Extended Abstract
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Paper/Poster Title	Paper/Poster Title: Assessing the (a)symmetric effect of global climate anomalies on food prices: Evidence from local prices

Abstract prepared for presentation at the 97th Annual Conference of the Agricultural Economics Society, The University of Warwick, United Kingdom

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Abstract	200 words max

This paper uses time-varying smooth transition autoregressive (TV-STAR) model to investigate the asymmetric nature of ENSO (an exogenous climatic factor) with respect to the non-linear dynamics of food prices in sub-Saharan Africa (SSA). Curating food price series from more than 1100 markets from 36 SSA countries, the study finds that ENSO (linearly or nonlinearly) affects roughly half of food prices considered, with most nonlinear models exhibiting strong asymmetric properties with shock-inflicted persistence. Moreover, in terms of the location of the burden of ENSO impact, I find a geographical and food product divide. Specifically, ENSO appears to be more efficacious on maize prices in Southern, Eastern and some parts of Central Africa, while the effect is subdued in the Western African subregion. On the other hand, imported rice and processed foods such as bread appear to be the most affected, while local rice, cassava, millet and animal products like meat and milk are least affected. The policy implication of this dichotomy is that response to ENSO news should be subregion-specific rather than region-specific depending on how the subregions absorb the shock.

Keywords	El Niño Southern Oscillation; food prices; multivariate ENSO; time-varying smooth transition autoregressive model
JEL Code	C22; C58; I31; Q11 see: www.aeaweb.org/jel/guide/jel.php?class=Q)

Introduction	100 – 250 words

Eradicating food insecurity remains one of the major goals of world leaders, as it combines with ending hunger, improving nutrition and promoting sustainable agriculture to form the second goal in the Sustainable Development Goals (SDGs). While this problem is a global issue, it is generally agreed that the threat is greatest in developing regions, like sub-Saharan Africa (SSA), where 23% of the people are malnourished (UN, 2017). Part of the reasons for such, as iterated in the UN Secretary-General's report, is due to the high or moderately high domestic prices for one or more primary cereal food products (UN, 2017).

Various studies have linked the behaviour of food prices in Africa to several covariates, such as global oil prices (e.g., Fowowe (2016); Dillon and Barrett (2015)); international food prices (e.g., Minot (2014); Abbott and Borot de Battisti (2011)); biofuels demand (e.g., Gilbert and Morgan (2010)); global financial factors (e.g.,

Headey and Fan (2008)); monetary and macroeconomic factors (e.g., Kargbo (2000)). Whereas the factors mentioned above appear to be robust and strong correlates of African food prices, their impacts are less food security-specific, with the exception of biofuel demands. One potential food-specific correlate that may affect food price volatility in SSA is El Niño Southern Oscillation (ENSO) effect. The importance of such medium-frequency climate anomalies (deviations from normal climate conditions) in the region has not received adequate attention in empirical studies. This paper intends to research in that direction. Consequently, this work leverages on Lundbergh et al. (2003) time-varying smooth transition autoregressive (TV-STAR) model to investigate the asymmetric nature of ENSO in relation to the non-linear dynamics of food prices in SSA, as well as to further control for potentially complex dynamic relationships between the two variables.

Methodology	*100 – 250 words*

I utilise a regime-switching method to account for both non-linearity and structural instability, two critical features of prices, especially when observed over long time spans. Previous studies focusing on African food price behaviour use standard linear models to investigate price behaviour. One main shortfall inherent in these econometric strategies is the assumption of a linear relationship between commodity prices and some exogenous variations, such as ENSO signals. Moreover, these models are inadequate for representing ENSO cycles as there is increasing evidence that indicates ENSO cannot be modelled by linear dynamics, as the impact of teleconnection may not necessarily be symmetric since climatic conditions in a location can be correlated with one phase of ENSO and not the other (Ubilava, 2017; Hsiang et al., 2011). Furthermore, there is compelling evidence from Balagtas and Holt (2009); Deaton (1999); Deaton and Laroque (1992) that the behaviour of many agricultural commodities prices follows a non-linear regime-dependence. Given these two reasons, the use of standard linear models may not correctly model the relationship between ENSO activities and price movements. this paper is the first to use a threshold model to investigate how food prices in African countries behave in the presence of ENSO. Basically, we leverage the regime-switching ability of our threshold model to capture asymmetries in price trends.

Given that the pass-through effect of ENSO may differ for commodities and countries (depending on the location vis-a-vis the location of ENSO activities - the Eastern Pacific Ocean), we disaggregate shocks into commodity-country classes. We will follow Lundbergh et al. (2003) TV-STAR modelling framework to examine the nexus between ENSO shocks and food prices in sub-Saharan Africa.

Results	*100 – 250 words*

This paper considers the regime-switching and structural instability of selected food prices in sub-Saharan Africa using a time-varying smooth transition autoregressive

(TV-STAR) model, as well as the extent to which ENSO (an exogenous climatic factor) influences food prices in the region. This study confirms a geographical and commodity dimension to the nature of the impact of ENSO on food prices in SSA. I find the impact of ENSO on maize prices to be more efficacious in Southern, Eastern and some parts of Central Africa, while the effect is subdued in the Western African subregion. This finding confirms earlier studies that report a significant teleconnection effect in the highly affected subregions.

In terms of food products, the results find the effect of ENSO to be non-homogeneous across food prices. For example, imported rice and processed foods such as bread appear to be the most affected, while local rice, cassava, millet and animal products like meat and milk are least affected. These results are not unexpected, given the physiological constituents of crops like millet and cassava that fortify them against adverse meteorological events. Consequently, some countries in the region, like DR Congo, are turning to these climate-resistant food commodities as a means of adapting to climate change (UNDP Climate, 2017). On the other hand, the effect of ENSO on prices of other food products such as maize, sorghum, etc., are evenly distributed across countries in the region.

Discussion and Conclusion	*100 – 250 words*

This paper reports the impacts of ENSO on various food prices in several SSA countries. Overall, the research found that Western African countries are less prone to the damaging effect of ENSO than other subregions in SSA. This result is interesting but not surprising, as the subregion is further off the tropical Eastern Pacific Ocean (the location of ENSO) than the rest subregions. More so, the findings in the result revealed that the influences of global climate anomalies more hardly hit food prices in conflict-prone areas like Zimbabwe and DR Congo. Policymakers need to think of how to cushion these effects. One way of thinking about it is trading between countries that are "safe haven" from ENSO and those that are severely affected. Specific food classes were also found to be more affected than others. While imported rice, sorghum and bread are the most affected, millet, cassava, and animal products are almost insensitive to ENSO happenings. In the face of a looming "end of cheap food" possibility, these climate-resistant products may be the future of food security in SSA. An issue with the newly-assembled dataset is that most country price collections do not have prices for commodities that represent the population's nutritional well-being, such as vegetables, fruit or fish products.

Furthermore, it is important to state that the research did not consider individual channels through which ENSO effects are passed onto food prices. From an economic perspective, investigating these channels may give a better understanding of how to mitigate ENSO forces. Overall, this paper's results can serve as a handbook to provide relevant stakeholders and policymakers with the potential impacts of future ENSO events on several food prices in most SSA countries.