highlighted the importance of stable and effective economic policies from 1973 to 2014. Aye (2018) analysed the short-run effect of fiscal and monetary policy uncertainty on inequality in the US using quarterly time-series data from quarter 1 to quarter 4 in 1980. The focus of this study is to provide empirical evidence on the effect of economic policy (monetary, fiscal and trade) uncertainty on agricultural growth, in terms of which it hopes to make a contribution to the body of knowledge. To the best of our knowledge, no study has been previously done on topic.

1.1 Objective of the study

The broad objective of this study was to analyse the effects of economic policy uncertainty on agricultural growth. The specific objectives were to:

1. examine the long-run effect of economic policy (monetary, fiscal, trade and inflation) uncertainty on agricultural growth; and
2. determine the short-run effect of economic policy uncertainty on agricultural growth.

1.2 Statement of hypotheses

The following null hypotheses were formulated and tested:

Ho_1: Economic policy uncertainty has no significant effect on agricultural growth in the long run.
Ho_2: Economic policy uncertainty has no significant effect on agricultural growth in the short run.

1.3 Justification for the study

This study is essential because, if properly understood, economic policy uncertainty will go a long way to improve agricultural growth, particularly with the current state of uncertainty in the country. This research would contribute to the ongoing policy debate by identifying growth patterns in the Nigerian economy. The result of the short- and long-run effect of economic policy uncertainty on agricultural growth will assist policymakers in discovering how best their implementation practices can be effective to encourage agricultural growth in order to raise national incomes. Academically, this study will contribute to the existing body of knowledge, and thereby be useful to present and future scholars, researchers and students interested in the subject matter. The result will also give direction to policymakers in designing appropriate policy and ensuring proper implementation of agricultural programmes. It will also provide a useful guide to international and local agencies interested in policy implementation.

The rest of the paper is organised as follows: The data and empirical methods are discussed in Section 2, while Section 3 is devoted to the results and a discussion of them. Section 4 concludes the paper.

2. Methodology

2.1 Empirical models and relevant diagnostics

A preliminary analysis was conducted using descriptive statistics, such as mean and standard deviation, and unit root tests such as the augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests. The bounds test component of the autoregressive distributed lag (ARDL) model, and the error-correction model (ECM) part of the ARDL model, were used in analysing the objectives.

2.2 Data sources

Secondary data consisting of annual time series covering a period of 36 years (1981 to 2016) was used for the study. In particular, data on interest rates, exchange rates, government expenditure, the consumer price index (a measure of inflation), and agricultural GDP was obtained from the Central Bank of Nigeria and the World Development Indicators.

2.3 Measurement of variables

The ARDL representation of the economic relationship between the selected variables can be constructed as

$$\Delta Ln\ \ AGDP_t\ \ = a_1 + \sum_{i=1}^{n1} a_{2i}\,\Delta LnAGDP_{t-i} + \sum_{i=0}^{n2} a_{3i}\,\Delta LnMPU\ \ _{t-i} + \sum_{i=0}^{n3} a_{4i}\,\Delta LnTPU\ \ _{t-i} + \sum_{i=0}^{n4} a_{5i}\,\Delta LnFPU\ \ _{t-i} + \sum_{i=0}^{n5} a_{5i}\,\Delta LnCPI_{t-i}\ \ + \emptyset_i LnAGDP_{t-i} + \emptyset_2 LnMPU\ \ _{t-1} + \emptyset_3\ LnTPU\ \ _{t-1} + \emptyset_4 LnFPU\ \ _{t-1} + \emptyset_5 LnCPI_{t-1}\ \ + \in_t, \quad (1)$$

where
MPU = Monetary policy uncertainty derived from the conditional volatility of interest rates,
FPU = Fiscal policy uncertainty derived from the conditional volatility in government expenditure,
TPU = Trade policy uncertainty derived from the conditional volatility in exchange rates,
AGDP = Agricultural gross domestic product (in naira),
CPI = Consumer price index,
n1,…., n5 = is the number of the optimum lag order for each variable,
Ln = Natural logarithm and
$\in_t$ = the error term at time t.

The choice of economic policy variables whose volatilities are included in our model follows from previous literature cited in the introductory section and the availability of time-series data. Basically, most of the recent research on economic policy uncertainty is conceptualised on the basis of Baker *et al*.'s (2016) news-based economic policy uncertainty index. Their database comprises both aggregate and categorical economic policy uncertainty indexes, such as monetary, fiscal, trade, climate, regulatory, national security and healthcare policy uncertainties. However, their aggregate index data is available for only 28 countries, while the categorical indexes are constructed for only four countries – the USA, Japan, Greece and Korea. Hence, empirical studies on other countries such as Nigeria draw insights from Baker *et al*. (2016) and related studies.

2.4 Generalised autoregressive conditional heteroskedasticity (GARCH) model

The mean equation specification of a GARCH model for each of the three variables is as follows:

$$IR_t = a + a_1 IR_{t-1} + \mathcal{E}_t \quad (2)$$

$$GE_t = a + a_1 GE_{t-1} + \mathcal{E}_t \quad (3)$$

$$EX_t = a + a_1 EX_{t-1} + \mathcal{E}_t \quad (4)$$

The conditional variance equation in a general form is given as:

$$h_t^2 = \beta_0 + \beta_1 \mathcal{E}_{t-1}^2 + \beta_2 \mathcal{E}_{t-2}^2 + \beta_5 \mathcal{E}_{t-q}^2 + \emptyset_1 h_{t-1}^2 + \emptyset_2 h_{t-2}^2 + \cdots + \emptyset_p h_{t-p}^2, \quad (5)$$

where
IR = Interest rate (monthly money market weighted average interest rate in %),
GE = Government expenditure (in naira), and
EX = Exchange rate (official naira per dollar exchange rate).

2.5 The study area

The area of study is Nigeria. The country's coastal boundary is delimited by the Gulf of Guinea in the south, and the land boundary is shared by Cameroon and Chad in the east, Niger in the north and Benin in the west. The Atlantic Ocean forms the southern boundary. Nigeria comprises 36 states and the Federal Capital Territory, Abuja. Nigeria has been home to a number of kingdoms and tribal states over the millennia. The modern state originated from British colonial rule beginning in the 19th century, and took its present territorial shape with the merging of the Southern Nigeria Protectorate and the Northern Nigeria Protectorate in 1914. The British set up administrative and legal structures whilst practising indirect rule through traditional chiefdoms. Nigeria became a formally independent federation in 1960 (Wikipedia 2018).

3. Results and discussion

The mean of the variables used in the analysis, that is interest rate, exchange rate, government expenditure, consumer price index and agricultural GDP, shows their average values from 1981 to 2016. Looking at the standard deviations, the highest volatility during the period of study was exhibited by monetary policy uncertainty (MPU) (2.522), followed by the consumer price index (CPI) (1.968). The fiscal policy uncertainty (FPU) derived from the conditional volatility in government expenditure had the lowest volatility (0.179). There was no substantial gap between the maximum and minimum of variables such as AGDP and TPU, while there was a substantial gap between the maximum and minimum of CPI, MPU and FPU, which gives support to volatility. Regarding the results, AGDP (0.253), MPU (1.563), FPU-GE[1] (1.169) and TPU (1.429) are skewed to the right, while CPI (-0.447) is negatively skewed, which implies that the distribution has a long left tail and a deviation from normality. In addition, AGDP (1.551), and CPI (1.719) are platykurtic; in other words, their distribution is shorter and tails thinner than the normal distribution. This implies there is less data on the left tail relative to a normally distributed series. The reason for this is that the extreme values are less than those of the normal distribution, while MPU (4.179), FPU (3.483) and TPU (3.672) are leptokurtic, with longer distribution and fatter tails. Regarding the Jarque-Bera test for normality, it was consistent with the outcome provided by the statistics of both kurtosis and skewness. The Jarque-Bera probability values of AGDP (0.171) and CPI (0.160) are greater than 0.05, which shows normal distribution, while MPU (0.000466), FPU (0.0198) and TPU (0.00265) were non-normally distributed, with values less than 0.05 (see Table 1).

[1] Fiscal policy uncertainty derived from the conditional volatility in government expenditure.

Table 1: Descriptive statistics

	LAGDP	LCPI	MPU	FPU	TPU
Mean	8.661	2.671	2.759	0.225	0.228
Median	8.431	3.298	1.918	0.159	0.0887
Maximum	9.718	5.214	9.562	0.685	0.872
Minimum	7.742	-0.706	0.366	0.0239	0.0204
Standard deviation	0.665	1.968	2.522	0.179	0.259
Skewness	0.253	-0.447	1.563	1.169	1.430
Kurtosis	1.551	1.719	4.179	3.483	3.672
Jarque-Bera	3.537	3.659	15.342	7.840	11.868
Probability	0.171	0.160	0.000466	0.0198	0.00265

Source: Field survey

3.1 Unit root test

The results of the fiscal, trade and monetary policy uncertainty variables are shown by the unit root tests in Table 2. AGDP has a t-statistic of 0.228 and a p-value of 0.971 when the unit root is conducted in levels. Hence, the null hypothesis of no unit root cannot be rejected. However, at first difference it has a t-statistic of -5.722 and a p-value of 0.000, which lead to the rejection of the null hypothesis. This implies that AGDP has a unit root (not stationary) in level, but has no unit root (stationary) in its first difference. Therefore, AGDP is integrated of order 1 since it became stationary after differencing it once. Based on the ADF test, CPI, MPU, FPU and TPU have p-values of 0.562, 0.0565, 0.777 and 0.0748 respectively, implying that the null hypothesis can only be rejected for MPU and TPU. A similar analysis based on the PP unit root test, which has more power than the ADF, shows that only TPU is stationary, while the rest are non-stationary or have a unit root in level.

Table 2: Unit root tests

Variables	Levels				First difference			
	ADF test		PP test		ADF test		PP test	
	T-stat	P-value	T-stat	P-value	T-stat	P-value	T-stat	P-value
AGDP	0.228	0.971			-5.722	0.0000	-5.722	0.0000
CPI	-1.412	0.562	-1.548	0.498	-3.429	0.0170	2.724	0.0805
MPU	-2.899	0.0565	2.424	0.143	-3.968	0.0055	9.442	0.0000
FPU	-0.889	0.777	2.0803	0.254	-7.0929	0.0000	5.436	0.0001
TPU	-2.764	0.0748	-2.631	0.0974				

Source: Field survey

3.2 The long-run effect of economic policy uncertainty on agricultural growth

The results of the bounds test on the long-run effect of economic policy uncertainty on agricultural growth are summarised in Table 3. The calculated F-statistic (24.4) in the lower panel of Table 3 is greater than the critical value (5.532) for the upper bound, 1(1), at all the conventional levels of significance. This implies there is a long-run relationship or cointegration between economic policy uncertainty and agricultural growth. It also shows that the null hypothesis of no long-run relationship can be rejected, affirming a long-run relationship between economic policy uncertainty and agricultural growth. This is consistent with the findings of Aye *et al*. (2019), which shows that there is a long-run relationship between monetary, fiscal policy and economic activity. The finding also confirms that of Matthew and Mordecai (2016), who found that there is a significant long-run relationship between agricultural output, public agricultural expenditure and economic policy.

The upper panel of Table 3 presents the long-run coefficients of the economic policy uncertainty variables. The coefficients of MPU, FPU, TPU and CPI are -0.00445, -0.218, -0.507 and 0.284, with t-statistics of -0.334, -0.726, -2.727 and 12.578 respectively. Based on statistical significance only,

TPU and CPI have a significant long-run effect on agricultural growth. However, from an economic perspective, MPU, FPU and TPU have negative coefficients, which implies that an increase in monetary, fiscal and trade policy uncertainty decreases agricultural growth in the long run. On the other hand, CPI is positive, which implies that the effect of CPI on agricultural growth is positive; in other words, an increase in the general price level proxied on the consumer price index in this study may help to boost agricultural growth in the long run.

Table 3: Estimates of long-run effect of economic policy uncertainty on agricultural growth

Variables	Coefficient	Standard error	T-statistic	Probability
MPU	-0.00445	0.0133	-0.334	0.746
FPU	-0.218	0.310	-0.726	0.486
TPU	-0.507***	0.186	-2.727	0.0233
CPI	0.283***	0.0226	12.578	0.0000
C	8.598***	0.133	64.773	0.0000
F-bound test	**Null hypothesis: No levels relationship**			
Test statistic	**Value**	**Significance**	**1(0)**	**1(1)**
F-statistic	24.401***	10%	2.46	3.46
K	4	5%	2.947	4.088
		1%	4.093	5.532

*** indicates significance at the 1% level
Source: Field survey

3.3 The short-run effect of economic policy uncertainty on agricultural growth

Table 4 shows the short-run effect of economic policy uncertainty on agricultural growth. The estimated value of R-squared is 0.986 in the dynamics of the short-run relation, which demonstrates that about 99% of the variation in agricultural growth is accounted for by the independent variables included in the model. Importantly, the error correction coefficient in Table 4 carries the expected negative sign and is highly significant. This implies that the dynamics of the error correction model would force it back towards the long-run equilibrium. About 33% of the disequilibria could be restored in one period. The coefficient of the MPU is -0.00862 and it significance at 1%, with a t-statistic of -7.181. This implies that monetary policy uncertainty affects agricultural growth negatively in the short run. This result supports the findings of Wagan *et al*. (2018), who found that monetary policy has a significant negative effect on agricultural growth. Current FPU has a coefficient of -0.0376, a t-statistic of -0.805 and a p-value of 0.441, indicating that the current FPU has a negative but insignificant effect on agricultural growth in the short run. However, the effect at first lag is significant at 1%, with a coefficient of -0.108, a t-statistic of 2.848 and a p-value of 0.0192. This implies that fiscal policy uncertainty has a significant effect on agricultural growth in the short run, supporting the finding that the amount of tax imposed on agricultural exports has effects on growth in agriculture (Okoh 2015). TPU has a significant coefficient of-0.207, a t-statistic of -11.733 and a p-value of 0.0000. At first lag, the t-statistic is -7.648 and the p-value is 0.0000. The second lag has a coefficient of -0.033, a t-statistic of-2.228 and a p-value of 0.0529, while the third lag has a coefficient of 0.167, a t-statistic of 9.505 and a p-value of 0.0000. In general, uncertainty in trade policy had a negative effect of agricultural growth in the short run. While the findings of De Silva *et al*. (2014) show that trade openness increases agricultural production growth by eliminating major trade barriers exhibited in the economy, uncertainty about this may hamper agricultural growth, since investors may be reluctant to invest if the future of trade policy is bleak. Current CPI is not significant, with a t-statistic of -0.0591 and a p-value of 0.954, but it is significant at second and third lags, with a t-statistic of 5.241 and 7.882 and a p-value of 0.0005 and 0.0000 respectively. This implies that the trend of inflation has been significant in negatively influencing agricultural growth in the short run. This is in agreement with the findings of Oyinbo and Rekwot (2014).

Table 4: Estimates of the short-run effect of economic policy uncertainty on agricultural growth

Variable	Coefficient	Standard error	t-statistic	Probability
D(AGDP(-1))	-0.309***	0.0466	-6.640	0.0001
D(AGDP(-2))	-0.193***	0.0407	-4.740	0.0011
D(AGDP(-3))	0.258***	0.0450	5.721	0.0003
D(MPU)	-0.00862***	0.00120	-7.181	0.0001
D(FPU)	-0.0376	0.0467	-0.805	0.441
D(FPU(-1))	-0.108***	0.0380	-2.848	0.0192
D(TPU)	-0.207***	0.0176	-11.733	0.0000
D(TPU(-1))	-0.164***	0.0214	-7.648	0.0000
D(TPU(-2))	-0.0330**	0.0148	-2.228	0.0529
D(TPU(-3))	0.167	0.0176	9.505	0.0000
D(CPI)	-0.00213	0.0360	-0.0591	0.954
D(CPI(-1))	-0.0372	0.0453	-0.822	0.432
D(CPI(-2))	-0.204***	0.0389	-5.241	0.0005
D(CPI(-3))	-0.380***	0.0481	-7.882	0.0000
CointEq(-1)	-0.332	0.0220	-15.0910	0.0000
R-squared	0.986			
Adjusted R-squared	0.971			

** and *** indicate significance at the 5% and 1% level respectively
Source: Field survey

4. Conclusion

This study investigated the effect of economic policy uncertainty on agricultural growth in Nigeria. The data used are yearly time-series data covering the period 1981 to 2016. The bounds test and ECM regression provide evidence of a long- and short-run effect of economic policy uncertainty on agricultural growth. The long-run effect of MPU, FPU and TPU on agricultural growth is negative in the short run, and all the economic policy uncertainty variables exhibit a negative effect on agricultural growth. Agricultural growth plays a significant role in the national economy of Nigeria. Therefore, enhancing the growth of the sector will boost national development. The study concludes that this can be achieved by developing and implementing economic policies that create less uncertainty.

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