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The Impact of Food Aid and Governance on Food and Nutrition Security in Sub-Saharan Africa

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Abstract: The paper focuses on the impact of food aid and governance quality (the latter disaggregated in different components) on both food and nutrition security in the SSA region and for a sample of 25 countries over the period 1996 to 2018. The main novelty and contribution of the paper in the relevant literature is by providing macro-level evidence in the SSA region to complement country-specific evidence in this research area. We also use different food and nutrition security outcome measures, which include the average value of food production, average dietary energy supply adequacy, and prevalence of undernourishment. Furthermore, we combine the above with the use of both aggregated and disaggregated governance indicators to examine the impact of governance quality on the outcome variables. We find evidence of a robust relationship between food aid, governance quality, and food and nutrition security outcomes by employing the GMM estimator. We also find that food aid increases food and nutrition security while it reduces undernourishment. Among the various governance quality indicators we have employed, the control of corruption and political stability show a significant relationship with the measured outcomes. However, the composite governance index and food aid jointly have no significant effect on food security, but they significantly increase nutrition security and reduce undernourishment across the various empirical models we have employed in our empirical analysis. An important policy lesson emanating from our empirical findings is that controlling corruption and maintaining political stability may have significant implications for enhancing the impact of food aid on food and nutrition security in the region.

Keywords: food aid; food security; nutrition security; governance indicators; GMM estimation; SSA

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1. Introduction and Background

Food aid has long been targeted to help countries in the developing world to achieve adequate levels of food and nutrition security, especially for the poorest and most vulnerable. In recent years, food aid has been more development-oriented as it is now channeled through different interventions for targeted groups in specific contexts for social protection, poverty alleviation, disaster prevention, and relief food distribution. Examples of food aid interventions in cash or in-kind over the past two decades are the distribution of free food as relief in crises [1,2] or free food in schools to pupils [3,4], food for work in the agricultural sector [5], and complementary intervention such as behaviour change communication in nutrition and health [6].

However, the food and nutritional impacts of food aid to the developing world, particularly in the sub-Saharan Africa (SSA) region, remain debatable among researchers [7]. Yet, food aid is even now indispensable in this region of the world. This is because many countries in SSA, a region where 53% of the population still derive their livelihoods only from agriculture [8], are home to a larger proportion of the world's poor and hungry people, a significant number of which are in a dire humanitarian crisis caused by floods, droughts, and conflicts events. In recent years, the increased vulnerability of the region's agricultural

production to climate change and protracted conflict continues to result in poor agricultural harvests, decreased livestock production, and high food prices, affecting the food access and availability of many households [9].

Furthermore, the SSA region is largely characterised by a growing population, combined with a reduced institutional capacity, limited provision of services for the population and limited ability to manage or mitigate social, economic, political, and environmental risks [10], thus undermining the region's efforts to achieve an optimal level of food and nutrition security [11,12]. These features have made the statistics for the SSA region's food security and nutrition indicators in the past few years worse globally. For example, the prevalence of undernourishment in the region was 24.1% in 2020, the highest globally and doubled the rest of the world average [13]. Moreover, as of 2019, about 60% of the workforce across the world living in poverty is in SSA [14]. Finally, 87% of the world's poorest are expected to live in the SSA region by 2030 [15].

Given the present reality in SSA, food aid continues to be a critical part of the development assistance to the region, notwithstanding the criticisms it has received [16,17]. While the narrative of a negative long-term effect of food aid (mainly via a system of dependency) is shared by some authors [5,18], a significant number of studies have refuted the evidence by examining the specific context of food aid supply and its implementation [19,20]. For example, an important context in evaluating aid and other capital flows effectiveness on food and nutrition security in SSA is the quality of governance in recipient countries.

Empirical evidence shows substantial variations regarding the impact on food and nutrition security depending on the type of capital flows and the different components of governance quality indicators, thus suggesting the need to delve deeper into the channels through which foreign aid and other capital flows may impact food and nutrition security and the way governance quality may affect the final outcome [21–23]. Dhahri and Omri [24] examined the impact of foreign direct investment and foreign aid in 16 SSA countries on food security and poverty reduction to show that while FDI has a positive impact on food security and poverty reduction, only specific types of foreign aid have positive impacts on food security. However, they also found that the joint effect of FDI and foreign aid had a stronger impact on food security and poverty reduction. Focusing on Nigeria, Ogunniyi and Igberi [25] employed an ordinary least square estimator to show that FDI has no impact on real per capita income, which is a proxy for economic access to food. In another study by Gyimah-Brempong and Gentry [26], aggregate foreign aid and the components of aid to the agricultural sector were found to have a positive effect on food security. However, the interaction between foreign aid and governance results in a negative statistically significant effect on food security, suggesting that foreign aid may improve food security only in countries with good governance quality. We would like also to mention that it is clearly beyond the scope of this paper to discuss here the voluminous aid effectiveness literature in aid-recipient countries. A detailed discussion is provided by Cassen [27], White [28], Arvin [29], Riddell [30], Lahiri [31], Dalgaard et al. [32], Addison et al. [33], Cassimon and Van Campenhout [34], Baliamoune-Lutz and Mavrotas [35], Doucouliagos and Paldam [36], Fielding and Mavrotas [37], Guillaumont and Chauvet [38], Mavrotas and Nunnenkamp [39], Clemens et al. [40], Mavrotas [41–44], Mavrotas and Ouattara [45], and Agenor and Aizenman [46], among others.

Food aid effectiveness, in particular, is more conditioned on the good quality of governance [47], especially in countries that have good control of corruption and those with institutional capacity to implement development projects [21,22,48–50]. According to Mary et al. [20], food aid mismanagement is more likely to prevail in developing countries where corruption is rampant, and there is a lack of strong institutions. In particular, evidence has shown that food aid interventions are rife with risks for corruption and may reduce their effectiveness on the targeted beneficiaries [51]. Zúñiga and Mullard [52] also show that the effect of the Structural Adjustment Programs (SAPs) implemented by most African countries to improve food security and nutrition in SSA was stalled by issues surrounding poor governance, as corruption, political rent-seeking and inefficiencies tended

to thrive in privatisation processes. Callaghy [53], and Martinez and Kukutschka [54] have also shown how government officials co-opted foreign aid for personal purposes in developing countries. Thus, understanding food aid effectiveness in the context of quality of governance in recipient countries may provide further insights into the mediating role of governance quality in the overall nexus between food aid and food and nutrition security in SSA [55]. This is an area that has surprisingly not received the attention it deserves in the relevant literature and where the present paper will try to make some significant contributions.

Against this background, in the present paper, we examine the impact of food aid and governance quality, the latter disaggregated in different components, on both food and nutrition security in the SSA region and for a sample of 25 countries from 1996 to 2018. Three years (see 1997, 1999, and 2001) were excluded from the analysis due to unavailable data. The paper contributes to the relevant literature on the subject in a number of ways. Firstly, we employ dynamic panel data modelling in the empirical analysis, which is appropriate for estimating policy reforms that have long-term effects. The paper also deviates from previous studies in some key aspects. The first relates to the use of macro-level evidence in SSA to complement country-specific evidence in the literature [5,56]. The second is the use of different food and nutrition security outcome measures, which include the average value of food production (AVFP), average dietary energy supply adequacy (ADESA), and prevalence of undernourishment. Lastly, we combine the above with the use of both aggregated and disaggregated governance indicators following some very recent research work in this area [21–23].

We provide evidence of a robust relationship between food aid, governance quality, and food and nutrition security outcomes by employing the dynamic generalised method of moments (GMM) estimator. In particular, we find that food aid increases AVFP and ADESA while it reduces undernourishment. Among the governance quality indicators we have employed, the control of corruption and political stability show a significant relationship with the measured outcomes. However, the composite governance index and food aid jointly have no significant effect on AVFP, but they significantly increase ADESA and reduce undernourishment across the empirical models we have employed. In the remainder of this paper, we present the data and descriptive statistics in Section 2, and we discuss the empirical strategy employed in Section 3. Section 4 reports and discusses empirical findings, and we conclude the paper and draw some emanating implications for policy in Section 5.

2. Data and Descriptive Statistics

2.1. Data

This paper employs data from a sample of 25 SSA countries over the period 1996 to 2018 from four primary sources: the Food and Agriculture Organization Corporate Statistical Database (FAOSTAT), the Worldwide Governance Indicators (WGI), the Organization for Economic Cooperation and Development (OECD), and the World Development Indicators (WDI). The selection of countries was based on data availability for the years covered. We extract variables for analysis from these datasets as guided by the previous literature focusing on similar objectives. Table 1 provides information on data sources and the summary statistics of variables used in the empirical analysis, while the countries selected are listed in the table footnote. See also Table A2 in Appendix A for further details.

Table 1. Data sources and summary statistics of variables used in the empirical analysis.

Variable	Description	Source	Mean	Std. Dev.
Outcomes				
AVFP	Average value of food production (constant USD 1 per person) (Three-year average)	FAOSTAT	165.1	57.66

Table 1. *Cont.*

Variable	Description	Source	Mean	Std. Dev.
ADESA	Average dietary energy supply adequacy (%) (Three-year average)	FAOSTAT	106.74	12.40
Undernourishment	Prevalence of undernourishment (per cent) (Three-year average)	FAOSTAT	22.66	13.02
Determinants				
Development Food Aid (DFA)	Development food aid (Constant USD 2015)	OECD	18.76	38.98
Control of corruption score	Control of corruption score	WGI	−0.39	0.62
Government effectiveness score	Government Effectiveness score	WGI	−0.52	0.60
Political stability score	Political Stability score	WGI	−0.34	0.86
Rule of law score	Rule of law score	WGI	−0.42	0.62
Voice and accountability score	Voice and Accountability score	WGI	−0.33	0.70
Regulatory quality score	Regulatory quality score	WGI	−0.41	0.53
Composite governance index (CGI)	Composite value of governance indicators	Authors	1.13e–09	2.21
DFA × CGI	Interaction of logged composite governance indicator and logged development food aid	Authors	3.43	8.52
Share of agriculture in GDP	Agriculture, forestry, and fishing, value added (% of GDP)	WDI	22.41	14.85
Population growth	Percentage of population growth (annual %)	WDI	2.33	.99
Inflation	Consumer price index (annual %) as a proxy for inflation	WDI	7.17	12.65
Secondary school enrollment	Secondary school enrollment (% of gross)	WDI	43.56	25.21

Note: Countries included in the analysis are Angola, Botswana, Burkina Faso, Cape Verde, Central Africa Republic, Côte d'Ivoire, Ethiopia, Gabon, Ghana, Lesotho, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Togo, and Uganda.

2.2. Variables Measurement

We extract from the datasets indicators for measuring food and nutrition security using the average value of food production (AVFP) as a measure of food security, and average dietary energy supply adequacy (ADESA) and prevalence of undernourishment in a population as a measure of nutrition security. These variables are already in aggregated form and are used as obtained from FAOSTAT. The first indicator is a good measure of food availability of a country and shows the net food production value of a country. The other two indicators respectively measure the adequacy of the food supply in terms of calories or the ratio between the average caloric supply and the population's actual needs and measure hunger in a population; that is, those whose caloric intake is insufficient. Analysing the average dietary energy supply adequacy together with the prevalence of undernourishment allows for a better understanding of whether undernourishment is mainly due to insufficient food supply or to any distortion in food distribution [57]. Undernourishment is a lead indicator for measuring hunger for international hunger targets such as the SDG-2 and a good measure for food access component of food security at the macro level [58].

In this paper, we use food aid disbursements, representing grants and concessional loans that conform to Official Development Assistance (ODA) as provided on the OECD website. Following the OECD definition, food aid can be categorised into programme food aid, which is supplied as a resource transfer providing balance of payment or budgetary support to recipient countries; project food aid, disbursed to support specific activities geared towards alleviating poverty and preventing disasters for certain beneficiary groups and in specific locations; and relief food aid, which is free food distribution to victims of natural or man-made disasters. It can also be defined by modes of supply which comprises direct transfers, including all "food aid originating from a donor country, food aid purchases or exchanges in one developing country for use as food aid in another country, and local

purchases, procured in a country and used as food aid in the same country" [59]. By this definition, food aid is seen to address specific aspects of food security (particularly food access), social protection, or poverty alleviation programmes.

We use a set of indicators of governance from the WGI database. The WGI comprises six dimensions of governance: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, the rule of law, and control of corruption for over 200 countries and territories since 1996 [60]. These dimensions capture key aspects of governance quality, including the political, economic, and legal aspects. However, given the possible correlation between the six governance indicators and multicollinearity in an empirical model, we compute a composite governance index (CGI) from the six governance indicators using a principal component analysis approach. We use three variables to capture a country's economic and demographic characteristics, which include the share of agriculture in GDP, population growth, and human capital formation, while the consumer price index-CPI (inflation) is used to capture the effect of a country's macroeconomic policies.

These variables were used as contained in the WDI database. The share of agriculture in GDP is measured from the contributions of agriculture, including crops and livestock, forestry, and fishing. When the contributions are driven by innovation and technological progress, they have the capacity to boost household food security, increase aggregate food supply and drive economic growth in the SSA region [61]. Furthermore, the annual population growth rate is employed to account for the demographic change in SSA, which is on the increase in recent years and at a faster pace than the aggregate food supply [62], thus exerting demographic pressure on the economy as food needs increase, and per capita food availability decreases. We proxy human capital formation by using enrolment in secondary schools [63]. The inflation rate measures macroeconomic stability, and high inflation is associated with bad macroeconomic policies [64]. While domestic stabilisation policies that create an economically stable environment tend to have welfare-enhancing effects, macroeconomic instability is found to increase poverty with undesirable effects on food security [65].

2.3. Bivariate Relationship between Food Aid, Governance, and Food and Nutrition Security Outcome Variables

In Figure 1, we observe a negative linear relationship between the value of food production and food aid and a rather similar relationship between food aid-governance interaction and the value of food production. Similarly, Figure 2 shows that food aid is inversely related to dietary energy supply adequacy and directly related to undernourishment, as shown in Figure 3. However, the food aid interaction with the composite governance index reverses the direction (Figures 2 and 3). The relationships observed here are correlational and suggest that food aid is channeled to countries that are more food and nutritional insecurity. This is not unusual, as development donors often disburse more food aid to poor countries and those with significant food and nutrition challenges [66]. For example, Mary et al. [20] show that countries that received less aid between 2004 and 2006 had, on average, a lower prevalence of undernourishment. At the same time, we also see that countries with good quality governance are those with improved food security indicators. These preliminary findings suggest that good governance indicators in aid-recipient countries may be a strong complement to food aid effectiveness on food security outcomes. See also Table A1 in Appendix A for further details about the correlation matrix between the dependent and the explanatory variables.

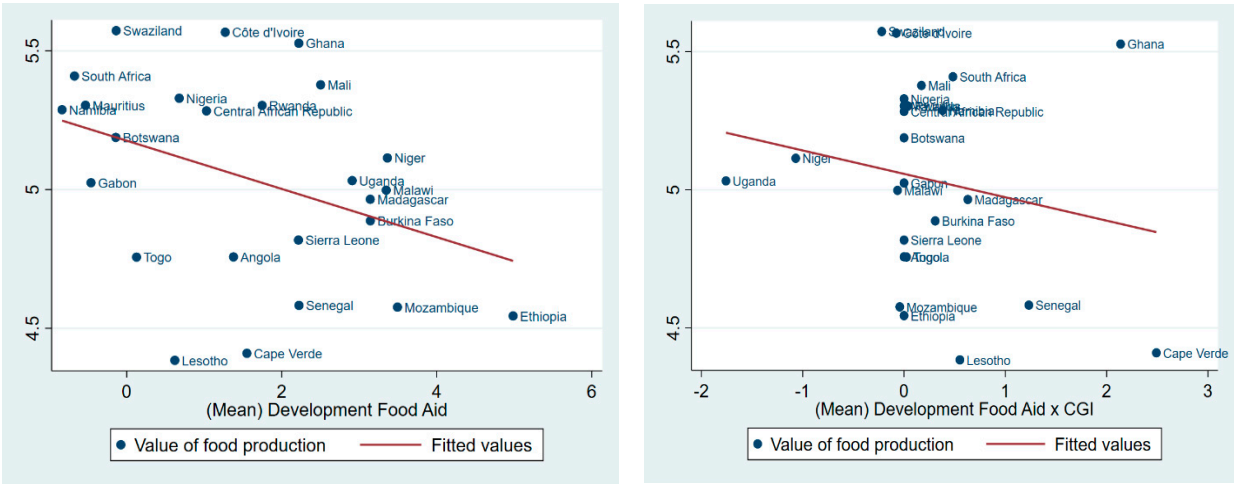

Figure 1. Bivariate relationship between food aid, governance, and food security (AVFP) in SSA (1996 to 2018).

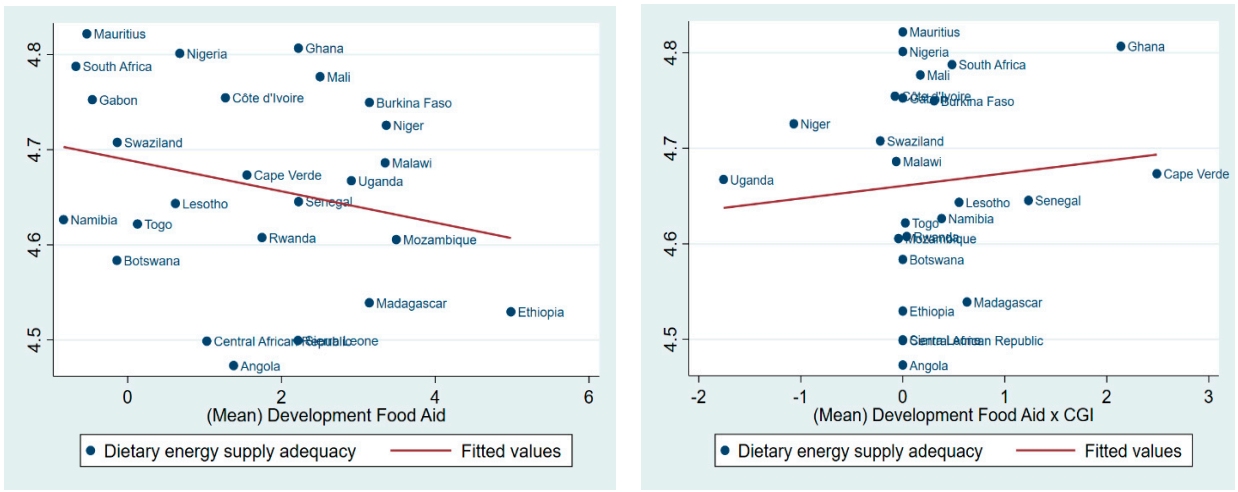

Figure 2. Bivariate relationship between food aid, governance, and nutrition security (ADESA) in SSA (1996 to 2018).

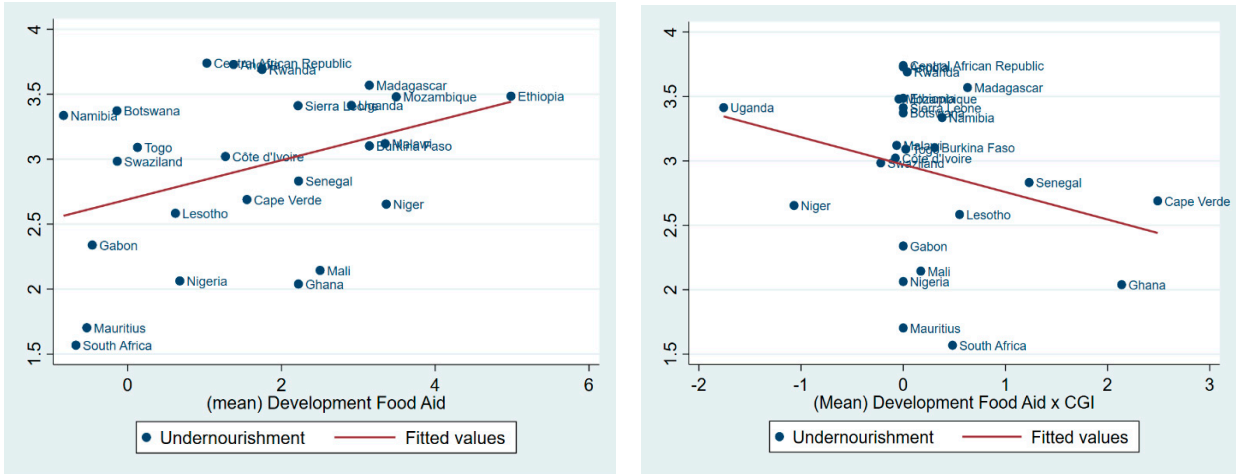

Figure 3. Bivariate relationship between food aid, governance, and nutrition security (undernourishment) in SSA (1996 to 2018).

At the same time, some studies have found that food aid may reduce local food production [5]. The possible reason for this effect is explained in the seminal study by [17], which shows that food supply from food aid may inversely affect local producer prices, which could be a disincentive for local agricultural production. Furthermore, following some arguments in the literature that have conceptualised food insecurity as aid dependency, it has been argued that food aid may negatively affect some food commodities and dietary diversity [67]. Although these may be true in some situations, most of these findings have been suggested to be misleading as they appear to result from failure to adequately control for endogeneity associated with targeting-related placement effects [16]. In view of this, in this paper, we provide further evidence of the relationship between food aid and our food and nutrition security outcomes in our empirical results by specifically addressing endogeneity issues in identifying causal relationships.

3. Empirical Strategy

As hinted previously in the bivariate analysis, food aid is high in countries with low food and nutrition security, which does not necessarily mean that food aid results in food and nutrition insecurity. However, donors may also want to disburse food aid to countries that have improved food security and nutrition in a bid to achieve a zero-hunger level, thus resulting in more aid correlating with, and not necessarily causing, reduced food and nutrition security levels. Similarly, food and nutrition insecurity can result in bad governance, just as the reverse is possible [68,69]. This is because poor and hungry people lack the incentive to obey law and order and have limited capacity to contribute productively to the economy, thus undermining government effectiveness [70]. Moreover, in the long-run, malnutrition in children reduces cognitive development and low economic productivity later in life [71] and weakens government institutions. At the same time, corruption, political instability and violent crime are also associated with hunger and food and nutrition insecurity [72].

The above scenarios complicate identifying causal effects in the relationship between development food aid, governance quality, and food and nutrition security. We identify unobserved confounders and reverse causality or simultaneity as threats to identification in our model, and at the same time, we cannot also rule out the possibility of measurement errors in the explanatory variables. In order to properly address these estimation challenges, we employ a dynamic estimation approach to account for time-invariant and time-varying omitted variables and potential endogeneity associated with food aid and governance quality in the model using a two-step Generalised Method of Moments (GMM) estimator. This approach is most suitable due to the fact that the running of economic processes is dynamic in nature when considering policy reforms with potential long-term effects beyond the present time into the future. Thus, there has been a preference for applying a dynamic approach over a static model in similar studies [21,23]. With this understanding, food and nutrition security are modelled as a function of past food security and nutrition security levels and present factors, with the lagged dependent variable controlling for the long-run effect of all covariates [73]. Against this background, we specify the dynamic equation as follows:

$$Y_{it} = \delta Y_{it-1} + \beta A_{it} + \rho G_{it} + \varphi X_{it} + \sigma_i + \vartheta_t + \mu_{it} \quad (1)$$

where Y_{it} denotes the food nutrition and security outcomes of country i at time t, whereas δY_{it-1} represents the outcome variables lagged at one year. A_{it} is food aid, whereas G_{it} is the composite governance indicator and is measured as the first principal component of indicators of governance quality indicators, including control of corruption, government effectiveness, political stability, rule of law, voice and accountability, and regulatory quality [74]. As previously discussed, we treat governance quality and food aid as endogenous for the possibility of reverse causality or simultaneity. Also contained in vector X_{it} are some control variables that are also expected to determine the food and nutrition security of a country. σ_i are the unobserved country-specific effects, that is, factors that

do not change with time, whereas ϑ_t denotes the time-specific effect, which accounts for shocks that do not vary among countries, and μ_{it} is the error term. The subscripts i and t, respectively, represent the country and time periods, whereas δ, β, ρ, and φ are the estimated parameters.

It is important to note that including a lagged dependent variable in Equation (1) presents some challenges. In particular, there may be a serial correlation between the time-invariant unobserved heterogeneity and the independent variables. At the same time, as the dependent variables and the lagged dependent variable are a function of unobserved heterogeneity, they may correlate with the error terms, increasing an upward bias of the OLS estimation [75]. Similarly, Nickell [76] has also argued the correlation between the lagged dependent variable and the error term also makes the fixed effects approach inconsistent. Demeaning the data approach is also not efficient because the lags of the explanatory variable would still be correlated with the demeaned variable. However, using forward orthogonal deviations [77] or first differencing the data [78–80] have been more efficient methods used to remove the time-invariant term and the unobserved heterogeneity. We employ the latter following some previous but very recent studies [21,23]. Thus, we rewrite Equation (1) in Equation (2) below as follows:

$$Y_{it} - Y_{i,t-1} = \delta(Y_{i,t-1} - Y_{i,t-2}) + \beta(B_{it} - B_{i,t-1}) + (\vartheta_t - \vartheta_{t-1}) + \left(\mu_{it\,it} - \mu_{it\,i,t-1}\right) \quad (2)$$

where B_{it} includes G_{it}, A_{it} and X_{it}, and given that the error term of Equation (2) $\left(\mu_{it\,it} - \mu_{it\,i,t-1}\right)$ is now correlated with the lagged dependent variable $(Y_{i,t-1} - Y_{i,t-2})$, instruments are required to address this problem. The instruments employ the panel nature of the data, which consists of previous observations of the lagged dependent variable. Using this procedure, we account for potential endogeneity of other explanatory variables G_{it}, A_{it} and X_{it}. Given the assumptions that our error term is not serially correlated and our explanatory variables are weakly exogenous, we use the lagged levels of the explanatory variables as instruments in our specification [81]. According to Arellano and Bond [80], the differencing approach, alongside using the level of past values as instruments, is referred to as the Difference-Generalised Method of Moments (DGMM) estimator. However, this approach also has its own shortcomings. First, information related to the long-run relationship between the explanatory variables and the dependent variable can be lost by taking the first differences. Second, the lagged levels are shown to be weak instruments for first differences if the series is very persistent [82]. This may affect the asymptotic and small-sample performance of the DGMM estimator [83].

To increase the efficiency of the DGMM estimator, Arellano and Bover [77] suggest adding the original equation in levels to the system and referred to as the System-Generalised Method of Moments (SGMM) estimator. Hence, we use the two-step SGMM estimator featuring Windmeijer's [84] finite-sample correlation for standard errors. The two-step SGMM estimator employs an optimal weighting matrix for the moment conditions. To satisfy the consistency of the GMM estimator, we use the Arellano-Bond AR (1) and AR (2) tests of the serial correlation properties and the Hansen [85] J-test of over-identifying restrictions. By using this, we validate the assumption that lagged values of the explanatory variables are valid instruments.

4. Results and Discussion

In this section, we present the results of the estimates of the model specification captured in Equation (2). Table 2 contains the results of food security outcome, measured as average value of food production, whereas the results of nutrition security are presented in Table 3, measured as average dietary energy supply adequacy (Part A), and as undernourishment (Part B). The estimates in models 1 and 4 contain the six components of governance quality index, whereas the composite governance index is captured in models 2 and 5. The estimates for the interaction term of food aid and composite governance index are provided in models 3 and 6. All the models contain the same control variables, and their effects are

reported along with the effect of the main explanatory variables. We compare the results of the DGMM estimator (see models 1 to 3) with the results of the SGMM estimator (see models 4 to 6) to test the model efficiency, although reporting the results of the SGMM estimator shows more robustness as described in our empirical strategy.

Table 2. Results of the impact of food aid and governance quality on food security (AVFP).

	Average Value of Food Production (AVFP)					
	Difference GMM			**System GMM**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Development food aid (DFA)	0.038 **	0.041 ***		0.050 ***	0.051 ***	
	(0.016)	(0.016)		(0.016)	(0.016)	
Composite governance index (CGI)		1.412 **			−0.612	
		(0.574)			(0.468)	
CDI × DFA			−0.052			−0.005
			(0.050)			(0.053)
Voice and accountability score	−0.763			0.278		
	(0.556)			(0.463)		
Political stability score	0.076			−0.115		
	(0.468)			(0.495)		
Government effectiveness score	0.150			0.102		
	(0.337)			(0.357)		
Regulatory quality score	0.431			0.313		
	(0.300)			(0.313)		
Rule of law score	−0.215			−0.766		
	(0.472)			(0.488)		
Control of corruption score	8.734 ***			1.118		
	(2.707)			(2.477)		
Inflation	1.630	1.690	1.160	−3.988 ***	−4.089 ***	−3.796 ***
	(1.448)	(1.415)	(1.414)	(1.375)	(1.310)	(1.327)
Share of agriculture in GDP	−0.035	0.031	0.091	−0.076	−0.136	−0.116
	(0.297)	(0.292)	(0.293)	(0.313)	(0.307)	(0.306)
Secondary school enrollment	−3.032	−1.900	−1.285	8.764 ***	8.556 ***	9.386 ***
	(2.641)	(2.594)	(2.593)	(2.352)	(2.325)	(2.299)
Population growth	1.047	1.182	0.966	1.877 *	1.289	2.342 **
	(1.175)	(1.163)	(1.140)	(1.074)	(1.096)	(1.018)
Constant	32.216 ***	31.783 ***	31.786 ***	6.086	9.026	4.140
	(7.108)	(6.879)	(6.917)	(6.957)	(6.824)	(6.664)
Lagged dep. Variable(t-1)	0.756 ***	0.767 ***	0.783 ***	0.959 ***	0.959 ***	0.964 ***
	(0.026)	(0.026)	(0.025)	(0.017)	(0.017)	(0.016)
Observations	375	375	375	400	400	400
Number of countries	25	25	25	25	25	25
AR (1) *p-values*	0.000 ***	0.001 ***	0.001 ***	0.000 ***	0.000 ***	0.000 ***
AR (2) *p-values*	0.180	0.247	0.210	0.180	0.660	0.641
Hansen test *p-values*	0.730	0.622	0.621	0.742	0.504	0.854

Note: Values in parentheses are standard errors of the estimates. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ represent significance at 1%, 5%, and 10% level respectively. All models include time and country fixed effects.

Table 3. (**Part A**) Results of the impact of food aid and governance quality on nutrition security (ADESA); **(Part B)** Results of the impact of food aid and governance quality on nutrition security (undernourishment).

(Part A)						
	Average dietary energy supply adequacy (ADESA)					
	Difference GMM			**System GMM**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Development food aid (DFA)	0.006	0.007 *		0.015 ***	0.018 ***	
	(0.004)	(0.004)		(0.004)	(0.004)	
Composite governance index (CGI)		0.677 ***			0.812 ***	
		(0.145)			(0.119)	
CDI × DFA			0 *			0.025 *
			(0.013)			(0.013)
Voice and accountability score	−0.137			−0.082		
	(0.114)			(0.119)		
Political stability score	0.406 ***			0.618 ***		
	(0.126)			(0.130)		
Government effectiveness score	0.095			0.155 *		
	(0.084)			(0.091)		
Regulatory quality score	0.041			−0.113		
	(0.078)			(0.083)		
Rule of law score	−0.404 ***			−0.693 ***		
	(0.122)			(0.131)		
Control of corruption score	3.419 ***			2.266 ***		
	(0.695)			(0.641)		
Inflation	−1.517 ***	−1.747 ***	−1.510 ***	−3.066 ***	−3.363 ***	−2.998 ***
	(0.366)	(0.350)	(0.359)	(0.308)	(0.289)	(0.296)
Share of agriculture in GDP	−0.054	−0.032	−0.060	−0.188 **	−0.135 *	−0.182 **
	(0.076)	(0.075)	(0.076)	(0.081)	(0.079)	(0.079)
Secondary school enrollment	−0.704	−0.696	−0.952 *	4.390 ***	4.323 ***	4.175 ***
	(0.539)	(0.530)	(0.534)	(0.463)	(0.444)	(0.442)
Population growth	0.621 **	0.795 ***	0.830 ***	−0.165	0.388	0.011
	(0.299)	(0.291)	(0.295)	(0.281)	(0.275)	(0.260)
Constant	13.925 ***	14.056 ***	12.392 ***	4.477 ***	6.438 ***	2.802 *
	(1.822)	(1.791)	(1.791)	(1.697)	(1.657)	(1.595)
Lagged dep. Variable(t-1)	0.903 ***	0.918 ***	0.928 ***	1.014 ***	1.002 ***	1.038 ***
	(0.018)	(0.018)	(0.018)	(0.015)	(0.015)	(0.014)
Observations	375	375	375	400	400	400
Number of countries	25	25	25	25	25	25
AR (1) *p-values*	0.001 ***	0.003 ***	0.001 ***	0.001 ***	0.002 ***	0.002 ***
AR (2) *p-values*	0.201	0.163	0.166	0.475	0.472	0.458
Hansen test *p-values*	0.577	0.564	0.557	0.547	0.554	0.607
(Part B)						
	Undernourishment					
	Difference GMM			**System GMM**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Development food aid (DFA)	−0.001	−0.001		−0.011 ***	−0.013 ***	
	(0.004)	(0.004)		(0.004)	(0.004)	

Table 3. *Cont.*

	(Part A)					
	Average dietary energy supply adequacy (ADESA)					
	Difference GMM			**System GMM**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Composite governance index (CGI)		−0.337			−0.900 ***	
		(0.205)			(0.158)	
CDI × DFA			−0.004			−0.033 **
			(0.016)			(0.016)
Voice and accountability score	−0.000			−0.104		
	(0.135)			(0.135)		
Political stability score	−0.344 **			−0.442 ***		
	(0.142)			(0.142)		
Government effectiveness score	−0.113			−0.042		
	(0.109)			(0.109)		
Regulatory quality score	0.137			0.167 *		
	(0.093)			(0.092)		
Rule of law score	0.219			0.219		
	(0.150)			(0.146)		
Control of corruption score	−1.168			−3.283 ***		
	(0.856)			(0.773)		
Inflation	2.510 ***	2.671 ***	2.567 ***	2.737 ***	3.092 ***	2.388 ***
	(0.465)	(0.454)	(0.452)	(0.424)	(0.420)	(0.406)
Share of agriculture in GDP	−0.156	−0.160	−0.150	0.240 **	0.265 ***	0.236 **
	(0.095)	(0.094)	(0.094)	(0.094)	(0.092)	(0.092)
Secondary school enrollment	−5.176 ***	−4.647 ***	−5.004 ***	−6.576 ***	−6.265 ***	−6.992 ***
	(0.848)	(0.835)	(0.799)	(0.511)	(0.513)	(0.484)
Population growth	−0.472	−0.544	−0.545	0.782 **	0.490	1.116 ***
	(0.353)	(0.347)	(0.348)	(0.308)	(0.310)	(0.287)
Constant	−1.807	−3.354	−2.718	−4.064 *	−6.127 ***	−5.439 **
	(2.431)	(2.438)	(2.401)	(2.270)	(2.232)	(2.243)
Lagged dep. Variable(t−1)	1.010 ***	1.011 ***	1.016 ***	1.039 ***	1.033 ***	1.069 ***
	(0.022)	(0.022)	(0.021)	(0.018)	(0.018)	(0.017)
Observations	375	375	375	400	400	400
Number of countries	25	25	25	25	25	25
AR (1) *p-values*	0.001 ***	0.001 ***	0.000 ***	0.000 ***	0.000 ***	0.001 ***
AR (2) *p-values*	0.574	0.669	0.657	0.578	0.591	0.629
Hansen test *p-values*	0.578	0.579	0.591	0.600	0.584	0.597

Note: Values in parentheses are standard errors of the estimates. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ represent significance at 1%, 5%, and 10% level respectively. All models include time and country fixed effects.

Furthermore, we test for the autocorrelation of the residuals by conducting the mis-specification diagnostics of the results using the Arellano-Bond statistics, AR (1) and AR (2). The test results reject the null hypothesis of no first-order residual serial correlation and accept the hypothesis of no second-order serial correlation. Furthermore, the Hansen test fails to reject the hypothesis of jointly valid instruments for all the estimated models, whereas the test statistic of overidentifying restrictions is insignificant, suggesting that the instruments employed are valid and fulfil the exogeneity condition for obtaining consistent estimates of the models.

4.1. Impact of Food Aid and Governance Quality on Food Security (Average Value of Food Production)

Table 2 shows that food aid has a positive effect on the average value of food production both in the DGMM and the SGMM model specification at 1% significance level. These results suggest that increased food aid in SSA does not reduce local food production on the aggregate, supporting earlier work by Singer [86] and many other authors to improve our understanding of food aid and food production in SSA. According to Del Ninno et al. [87], a significant positive impact of food aid on local food production could result if food aid is development-oriented and not only as a response to crisis, in which case local food production is affected due to flood, drought, or conflict, thus becoming impossible to provide food supply locally.

In the absence of a crisis, food aid targeted specifically at intervention, such as school feeding programmes [3,4] or food-for-work programmes in the agricultural sector [5] could incentivise local farmers, especially when food aid supply is sourced from local producers or regional and not from overseas [88]. Some authors have argued that production-sensitive targeting, such as conditioning food aid on local food production, would help to circumvent disincentive effects [89]. The study by Abdulai et al. [16] in SSA over the period 1970–2000 shows robust evidence that food aid has no disincentive effect on food production, but has proved rather stimulative.

On the other hand, some country-specific studies and studies on specific food crops have shown that food security may be negatively affected if food aid supply disincentivises farmers from producing food in cheap circulation [55,90]. For example, the impacts on cereal production may be significant if examined in isolation because cereals food aid accounts for more than 90% of total food aid shipments to SSA [91]. Additionally, some earlier works [92] suggest a negative policy effect of food aid in recipient countries if the supply of cheap food aid causes the recipient government to pay little attention to required policy reforms in the agricultural sector, diverting attention and developmental resources elsewhere. Following a similar reasoning, Gilligan and Hoddinott [2], assessing the impact of emergency food aid in post-drought rural Ethiopia, found that the food-for-work programme negatively affects food production. Furthermore, they show that participants had significantly reduced livestock holdings, suggesting a reduced demand for precautionary savings in livestock holdings as beneficiaries gain more confidence in food aid as their food insurance.

Furthermore, we find that the impacts of the composite governance index and control of corruption are positive but only significant in the DGMM model. Previous evidence suggests that corruption increases food insecurity across the developing world [93], whereas in SSA, Olabiyi [94] shows that corruption and poor institutions negatively impact household food security. Food aid programmes may also be less effective in countries with a significant deficit of good governance caused by bureaucratic corruption and related factors. Essentially, the combined effect of governance quality and food aid is negative but not statistically significant, suggesting that the quality of governance may be poor in complementing food aid for enhanced food security.

Although none of the control variables is significant in the DGMM estimates, the more robust SGMM estimator shows that a high inflation rate in terms of the consumer price index has a significant negative effect on food security. However, secondary school enrollment and population growth have a significant positive effect on food security. A high rate of inflation may significantly reduce food production in SSA, given that many countries in SSA are increasingly exposed to economic, environmental, and political shocks, resulting in a rise in the prices of commodities, including agricultural inputs and credit access constraints. Furthermore, an increase in secondary school enrolment correlates with a high level of literacy in a country. Therefore, it may significantly enhance food security through its effect on technology adoption, market linkages and other factors that increase productivity and income [95]. Similarly, the SSA population is significant, with over 60% of the population still engaged in agricultural production; as such, an increasing

population may positively affect food production in the region. However, this may not necessarily translate into food access and adequate dietary consumption, as reported in Cassimon et al. [23].

4.2. Impact of Food aid and Governance Quality on Nutrition Security (Average Dietary Energy Supply Adequacy and Undernourishment)

In Table 3, we observe a variation in the results of our empirical models using the DGMM and SGMM estimators. Although the DGMM models show little or no significance, the more reliable SGMM models show a consistent and more robust relationship between our main explanatory variable and outcomes. Notably, in the DGMM models, governance quality and food aid have no significant impact on undernourishment. In contrast, the SGMM models show a strong statistical significance when endogeneity in the model is adequately accounted for. The results show that food aid has a positive impact on nutrition security statistical significance at 1% level in the SGMM estimates, meaning food aid strongly increases ADESA while it reduces undernourishment.

These results are expected because food aid can support the total domestic food supply and leads to food price reduction with a positive impact on nutrition security for the poor and most vulnerable, especially women and children. In addition, there could be a long-term effect on human capital if it increases school enrolment for children and maternal nutrition during pregnancy. The findings may also suggest that most of the development food aid in SSA gets to the targeted group, primarily the poor and most vulnerable to food insecurity. Studies have also shown that an important determining factor for food aid effectiveness is the right targeting [7].

Furthermore, results from developing countries and regional or country-specific case studies have found similar results. For example, Mary et al. [20] employed panel data from 95 developing countries between 2002 to 2015 to find that "a 10% increase in food aid per capita would reduce undernourishment by 1.3% three years later on average, against 1% for a similar increase in emergency food aid per capita". They suggest that specific nutrition-sensitive development programmes should be given more priority within the SDG agenda. In Ethiopia, Gilligan and Hoddinott [2] show that free food distribution programmes to drought victims had a significant positive impact on food consumption, especially for the poor. They also found that although the food-for-work programme had no significant effect on food consumption of the poor, households in the middle and upper tail of the consumption distribution significantly improved their food consumption. This result is caused by less labour hour commitment by poor households, as there may be tighter labour constraints in poor households [96]. In the conflict zone in northern Uganda, food aid significantly increased meals consumed only for male-headed households and reduced food expenditures [97]. The importance of food aid in fighting hunger and malnutrition among the poor and vulnerable in developing countries is less debated, except in cases involving corruption and poor quality of governance.

Our results further provide robust evidence across models and specifications that some components of governance indicators, particularly political stability and control of corruption, statistically and significantly enhance nutrition security using the two outcomes. Similarly, nutrition security is statistically improved when considering a composite governance index and the interaction between the composite governance index and food aid. These findings suggest that political stability and control of corruption are the most important determinants of nutrition security and crucial indicators in enhancing food aid effectiveness in SSA. Another macro study covering 124 developing countries from 1984 to 2018 also suggests that political stability, rule of law, investment profile, and democratic accountability positively impact dietary energy supply [98]. Furthermore, according to Burchi [99], political stability is associated with a reduced burden of chronic and hidden hunger. Furthermore, Smith and Haddad [100] show that governance quality can reduce child undernutrition.

We also find that a high inflation rate shows a statistically significant negative impact on ADESA and a positive impact on undernourishment. This result may be expected, especially in developing countries. In most countries in SSA, where there is limited social security, high food prices significantly undermine the nutritional status of poor households. This is because of reduced purchasing power; thus, a household may engage in dangerous nutrition coping strategies such as consuming cheaper and low-quality food [101]. In the study by Devereux [102] in SSA, there is evidence that food access through the markets can be challenging because of food price inflation, thus reducing the quality of food supply and nutrition.

The results also show that population growth shows a positive and statistically significant relationship with ADESA in the DGMM models but lost significance in the SGMM, whereas it shows a positive and statistically significant relationship with undernourishment only in the SGMM models. As expected, population growth in SSA may increase ADESA, but this may not necessarily lead to reducing undernourishment. This finding has been validated in previous studies in SSA [103]. Futhermore, studies from Nigeria, a country with a 20% share of the SSA population, show that households with large members have a negative relationship with food and nutrition security [104].

Finally, secondary school enrolment has a positive and statistically significant relationship with ADESA and a negative relationship with undernourishment, a finding suggesting an enhancing effect on nutrition security. A higher level of education was found to have a consistently positive relationship with improved food and nutrition security in SSA [21–23]. Education beyond the primary level, in particular, is effective in reducing malnutrition in young children as it increases nutritional and health knowledge for mothers to make better nutrition and health choices for the family [104–108].

5. Concluding Remarks

The paper contributes to the relevant literature on the subject in a number of ways. Firstly, we examined the impact of food aid and governance quality (the latter disaggregated in different components) on both food and nutrition security in the SSA region and for a sample of 25 countries over the period 1996 to 2018. We also employed dynamic panel data modelling in the empirical analysis, which is appropriate for estimating long-term effects. In doing so, the paper contributes to the relevant literature by providing macro-level evidence in the SSA region to complement country-specific evidence. We also used different food and nutrition security outcome measures, which include the average value of food production, average dietary energy supply adequacy, and prevalence of undernourishment. Finally, we combine the above with the use of both aggregated and disaggregated governance indicators, following some very recent research work in this area. We find evidence of a robust relationship between food aid, governance quality, and food and nutrition security outcomes by employing the dynamic generalised method of moments (GMM) estimator. In particular, we find that food aid increases AVFP and ADESA while it reduces undernourishment. Among the various governance quality indicators we have employed, the control of corruption and political stability show a significant relationship with the measured outcomes. However, the composite governance index and food aid jointly have no significant effect on AVFP, but they significantly increase ADESA and reduce undernourishment across the various empirical models we have employed in our empirical analysis. An important policy lesson emanating from our empirical findings is that controlling corruption and maintaining political stability may have significant implications for enhancing the impact of food aid on food and nutrition security in the region. This is an important research and policy area that requires further future research in order to delve deeper into the mechanisms through which the combined effect of food aid and governance quality on food and nutrition security operates at both the macro and micro levels.

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Appendix A

Table A1. Correlation matrix between the dependent and the explanatory variables.

	avgval	avgdesa	underno	FoodAid	vae	pve	gee	rqe	rle	cce	cgi	cgifood	inflation	agricgdp	sesec	sppop
avgval	1.000															
avgdesa	0.507	1.000														
underno	−0.333	−0.818	1.000													
FoodAid	−0.308	−0.196	0.297	1.000												
vae	0.046	0.027	−0.102	−0.052	1.000											
pve	0.070	0.093	−0.193	−0.237	0.223	1.000										
gee	0.002	−0.103	0.018	−0.249	0.272	0.177	1.000									
rqe	0.062	0.000	−0.091	−0.141	0.299	0.121	0.214	1.000								
rle	0.130	0.152	−0.240	−0.368	0.388	0.314	0.301	0.389	1.000							
cce	0.009	0.233	−0.262	−0.222	0.463	0.310	0.323	0.423	0.347	1.000						
cgi	0.008	0.136	−0.322	−0.340	0.416	0.469	0.473	0.394	0.422	0.472	1.000					
cgifood	−0.109	0.081	−0.185	0.021	0.193	0.324	0.181	0.114	0.227	0.350	0.460	1.000				
inflation	0.108	−0.083	0.048	0.094	0.067	0.024	−0.013	−0.083	0.090	−0.066	−0.011	−0.021	1.000			
agricgdp	−0.035	−0.182	0.349	0.496	−0.281	−0.283	−0.287	−0.328	−0.481	−0.458	−0.416	−0.081	−0.083	1.000		
sesec	0.208	0.411	−0.411	−0.428	0.238	0.246	0.286	0.151	0.299	0.313	0.316	0.223	0.068	−0.369	1.000	
sppop	−0.040	−0.140	0.279	0.436	−0.307	−0.266	−0.299	−0.203	−0.300	−0.421	−0.375	−0.116	−0.037	0.473	−0.444	1.000

Table A2. Years covered in the analysis.

Year	Number of Countries	List of Countries
1996	25	Countries included in the analysis are Angola, Botswana, Burkina Faso, Cape Verde, Central Africa Republic, Côte d'Ivoire, Ethiopia, Gabon, Ghana, Lesotho, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Togo, and Uganda.
1998	25	
2000	25	
2002	25	
2003	25	
2004	25	
2005	25	
2006	25	
2007	25	
2008	25	
2009	25	
2010	25	
2011	25	
2012	25	
2013	25	
2014	25	
2015	25	
2016	25	
2017	25	
2018	25	
Total	500	

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