International Journal of Intellectual Discourse (IJID)
ISSN: 2636-4832 Volume 4, Issue 2. June, 2021

Impact of food production on food security in African countries

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Abstract
Using dynamic system GMM estimator, the study examines the impact of food production on food security in 34 African countries. It was obtained that food production do reduce food insecurity in the studied countries. Similarly, GDP per capita has been found to have a negative effect on food insecurity across the sample countries. By implication, governments should strive to subsidize farming activities across these countries in order to ensure the production of enough food for all. Interestingly, that would mean additional economic strength to the farmers that may translate into having more ability to access the additional required food nutrients for proper living.

Keywords: Africa, Food production Index, Prevalence of undernourishment

1. Introduction

Hunger and food supply deficit have remain one of the world problems that have been a top priority for the international community with the view to proffer a lasting solution to the problem (International Food Policy Research Institute, 2016). Undoubtedly, a remarkable progress though with variations across regions has been recorded within the recent years, nevertheless, hunger still remains a daily challenge for almost 795 million people globally, with Africa being on top of the list (Food and Agriculture Organization of the United Nations, 2018). Accordingly, the major proposed remedy to this problem for not only Africa but to the developing regions has been reforming the agricultural sector, which is aimed to bring massive increase in food production, particularly by small rural farmers (Toenniessen, et al., 2008). Nonetheless, through all these years, Africa achieved only minimal in terms of increasing its agricultural productivity when compared to other developing regions- this is clearly represented by the region`s annual food importation of about $25 billion (African Development Bank, 2019). Thus, the current research aims to examine the impact of food production on food security in the African region.

This paper is categorized into five sections. Section 1 provides the introduction of the study, whereas, section 2 presents the review of related previous studies. Section 3 describes the data and methods employed in analysing the data. In section 4, empirical findings were presented and discussed; and lastly, section 5 gives the conclusion of the main findings.

2. Literature Review

Despite the inclusion of a wide list of factors among the food security determinants during the World food summit of 1996, “food availability” being the oldest is still recognised as the most influential food security determinant, particularly for developing economies (Burchi and De Muro, 2016). From the perspective of this aproach, the most certain way to supress hunger and undernutrition is to ensure equilibrium between the population and the total food available (per capita). Accordingly, a significant number of studies pertaining to the effect of agricultural food production on nutrition could be found in Girard et al., (2012). In a

study by Conceicao et al., (2016), increasing agricultural yields was found to improve food security and as well advance human development in the developing region of Africa.

On the other hand, other determinants for food availability such as food price and gross domestic product per capita are important especially in the urban centre where markets are mostly relied upon for food supply (Burchi and De Muro, 2016). This has corroborated with studies who show a strong correlation between individual or household income level, food prices and the nature and quantity of food consumed (Cornia et al., 2012; Harttgen et al., 2015; Kargbo, 2005; Hadley et al., 2012; Crush et al., 2012). Specifically, Cornia et al., (2012) found that nutrition was partly linked to the volatile international food prices, and primarily to the long term impact of agricultural policies on food production and prices.

3. Methodology

3.1 Data

The sample consists of 34 African countries, with the data for the dependent variable was obtained from World Bank-World Development Indicators (WDI). Data for food production index (*fpi*) was sourced from the FAOSTAT database and the control variables comprise of, gross domestic product per capita (*gdpc*) and domestic food price indices (*dfpi*) all obtained from the World Bank. In general, the panel study is based on 9 years observations (2010-2019).

3.2 Food security model

In line with Dithmer & Abdulai (2017), food security is modelled in the following form:

$$FS_{i,t} = \alpha + \beta FS_{i,t-1} + \emptyset_1 fpi_{i,t} + \emptyset_2 gdpc_{i,t} + \emptyset_3 dfpi_{i,t} + +\eta_i + \mu_i + \varepsilon_{i,t} \quad (1)$$

subscripts *i* and *t* stands for country and time periods; whereas *FS* represents food security as captured by prevalence of undernourishment. The hypothesized variable in the study is the food production indicator, whereas, gross domestic product per capita (*gdpc*) and domestic food price indices (*dfpi*) are policy variables included due to their effect on the dependent variable. Lastly, η_i stands for the country specific effect that may mean the cultural or geographical characteristics unique to each of the countries, which are somewhat stable over time; μ_t denotes the time specific effects assumed to be common across all sample countries and $\varepsilon_{i,t}$ is the error term.

3.3 Estimation method

Considering the research objective, coupled with the nature of variables involved in the estimation, the generalized method of moment estimator (Arellano and Bover (1995); Blundell and Bond (1998) that control for endogeneity is employed. In line with Arellano and Bond (1991), the simultaneity bias in the equation could be corrected through transforming the equation into its first difference while using the lagged level of the regressors as instruments. But given that lagged levels have been shown to be weak instruments in the event where the regressors are quite persistence, Arellano and Bover (1995) and Blundell and Bond (1998) suggested system GMM in which both the level and difference equations are combined. In view of that, the system GMM estimator is found to be more efficient compared with the difference estimator, particularly when dealing with an unbalanced data, and or a small time period study.

The consistency of the GMM estimator hinges on Hansen/Sargan test for over-identifications and a serial correlation test in the disturbance terms. Once the instruments in the specified model are not correlated with the error terms, the null hypothesis of Hansen/Sargan is failed to be rejected, then the instruments are considered valid. On the serial correlation test, it is required that the null hypothesis signifying absence of the first order serial correlation (AR1) should be rejected, and

not the second order serial correlation (AR2). Giving it multiple advantages, the research has thus employed the system GMM to examine the impact food production on food security.

4. Results and Discussions

As already stated, the results from equation 1 are based on system GMM estimator (table 1) for the fact that the current research deals with a small sample size. Whereas to ensure the results are valid for making proper inferences, two post estimation tests were conducted on the estimated models where all of the instruments are found to be valid.

Given the results, the lagged dependent variable is positive and statistically significant at 1% level, indicating prevalence of undernourishment in the sample countries is persistent. The results for the hypothesised variable show log of food production (fpi) having a negative and statistically significant effect on the dependent variable. The coefficient of food production is 0.261, signifying a 1% increase in food production across the continent would reduce prevalence of undernourishment and hence improve food security by about 26.1%.

One of the policy variables included is GDP per capita (lgdpc) representing the determinant of economic access to food (Dithmer & Abdulai, 2017). Based on the results, lgdpc is found to have a negative and significant coefficient, implying that food security could be improved with increase in the income of the people. Surprisingly, for the coefficient of domestic food price, it does not appear to be significant in affecting the dependent variable

Table 1: Impact of Food production on food security in African countries

Regressors	Difference GMM	System GMM
	Column (1)	Column (2)
lpu_{it-1}	0.7230***	0.861***
	(0.0331)	(0.013)
Food production index (fpi)	-0.193***	-0.261***
	(0.0001)	(0.0001)
Control Variables		
Domestic food price (dfpi)	0.0003	0.0065
	(0.0001)	(0.0041)
Log of GDP per capita (lgdpc)	-0.130*	0.111**
	(0.0799)	(0.031)
Constant	2.8053**	0.393
	(1.1859)	(0.337)
Observations	221	241
Diagnostic tests		
Number of instruments	16	19
Number of groups	34	34
AR(2) p-value	0.4301	0.3622
Sargan p-value	0.6201	0.7101

Notes: * (**) *** indicates significance at the 10%, 5% and 1% levels, respectively.
The figures in parentheses are the standard errors.

5. Conclusion and Recommendations

Using the system GMM estimator, this paper has examined the impact of food production on food security of African countries. Remarkably, the models have all passed the required diagnostic test conducted on them. Going by the results obtained, the hypothesized variable of food production is found to have a negative and significant coefficient thereby improving food security through combating the problem of under-nutrition in the region.

By implication, with the hypothesized variable having a positive effect on food security, governments should strive to subsidize and support farming activities to ensure the production of enough food for all.

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