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# Food Price Shocks and Government Expenditure Composition: Evidence from African Countries

Carine Meyimdji

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## **Abstract**

The delicacy of socio-political consequences during the recent commodities' prices spikes has given rise to stabilising measures that might have had repercussions on public policy alternatives. This effect may be worrying for developing countries, which because of the importance of the share of imports in their households' basket, have observed a remarkable increase of their food import bills. This paper attempts to evaluate the effect of food price shocks on public expenditure in level and composition on 47 African countries between 1980 and 2011. After solving for endogeneity issues, our results show that food price shocks positively and significantly affect total government expenditure and the share of current government consumption in the total government expenditure. More precisely, an additional one standard deviation of the food price shock increase is associated to an increase of 0.06 standard deviation of the percentage of current government consumption in the total government expenditure. Interestingly, this effect highly depends on the vulnerability level. Future studies will use more disaggregated data of fiscal variables, including those on revenue, to better assess food security policies.

## **Keywords**

Expenditure composition, Price shock, Vulnerability, Africa.

## **JEL Codes**

H50, N57, Q11.

## **Acknowledgment**

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# 1 Introduction

Major food commodities' prices met two important peaks in 2006-2008 and by the end of 2010. This happened after two decades<sup>1</sup> with relatively low price levels. Many factors have contributed to this instability, namely the oilseeds and grains demand increase, the dollar's depreciation and adverse weather conditions, etc.

These price surges thus ensued to many consequences that were particularly dramatic for developing countries for many reasons. Firstly they do not possess sufficient and safe buffer stocks capacities. Secondly, they are trade-dependent in terms of both food and fertilisers, and, even when they are exporters of certain commodities, their price takers position' does not allow them to decide on the prices level. These prices are set in the world market without always taking into account their socio economic situations. Thirdly they lack developed credit and financial tools to face random shocks. Fourthly they spend about 75 % of their budget on consumption expenditures (whereas developed countries spend 10 to 15 %), [Body \(2012\)](#); etc. All these factors contribute to make them less resilient and more exposed to random shocks. Indeed, food price increase and volatility are of concern because of their severe impact on households' well being<sup>2</sup>. Moreover, political stability has been threatened in some cases, by social unrest and instability due to hunger, [Bellemare \(2015\)](#). Cereals<sup>3</sup>, the main food meals for developing countries, were particularly hidden.

Indeed, such food price surge may have had an important impact on political economy. Accordingly, [Catão & Chang \(2015\)](#) points out that food price shocks have recently driven central banks' monetary policies<sup>4</sup>. Further, this phenomenon may have been of the considerable change in both financial and fiscal areas, as it gives rise to food crisis and governments need to intervene in order to make households meet their meal.

Many studies have evidenced food price shocks by assessing its relations with poverty, growth and institutional management, vulnerability, exchange rate, etc, [Ivanic & Martin \(2008\)](#), [De Janvry & Sadoulet \(2010\)](#), [Arezki & Bruckner \(2011\)](#), [Bar-Yam et al. \(2015\)](#). In general, during food price surge, governments take policy measures (principally on import and or export taxes, and subsidies to consumers and/or producers, [Ianchovichina](#)

et al. (2014), in order to reinforce household food accessibility and political stability: these stabilising tools theoretically defended by the permanent income theory [Friedman & of Economic Research \(1957\)](#). However, the relation between food crisis and the main effects of such stabilising tools is less explored in the literature.

In parallel, authors claim the subject of government size and particularly its role in output and macroeconomic volatility and instability, [Gali \(1994\)](#), [Afonso & Furceri \(2010\)](#). The seminal paper of [Rodrik et al. \(1998\)](#) underlines the key place of the government size as an insurance in random shocks situations. This thesis joins the 'compensation effect' of government expenditure on globalisation, as the country' external openness makes it more exposed to shocks and may worsen its vulnerability, [Garrett \(2001\)](#). As food price are unstable and that government generally act in accordance to its stabilising role, there may be an impact on government tools resulting to that action: this is in accordance with the permanent income theory supported by [Friedman & of Economic Research \(1957\)](#). [Smith \(1997\)](#) points out that government faces production instability and food insecurity concerns, be it chronic or transitory food insecurity, regarding the importance of the latter on political, social and economic<sup>5</sup> ramifications. These authors remind that food security is one of the legitimacy characters of the government in many countries and must also avoid the negative consequences of agricultural instability in the whole economy. Intuitively, it appears that this action can be more important in countries that have an important weight of agricultural production in the (their) GDP. In the same vein, [Timmer \(1989\)](#) points out that escaping from food insecurity is not ensued from the private decision. It comes through the integration of food policy measures on the government strategy, that favour rapid and distributive growth.

The aim of this paper is to evidence how food price shocks affect government size and government expenditure composition in african countries. The relevance of our subject can be cited in the area of public good provision, as government would have adjusted on government expenditure in order to face public good provision market failures in the case where individuals are constrained, this justifies government intervention by the market incompleteness and consumers' risk aversion [Gouel \(2013\)](#), [Newbery \(1989\)](#). As part

of food security fiscal policies literature, this study tries to fill the gap in the literature that links food price issues to fiscal policy, by assessing whether government expenditure composition have changed during the recent food crises. Indeed, one may think that as african countries are the most exposed to staple food price shocks and the less resilient in the world,that could explain the instability of their fiscal tools [Agnello & Sousa \(2009\)](#), [Thornton \(2008\)](#). It appears to be more interesting to evidence that idea in government composition, in order to know what component is more used by those politicians facing food crises. However, more disaggregated expenditure (government consumption, debt interest, and capital investment, [Censolo & Colombo \(2008\)](#)) data availability being quite challenging, we only focus our attention on aggregate expenditure components, namely current and investment expenditures.

In order to properly conduct this research, after presenting an example of theoretical model of consumer' government expenditure demand, we use a SYSTEM-GMM of [Blundell & Bond \(1998\)](#) econometric approach that allows us to solve the endogeneity issues Our food price shocks variables take into account the world price composite index of the most imported food commodities, that is maize, wheat, soybeans, oil soybeans, refined sugar and rice. Using a sample of 47 african countries from 1980 to 2011, we found that food price shocks significantly lead to an increase of the total government expenditures, and particularly shift in government expenditure composition, in favour of current expenditures.

The rest of the paper is organised as follows. The second section sets forth some explanation on food price movements and government intervention; the third presents a brief literature review and the fourth is devoted to empirical analysis. Before concluding, the fifth section presents empirical results and discussions.

## 2 Food price movements and government intervention

According to the permanent income hypothesis, the consumer's interest is not only to satisfy his consumption, but also to be assured for his consumption' regularity. That is, it wants to assure he will be able to purchase and access consumption in the future periods. But in developing countries the situation is a little bit different. Most households in LDCs are poor and do not have savings, the insurance sector is underdeveloped, this renders these households unable to overcome hunger in time of crisis. That is why in the case of random shocks, government resorts itself to stabilisation ends, in order that households can be protected against food insecurity.

During the recent crises, most LICs react by banning exportations, (even if this measure is said to be particularly inefficient, as it can lead to more price volatility), increasing transfers and/or lowering taxes. These crises have also prompted an evolving food price literature focusing on food price shocks consequences on both households and countries. Focusing on the most common measures taken by governments in accordance with its stabilisation roles, some authors stressed on governments' reactions to food prices' increase, [Timmer \(1989\)](#), [Byerlee et al. \(2006\)](#). These studies assess the key role of government intervention during food crisis. They all arrive to the conclusion that food price surges give right to the government intervention, even though the cost-efficacy of each fiscal<sup>6</sup> tool remains questionable. In parallel, [Yu et al. \(2015\)](#) recently assessed government expenditure composition and found out that agriculture and infrastructure investments, measured as the share of government spending, have been increasing from 1980 to 2010 in developing countries. Additionally [Agnello & Sousa \(2009\)](#) found that those countries' fiscal tools are the most unstable. In fact, the variability or the change in food prices( or price) may have affected the composition of government expenditure. Thus, it can be interesting to evidence that relation for LDCs and african countries in particular, which are more vulnerable to food price shocks, and whose fiscal tools are the more unstable [Agnello & Sousa \(2009\)](#).



Furthermore, the output stabilisation is an important issue and large studies have found out that government size volatility does matter. That is, the more the government size is volatile, the more the output is unstable. However, according to [Andrés et al. \(2008\)](#), this stabilising effect is only present because of compositions effect, that is, when the fiscal adjustment will pass through a shift in government tools composition.

Our main research hypotheses are given as follow :

- Food price shocks have caused total government expenditure to change: firstly, we expect not to reject this hypothesis, departing from the intuition that government increases its expenditure in order to smooth the negative consequences of external shocks on households. Secondly, this hypothesis can also be rejected : if it happens that the government reacts on other fiscal measures, as tax alleviation for example, in order to reinforce food access for households ; or if the government decides to maintain the same total expenditure, and then plays on expenditure composition to stabilise price ( for exemple, temporarily reduce the share of investment expenditure in the total expenditure in order to supplement the share of current consumption );
- Food price shocks have caused the shift of government expenditure composition, in favour of government current consumption : we expect not to reject this hypothesis, our intuition being that government stabilisation tools, namely food subsidies, price administration, wage adjustment, etc, are mostly part of current government consumption;
- The effect of food price shocks on government expenditure are more important for food vulnerable countries : we expect not to reject this hypothesis, as we suppose that vulnerable households are most negatively affected by external positive price shocks and that the government's reaction must include that.

## 3 Literature review

### 3.1 Food price movements and stabilising measures

According to [Ivanic & Martin \(2008\)](#), food price increase caused net exporters to realise much profit, but social middle classes township populations have been more negatively impacted. [UNCTAD \(2008\)](#) explains that the effect of the last food crises was particularly pronounced in African countries because of their food dependency and the weight of food consumption budget in their total budget expenditure. It appears that within 2006 and 2008, African countries have seen their food import bills increased by 74 % whereas about 60 to 80 % of household's budget is spent on consumption (that figure is about 10 and 20 % in developed countries). The striking issue is that at the same time, cash crop price have also increased, but at slower pace. This food import dependency will be controlled here using a vulnerability index. Generally, food price shocks have many socio economic consequences.

Using a large sample of 150 countries between 1980 and 2009, [Combes et al. \(2014\)](#) found out that positive food price shocks negatively and significantly impact households food consumption, this effect is more important for the most vulnerable countries. Further, these authors found that shock's effect depend on remittances and official assistance received by the country (we will assess if this heterogeneity of food price shocks according to vulnerability also exists when using government expenditure). [Anríquez et al. \(2013\)](#) noted that this effect is observable both in terms of food quantity and nutritional substances, these authors pointed out the role of agricultural development in order to deal with food insecurity issues. Their findings support [Horton et al. \(1988\)](#) that infant mortality usually increases by the time of positive food price shocks.

[De Janvry & Sadoulet \(2010\)](#) arrives to the results that food price outbreaks have led many developing countries to meet hunger and starvation, and then, caused social unrest and political instability, [Bellemare \(2015\)](#). [Ortiz & Cummins \(2012\)](#) mentioned that food price outbreaks have contributed to riot intensification during the Arab spring. According to [Ravallion \(1997\)](#), [Gráda \(2011\)](#), [Ianchovichina et al. \(2014\)](#), price shocks consequences on households depend on the manner in which it does affect macroeconomic conditions,

like salaries, assets and subsidies. In the same vein, [Albers et al. \(2011\)](#) shows that it positively affects food and fertilizer subsidies. Whereas [Abbott & De Battisti \(2011\)](#) found that social assistance spending must increase with the sensibility of households in time of crises. That is why [Demeke et al. \(2011\)](#) mentioned that social assistant programs allow to maintain food demand in time of crisis. [Abbott & De Battisti \(2011\)](#) think that developing countries' food security policy options are food safety-net, agricultural incentives and government intervention. In the light of the above, in our knowledge, empirical researches are almost absent from the area of government intervention for stabilisation ends. We endeavour to fill this gap by presenting how food price shocks have affected government expenditure size and composition.

### **3.2 Government expenditure and government expenditure composition**

Government expenditure composition is generally evidenced in the situation where the change in governments expenditure components may not be on the same extent, even when total expenditure have also changed or not. The concept of Government expenditure composition have most been covered in the studies of : electoral cycles, [Brender & Drazen \(2013\)](#); growth performance to evidence if expenditure composition matter in the growth performance, [Devarajan et al. \(1996\)](#), [Mauro \(1998\)](#); and particularly for LDCs in SAP<sup>7</sup> frameworks, according to what indebted countries have resorted to government composition changed in order to reach IMF's prescriptions<sup>8</sup> in order to have their debts cancelled, [Mahdavi \(2004\)](#), [Hicks & Kubisch \(1984\)](#). Whereas [Eslava \(2011\)](#) points out that the latter is better to alleviate a deficit, that is government have to manage and share redistribution of government expenditures on its different components.

According to [Rodrik \(1996\)](#), external shocks have an impact on the government size, as the latter may acts as an insurance in bad period in the stabilisation-led role of the government. Interestingly, according to [Andrés et al. \(2008\)](#), this stabilising effect of the government size in growth is only present because of the composition effect, that is, when

the fiscal adjustment will pass through a change in government tools composition. Many studies have been done on government expenditure' determinants. Using a sample of 19 developed countries in 1980-2006, [Sacchi & Salotti \(2015\)](#) found out that the most important determinants of sub-government expenditure composition are demographic and political changes. It was also found out that corruption, external shock exposition, political stability, ethnolinguistic fragmentation [Annett \(2001\)](#), have an impact on government expenditure composition [Gupta et al. \(2001\)](#), [Mogues & Benin \(2012\)](#), [Keefer & Knack \(2007\)](#), [De la Croix & Delavallade \(2009\)](#). Certain papers are more deeper, like that of [Mauro \(1998\)](#) which shows that the greater the corruption level, the lower spending on health and education investment. Moreover, [Delavallade \(2006\)](#) rises to the same conclusion and found also that expenditure on energy and fuels are positively correlated with corruption.

[Borcherding & Deacon \(1972\)](#) and [Bergstrom & Goodman \(1973\)](#) show in a median voter' theoretical model that citizens that share the same social characteristics tend to demand the same government expenditure component. Following them, we will interact the vulnerability variable with the shock variable, in other to assess if there could be an heterogenous effect of shock on expenditure composition depending on the vulnerability degree.

In this paper, we try to see if the stabilisation role of the government expenditure on food price shocks may also pass through government expenditure composition shift, as [Andrés et al. \(2008\)](#) found in the case of economic growth<sup>9</sup>.

As data availability allows us, the main factors that affect government expenditure according to the literature will be controlled in our empirical model<sup>10</sup>.

## 4 Empirical analysis

### 4.1 Some stylised facts

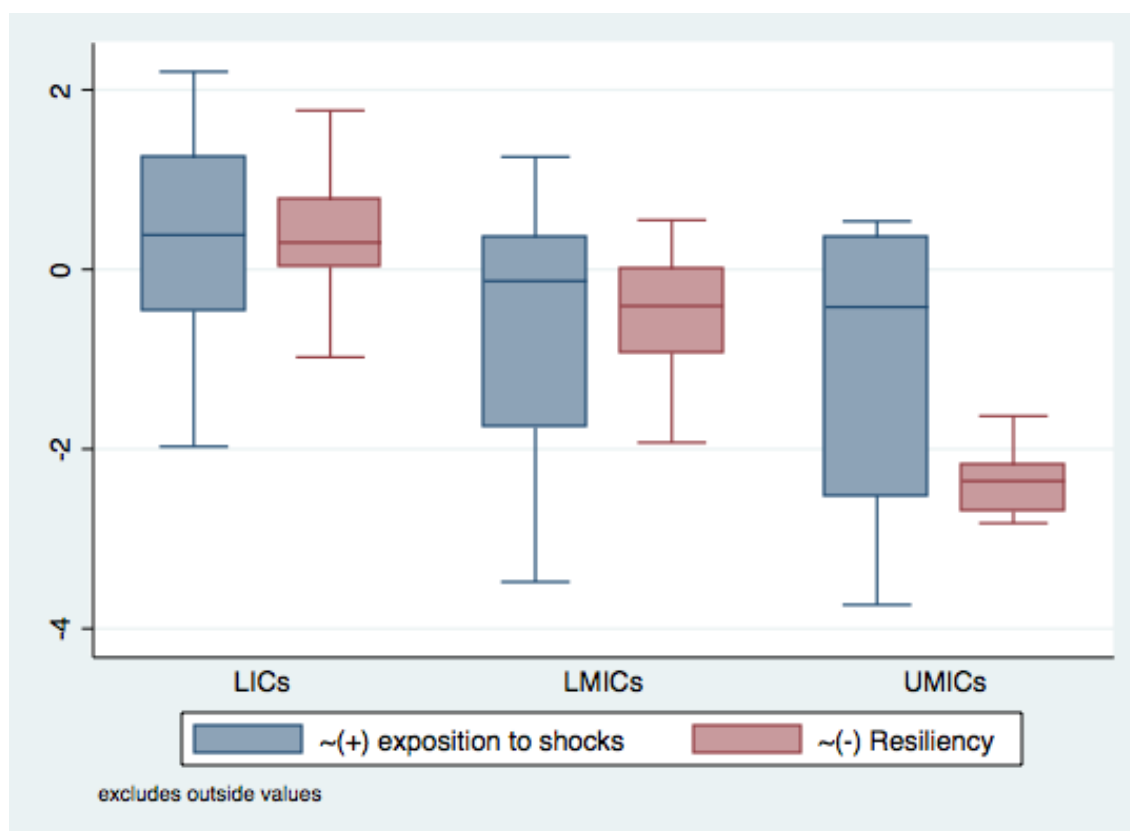
#### 4.1.1 Computing vulnerability index

[De Janvry & Sadoulet \(2008\)](#) and [Combes et al. \(2014\)](#) point out that the food price shock' effect on a given country depends on it's resilience capacity and to which extent

it is exposed to shocks. Following these authors, we compute a vulnerability index based on relevant aspects to which countries can be affected.

- The first aspect explains how the country is capable of constituting sufficient buffer stocks, using exports earnings, in order to face bad periods. This criteria is measured here by the difference between food export and food import<sup>11</sup>. The idea is, the more the country can export more than it can import, the lower is its vulnerability level;
- The second aspect stresses on the country's wealth: it can be used to estimate the extent to which a country is capable of purchasing an additional food quantity in order to reinforce household consumption structures. This criteria is measured by the difference between the per capita GDP at a given year and the GDP of the richest countries in the same year. In other words, the more the country's GDP for a given year is closer to the GDP of the richest country, the lower its vulnerability level;
- the third stresses on the weight of food import in the country's trade capacity: the idea here is, the more the country's import weight is important in term of its current balance, the more its consumption will depend on international food price, this criteria is approximated here using the relative weight of food import on the total imports (because of non-availability of data on current balance). The idea being that the less the country's food import's proportion is important, the less is its vulnerability level;
- the last aspect is the food import weight on households consumption: that can give some information on the extent to which household purchasing can change following the international price change. This is approximated by the weight of the households' expenditures on food importation.

All these aspects are taken into account to draw a composite index using the PCA (Principal Component Analysis). Figure 1 draws the relation between our expenditures variables and the countries' income level in the next graph.



Notes:  
 These boxes present income groups of countries per vulnerability degree. We have retained two components from our PCA: the first component was represented by the share of import good in households expenditure on consumption, that is why we have assimilated this factor as the exposition to shocks; while the second component was more represented by the income gap as compare to the richest country at each period, that component is assimilated as the country's resiliency. We run the percentiles of the two components and distributed them over income groups of countries. The line inside the boxes represents the median.  
 Source: Autor's calculations, using WDI data

Figure 1: Group income countries par vulnerability level

Figure 1 shows that the more the income of the country, the greater it is resilient. Remarkably, we can also see here that LICs are particularly exposed to food price shocks. It appears that their insufficient production capacity causes them to import an important proportion of food, exacerbating their sensitivity to external shock on food price.

#### 4.1.2 Food price and food price shock variables

Following Deaton et al. (1995), we compute the food price variable in three steps: First, for each country, we draw the food price index using the relative values of the most imported food commodity within the period. The values are computed using the quantities and the prices of those commodities in the world market during the period of our analysis. Such commodities<sup>12</sup> include wheat, sugar, soybeans, soybeans oil, maize and rice. Prices data are from FAO database while import quantities data are from IMF outlook.

Let  $w_{i,j}$  be the relative value of commodity  $j$  imported by the country  $i$  each year  $t$  is specified as follow:

$$w_{i,j} = \frac{p_{j,\cdot} * q_{i,j,\cdot}}{\sum_{j=1}^6 p_{j,\cdot} * q_{i,j,\cdot}} \quad (1)$$

Where  $q_{i,j,\cdot}$  represents the total quantity of commodity  $j$  imported by the country  $i$  for each year. Secondly, for each country and each year, the price index is given by

$$fp_{i,t} = \prod_{j=1}^6 p_{j,t}^{w_{i,j,\cdot}} \quad (2)$$

Where  $fp_{i,t}$  is the price index, and  $p_{j,t}$  is the price of the commodity  $j$  in the world market at time period  $t$  (same price for all countries). After computing this price index, we then centralised it on the base year 1995 in order to make price yearly comparative. This choice is motivated by the fact that most african countries had devaluated they currency in 1994 and that phenomena could have made huge change in their respective economies.

Third, for each country, we regress the normalised price index on an intercept, its long time trend and its first and second order lag variables (this allow us to control for the fact that the government can use the later price variability to predict the present price level, thus this autocorrelation is removed here)<sup>13</sup>. By doing so, we attempt to obtain food

price residuals which are the most unpredictable. The regression is specified as follow:

$$\ln(fp_{i,t}) = \alpha_{i,0} + \alpha_{i,1}time + \alpha_{i,2} * \sum_{p=1}^3 \theta_{i,p} \ln(fp_{i,t-p}) + \epsilon_{i,t} \quad (3)$$

As prices are given by the international market and are differently transmitted in each country, the latter regression has been ran for each country separately.

We construct two different food price shocks variables basing on the latter regression: (1) the first shock variable (SHOCK) is the residual of the regression in equation ??, it represents the shocks magnitude; (2) the second shock variable (SHOCKF) is the number of positive price residuals in each period (four successive non overlapping years) that is larger than one standard deviation of the period, this variable learns about the positive shocks frequency.

## 5 Empirical Methodology

In this section, we will begin by presenting descriptive statistics followed by econometric analysis and results.

### 5.1 Variables and Descriptive statistics

Our study is based on 47 African countries in the period 1980-2011. The choice of this geographic area is motivated by the fact that such countries are most vulnerable to external shocks. That explains their first position in food insecurity across the world (FAO 2009). Furthermore, as it is showed in the literature, these countries have the weakest institutions throughough the world. The time period is conditioned by data availability. In the default of monthly price data that are not available, we use yearly data. In order to mitigate missing data problem and non-stationarity, we subdivide our period of study into eight periods, one of 3 years and seven of 4 years. That is, for each variable, the period data is given by the mean on the 4 successive non-overlapping years. Managing like this, information is being lost, but this is the best way, as our econometrical methodology, the GMM estimator, is more efficient when series are stationary in mean, and estimators are



more convergent.

### 5.1.1 Variables

- Dependent variables: We will draw two sets of equations that respectively use the total government expenditure and the share of current expenditure (government final consumption) in the total government expenditure<sup>14</sup> as dependent variable. Government total expenditure here is the sum of government current consumption and government gross fixed capital formation expenditures in percentage of GDP.
- Interest variables: our interest variables are **food price shocks** variables computed in the latter section.)
- Control variables: following the literature, we will control our regressions with variables that may affect each dependent variable.

**The vulnerability:** the literature<sup>15</sup> highlights that food price shocks' effects may depend on the country's capacity to absorb shocks and its exposure to shocks. This variable have been computed in the above section and will be added in additional term and an interactive term with food price shock in our regressions.

**Corruption:** it is found in the literature that the corruption's effect matter on the government expenditure composition, as a corrupt government generally favour some kind of expenditure detrimental of others (health and education for example), [Delavallade \(2006\)](#), [Mauro \(1998\)](#).

**Openness:** [Rodrik \(1996\)](#) and [Alesina & Wacziarg \(1998\)](#) found that government size and the openness are not independent, that will be controlled in this paper. The variables **Trade%** and **Trade** are respectively the relative proportion , taking respectively in percentage and in logarithmic form, of the sum of total exportations and importations of good and services in the GDP. **Kaopen** is the financial openness and is the first component of a PCA that take into

regulatory variables as the current and capital accounts transactions, the existing of the multiple exchange rates and the requirement of surrounding export proceeds

. **Ka\_open** is the variable obtained by normalising **Kaopen** to 1 (the maximum value of kaopen).

**The external debt:** the government's decision on the government expenditure size and composition can depend on how it is financed.

**The GDP per capita and GDP growth :** country with more wealth will tend to spend more, ceteris paribus: that is illustrated by the *Wagner Law*.

**Net Official Development Assistance:** this represents the net official aid received from abroad per capita of inhabitant in % of GDP. As this the internal aid received can be a potential substitute of government expenditure, it can contribute to food price effect stabilisation tools.

Other control variables include : the inflation, the status of democracy, as these variables may also explain government spending.

These variables are from the World Bank (World Bank Indicators),IRCG and [Chinn & Ito \(2006\)](#) databases. (Appendix)

### 5.1.2 Descriptive statistics

Table ?? shows some statistics of the main variables. We can see that our dependent variables present variability both within and between countries, that variability is more pronounced for the current expenditures, which varies for 22 % and 130% of the total expenditure; while total expenditure varies for between 2 and 73% of the GP. Their standard deviation also show a huge dispersion of the current expenditure. The lower variability of expenditure within countries can be explained by their inertia along any given country. Consequently, we will introduce our dependent variable first lag as explanatory variable in our econometric regression to control for that inertia. Food price shocks vary between 2.23 and 3.07, this variability is more explained by the within country component ( between 5 and 11). The lower variability of food price shocks between countries underlined the international dimension of food price. In fact, this variable is nearly the same for all country, but its impact can differ for each country depending on its own conjuncture.

In order to have an idea on the relationship between food price shocks and government

Table 1: Some descriptive statistics of our main variables

Variable		Mean	Std. Dev.	Min	Max	Observations
TOTALEXP	overall	23.93526	9.431144	6.545393	66.02338	N = 281
	between		7.590563	13.33039	48.47107	n = 43
	within		5.369829	5.861579	54.5301	T-bar = 6.53488
CURRENTEXP	overall	66.69126	12.87414	25.47749	91.44778	N = 281
	between		10.53216	31.04214	85.9332	n = 43
	within		8.531035	40.94977	92.21398	T-bar = 6.53488
SHOCK	overall	.0065463	.6834808	-2.230677	3.078257	N = 374
	between		.0191144	-.0524074	.0610451	n = 47
	within		.6832188	-2.237346	3.137211	T-bar = 7.95745
SHOCKF	overall	.5080214	.5006054	0	1	N = 374
	between		.1348577	.25	.75	n = 47
	within		.4824906	-.2419786	1.258021	T-bar = 7.95745

source: Author's calculations using FAO, IMF outlook and WDI data

expenditure, some stylised facts are drawn in the graph below. Figure 2 plots the relation between food price shocks and current expenditures. It is done per vulnerability level and for the total sample. As illustrated in this plot, we can see that food price shocks tend to be negatively related with current expenditure when the total sample is considered. But, when we examine the relation per vulnerability percentiles, we see a positive relationship between food price shocks for the high and the middle class of vulnerability, whereas it is negative for low vulnerability. To summarise, it appears that the relationship between food price shocks and government expenditure composition depends on country's vulnerability.

The results of this section are drawn from pure correlation. Therefore, we propose in the below section a causality assessment, that can help us to draw more credible conclusions, as we will take into account other factors that may likely affect government expenditures.

## 5.2 Econometric framework

Our objective in this section is to measure the causal impact of food price shocks on government expenditure size and composition. For a given country, as the political structure do not change brutally, there is inertia because of such low evolution. In order to take into account that inertia, we will control our regression with the first lag value of the dependent. However, the introduction of the latter variable in the equation leads to an important bias on both the OLS<sup>16</sup> and the fixe effect estimators, because of the endogeneity between the error term and the first lag dependent variable. That bias, said of Nickel (1981), is particularly relevant in small samples as ours.

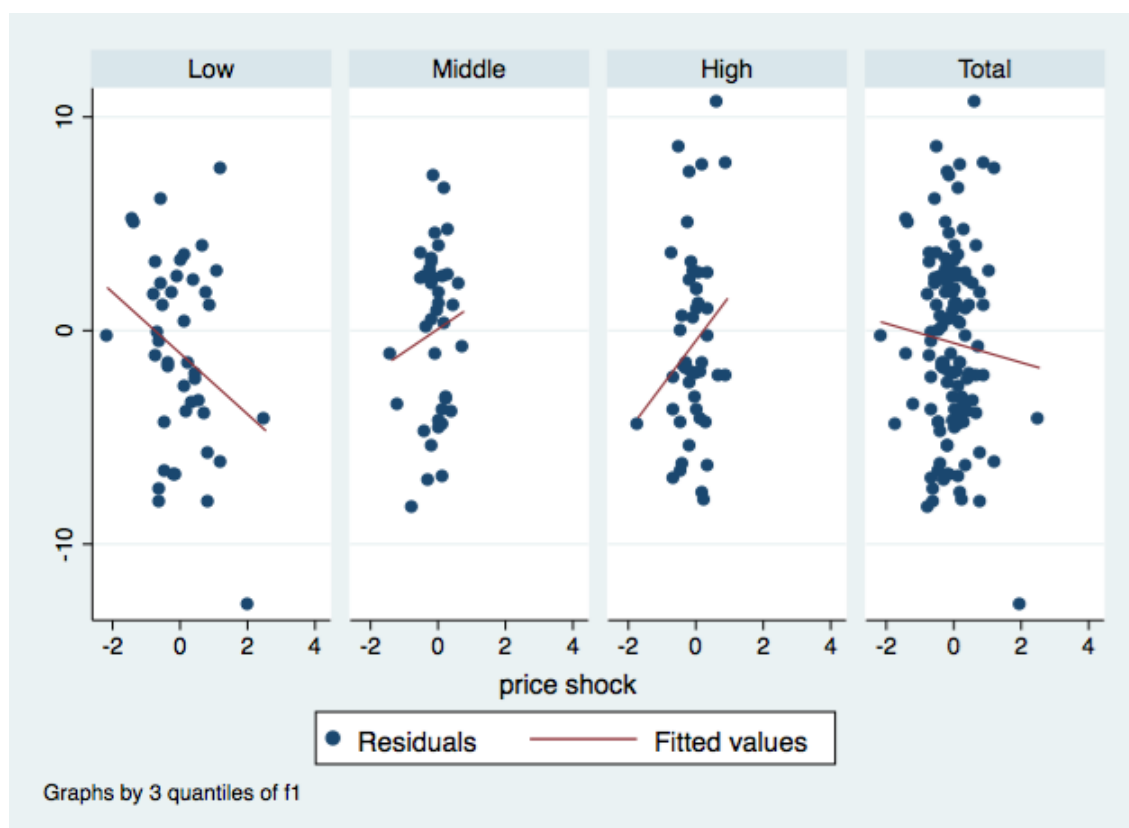


Figure 2: Food price shocks and current government expenditures, by vulnerability quantiles  
 source: Author's calculations using FAO, IMF outlook and WDI data

The ideal methods<sup>17</sup> to solve that could be PVAR (Panel Var ) or PMG (Pooled Mean Group) methods which are more suitable to solve dynamic panel series with non stationary concerns, but, because of their requirements<sup>18</sup>, we will solve this model using the second alternative estimator, that is the GMM<sup>19</sup> approach . Several GMM estimators have been proposed and of all, the system-GMM<sup>20</sup> (Blundell & Bond (1998)), is said to be the most consistent. It proceeds by instrumenting variables in first difference with those in level and inversely, those in level are instrumented by the first difference variables. Its estimators are then robust and stable, as the process imposes average stability condition on the dependent variable, Araujo et al. (2008).

This approach has been criticised for having many instruments, but the over identification test of Hansen will be used here for that concern. The model is validated by the rejection of the over identification hypothesis, the presence of serial independence of order 1 (AR1) and the absence of that of order 2, Arellano & Bond (1991). The *windmeijer* Windmeijer (2005) correction is also applied in its second step version in order to correct standard errors.

### 5.3 Econometric estimates

In order to take into account the fact that government expenditure may depend on many other variables, we follow the literature to draw many variables that will be controlled in our regressions, all that will allow us to evidence causality. In these equations,  $i$  is the country  $i$ ,  $t$  is the time  $t$ ,  $\nu$  is the country's specific effect,  $\mu$  is the time's specific effect.  $shock$  is the food price shock variable,  $vul$  is the vulnerability index,  $X$  represents the control variables matrix and  $\epsilon$  is the error term.

- Econometric estimates of the effect of food price shocks on total government expenditure The first set of equations estimate the effect of food price shocks and that of food price shocks condition on the vulnerability level respectively, on the total government expenditure in percentage of GDP.

$$totalex_{i,t} = \rho totalex_{i,t-1} + \beta shock_{i,t} + \theta x_{i,t} + \nu_i + \mu_t + \epsilon_{i,t} \quad (4)$$

- Econometric estimates of the effect of food price shocks on current government expenditure The second set of equations estimates the effect of food price shocks and that of food price shocks condition on the vulnerability<sup>21</sup> level respectively, on the current government expenditure in percentage of GDP.

$$currentexp_{i,t} = \rho currentexp_{i,t-1} + \beta shock_{i,t} + \theta x_{i,t} + \nu_i + \mu_t + \epsilon_{i,t} \quad (5)$$

$$currentexp_{i,t} = \rho currentexp_{i,t-1} + \beta_1 shock_{i,t} + \beta_2 vul_{i,t} + \beta_3 shock_{i,t} * vul_{i,t} + \theta x(i,t) + \nu_i + \mu_t + \epsilon_{i,t} \quad (6)$$

Table 2: Estimates results of food price shocks' effect on total\_expenditure

	(1)	(2)	(3)	(4)	(5)
	totalexp	totalexp	totalexp	totalexp	totalexp
L.totalexp	0.545*** (4.66)	0.443*** (3.59)	0.511*** (4.86)	0.389*** (2.95)	0.592*** (4.16)
SHOCK	0.0244*** (2.78)	0.0214* (1.81)	0.00671 (0.52)	0.00121 (0.09)	0.630* (1.83)
Log_gdp	1.769 (1.05)	3.486** (2.48)	0.911 (0.57)	1.500 (0.67)	-0.471 (-0.25)
ODA	2.845*** (2.98)	3.674** (2.19)	1.042 (0.79)	1.059 (0.53)	0.153 (0.09)
Remittance			0.293** (2.17)	0.379** (2.15)	0.344* (1.81)
SHOCK*Remittance				-0.0735 (-0.37)	0.0170 (0.11)
Ka_open				-2.265 (-0.43)	
SHOCK*Ka_open				0.104* (1.94)	-0.00976 (-0.20)
Kaopen				0.631 (0.72)	
SHOCK*ODA					-3.046* (-1.77)
External_debt		-0.00195 (-0.33)	-0.00743 (-1.28)	-0.00734 (-0.77)	-0.0109* (-1.65)
Trade%		-2.182 (-1.58)	-0.707 (-0.57)	-1.382 (-0.64)	-1.847* (-1.67)
_cons	-58.62** (-2.36)	-51.77 (-1.24)	-6.052 (-0.16)	3.080 (0.05)	35.75 (0.81)
i_Period	NO	NO	NO	NO	NO
Effect_scale	0.15***		NO	.0088+ 0.31*(ka_open)	4.6*-0.03*(ODA)
Effect_scale at the Median			NO	0.05	4.00*
Nber_obs	234	188	164	163	163
Nber_group	43	38	36	36	36
Ar1	0.0612	0.0472	0.0606	0.0448	0.0501
Ar2	0.139	0.137	0.261	0.366	0.448
Hansen	0.472	0.486	0.431	0.264	0.275

*t* statistics in parentheses. \* ( $p < 0.10$ ), \*\* ( $p < 0.05$ ), \*\*\* ( $p < 0.01$ )

Notes: Data of this table are the average of the yearly data over the successive non overlapping 4 years from 1980 to 2011. Robust standard errors are below the coefficients. The estimation method is the two-step system-GMM with Windmeijer (2005) correction of standard errors. i\_Period means if the period specific effect was controlled.

In general, our results do not change considerably with or without i\_Period.

Effect\_scale is the impact of an increase of a one standard deviation of food non significant.

price shock on the total government expenditure in % of GDP, this have been obtained by dividing the shock marginal effect by its standard error. In these regressions, shocks and period variables are exogenous.

## 6 Econometric Results

### 6.1 Econometric results of the effect of food price shocks on total government expenditure

Table ?? gives the estimated results of the effect of food price shocks on total government expenditure between 1980 and 2011. These estimates are validated by the presence of the first order lag serial autocorrelation (AR1) and the absence of that of second order (AR2) statistics of [Arellano & Bond \(1991\)](#), more over, the Hansen statistics reject the over identification hypothesis.

Column (1) shows a positive and significant effect of food price shock on total government expenditure, more precisely, an increase of one standard deviation in the shock variable is associated with an increase of 0.15 standard deviation off government expenditure in percentage of GDP, this effect is significant at 1%. This effect increase to 0.01

percentage of GDP, when we add the external debt and the trade openness (column 2) in the regression. But, when we add remittances (column 3), the shock variable loses its significance and the only significant variable of the regression is the remittances, which have a significant and positive effect on total government expenditure. In the column (4), we add financial openness and its interaction term. As a result, the shock' effect is not significant, but its interaction term with financial openness is positive and significant at 10%, remittance is still significant at 5%. Interestingly, adding the interaction term of official assistance to column (4), we obtain column (5). Here, the shock' effect became significant at 10%, remittances are still significant even if its significance gets lower. External debt and trade openness became both negative and significant at 10%. More interestingly, the interaction term of the shock and ODA is significant and negative. That means that, the positive impact of food price shock on total government expenditure decreases in presence of ODA. This can be justified by the fact that the ODA may be a potential substitute of government expenditure<sup>22</sup>, even in time of price shocks. The positive effect of remittances in the total government expenditure can be interpreted by the fact that remittances received by households allows them to pay taxes that finance government spending. However, there is not a significant heterogeneous effect of food price shocks on total government expenditure depending on remittances, thus the hypothesis of government moral hazard ([Hubert Ebeke \(2012\)](#)) is not found in our study, rather, this moral effect do exist with official development assistance. The significant and negative effect of external debt can be justified in the case where government is more interested in its debt reimbursement, since our government expenditure here do not include interest payment on external debt. The trade openness effect is less intuitive.

From the latter, we have drawn that food price shocks are positively associated to total government expenditure, but that effect depends on ODA . Therefore, we can imagine that there can be a shift in government expenditure composition, in order to favour some classes of expenditure that should be more advantageous for food security issues. We suppose that the expenditure component that is more suitable to food security may be current consumption expenditure (as food subsidies, wage and salaries,..) and agricultural

expenditure. But, agricultural expenditures data are quite challenging to obtain for our countries, that is why we limit our analysis on the current government expenditure. More precisely, we use the share of current expenditure on the total government expenditure as the composition variable. That is, as the total expenditure is constituted of capital and current expenditures, if our study shows a positive impact of food price shocks on the share of current expenditure in total expenditures, it implicitly means that food price shocks are negatively associated with the share capital expenditures in total expenditure.

## 6.2 Econometric results of the effect of food price shocks on current government expenditure

The table ?? gives results of food price shocks effects on the share of current government expenditure in total government expenditure. The variable SHOCKF is the number of positive shocks in each period of successive non overlapping 4 years.

Food price shocks are positively and significantly associated to current government consumption in percentage of total government expenditure. *Ceteris paribus*, an increase of one standard deviation in the shock variable is associated with an increase current government consumption of 0.06 percentage of the total government expenditure. This effect remains the same when we introduce other controls in the regression (column 3). Moreover, as seen in the case with total government expenditure, column (4) shows a non linear effect of food price shock on current government expenditure depending: indeed the increase of current consumption is lesser in the presence of remittances. we also add the interaction term of shock and ODA, but the effect was not significant. External debt significantly increases with current government consumption, whereas it negatively affects total government expenditure (table 2), this can be interpreted by the fact that even if the country is indebted, it will not lesser its current expenditure in order to reimbursed its debts. The government likely plays with government expenditure composition, by lowering the share capital expenditure in the total expenditure in order to pay interests. The credit provided by the banking sector to private agents significantly affects the current expenditure. As this credit can help households facing positive food price shocks, it can



Table 3: Estimates results of food price shocks' effect on current\_expenditure

	(1)	(2)	(3)	(4)
	currentexp	currentexp	currentexp	currentexp
L.currentexp	0.605*** (3.68)	0.620*** (3.09)	0.549*** (5.43)	0.471*** (3.66)
SHOCK	0.0114** (2.42)		0.0120* (1.85)	0.0264 (0.48)
SHOCKF		2.591* (1.78)		
Remittance				0.305** (2.12)
SHOCK*remittance				-0.482*** (-2.66)
Log_gdp	-0.777 (-0.19)	-1.613 (-0.42)	-1.474 (-0.67)	0.158 (0.08)
ODA	-4.467 (-1.23)	-5.465* (-1.71)	-6.110*** (-3.42)	-0.679 (-0.32)
External_debt	0.0320*** (3.13)	0.0305*** (3.38)	0.0186 (1.11)	0.0299*** (3.15)
Log_trade	2.368 (0.61)	1.043 (0.22)	2.628* (1.68)	
Private_credit			0.0811*** (2.62)	
Urbanpop			0.0910 (0.47)	
Dependence_rate			0.156 (1.46)	
Inflation			-0.0110 (-0.07)	
Trade%				0.0000814 (0.25)
Ka_open				1.684 (0.43)
_cons	83.86 (1.22)	126.6 (1.54)	102.8** (2.50)	42.26 (0.78)
i_Period	NO	NO	NO	YES
Effect_scale	.060**	.063*		0.1403 <sup>ns</sup> - 0.15***(remittance)
Effect_scale at the median				0.1403 <sup>ns</sup> - 0.18***
Nber_obs	188	188	153	163
Nber_group	38	38	32	36
Ar1	0.0966	0.0813	0.0171	0.0983
Ar2	0.498	0.365	0.112	0.355
Hansen	0.409	0.493	0.762	0.452

*t* statistics in parentheses. \* ( $p < 0.10$ ), \*\* ( $p < 0.05$ ), \*\*\* ( $p < 0.01$ )

Notes: Data of this table are the average of the yearly data over the successive non overlapping 4 years from 1980 to 2011. Robust standard errors are below the coefficients. The estimation method is the two-step system-GMM

with Windmeijer (2005) correction of standard errors. i\_Period means if the period specific effect was controlled. In general, our results do not change considerably with or without i\_Period. ns means non significant. Effect\_scale is the impact of an increase of a one standard deviation of food price shock on the current government consumption in % of total government expenditure, this have been obtained by dividing the shock marginal effect by its standard error. In these regressions, shocks and period variables are exogenous.

thus be a potential substitute to government expenditure, but when the interaction term of food price shocks and private credit is introduced, this term is not significant. That can be understood if we suppose that households have limited access to credit, and thus, the quantity provided is to allow to allow them facing random shocks<sup>23</sup>.

In table ?? below, we present the estimated results of the food price shocks effects on current expenditure, conditional on the vulnerability level of the country. In the first column, the food price shocks' effect is significant at 5 %, but when we introduce the vulnerability variable in column (2), maintaining the same controls, the shock variable loses its significance and the vulnerability effect is significant, all other control variables that were significant in the first column remain significant. When we introduce the interaction term of vulnerability and shock (in column (3)), this term is significant, the vulnerability variable is still significant and larger in magnitude. However, the food price shock is not significant. In the last equation, we add the democracy variable as control and even if the private credit, the dependance ratio and the GDP became significant, vulnerability and its interaction term with shock remain significant. We then conclude that the food price shocks effect on government expenditure on current expenditure positively depend on the vulnerability.

Remarkably, the food price shocks effect became significant at the fifth percentile and the marginal effect is increasing with the percentile ranking.

Table 4: Estimates results of food price shocks' effect on current\_expenditure given the vulnerability

	(1)	(2)	(3)	(4)
	currentexp	currentexp	currentexp	currentexp
L.currentexp	0.809*** (2.68)	0.749*** (3.39)	0.766*** (3.54)	0.842*** (3.37)
SHOCK	0.0197** (2.16)	0.0211 (1.53)	0.0508 (1.59)	0.0385 (1.00)
VULN		8.329* (1.72)	8.816* (1.88)	8.455* (1.66)
SHOCK*VULN			0.0269* (1.82)	0.0324* (1.87)
Initgdp	-2.508 (-0.36)	-6.719 (-0.73)	-4.557 (-0.52)	-10.94 (-1.08)
Residual_growth	0.415 (1.14)	0.587 (1.13)	0.102 (0.17)	0.0513 (0.07)
Private_credit	0.0907** (2.03)	0.311* (1.71)	0.165 (1.51)	0.191** (2.56)
Log_gdp	5.651 (0.87)	14.76 (1.36)	14.71 (1.34)	19.79** (2.03)
Dependence_rate	0.384 (1.10)	0.809 (1.63)	0.493 (1.20)	0.590** (2.02)
Democracy				2.374 (0.94)
_cons	-46.34 (-0.78)	-120.9 (-1.50)	-102.9 (-1.46)	-118.1* (-1.76)
Period	YES	YES	YES	YES
Effect_scale	0.10**	ns	0.27 <sup>ns</sup> +0.12*(VULN)	0.20 <sup>ns</sup> +0.15*(VULN)
Effect_scale at the Median			0.02*	0.03*
Nber_obs	175	133	133	130
Nber_group	35	33	33	33
Ar1	0.0914	0.0846	0.0767	0.0652
Ar2	0.303	0.624	0.295	0.779
Hansen	0.541	0.488	0.605	0.576

*t* statistics in parentheses. \* ( $p < 0.10$ ), \*\* ( $p < 0.05$ ), \*\*\* ( $p < 0.01$ ). Notes: Data of this table are the average of the yearly data over the successive non overlapping 4 years from 1980 to 2011. Robust standard errors are below the coefficients. The estimation method is the two-step system-GMM with Windmeijer (2005) correction of standard errors. i\_Period means if the period specific effect was controlled. In general, our results do not change considerably with or without i\_Period. means non significant. Effect\_scale is the impact of an increase of a one standard deviation of food price shock on the current government consumption in % of total government expenditure, this have been obtained by dividing the shock marginal effect by its standard error. In these regressions, shocks and period variables are exogenous.

## 6.3 Robustness check

### 6.3.1 Robustness check of the effect of food price shocks on total government expenditure

In order to be sure that results recently found are robust, we draw the regressions of table 5 and there is not a significant change. the column (2) shows an heterogeneous effect of food price shocks on total government expenditure, depending on the remittances level. More precisely, even if the shock variable is not significant, the interaction term with remittances is negative and significant whereas the remittances variable is positively associated with total expenditure. This can be interpreted as remittances are used to finance taxes, that contributed to finance government expenditure, but in time of food price shocks, people pay less taxes and use remittances to meet their meals. In column (4), we see an heterogeneous effect of shock on government expenditure depending on the financial openness, but when we divide the financial openness variable into 3 percentiles, the shock variable effect is not significant in both sub-samples, even if the marginal effect

Table 5: Robustness checks: Estimates results of food price shocks' effect on total\_expenditure

	(1)	(2)	(3)	(4)	(lower_ka_open)	(higher_kapen)
	totalexp	totalexp	totalexp	totalexp	totalexp	totalexp
L.totalexp	0.511*** (4.86)	0.574*** (4.78)	0.481*** (4.48)	0.411*** (3.52)	0.908*** (3.68)	0.143 (0.69)
SHOCK	0.00671 (0.52)	0.00441 (0.27)	0.00998 (0.83)	-0.00176 (-0.12)	-0.00603 (-0.79)	0.00110 (0.12)
Remittance	0.293** (2.17)	0.127* (1.67)	0.313** (2.27)	0.347** (2.16)	-0.0532 (-0.26)	0.449*** (2.78)
SHOCK*Remittance		-0.214* (-1.94)				
Ka_open			-0.586 (-0.34)	-2.208 (-0.43)		
SHOCK*Ka_open				0.100* (1.77)		
Log_gdp	0.911 (0.57)	0.873 (0.56)	1.347 (0.89)	1.876 (0.75)	-1.330 (-0.71)	3.365* (1.70)
ODA	1.042 (0.79)	1.643 (1.08)	1.244 (0.86)	0.861 (0.46)	1.877 (0.95)	2.024 (1.55)
External_debt	-0.00743 (-1.28)	-0.00984 (-1.51)	-0.00651 (-1.18)	-0.00594 (-0.62)	-0.0411* (-1.93)	-0.00770*** (-2.98)
Trade%	-0.707 (-0.57)	-0.908 (-0.49)	-1.202 (-0.94)	-0.866 (-0.43)	-3.467 (-1.64)	-1.259 (-0.86)
_cons	-6.052 (-0.16)	-15.73 (-0.36)	-4.942 (-0.12)	-3.482 (-0.06)	26.88 (0.69)	-26.23 (-1.40)
i.Period	NO	NO	NO	NO	NO	NO
Nber_obs	164	164	163	163	99	64
Nber_group	36	36	36	36	30	25
Ar1	0.0606	0.0661	0.0305	0.0389	0.0816	0.0518
Ar2	0.261	0.186	0.177	0.424	0.111	0.111
Hansen	0.431	0.437	0.489	0.283	0.510	0.640

*t* statistics in parentheses. \* ( $p < 0.10$ ), \*\* ( $p < 0.05$ ), \*\*\* ( $p < 0.01$ )

Notes: Data of this table are the average of the yearly data over the successive

non overlapping 4 years from 1980 to 2011. Robust standard errors are below the coefficients.

The estimation method is the two-step system-GMM with Windmeijer (2005) correction of standard errors. i.Period means if the period specific effect was controlled. In general, our results do not change considerably with or without i.Period . shocks and period variables are exogenous.

is negative on the less financial open and positive on the more financial open. The external debt effect is still significant in both sub-samples. But, remittances' effect and GDP' effect are positively and significantly associated with current government expenditure in the sample of the higher financial opened countries. This result concerning the GDP is consistent with the *WagnerLaw* hypothesis for the more financial opened countries.

### 6.3.2 Robustness check of the effect of food price shocks on current government expenditure

In order to insure that our results are not sensitive to the variables involved, we run other regressions with more specifications. We ensure the robustness<sup>24</sup> of our latter findings, using alternative measures of the shock variable and adding another controls. First, we add control variables to the previous regressions. Second, given that previous results draw some heterogeneity of the food price shock's effect in total government expenditure depending on financial openness and remittances, we subdivide our sample into subsamples over the financial openness level, over income level. All those results are given in the above.

Results of table 6 are consistent with the results recently found for the effect of food price shock on current government expenditure. Further, when we use an interaction term of remittances and the shock variable SHOCKF, its effect is positively associated with current expenditure, whereas it is not the case when we use the variable SHOCK. This can be interpreted as, current expenditure reacts less positively to food price shocks when there are remittances, but, more positively if positive price shocks are more common. That states that the moral hazard of the government in the presence of remittances is not verified if positive shocks are more common.

Table 6: Robustness checks: Estimates results of food price shocks' effect on current\_expenditure

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	currentexp	currentexp	currentexp	currentexp	currentexp	currentexp	currentexp	currentexp
L.currentexp	0.540*** (3.05)	0.375** (2.16)	0.521*** (2.82)	0.479*** (3.16)	0.603*** (4.08)	0.568*** (4.83)	0.504*** (3.06)	0.594*** (4.31)
SHOCK	0.0115** (2.32)	0.0415 (0.64)	-0.429 (-0.56)	0.0301 (0.45)				
Remittance		0.253** (2.04)		0.292* (1.87)			-0.133 (-0.94)	
SHOCK*Remittance		-0.448** (-2.08)		-0.464** (-2.48)				
SHOCK*ODA			2.200 (0.58)					
Ka_open				3.615 (0.72)				12.35 (1.01)
SHOCK*Ka_open				-0.0449 (-0.52)				
SHOCKF					2.377** (2.12)	2.715 (1.12)	0.843 (0.75)	3.153 (0.94)
SHOCKF*Remittance							-0.0430 (-0.70)	
Kaopen						3.160** (2.45)		
SHOCKF*Kaopen						-4.654 (-0.84)		-4.708 (-0.47)
Log_gdp	1.955 (0.80)	-0.0702 (-0.03)	1.063 (0.39)	-0.654 (-0.29)	2.458 (0.45)	5.478 (0.79)	12.11* (1.65)	-1.153 (-0.18)
ODA	-1.810 (-0.73)	-1.729 (-0.67)	-1.982 (-0.67)	-1.195 (-0.47)	-4.109** (-1.98)	-2.288 (-1.49)	-3.697 (-1.53)	-4.881* (-1.69)
External_debt	0.0363*** (4.60)	0.0277*** (2.96)	0.0337*** (3.64)	0.0271*** (3.18)	0.0330* (1.90)	0.0315*** (2.70)	0.0340*** (2.95)	0.0301** (1.99)
Trade%	0.000115 (0.20)	0.000142 (0.31)	0.000295 (0.40)	0.000135 (0.42)	0.000815** (1.98)	0.000268 (0.83)	0.00165* (1.94)	0.000481 (1.23)
M2_gdp					-0.0403 (-0.24)	-0.122 (-0.64)	-0.143 (-1.03)	0.00998 (0.07)
Dependence_rate					0.246 (0.95)	0.216 (1.02)	0.510** (2.05)	0.285 (1.56)
_cons	50.29 (0.82)	71.81 (1.03)	60.76 (0.86)	60.62 (0.93)	66.63 (0.86)	22.64 (0.37)	-20.05 (-0.24)	98.84 (1.05)
i_Period	YES	YES	YES	YES	NO	NO	NO	NO
Nber_obs	188	164	188	163	182	182	160	182
Nber_group	38	36	38	36	38	38	36	38
Ar1	0.0443	0.0552	0.0510	0.0998	0.0169	0.0576	0.0677	0.0348
Ar2	0.253	0.267	0.285	0.347	0.187	0.196	0.115	0.212
Hansen	0.654	0.525	0.486	0.397	0.336	0.755	0.695	0.690

*t* statistics in parentheses. \* ( $p < 0.10$ ), \*\* ( $p < 0.05$ ), \*\*\* ( $p < 0.01$ ). Notes: Data of this table are the average of the yearly data over the successive non overlapping 4 years from 1980 to 2011. Robust standard errors are below the coefficients.

In order to find evidence if there can exist a heterogeneity on the effect of price shocks on financial openness depending on financial openness, we present in the following table the results for different financial openness percentiles (3 percentiles). The shock variable is not significant in both sub-samples. We can then conclude that the heterogeneous effect according to financial openness may have existed if the subsamples were a bit larger.

Table 7: Robustness checks: Estimates results of food price shocks' effect on current\_expenditures by financial openness\_group

	(All) currentexp	(lower_ka_open) currentexp	(lower_ka_open) currentexp	(higher_ka_open) currentexp	(higher_ka_open) currentexp	(All) currentexp	(lower_ka_open) currentexp
L.currentexp	0.655*** (4.56)	0.390 (0.59)	0.291 (0.46)	0.0393 (0.09)	0.0962 (0.32)	0.644*** (4.42)	0.718*** (3.44)
SHOCK	0.0106* (1.95)	0.0147 (1.00)		-0.0572 (-1.32)		0.219 (0.44)	0.0101 (0.95)
SHOCKF			3.077 (1.23)		-2.899 (-0.51)		
SHOCK*ODA						-1.032 (-0.42)	
Log_gdp	-1.803 (-0.56)	-9.415 (-0.49)	-10.39 (-0.81)	-6.389 (-1.37)	-6.893* (-1.72)	-3.225 (-1.16)	-2.979 (-0.43)
ODA	-4.017** (-2.05)	-13.03* (-1.72)	-14.18** (-2.50)	1.414 (0.40)	-6.283*** (-2.76)	-4.374* (-1.75)	-7.325* (-1.90)
External_debt	0.0376*** (3.86)	-0.0397 (-0.42)	-0.0314 (-0.53)	0.00867 (0.36)	-0.00268 (-0.13)	0.0344*** (3.81)	-0.0165 (-0.63)
Trade%	0.000732 (0.72)	0.000674 (0.55)	0.00101 (0.78)	0.00235* (1.68)	-0.000953 (-0.65)	0.000545 (0.76)	0.000706 (0.92)
M2_gdp	-0.0346 (-0.29)	0.367 (0.94)	0.439 (1.24)	0.276** (2.27)	0.167 (1.16)	0.0217 (0.26)	0.0782 (0.29)
Prbanpop	-0.0902 (-0.77)	0.000663 (0.00)	0.00817 (0.02)	0.662 (1.54)	0.254 (1.36)	-0.00826 (-0.08)	-0.140 (-0.65)
Pop_growth	-0.618 (-0.51)					-0.367 (-0.35)	-1.158 (-0.91)
_cons	117.3** (2.50)	351.3 (1.50)	381.3** (2.49)	42.71 (0.49)	221.1*** (2.72)	129.5** (2.14)	190.3** (2.01)
i_Period	NO	NO	NO	NO	NO	NO	NO
Nber_obs	154	100	100	54	54	154	100
Nber_group	32	29	29	19	19	32	29
Ar1	0.0378	0.0955	0.0586	0.0590	0.0932	0.0751	0.0312
Ar2	0.307	0.140	0.141	0.174	0.112	0.389	0.209
Hansen	0.756	0.312	0.357	0.738	0.676	0.758	0.424

*t* statistics in parentheses. \* ( $p < 0.10$ ), \*\* ( $p < 0.05$ ), \*\*\* ( $p < 0.01$ ). Notes: Data of this table are the average of the yearly data over successive non overlapping 4 years from 1980 to 2011. Robust standard errors are below the coefficients.

The estimation method is the two-step system-GMM with Windmeijer (2005) correction of standard errors.

i\_Period means if the period specific effect was controlled. In general, our results do not change considerably with or without i\_Period.

In these regressions, shocks and period variables are exogenous.



Table 8 gives the estimated results of the food price shocks effect on government expenditures per income group.

Column (3) uses the shock price variable SHOCKF, that represents the frequency of food price shocks for each period. One additional positive shock is associated with 2,45 percentage of the current expenditure in total government expenditures. This effect is significant at 10 %. When we use the SHOCK variable in the last 3 columns, all that results show a positive and significant effect of food price shock price on the share of current expenditure in the total expenditure. It is also found that that ODA negatively and significantly impacts current expenditure, this result make sense if we think that the government tend to reduce current expenditure and favours capital expenditure in the case where there are ODA. External debt positively and significantly affects current expenditure, this is the same for the credit obtained by the private sector. The fifth column is based on the two low income classes of the country, while the last column is based on the bottom income group<sup>25</sup>. Controlling with the same interest variables, results show a positive and significant effect of food price shocks on current expenditures for the two subsamples. The amplitude is bigger and more significant for the poorest countries (0,015 versus 0,010 for the the 2 more poor groups).

### **6.3.3 Robustness check of the effect of food price shocks on current government expenditure per vulnerability percentiles**

Table 8: Estimates results of food price shocks' effect on current\_expenditures by income\_group table

	(1)	(2)	(3)	((LICs & LMICs))	(LICs)
	currentexp	currentexp	currentexp	currentexp	currentexp
L.currentexp	0.522** (2.45)	0.531*** (2.76)	0.655*** (4.56)	0.375* (1.66)	0.715* (1.81)
SHOCKF	2.468* (1.68)				
SHOCK		0.0116** (1.98)	0.0106* (1.95)	0.0151*** (2.78)	0.0149** (2.20)
Log_gdp	-3.817 (-0.96)	-0.833 (-0.36)	-1.803 (-0.56)	0.354 (0.08)	7.743 (0.78)
ODA	-6.054** (-1.99)	-3.844* (-1.82)	-4.017** (-2.05)	-4.929* (-1.72)	-5.774* (-1.89)
External_debt	0.0280 (1.22)	0.0190* (1.94)	0.0376*** (3.86)	0.0297** (2.42)	0.0557** (2.06)
Log_trade	2.780 (1.23)				
M2gdp	0.116 (0.53)		-0.0346 (-0.29)	0.0670 (0.38)	0.146 (0.70)
Urbanpop	-0.124 (-0.28)		-0.0902 (-0.77)	0.0160 (0.06)	-0.0628 (-0.29)
Trade%		0.000154 (0.31)	0.000732 (0.72)	0.0000994 (0.13)	0.00288* (1.80)
Private_credit		0.0710** (2.04) (-0.56)			
Pop_growth			-0.618 (-0.51)		
_cons	135.6** (2.35)	108.7** (2.10)	117.3** (2.50)	135.4* (1.70)	75.84 (0.67)
i.Period	NO	YES	NO	NO	NO
Nber_obs	154	181	154	129	110
Nber_group	32	38	32	29	25
Ar1	0.0813	0.0297	0.0378	0.0813	0.0567
Ar2	0.232	0.218	0.307	0.233	0.158
Hansen	0.393	0.687	0.756	0.571	0.760

*t* statistics in parentheses. \* ( $p < 0.10$ ), \*\* ( $p < 0.05$ ), \*\*\* ( $p < 0.01$ ). Notes: Data of this table are the average of the yearly data over the successive non overlapping 4 years from 1980 to 2011. Robust standard errors are below the coefficients. The estimation method is the two-step system-GMM with Windmeijer (2005) correction of standard errors. i.Period means if the period specific effect was controlled. In general, our results do not change considerably with or without i.Period. In these regressions, shocks and period variables are exogenous.

Holding the fourth column of table 4, table 11 gives the marginal effect of food price shocks on government expenditures composition for the **first ten** vulnerability percentiles. It clearly shows that food price effect is significant on current expenditure for the 4 highest percentiles of vulnerability.

## 7 Conclusion

Our aim was to assess the impact of food price shocks on government expenditure level and composition. We use the GMM-system instrumentation approach given the inertia of government expenditure. Based on 47 african countries between 1980 and 2011, we found that food price shocks are positively and significantly associated with government expenditure. This effect is accompanied by the positive effect of food price shocks on government consumption expenditure in share of total government expenditure. More precisely, an additional one standard deviation of food price shock increase is associated to an increase of 0.06 standard deviation of the percentage of current government consumption in percentage of the total government expenditure. Interestingly, we found that this effect is conditional on the country's vulnerability. More precisely, food price shocks may only significantly affect the government expenditure composition when country is vulnerable and poor. Further, food price shocks effect on government expenditure composition is lower in the presence of remittances and Official net assistance. This result is coherent with the intuition that as food crises generally rise food insecurity problem, this may call for the government reaction, but that the government will tend to react more if there are another substitutes of government expenditures, such as external aid assistance and remittances<sup>26</sup>. It can be drawn from these results that current expenditure have been involved in order to help households facing difficult periods of food crisis, but the question on the extent to which such expenditure have benefit to more vulnerable have a merit to be evidence. Further, not only current expenditure have to be added, but also agricultural investments, that remains a corner stone of any food security ends, needs to be highly involved. In parallel, price forecasting systems are needed; food trade distorting measures at the borders have to be banned.

Because of the data unavailability, we can not evidence this impact on more disaggre-

gated government expenditure component. It will be interesting in our further study to use agricultural expenditure and revenue (tariffs and the the direct taxes on food ), in order to more explore the responses to food price shocks' effects and their consequences. We recognise that the shortest the time horizon used for shocks variables the more consistent are these variables. That is why another limit of this study might be the long time horizon of the data that was available to carry out this work.

## Notes

<sup>1</sup>After 1979 (the 2<sup>nd</sup> oil shock )

<sup>2</sup> [Organization et al. \(2012\)](#) reported that countries' import bills had considerably increased and billions of people toggled below the poverty threshold since 2006.

<sup>3</sup> wheat (whose price increased by about 200 % within the period 2002-2008); rice (whose price have accelerated in 2007 to attain the 430% of the 2002s level); soybean and maize. The main difference between the surges of 2006-2008 and that of mid\_ 2010 lied in the level of staple food groups: concerning the last crisis, the rice price have been moderate whereas oilseeds price have continued to rise, see [Minot et al. \(2009\)](#), and the IMF rapport (2009)

<sup>4</sup>These authors mentioned that many countries have adopted inflation target policy because of food price instability

<sup>5</sup>government have to respond for famers', consumers groups' and industrialists' pressures

<sup>6</sup>food price impact will not been addressed in this paper, as it is the subject of another works

<sup>7</sup>Structural Adjustment Program

<sup>8</sup>These prescriptions consisted of deficit reduction, that can either be reached by reduced government spending or increased revenue, as the latter can appear to distort economic productivity.

<sup>9</sup>in fact, [Andrés et al. \(2008\)](#) found out that government expenditure stabilisation role on economic growth is only fulfilled when there is shift in government tools composition

<sup>10</sup>we will also control our result with financial openness, as [Kinda et al. \(2016\)](#) found that price shocks matter on the financial sector

<sup>11</sup>food import and export variables that we have used in this study include both for staple foods and other varieties because we did not disposed of more disaggregated data. That constitutes one of the limits of this work.

<sup>12</sup>see [FAO et al. \(2011\)](#)

<sup>13</sup>The number of lag is robust when we introduce only one lag or three lags

<sup>14</sup>The payment of debt interests are not included in government expenditure.

<sup>15</sup>Combes et al. (2014) and De Janvry & Sadoulet (2010)

<sup>16</sup>Ordinary Least Square

<sup>17</sup>see Love & Zicchino (2006) and Pesaran et al. (1999)

<sup>18</sup> balanced panel series

<sup>19</sup>A note about GMM advantages and concerns. Advantages: The GMM estimator is consistent asymptotically under a variety of situations, including when the only instruments available are predetermined rather than strictly exogenous (Arellano & Bond (1991)). The GMM estimator is also efficient in certain classes of estimators. GMM estimator is consistent and asymptotically efficient when both N and T tend to infinity under certain conditions (Arellano (2003)).

Concerns: GMM could be biased when the number of moment conditions expands, leading to a bias/efficiency trade-off. (Arellano (2003)) also found that the GMM estimator is asymptotically biased when T/N tends to a positive constant (c). Moreover, it is inconsistent as when the autocorrelation in the first differenced errors are neglected. That is why we ran appropriate tests of autocorrelation, and we also subdivide our time period into sub periods

<sup>20</sup>Moreover, the Monte-carlo simulation done by Blundell et al. (2001) showed that system GMM precision is more important as the studied period decreases.

$$^{21} \frac{\delta \text{expend}_{i,t}}{\delta \text{shock}_{i,t}} = \beta_1 + \beta_3 \text{vul}_{i,t} = 0 \Rightarrow \text{vul} = -\frac{\beta_1}{\beta_3}$$

<sup>22</sup>ODA, perhaps acts as a shock absorber

<sup>23</sup>We have also controlled for institutional variables, as democracy and corruption (not presented here) in our GMM estimator equations, but they were not significant. In the follow, we evidence if country's vulnerability matters in the reaction of government expenditure composition when there is food price shocks effect.

<sup>24</sup>we also try to run our regressions using the first difference GMM estimator, but results have not changed

<sup>25</sup>hyperref <http://data.worldbank.org/news/2015-country-classifications> using the world bank (2013) classification

<sup>26</sup>this is in contradiction with the moral hazard hypothesis of the government in presence of remittances when positive price shocks are more common

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Table 9: Variables' definitions and sources

Variables	Definitions	Sources
Price index	seen section (3)	WEO(2015) <sup>27</sup>
Currenexp	current government expenditure	FAOSTATISTIQUES (2016)
	total government expenditure	WDI <sup>28</sup>
Totalexp	= current government expenditure +public gross capital formation (both in % GDP)	Authors using WDI
GDP	Gros Domestic Product per capita	WDI (2015)
Growth	GDP growth	Authors using WDI
Res_growth	GDP growth cycle	WDI
Openess	trade openness, measure as the sum of goods and services import and export over the total GDP	WDI
Remittance	Net remittances received par individual from abroad	WDI
ODA	Net Official assistance received per capita	WDI
External debt	external debt of the central government in % of GDP	WDI
Urbanpop	the share of the population living in urban regions	WDI
Dependence rate	the ratio of people from 0 to 15 and +64 to the total population	WDI
Population	population growth rate	WDI
Inflation	rate of inflation deflator	WDI
M2_GDP	Money and quasi-money (in % of GDP)	WDI
Private_credit	ratio of the credit addressed by the financial and bank sectors to the private sector in % of gdp	WDI
Ka_open	international openness ( in real term)	Chinn & Ito (2006) <sup>29</sup>
Kaopen	international openness (normalised from 0 to 1)	Chinn & Ito (2006)
Corruption	corruption level	IRCG
Democracy	democracy level (ranking -10 to +10, from highest autocracies to highest democracies )	IRCG

source: authors

Table 10: Country par Geographic region

NORD	SUD	EST	OUEST	CENTRALE
Algeria	Angola	Burundi	Benin	Cameroon
Egypt	Botswana	Djibouti	Burkina Faso	RCA
Libya	Comoros	Ethiopia	COTE D'IVOIRE	Chad
Mauritania	Lesotho	Kenya	Gambia	Congo
Morocco	Madagascar	Rwanda	Ghana	Gabon
Sudan	Malawi Namibia	Somalia	Guinea Guinea-Bissau	CaboVerde
Tunisia	Mauritius	Uganda	Mali Niger Nigeria	
	Mozambique	Tanzania	Sierra Leone	
	South Africa		Togo	
	Zambia		Senegal	
	Zimbabwe		Liberia	

source: authors' classification using WDI data

Table 11: Marginal effect of food price shocks on the current government expenditure for the first ten percentiles of the vulnerability index

percentile	dydx	SE	pvalue
1	.0091772	.0428305	.8303382
2	.0324438	.0353525	.3587646
3	.0447293	.0327643	.1721951
4	.0519669	.0318194	.102431
5	.0554578	.0315341	<b>.0786345</b>
6	.0583288	.0313858	<b>.0631056</b>
7	.0633445	.0313171	<b>.0431058</b>
8	.0702047	.0316159	<b>.0263815</b>
9	.0833068	.0333883	<b>.0125925</b>

These calculations are obtained by solving the equations below:  $\frac{\delta expend_{i,t}}{\delta shock_{i,t}} = \beta_1 + \beta_3 vul_{i,t} = 0 \Rightarrow vul = -\frac{\beta_1}{\beta_3}$  source: Author's calculations using post-estimates results

Table 12: PCA specificity criteria

Variable	F1	F2	Specificity
Income gap(Compare to the richest income)	-0.3555	0.4240	0.6939
food import/households consumption expenditure	0.7526	0.0859	0.4261
export food import food	0.5195	-0.2377	0.6736
food Imports /total import	0.4546	0.4609	0.5809

source: authors calculations using WDI data

Table 13: Eigenvalues and cumulative frequencies\_PCA

Component	Eigenvalue	Proportion	Cumulative relative frequencies
F1	1.82208	0.4555	0.4555
F2	1.2312	0.3078	0.7633
F3	.59987	0.1500	0.9133

source: authors calculations' using WDI data

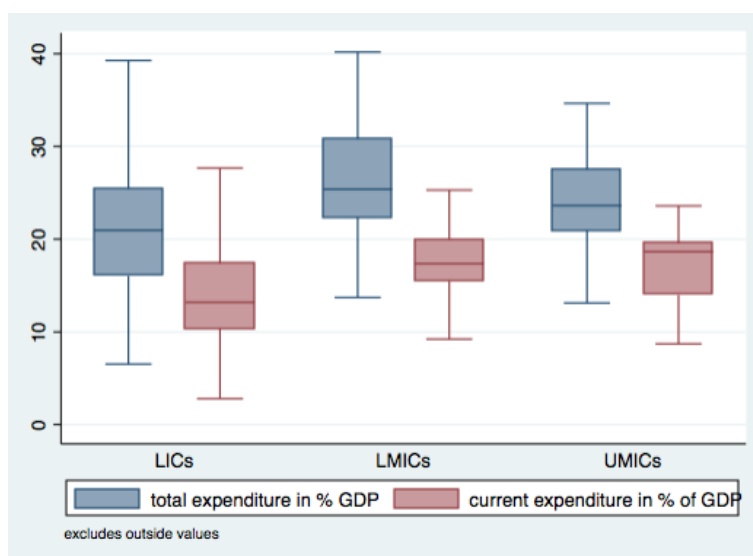


Figure 3: Group income countries par vulnerability level

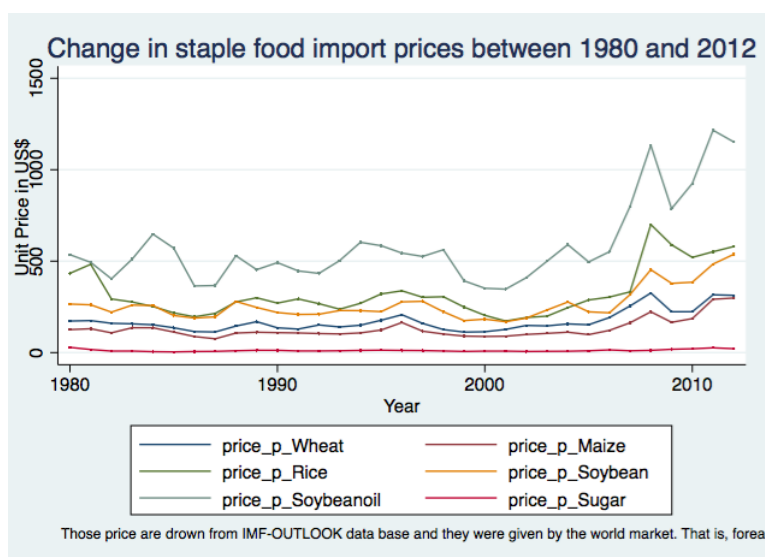


Figure 4: Staple food world price patterns from 1980 to 2011

Notes: Variation of the price of the six main imported food within the world. Data are drawn from the IMF outlook database

Table 14: PCA variables and participation

Variables	F1	F2	F3	F4
Income gap(Compare to the richest income )	-0.3169	0.6823	0.6072	0.2556
food import/households consumption expenditure	0.6499	0.1654	-0.1523	0.7260
export food import food	0.5397	-0.3106	0.7390	-0.2573
food Imports /total import	0.4312	0.6408	-0.2491	-0.5843

source: authors' calculations using WDI data

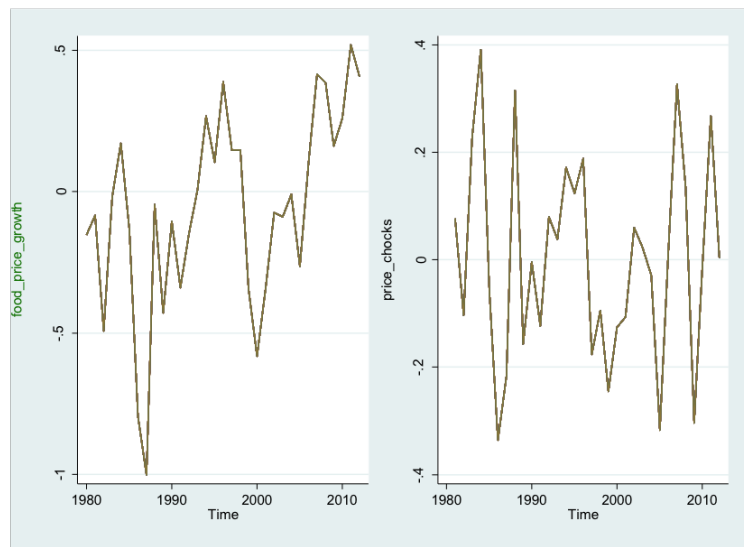


Figure 5: changes in food price shocks and food price variability between 1980 and 2011

This graph represents the variation of our food price shocks variable (at the right side) and the variation of the food price growth on the left side (that is the value at time  $n$  minus the value at time  $n-1$ , divided by the value at time  $n$ ). From to this plot, we can establish that the two variables may almost have the same evolution, but our food shocks variable fluctuate more, that is why we choose to use this variable that may be give the well approximation of food price shocks. All the two variable are given at the median values.  
 source: Author's calculations using FAO and WEO data