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Jean-Louis Combes, Christian Hubert Ebeke, Mireille S. Ntsama Etoundi, Thierry Yogo

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Abstract

This paper measures the effects of food price shocks on both the level of household consumption per capita and the instability of the household consumption per capita growth rate in developing countries. In this vein, the paper explores specifically the role of aid and remittance inflows in the mitigation of the effects of food price shocks in the recipient economies. Using a large sample of developing countries observed over the period 1980 – 2009 and mobilizing dynamic panel data specifications, the econometric results yield three important findings. First, food price shocks significantly affect both the level and the instability of household consumption in the highly vulnerable countries. Second, remittance and aid inflows significantly dampen the effect of food price shocks in the most vulnerable countries. Third, a lower remittance-to-GDP ratio is required to fully absorb the effects of the food price shocks compared to the corresponding aid-to-GDP ratio.

Key words: Household consumption, food price shocks, vulnerability, aid, remittances.

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1. Introduction

The recent increase in food prices in the previous years have raised concerns about the risk of seeing the resurgence of the undernourishment, hungry around the world and mainly in poor countries. According to the World Bank (2011), global food prices remain high, partly due to increasing fuel prices as well as the speculative behaviors in the commodity markets, and the World Bank's food price index is again around its 2008 peak.[1] Moreover, the World Bank study stressed that since June 2010, an additional 44 million people fell below the $1.25 poverty line as a result of higher food prices. Simulations show that a further 10% increase in the food price index could lead to 10 million people falling into poverty, and a 30% increase could raise poverty by 34 million people.

Notwithstanding the recognized damaging effects of food price shocks on poverty and welfare in developing food importing countries, little is known about the role that international capital flows can play in dampening the effects of food price shocks. Several reasons justify the interest to look at the effect of international capital flows such as foreign aid and international migrant remittances.[2]

First, developing countries are among the top recipients of official development assistance and remittances (World Bank Migration and Remittances Factbook, 2011) and there are existing studies on the countercyclical responsiveness of aid and remittances when countries are facing various types of shocks such as exchange rate shocks, natural disasters, conflict, oil

[1] Several factors are behind the recurrent rises in food prices. The drivers include severe weather events in key grain exporter, the broad-based increase in agricultural commodity prices in 2010, which increased the competition for land and other inputs; and the link between higher oil prices and biofuels.

[2] According to the recent World Bank's (2011) report "Migration and Remittances Factbook", the total amount of remittances received by developing countries is three times the level of foreign aid, what posits remittances as among the top external sources of finance in the developing world.

shocks, and financial crises (Ratha, 2005; Yang, 2008; Lueth and Ruiz-Arranz, 2007; Mohapatra et al., 2009; Dabla-Norris et al., 2010; David, 2010).

Second, there are only few papers examining the role of international capital flows as shock absorbers in developing countries (Collier and Dehn, 2001; Chami et al., 2009; Craigwell et al., 2010; Combes and Ebeke, 2011). These papers essentially focused on the contribution of international capital inflows in the macroeconomic stabilization and help cope with various types of shocks. Collier and Dehn (2001) found that the adverse effects of negative export price shocks can, be mitigated by broadly contemporaneous increases in aid. Combes and Ebeke (2011) showed that remittance inflows help reduce the destabilizing effects of natural disasters, agricultural shocks, financial and banking crises, discretionary fiscal policy, and exchange rate volatility on the household consumption per capita. One principal limitation of these studies is that they neglected to compare the effectiveness of remittances and foreign aid in time of shocks, and especially food price shocks in developing countries. This issue is of concern since it has appeared the fear to see foreign aid to be crowded out by the large remittance flows observed nowadays.[3] Hence, it seems worthwhile to compare the effectiveness of these two flows in time of shocks, before making any judgment.

Third, there are very few macroeconomic papers examining the effects of the rise in the food prices by distinguishing the possible effects between the most exposed countries (the vulnerable ones) and those in which the effects are not necessarily negative for the welfare (the less vulnerable ones). One exception is Kamgnia (2011) who addressed the effects of the level of the food prices on various outcomes (undernourishment, agricultural production,

[3] According to Grabel (2009), skeptics of ODA and of international aid bureaucracies have embraced remittances as part of what Adelman (2003) approvingly calls the new "privatized foreign aid" and what the *Financial Times* (cited in Adelman) terms the "diaspora that fuels development". In this view, remittances are superior to traditional (public) ODA because they have little to no overhead, they are not subject to misuse by state officials, and they efficiently and directly meet human needs in developing countries.

current account and government spending), and allowed the effects to being different according to the levels of the vulnerability to food price shocks in Sub-Saharan African countries.

This paper measures the effects of food price shocks on both the level of household consumption per capita and the instability of the household consumption per capita growth rate in developing countries. In this vein, the paper explores specifically the role of aid and remittance inflows in the mitigation of the effects of food price shocks in the recipient economies.

Using a large sample of developing countries observed over the period 1980 – 2009 and mobilizing dynamic panel data specifications, the econometric results yield three important findings. First, food price shocks significantly affect both the level and the instability of household consumption in the highly vulnerable countries. Based on an earlier work of de Janvry and Sadoulet (2008), the vulnerability of the countries to food price shocks has been assessed by computing a continuous index which aggregates three main dimensions: level of underdevelopment, the high food dependency, and the high food import burden. Second, remittance and aid inflows significantly dampen the effect of food price shocks in the most vulnerable countries. Third, a lower remittance-to-GDP ratio is required to fully absorb the effects of the food price shocks compared to the corresponding aid-to-GDP ratio which is required.

The remainder of the paper is as follows. Section 2 computes the vulnerability index, the food price shocks and provides some stylized facts about the vulnerable countries. Section 3 presents the econometric models and discusses the main results. The paper concludes in Section 4 with policy implications.

2. Differential effects of food price shocks according to the level of vulnerability: Some stylized facts

2.1. Identifying the vulnerable countries

According to de Janvry and Sadoulet (2008), countries are vulnerable if they meet the following three criteria: (1) High food dependency, (2) High food import burden, and (3) Low income.

The first criterion highlights the importance of food consumption in the basket of goods consumed by the representative household in a given country. Hence, the greatest is the share of foods items in the basket, the hardest the households would be hit by the increase in food prices. But instead of using the share of cereal imports, we approximate food dependency by the share of total food imports in total household consumption. The second criterion stresses on the strong dependency of a country vis-à-vis the rest of the world, as for its supply for food items. Thus, net food importing countries would be naturally more vulnerable to the increase in food prices because they would considerably deteriorate their current account. Here we measure this variable by the ratio of food imports to total imports. Finally, the third criterion underlines the capacity of a country to constitute food safety nets for domestic consumers, should the price shocks being prejudicial to them. We measure this capacity by the level of income as approximated by per capita gross domestic product.

Using the criteria of de Janvry and Sadoulet (2008), we resort to principal component analysis (PCA) in order to build our vulnerability index. Thus the vulnerability index is a combination of the following variables: the ratio of food imports to total household consumption, the ratio of total food imports to total imports of goods and services, and the inverse of the level of per

capita GDP. This latter transformation is achieved to ensure that the level of development is negatively correlated to the degree of vulnerability to food price shocks. Finally, the vulnerability index is rescaled to be ranged between 0 and 10, with higher values corresponding to high levels of vulnerability. The calculation of the vulnerability index is made over the period 1980 – 2009. The statistical summary of the PCA are presented in the appendices (see Tables A1 and A2 in Appendix A.).

Overall, the first two principal components explain more than 89% of the total variance and are significantly correlated with the three main variables used to build the vulnerability index.

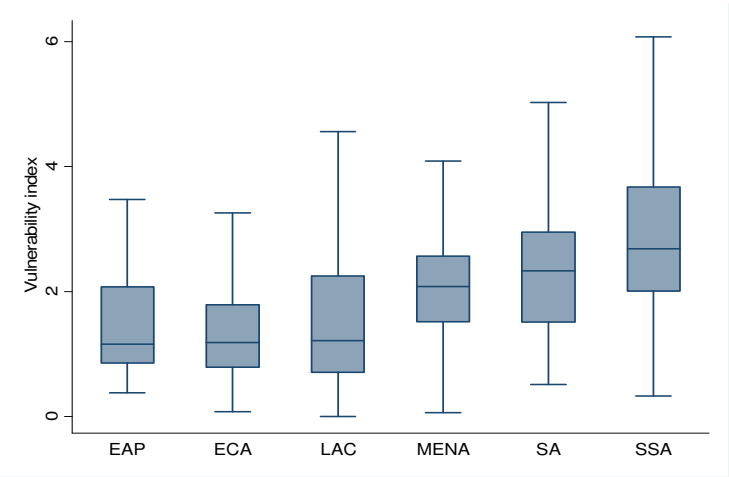
Once the vulnerability index in built, it is useful to see how it is distributed among income groups and regions worldwide.

Figure 1 presents the distribution of vulnerability to price shocks among developing regions. The figure shows that the vulnerability index is greater for Sub-Saharan African countries. This result is however intuitive. In fact most of these countries are highly dependent to food imports and does not have enough income to build safety nets to cope with food price shocks.

While looking at income groups, it appears that low income countries are the most vulnerable as shown in Figure 2. This is mainly due to their inability to build a safety net such as buffer stocks as underlined above.

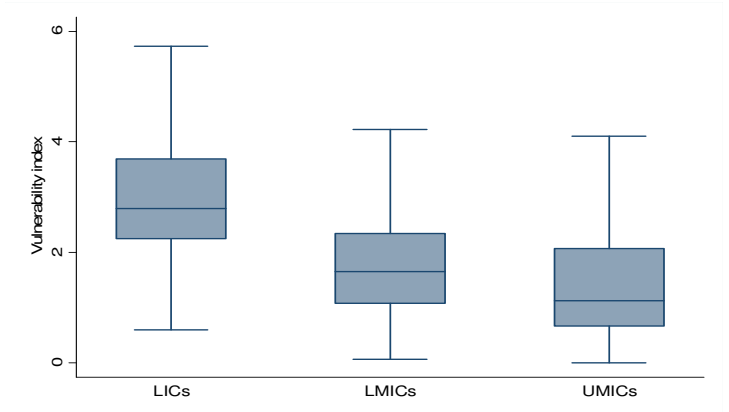
As a whole, the distribution of the vulnerability index among developing regions and income groups shows that the low income countries are the most vulnerable. But among this group, Sub Saharan African countries are worst off.

Figure 1 : Vulnerability to food price shocks among developing regions (1980 – 2009)



Note : The vulnerability to food price shocks index is the aggregation of three variables: the inverse of GDP per capita, the level of food imports as percentage of total imports of goods and the level of food imports as percentage of total household final consumption. The principal component analysis has been used as the technology of aggregation and the resulting vulnerability index has been rescaled to be between 0 and 10 with higher value indicating a strong level of vulnerability.
In box plots, the lower and upper hinges of each box show the 25th and 75th percentiles of the samples, the line in the box indicates the respective medians, and the end-points of whiskers mark next adjacent values.
EAP: East Asia and Pacific, ECA: Europe and Central Asia, LAC: Latin America and Caribbean, MENA: Middle East and North Africa, SA: South Asia, SSA: Sub-Saharan Africa.
Source : FAO-Stats, World Bank Development Indicators and authors' construction.

Figure 2 : Vulnerability to food price shocks among income groups (1980 – 2009)



Note : LICs: Low Income Countries, LMICs: Lower Middle Income Countries, UMICs: Upper Middle Income Countries.
Source : FAO-Stats, World Bank Development Indicators and authors' construction.

2.2. Computing the food price shocks Variable

In order to compute the food price shock variable, we follow the methodology developed by Deaton and Miller (1995) and retained by Dehn (2000), and Collier and Dehn (2001). Specifically, we follow two steps: (1) The food price index is computed following Deaton and Miller (1995); (2) Food price shocks are identified using the basic forecast model of Collier and Dehn (2001).

Let's $FP_{i,t}$ be the food price index in country i at the year t, $P_{j,t}$ the world price of food item j at time t, $w_{i,j\bullet}$ the country specific weighting food item at the base year, so that we have the following geometrically weighted structure of the commodity price index:

$$FP_{i,t} = \prod_{j=1}^{6} P_{j,t}^{w_{i,j\bullet}}$$

where $w_{i,j\bullet}$ is the value of food item j in the total value of all commodities $n=6$ for the constant base period. In this paper, the basket of goods is made up of six commodities: maize, rice milled, soybean oil, soybean, sugar refined and wheat. These commodities are considered as the most part of foods imports around the world (FAO, 2011).[4] The weighting item is obtained by the following formula:

$$w_{i,j\bullet} = \frac{P_{j\bullet} Q_{i,j\bullet}}{\sum_{j=1}^{6} P_{j\bullet} Q_{i,j\bullet}}$$

where $Q_{i,j,\bullet}$ represents the imports value of commodity j at the base year. 1995 was chosen as the year for which to construct country-specific commodity import weights because it

[4] FAO (2011) Women in Agriculture, Closing the Gender Gap for Development, The state of food and agriculture report.

allowed the inclusion of the former Soviet Union countries and maximizes the number of observations of food imports disaggregated by products in the sample (Burke and Leigh, 2010). The world food prices by products are drawn from the International Monetary Fund World Economic Outlook database and the food imports data are drawn from FAO – TradeStats online.

The second step consists in computing the shock variable. Following Collier and Dehn (2001), shocks are located by differencing each country's aggregate real commodity price index series to make it stationary, removing predictably elements from the stationary process and normalizing the residuals. The forecasting model used to identify shocks is estimated for each country separately and is the following:

$$\Delta FP_{i,t} = \alpha_0 + \alpha_1 t + \theta_1 \Delta FP_{i,t-1} + \theta_2 FP_{i,t-2} + \varepsilon_{i,t}$$

with *i* standing for the country and *t* represents the year. The residuals from the equation above, $\hat{\varepsilon}_{i,t}$, are normalised by subtracting their mean and dividing by their standard deviation. Food price shocks are those positive observations of the residuals $\hat{\varepsilon}_{i,t}$. In other terms, the negative observations of the normalized residuals $\hat{\varepsilon}_{i,t}$ are replaced by zeroes in the database. More formally, the food price shock $S_{i,t}$ is writing as follows:

$$S_{i,t} = 1[\hat{\varepsilon}_{i,t} > 0]$$

2.3. Comparing the level of household consumption in times of shocks among vulnerable and non-vulnerable countries

This subsection compares the effects of shocks on household consumption between vulnerable and non-vulnerable countries. For this purpose, the relative deviation (in

percentage) of the real household consumption per capita in the time of food prices shocks compared to a situation without a food price shocks is computed.

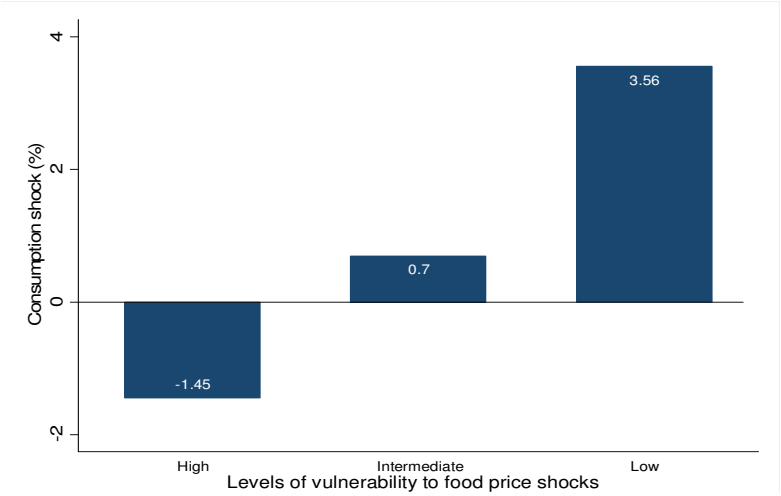
Figure 3 depicts the consumption deviation in time of food prices shocks over the period 1980 – 2009 according to the level of vulnerability. The x axis presents the ranges of vulnerability. High: refers to a level of vulnerability exceeding the 75th percentile of the vulnerability variable, Intermediate: refers to a level of vulnerability comprising between the median value and the 75th percentile of the vulnerability variable, Low: refers to a level of vulnerability below the median value of the vulnerability variable in the sample.

One can notice that the household consumption deviation is negative for the most vulnerable countries, slightly positive for the intermediates and quietly high for the low vulnerable countries. In other words, countries which are highly vulnerable experiment a decrease in consumption in case of shocks relatively to the normal situation. Those which are less vulnerable enjoy an increase in consumption relatively to the case where there is no shock. This is mainly due to the fact most of those countries are net foods exporters, and then benefit from the increase of prices.

It is worthwhile to see how official development assistance (ODA) and remittances respond to shocks. Figure 4 and Figure 5 present the ODA and remittances deviations in time of food prices shocks over the period 1980 – 2009, respectively.

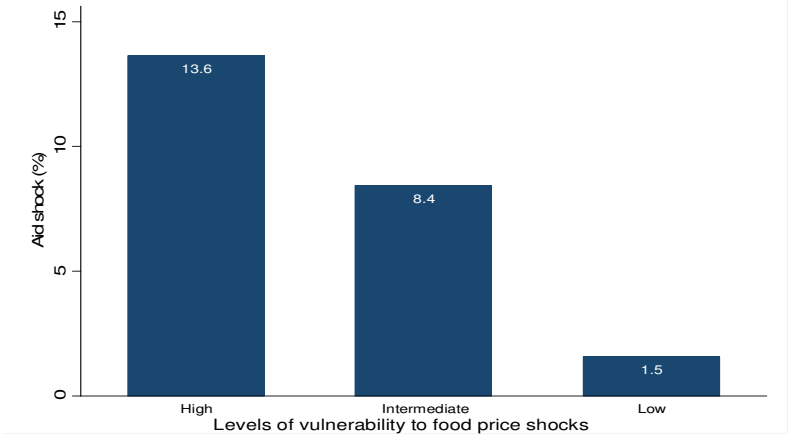
Figure 4 shows that in case of shocks, the most vulnerable countries receive more ODA than the other groups of vulnerable countries. The increase of ODA relatively to the case of the absence of shocks stands at 13.6% while it is 8.4% for the intermediate and 1.5% for the low vulnerable countries.

Figure 3: Consumption deviations in time of food price shocks (1980 – 2009)



Note : The consumption shock records the relative deviation (in percentage) of the real household consumption per capita in the time of food price shocks compared to a situation without a food price shock in each country.
High: refers to a level of vulnerability exceeding the 75th percentile of the vulnerability variable, Intermediate: refers to a level of vulnerability comprising between the median value and the 75th percentile of the vulnerability variable, Lows: refers to a level of vulnerability below the median value of the vulnerability variable in the sample.
Source : FAO-Stats, World Bank Development Indicators and authors' construction.

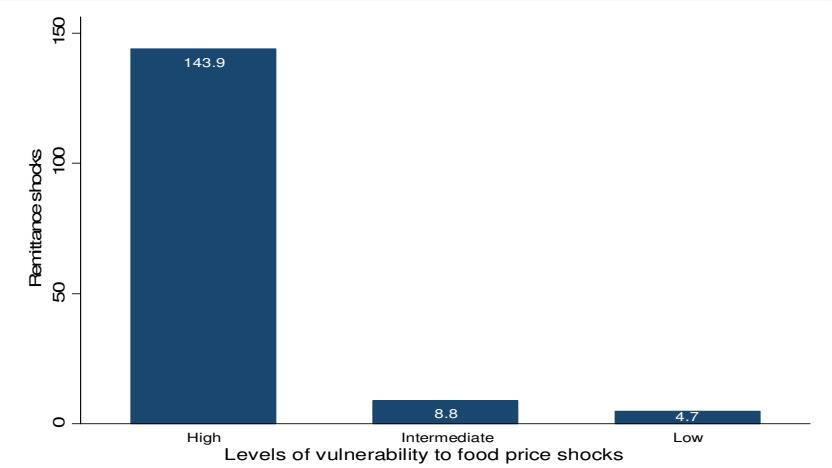
Figure 4: Official Development Assistance deviations in time of food price shocks (1980 – 2009)



Note : The foreign aid shock records the relative deviation (in percentage) of the aid-to-GDP ratio in the time of food price shocks compared to a situation without a food price shock in each country.
High: refers to a level of vulnerability exceeding the 75th percentile of the vulnerability variable, Intermediate: refers to a level of vulnerability comprising between the median value and the 75th percentile of the vulnerability variable, Lows: refers to a level of vulnerability below the median value of the vulnerability variable in the sample.
Source : FAO-Stats, World Bank Development Indicators and authors' construction.

In the same vein, Figure 5 presents the deviation of remittances relative to the absence of shocks. This figure suggests that in case of shocks, the highly vulnerable countries receive once again more remittances than intermediate and low vulnerable countries. However what is very striking in this case, it is the fact that the increase of the received amount is extremely high as it stands at 143.9% relative to the normal situation.

Figure 5: Remittance deviations in time of food price shocks (1980 – 2009)



Note : The remittance shock records the relative deviation (in percentage) of the remittance-to-GDP ratio in the time of food price shocks compared to a situation without a food price shock in each country. High: refers to a level of vulnerability exceeding the 75th percentile of the vulnerability variable, Intermediate: refers to a level of vulnerability comprising between the median value and the 75th percentile of the vulnerability variable, Lows: refers to a level of vulnerability below the median value of the vulnerability variable in the sample.
Source : FAO-Stats, World Bank Development Indicators and authors' construction.

3. Do aid and remittance dampen the effect of food price shocks? Econometric models

The following models are specified to test the impact of food price shocks on the household consumption.

a) Models of the effects of food price shocks on household consumption

The first models describe the effect of food price shocks on the level and the instability of the real household consumption per capita.

$$c_{i,\tau} = \rho c_{i,\tau-1} + X'_{i,\tau}\beta + \theta_1 S_{i,\tau} + u_i + \eta_\tau + \varepsilon_{i,\tau} \quad \textbf{(1)}$$

$$\sigma_{i,\tau} = \varphi \sigma_{i,\tau-1} + Z'_{i,\tau}\gamma + \phi_1 S_{i,\tau} + u_i + \eta_\tau + \varepsilon_{i,\tau} \quad \textbf{(2)}$$

with $c_{i,\tau}$ and $\sigma_{i,\tau}$ the level of the real consumption per capita, and the instability of the real household consumption per capita growth rate (both expressed in logarithmic terms), respectively. **X** and **Z** are the matrix of control variables. *S* represents the average number of positive food price shocks in each country at each period. There can be a concern if households anticipate food price shocks and increase their consumption (if households tend to constitute buffer stocks to cope with future shocks). This can lead to biased estimates of the effects of food price shocks on consumption. However this is less likely to occur due to the fact that we are using data averaged over several years. Indeed, this consumption overshooting would be easily observed with high frequency data (especially monthly data).

u_i represents the country fixed-effects and η_τ are the period dummies. i, τ are respectively the country and the non-overlapping sub-periods spanning from 1980 to 2009.[5] $\varepsilon_{i,\tau}$ is the idiosyncratic error term.

Two hypotheses are tested: $\theta_1 = 0$ and $\phi_1 = 0$. In other words, food price shocks on average have no significant effect on the level of household consumption except in a context of high vulnerability to food price shocks. To account for this heterogeneity, models 1 and 2 are modified to include a nonlinear effect. More formally, the following models are estimated:

$$c_{i,\tau} = \rho c_{i,\tau-1} + X'_{i,\tau}\beta + \theta_1 S_{i,\tau} + \theta_2 S_{i,\tau} * Vul_{i,\tau-1} + \theta_3 Vul_{i,\tau-1} + u_i + \eta_\tau + \varepsilon_{i,\tau} \quad \textbf{(3)}$$

[5] For equation 1, data are averaged over eight 4-years subperiods. For equation 2, data are computed over six subperiods of five-years.

$$\sigma_{i,\tau} = \phi\sigma_{i,\tau-1} + Z'_{i,\tau}\gamma + \phi_1 S_{i,\tau} + \phi_2 S_{i,\tau} * Vul_{i,\tau-1} + \phi_3 Vul_{i,\tau-1} + u_i + \eta_\tau + \varepsilon_{i,\tau} \qquad \textbf{(4)}$$

The hypotheses tested are: $\theta_1 \geq 0$, $\theta_2 < 0$, and $\phi_1 \leq 0$, $\phi_2 > 0$. Models 3 and 4 allow the computation of the threshold levels of vulnerability to food price shocks beyond which welfare – reducing effects of the food price shocks are observed. From the model 3, the vulnerability threshold is given by:

$$\frac{\partial c_{i,\tau}}{\partial S_{i,\tau}} = \theta_1 + \theta_2 Vul_{i,\tau-1} = 0 \Rightarrow Vul^* = -\frac{\theta_1}{\theta_2}$$

From the model 4, we get:

$$\frac{\partial \sigma_{i,\tau}}{\partial S_{i,\tau}} = \phi_1 + \phi_2 Vul_{i,\tau-1} = 0 \Rightarrow Vul^* = -\frac{\phi_1}{\phi_2}$$

For the model of the level of household consumption (model 1), the basic set control variables includes the lagged dependent variable, per capita income, the instability of per capita income growth, the age dependency ratio and the rural population. Positive signs are expected for the lagged dependent variable, and per capita income. The instability of per capita income is expected to decrease the level of consumption owing to the accumulation of precautionary savings, the decrease of private investment and the unavailability of jobs. The age dependency ratio would also lower the level of consumption per capita when active people take care of more inactive individuals (the youngest and the elders). Finally, in rural areas which are characterized by the low level of financial development and higher poverty rates, the share of consumption in household budgets would be higher. One could therefore expect a positive correlation between rural population and the level of household consumption.

The equation of the instability of household consumption per capita is close to the ones of Herrera and Vincent (2008), Craigwell et al. (2010), and Combes and Ebeke (2011). The variables that are expected to be positively correlated with the instability of household consumption are: the instability of GDP per capita growth rate, the government size, and trade openness. The private credit ratio, the level of economic development and the financial openness are expected to be negatively correlated with consumption instability in developing countries.

b) Models of the stabilizing effects of foreign aid and remittances

Several specifications are adopted to test the hypothesis that foreign aid and remittances act as food price shock absorbers in receiving economies. If this hypothesis holds, one would observe a decreasing marginal effect of food price shocks on household consumption as remittance and aid inflows rise. This would be the specific case of the most vulnerable countries. To empirically test this hypothesis, the paper proceeds in two steps. First, the stabilizing role of aid and remittances is evaluated by using the whole sample of countries. We expect a nonsignificant effect of aid and remittance inflows. Next, the sample of countries above the previously computed threshold of vulnerability (*Vul**) is used to identify the stabilizing effects of aid and remittances in time of food price shocks. As previously, the outcome variables are the level and the instability of household consumption per capita. The same matrix of control variables is also retained along with the identification strategy through the System-GMM. More formally, we have:

$$c_{i,\tau} = \rho c_{i,\tau-1} + X'_{i,\tau}\beta + \theta_4 S_{i,\tau} + \theta_5 S_{i,\tau} * R_{i,\tau} + \theta_6 R_{i,\tau} + u_i + \eta_\tau + \varepsilon_{i,\tau} \qquad \textbf{(5)}$$

$$c_{i,\tau} = \rho c_{i,\tau-1} + X'_{i,\tau}\beta + \theta_7 S_{i,\tau} + \theta_8 S_{i,\tau} * A_{i,\tau} + \theta_9 A_{i,\tau} + u_i + \eta_\tau + \varepsilon_{i,\tau} \qquad \textbf{(6)}$$

$$c_{i,\tau} = \rho c_{i,\tau-1} + X'_{i,\tau}\beta + \theta_{10} S_{i,\tau} + \theta_{11} S_{i,\tau} * A_{i,\tau} + \theta_{12} S_{i,\tau} * R_{i,\tau} + \theta_{13} A_{i,\tau} + \theta_{14} R_{i,\tau} + u_i + \eta_\tau + \varepsilon_{i,\tau} \quad \textbf{(7)}$$

For the consumption instability model, the following equations are estimated:

$$\sigma_{i,\tau} = \phi\sigma_{i,\tau-1} + Z'_{i,\tau}\gamma + \phi_4 S_{i,\tau} + \phi_5 S_{i,\tau} * R_{i,\tau} + \phi_6 R_{i,\tau} + u_i + \eta_\tau + \varepsilon_{i,\tau} \quad \textbf{(8)}$$

$$\sigma_{i,\tau} = \phi\sigma_{i,\tau-1} + Z'_{i,\tau}\gamma + \phi_7 S_{i,\tau} + \phi_8 S_{i,\tau} * A_{i,\tau} + \phi_9 A_{i,\tau} + u_i + \eta_\tau + \varepsilon_{i,\tau} \quad \textbf{(9)}$$

$$\sigma_{i,\tau} = \phi\sigma_{i,\tau-1} + Z'_{i,\tau}\gamma + \phi_{10} S_{i,\tau} + \phi_{11} S_{i,\tau} * A_{i,\tau} + \phi_{12} S_{i,\tau} * R_{i,\tau} + \phi_{13} A_{i,\tau} + \phi_{14} R_{i,\tau} + u_i + \eta_\tau + \varepsilon_{i,\tau} \quad \textbf{(10)}$$

with *R* and *A*, the remittance-to-GDP and aid-to-GDP ratios, respectively.

When models 5 to 10 are estimated with the restricted sample of countries exhibiting a vulnerability index above the critical threshold of *Vul** (the most vulnerable countries in the sample), the following hypotheses would hold: $(\theta_4, \theta_7, \theta_{10}) < 0$, $(\theta_5, \theta_8, \theta_{11}, \theta_{12}) > 0$, and $(\phi_4, \phi_7, \phi_{10}) > 0$, $(\phi_5, \phi_8, \phi_{11}, \phi_{12}) < 0$.

From the models 5 and 6, and 8 and 9, the threshold levels of aid and remittance-to-GDP ratios which allow the full absorption of the food price shocks in the group of the most vulnerable countries are given by:

$$\frac{\partial c_{i,\tau}}{\partial S_{i,\tau}} = \theta_4 + \theta_5 R_{i,\tau} = 0 \Rightarrow R^* = -\frac{\theta_4}{\theta_5}$$

$$\frac{\partial \sigma_{i,\tau}}{\partial S_{i,\tau}} = \phi_4 + \phi_5 R_{i,\tau} = 0 \Rightarrow R^* = -\frac{\phi_4}{\phi_5}$$

$$\frac{\partial c_{i,\tau}}{\partial S_{i,\tau}} = \theta_7 + \theta_8 A_{i,\tau} = 0 \Rightarrow A^* = -\frac{\theta_7}{\theta_8}$$

$$\frac{\partial \sigma_{i,\tau}}{\partial S_{i,\tau}} = \phi_7 + \phi_8 A_{i,\tau} = 0 \Rightarrow A^* = -\frac{\phi_7}{\phi_8}$$

c) Data and methodology

Data for the control variables are drawn from the World Development Indicators Online except the financial openness series which are drawn from the Chinn and Ito publicly available dataset.[6] The narrow definition of remittance is employed to record remittances. In other words, the remittance variable only records the money sent back by migrants residing in the host countries since at least one year.[7] Remittance data are normalized by country GDP series. The foreign aid variable records the total amount of the official development assistance to developing countries as percentage of GDP.[8]

The estimation of the dynamic panel models 1 to 10 presented above with the use of the OLS estimator is inconsistent since the lagged dependent variables are introduced besides country fixed-effects. This bias is particularly of a concern here owed to the short temporal dimension of the dataset that is used. The System-GMM estimator must therefore be implemented. The equations in levels and the equations in first differences are combined in a system and estimated with an extended System-GMM estimator which allows for the use of lagged

[6]The original series of Chinn and Ito (2008) dataset named KAOPEN contain both positive and negative values around – 2 and 2. We add the value 2 on all the observations to finally get only positive values.

[7] For a detailed discussion on why the narrower definition is suitable in empirical macroeconomic studies, see Chami et al. (2009).

[8] The reader may wonder if it not more appropriate to use disaggregated data on foreign aid such as food aid or agricultural aid instead of total aid. At least two reasons justify this choice. First, one objective of this paper is to compare the effects of remittances and foreign aid in the absorption of the food price shocks in developing countries. Given that there are no disaggregated data on remittances according to their uses, resorting to total aid allows the comparison of the effects with those of remittances. Second, disaggregated data of foreign aid are relatively scarce and are only available for few countries over a short time period.

differences and lagged levels of the explanatory variables as instruments (Blundell and Bond, 1998).[9] The GMM estimations control for the endogeneity of some explanatory variables.[10]

Two specification tests check the validity of the instruments. The first is the standard Sargan/Hansen test of over-identifying restrictions. The second test examines the hypothesis that there is no second-order serial correlation in the first-differenced residuals.[11]

4. Econometric results

This section begins by discussing the effect of food price shocks on the level and the instability of household consumption. Next, the analysis turns to the econometric results of the mitigating role played by aid and remittances.

a) Heterogeneity in the effect of food price shocks

Tables 1 and 2 present the results of the effect of food price shocks on both the level and the instability of household consumption per capita. In each table, the first columns describe the impact of food price shocks on the corresponding outcome variable. Whatever the dependent variable that is retained (the level or the instability of consumption), the hypothesis that food price shocks do not exert a statistically significant effect on consumption is not rejected (column 1 of Tables 1 and 2).[12]

[9] The paper uses the one-step System-GMM estimator developed by Blundell and Bond (1998) for dynamic panel data.

[10] In all specifications, food price shocks, the lagged vulnerability index, period dummies, initial GDP per capita, initial private credit, financial openness, the output growth volatility, the rural population ratio, and the age dependency ratio are taken as strictly exogenous. The other variables are taken as endogenous.

[11] To deal with the well-known problem of instrument proliferation raised by the system-GMM estimator (Roodman, 2009), the matrix of instruments is collapsed and the number of lags is always limited to a fix order.

[12] The specification tests associated with the system-GMM specifications give comfortable results and do not invalidate the dynamic panel specifications.

Column 2 of Tables 1 and 2 present the results of the nonlinear effect of food price shocks on the two outcomes depending upon the level of vulnerability to food price shocks. The results suggest that the food price shocks become statistically significant to explain both the level and the instability of consumption once the models allow the interaction with the vulnerability index. In other words, the results reveal a marginal decreasing and significant effect of the food price shocks on the level of household consumption per capita as the level of vulnerability increases. Regarding the model of consumption instability, the results highlight a marginal positive effect of food price shocks on the instability of consumption which increases with the extent of vulnerability.

From the results presented in the column 2 of Tables 1 and 2, one can compute the threshold levels of the vulnerability to food price shocks beyond which the effect of the food price shocks becomes critical for the household consumption. Results of Tables 1 and 2 indicate that the values of these thresholds are not very different across the two tables. Indeed, the threshold value of the vulnerability index stands at 1.75 (Table 1) and 1.64 (Table 2). The percentage of countries above this threshold stands between 53% and 58%. This suggests that, countries that are precisely located above the median value of the vulnerability index are particularly concerned by the damaging consequences of food price shocks on consumption. For the rest of the sample of countries (those which are not vulnerable and especially those with a vulnerability index closed to 0), food price shocks are likely to increase the level of household consumption but not necessarily its instability (according to the value and the significance of the coefficient associated with the additive term of food price shocks in Tables 1 and 2).

To sum up, the preliminary econometric investigations have highlighted the heterogeneity in the response of household consumption to food price shocks which depends upon the extent

of the vulnerability to food price shocks. The next task consists in examining the role played by foreign aid and remittance inflows in absorbing the food price shocks.

Table 1: Food Price Shocks Vulnerability and household consumption, GMM Dynamic Panel Data results

Dependent Variable: *log* real household consumption per capita	(1)	(2)
Food price shocks	**-0.000761**	**0.0201***
	(0.00452)	**(0.0109)**
Food price shocks*Vulnerability index		**-0.0114****
		(0.00567)
Vulnerability index		0.0230
		(0.0320)
lag dependent variable	0.704***	0.698***
	(0.155)	(0.205)
log (GDP per capita)	0.370***	0.385**
	(0.110)	(0.179)
Age dependency ratio	-0.00298**	-0.00311*
	(0.00133)	(0.00166)
Rural population (%)	0.00333	0.00374*
	(0.00243)	(0.00197)
GDP per capita growth volatility	-0.00830***	-0.00539
	(0.00271)	(0.00393)
Foreign Aid-to-GDP	0.00937*	0.0108*
	(0.00550)	(0.00639)
Remittances-to-GDP ratio	0.00635	0.00707*
	(0.00480)	(0.00363)
Intercept	-0.579	-0.706
	(0.543)	(0.455)
Observations	446	386
Number of countries	82	81
Joint test of Aid*food price shocks, *P*-value		0.13
Vulnerability index threshold		**1.75**
Percentage of countries concerned		53%
Arellano-Bond Test of AR(1) *P*-value	0.03	0.05
Arellano-Bond Test of AR(2) *P*-value	0.32	0.42
Hansen OID test, *P*-value	0.2	0.1
Number of Instruments	19	27

Notes: The estimation method is the one-step System-GMM. Robust *T*-statistics are below the coefficients. Data are averaged over eight nonoverlapping 4-year periods between 1980 and 2009. *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Food price shocks, vulnerability and the instability of household consumption

Dependent variable: *log* of *sd* of real household consumption per capita growth	(1)	(2)
Food price shocks	**0.105**	**-0.156**
	(1.429)	**(-1.184)**
Food price shocks*Vulnerability		**0.0954****
		(2.141)
Vulnerability to food price shocks		-0.129
		(-0.987)
lag of dependent variable	0.208**	0.113
	(2.324)	(1.030)
GDP per capita growth volatility	0.489***	0.453***
	(7.877)	(6.813)
Government final consumption ratio	0.00258	0.0448*
	(0.119)	(1.727)
Initial GDP per capita (*log*)	-0.0672	-0.0669
	(-1.327)	(-0.719)
Initial private credit-to-GDP ratio	-0.00429**	-0.00542**
	(-2.469)	(-2.236)
Trade openness	0.00633***	0.00568*
	(3.800)	(1.759)
Financial openness index	-0.322	-0.509
	(-1.126)	(-1.450)
Financial openness ²	0.0489	0.0905
	(0.867)	(1.332)
Intercept	0.892**	0.965
	(2.156)	(1.571)
Observations	367	330
Number of countries	90	89
Joint significance of food price shocks coeff.,*P*-value		0.087
Threshold level of the vulnerability index		**1.64**
Number of countries above the threshold		52
Percentage of countries above the threshold		58%
AR(1), *P*-value	0.000	0.000
AR(2), *P*-value	0.672	0.539
Hansen OID, *P*-value	0.219	0.157
Nb of instruments	22	26

Notes: The estimation method is the one-step System-GMM. Time effects are included in all the regressions. Robust *T*-statistics are below the coefficients. Instability is the 5-year standard deviation of the growth rate of the real household consumption per capita. Data are averaged over six nonoverlapping 5-year periods between 1980 and 2009.

*** p<0.01, ** p<0.05, * p<0.1

b) The mitigating role of aid and remittance inflows

Tables 3 and 4 present the results of the econometric specifications allowing a nonlinear effect of the food price shocks conditional to the levels of foreign aid and remittance inflows. For each dependent variable, the econometric models are firstly estimated using the whole sample (columns 1, 3, and 5 of Table 3, and columns 1, and 4 of Table 4). As expected, when the whole sample of countries (a mix of vulnerable and non vulnerable countries) is used, there is no statistically significant effect of aid and remittances in dampening the effects of food price shocks, except in the model of the level of household consumption. However, this specification should be taken with a pinch of salt given that the GMM specification tests are critical (column 1 of Table 3 and column 1 of Table 4).

The next task consists in estimating the models with the restricted sample of vulnerable countries, especially the sample of countries with an index of vulnerability above the median value of the variable.

The results of the Table 3 suggest that when the countries exhibit a degree of vulnerability above the sample median, remittance and foreign aid inflows strongly dampen the negative effect of the food price shocks on the level of household consumption (columns 2, 4, and 6). Indeed, as expected, the coefficient of the additive term of food price shocks is negative and statistically significant whereas the coefficient of the shocks interacted with the aid and remittance inflows is positive and significant. The results also highlight that the remittance and aid-to-GDP ratios required for a full absorption of the effects of food price shocks on the level of household consumption are 5% and 13%, respectively. For the remittance threshold, about 30% of countries are concerned and 24% for the corresponding aid threshold. This result reveals that a comparative low ratio of remittances is needed to cope with food price shocks.

Table 3: Remittances, Foreign Aid, Food prices shocks and household consumption, GMM Dynamic Panel Data results

Dependent Variable: *log* real household consumption per capita	Full sample	Vul>median	Full sample	Vul>median	Full sample	Vul>median
	(1)	(2)	(3)	(4)	(5)	(6)
Food price shocks	**-0.0118**	**-0.0237****	**-0.00401**	**-0.0395****	**-0.00696**	**-0.0543****
	(0.00777)	**(0.0110)**	**(0.00682)**	**(0.0183)**	**(0.0110)**	**(0.0239)**
Food price shocks*Remittance-to-GDP ratio	**0.00495****	**0.00531*****			**0.00229**	**0.00446***
	(0.00218)	**(0.00178)**			**(0.00210)**	**(0.00251)**
Food price shocks*Aid-to-GDP ratio			**0.000457**	**0.00304****	**0.000300**	**0.00340****
			(0.000819)	**(0.00137)**	**(0.000898)**	**(0.00155)**
Remittance-to-GDP ratio	0.00258	-0.000716			0.00411	-0.000161
	(0.00349)	(0.00354)			(0.00338)	(0.00291)
Aid-to-GDP ratio			-0.00117	-0.00507	0.00373	-0.00395
			(0.00341)	(0.00378)	(0.00503)	(0.00407)
lag dependent variable	0.592***	0.491***	0.488***	0.521***	0.474***	0.495***
	(0.151)	(0.138)	(0.0995)	(0.129)	(0.115)	(0.143)
log (GDP per capita)	0.440***	0.517***	0.555***	0.514***	0.528***	0.485***
	(0.100)	(0.126)	(0.0813)	(0.115)	(0.0916)	(0.141)
Total population of 65 years old (%)	0.0132***	0.0176	0.00806**	0.0107	0.0128***	0.0192*
	(0.00327)	(0.0109)	(0.00378)	(0.0104)	(0.00362)	(0.0115)
Rural population (%)	0.00300	0.00276	0.00353	0.00333*	0.00142	0.00146
	(0.00266)	(0.00284)	(0.00224)	(0.00200)	(0.00242)	(0.00265)
GDP per capita growth volatility	-0.00624**	-0.00364	-0.00737**	-0.00435	-0.00553**	-0.00478
	(0.00255)	(0.00279)	(0.00316)	(0.00323)	(0.00240)	(0.00298)
Intercept	-0.552	-0.414	-0.661	-0.536	-0.332	-0.116
	(0.586)	(0.652)	(0.460)	(0.414)	(0.540)	(0.608)
Observations	455	213	524	254	446	211
Number of countries	83	54	92	64	82	53

Joint test of shocks, shocks*remittances, *P*-value		0.01		0.07		0.09

Table 3, continued

Dependent Variable: *log* real household consumption per capita	Full sample	Vul>median	Full sample	Vul>median	Full sample	Vul>median
	(1)	(2)	(3)	(4)	(5)	(6)
Wald test of shocks*Aid= shocks*remittances, *P*-value						0.68
Remittance ratio required for a full absorption of food price shocks		**4.45%**				
Aid ratio required for a full absorption of food price shocks				**13%**		
Number of countries concerned		16		15		
Percentage of of countries concerned		**30%**		**24%**		
Arellano-Bond Test of AR(1), *P*-value	0.025	0.083	0.06	0.08	0.11	0.105
Arellano-Bond Test of AR(2), *P*-value	0.049	0.112	0.16	0.239	0.25	0.112
Hansen OID test, *P*-value	0.06	0.46	0.02	0.34	0.02	0.36
Number of Instruments	16	16	22	22	26	26

Notes: The estimation method is the one-step System-GMM. Robust *T*-statistics are below the coefficients. Data are averaged over eight nonoverlapping 4-year periods between 1980 and 2009. *** p<0.01, ** p<0.05, * p<0.1.

Regarding the model of consumption instability, the results of the Table 4 suggest that when the countries exhibit a vulnerability index above the sample median, foreign aid inflows strongly dampen the negative effect of the food price shocks on the instability of the household consumption growth rate (columns 5, 6, 7, and 8 of Table 4). For remittance inflows, countries must be highly vulnerable (above the 75th percentile of the distribution of the vulnerability index) to identifying a significant stabilizing effect of remittance inflows (columns 3, and 8). In other words, the instability of household consumption becomes less affected by food price shocks thanks to remittance inflows in the countries that are highly exposed to the food price shocks. A tentative explanation for this result could be that countries differ in their uses of remittances according to their location in the distribution of the vulnerability index. Remittances could be more likely devoted to the financing of consumption needs in countries that are highly dependent upon food imports compared to the other countries. This argument is also supported by the fact that the destabilizing effect of food price shocks significantly increases when the sample is restricted to the countries above the 75th percentile of the vulnerability index. Indeed, the coefficient associated with the food price shock variable introduced additively increases from 0.37 to 0.82 between columns 2 and 3, and from 0.74 to 1 between columns 7 and 8 of Table 4.

The results also highlight that the remittance and aid-to-GDP ratios required for a full absorption of the effects of food price shocks in countries located above the 75th percentile of the vulnerability index, are around 9% and 29%, respectively. For the remittance threshold, about 13% of countries are concerned and only 5% for the corresponding aid threshold.[13] As it has been previously shown, a comparative low ratio of remittances is in fact needed to cope with food price shocks.

[13] Indeed, Mozambique and Nicaragua are the sole countries for which the average aid-to-GDP ratio is above the threshold of 29% over the period 1980 – 2009.

Table 4: Remittances, aid, food price shocks and consumption instability

Dependent variable:	Full sample	Vul>median	Vul>75th per.	Full sample	Vul>median	Vul>75th per.	Vul>median	Vul>75th per.
log of *sd* of real household consumption per capita growth	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Food price shocks	**0.114**	**0.367****	**0.818*****	**0.108**	**0.461****	**0.614*****	**0.736****	**0.991*****
	(-1.023)	**(-2.119)**	**(-2.868)**	**(-1.147)**	**(-2.461)**	**(2.722)**	**(-2.492)**	**(-3.300)**
Food price shocks*Remittance-to-GDP ratio	**0.000832**	**-0.0132**	**-0.0915****				**-0.0198**	**-0.0504***
	(-0.0901)	**(-1.010)**	**(-2.309)**				**(-1.222)**	**(-1.851)**
Food price shocks*Aid-to-GDP ratio				**-0.00519**	**-0.0167****	**-0.0213****	**-0.0254*****	**-0.0243****
				(-0.570)	**(-2.192)**	**(-2.306)**	**(-2.815)**	**(-2.506)**
Remittance-to-GDP ratio	-0.0473**	-0.0456*	-0.0189				-0.00864	-0.0273
	(-2.379)	(-1.660)	(-0.497)				(-0.193)	(-0.989)
Aid-to-GDP ratio				0.0346	0.0317	0.0344	0.0477*	0.0480***
				(-1.576)	(-1.596)	(1.104)	(-1.762)	(-2.690)
lag of dependent variable	0.0698	-0.0173	-0.0284	0.153*	0.164	0.384*	0.211	0.294*
	(-0.692)	(-0.108)	(-0.116)	(-1.889)	(-0.992)	(1.701)	(-1.110)	(-1.787)
GDP per capita growth volatility	0.479***	0.298***	0.257*	0.453***	0.332***	0.278	0.337***	0.377***
	(-7.386)	(-4.580)	(-1.905)	(-8.156)	(-4.573)	(1.610)	(-4.801)	(-3.349)
Government final consumption ratio	0.0506	0.0671	0.108	0.0107	0.0494	0.0377**	0.0318	0.0493**
	(-1.378)	(-1.572)	(-1.350)	(-0.466)	(-1.174)	(2.018)	(-0.724)	(-2.052)
Initial GDP per capita (*log*)	-0.128	-0.318	-0.550*	0.0129	-0.128	-0.173	-0.142	-0.225
	(-1.212)	(-1.434)	(-1.849)	(-0.122)	(-0.856)	(-1.203)	(-0.787)	(-0.892)
Initial private credit-to-GDP ratio	-0.00409	0.00157	0.0105	-0.00377**	-0.00806**	-0.00292	0.00191	-0.0014
	(-1.232)	(-0.291)	(-0.883)	(-2.222)	(-2.311)	(-0.713)	(-0.335)	(-0.146)
Trade openness	0.00588	0.0119*	0.0168**	0.00476***	0.00375	0.00432	0.00562	0.00852
	(-0.960)	(-1.725)	(-1.981)	(-3.537)	(-1.368)	(1.295)	(-1.148)	(-1.409)
Financial openness index	-0.148	-0.433	-1.103	-0.142	-0.148	-0.0980	-0.287	0.0788
	(-0.487)	(-0.910)	(-1.271)	(-0.869)	(-0.552)	(-0.249)	(-0.974)	(-0.219)
Financial openness ²	0.0134	0.0879	0.269	0.0241	0.0474	0.0339	0.0888	-0.0131
	(-0.220)	(-0.849)	(-1.386)	(-0.701)	(-0.850)	(0.329)	(-1.476)	(-0.135)

Table 4, continued

Dependent variable:	Full sample	Vul>median	Vul>75th per.	Full sample	Vul>median	Vul>75th per.	Vul>median	Vul>75th per.
log of *sd* of real household consumption per capita growth	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	0.793	1.341*	1.785	0.14	0.173	-0.0891	-0.223	-0.731
	(-1.587)	(-1.667)	(-1.380)	(-0.176)	(-0.161)	(-0.0704)	(-0.199)	(-0.640)
Observations	328	155	92	360	171	103	155	92
Number of countries	86	51	38	90	54	40	51	38
Joint significance of food price shocks coeff., *P*-value	0.488	0.084	0.015	0.514	0.048	0.024	0.046	0.009
Remittance ratio required for a full absorption of the shock			**9%**					
Aid ratio required for a full absorption of the shock					**27.5%**	**29%**		
Number of countries above the threshold			5		1	2		
Percentage of countries above the threshold			**13%**		**2%**	**5%**		
AR(1), *P*-value	0	0.03	0.089	0	0.022	0.042	0.031	0.15
AR(2), *P*-value	0.672	0.435	0.681	0.656	0.784	0.765	0.714	0.55
Hansen OID, *P*-value	0.035	0.279	0.488	0.627	0.787	0.416	0.647	0.837
Nb of instruments	30	30	30	24	24	24	32	32

Notes: The estimation method is the one-step System-GMM. Time effects are included in all the regressions. Robust *T*-statistics are below the coefficients. Instability is the 5-year standard deviation of the growth rate of the real household consumption per capita. Data are averaged over six nonoverlapping 5-year periods between 1980 and 2009.

*** p<0.01, ** p<0.05, * p<0.1

4. Concluding remarks

The dramatic increase of food prices in the previous years has revived an increasing concern about food security, mainly for the most vulnerable countries. This paper examines the impact of food price shocks on household consumption according to the country levels of vulnerability to food price shocks. It also addresses the ability of foreign aid and remittance to mitigate the impact of food prices shocks.

Based on a large sample of developing countries, observed over the period 1980 – 2009, two main results are derived. First, food prices shocks significantly affect both the level and the instability of household consumption, especially in the most vulnerable countries. In a context of high level of vulnerability, food price shocks reduce the level of real household consumption per capita while it fosters the instability of household consumption. Second, the results highlight that when countries exhibit a high degree of vulnerability, remittance and foreign aid inflows strongly dampen the effects of food price shocks on household consumption. Finally, the results suggest that a lower remittance-to-GDP ratio is required to fully absorb the damaging effects of food price shocks on consumption compared to what is required in terms of foreign aid.

This paper has clear policy implications. The above results suggest that remittances and aid should be increased in order to drain-off the dramatic effects of food price shocks in the highest vulnerable countries. However, this could be a short-run policy. Indeed, in the long-run one should address the issue of vulnerability. One way to deal with this specific issue consists in investing massively in agriculture while increasing the level of diversification. In this latter case foreign aid and remittances could be at the heart of the process.

References

Adelman, C. (2003) The privatization of foreign aid: Reassessing national largess. Foreign Affairs, 8(6), November–December, 9 – 14.

Blundell, R., and Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models, Journal of econometrics, 87(1), 115 – 143.

Burke, P., and Leigh, A. (2010) Do output contractions trigger democratic change? American Economic Journal: Macroeconomics, 2(4), 124 – 157.

Chami, R, Fullenkamp, C., and Gapen, M. (2009) Measuring Workers' Remittances: What Should Be Kept in and What Should Be Left Out, International Monetary Fund, Mimeo.

Chami, R., Hakura, D. and Montiel, P. (2009) Remittances: An automatic output stabilizer?, IMF Working Paper No. 09/91.

Chinn, M., and Ito, H. (2008). A new measure of financial openness, Journal of Comparative Policy Analysis: Research and Practice, 10(3), 309 – 322.

Collier, P. and Dehn, J. (2001) Aid, shocks, and growth, World Bank Policy Research Working Paper Series n° 2688. The World Bank.

Combes, J-L., Ebeke, C. (2011) Remittances and household consumption instability in developing countries, World Development, 39(7), 1076 – 1089.

Craigwell, R., Jackman, M. and Moore, W. (2010) Economic volatility and remittances, International Journal of Development Issues, 9, 25 – 42.

Dabla-Norris, E.; Minoiu, C. and Zanna, L.-F. (2010) Business Cycle Fluctuations, Large Shocks, and Development Aid: New Evidence, IMF Working Papers 10/240, International Monetary Fund.

David, A. (2010) How do international financial flows to developing countries respond to natural disasters?, IMF Working Papers 10/166, International Monetary Fund.

de Janvry, A. and Sadoulet, E. (2008) The global food crisis: Identification of the vulnerable and policy responses. Agricultural and Research Economics Update, Special Issue: Causes and Consequences of the Food Price Crisis, 18 – 21.

Deaton, A. J., and Miller, R. I. (1995) International Commodity Prices, Macroeconomic Performance, and Politics in Sub-Saharan Africa, Princeton Studies in International Finance (79).

Dehn, J. (2000) Commodity price uncertainty and shocks: implications for economic growth. The Centre for the Study of African Economies Working Paper Series.

FAO (2011) Women in Agriculture, Closing the Gender Gap for Development, The state of food and agriculture report.

Grabel, I. (2009) Remittances: Political Economy and Developmental Implications. International Journal of Political Economy, 38(4), 86 – 106.

Herrera, S., and Vincent, B. (2008). Public expenditure and consumption volatility, Policy Research Working Paper Series 4633, The World Bank.

Kamgnia, D. (2011) Political Economy of Recent Global Food Price Shocks: Gainers, Losers and Compensatory Mechanism, Journal of African Economies, 20 (suppl 1), i142 – i210.

Lueth, E. and Ruiz-Arranz, M. (2007) Are Workers' Remittances a Hedge Against Macroeconomic Shocks? The Case of Sri Lanka, Asia-Pacific Development Journal, 14, 25 – 39.

Mohapatra, S., Joseph, G. and Ratha, D. (2009) Remittances and natural disasters : ex-post response and contribution to ex-ante preparedness, Policy Research Working Paper Series 4972, The World Bank.

Ratha, D. (2005) Workers' remittances: an important and stable source of external development finance, Remittances: Development Impact and Future Prospects.

Roodman, D. (2009). A note on the theme of too many instruments, Oxford Bulletin of Economics and Statistics, 71, 135 – 158.

World Bank (2011) Food price watch, April 2011.

World Bank (2011) Migration and Remittances Factbook 2nd Edition, The World Bank Group.

Yang, D. (2008) Coping with disaster: The impact of hurricanes on international financial flows, 1970-2002, Advances in Economic Analysis & Policy, 8, 1903 – 1903.

APPENDIX A: PRINCIPAL COMPONENT ANALYSIS RESULTS

Table A1 :Eigen value and cumulative relative frequencies

Principal component	Eigen Values	Proportion	Cumulative relative frequencies
1	1.61	0.53	0.53
2	1.07	0.35	0.89
3	0.314	0.1	1

Table A2: Eigen Vectors

Variable	*P*1	*P*2	*P*3
Food imports-to-household consumption	0.69	-0.26	0.03
Food imports-to-total imports	0.71	0.1	0.14
10,000/GDP per capita	0.05	0.94	0.13

Note : $Vul_i = (0.53/0.89)\times P_1 + (0.35/0.89)\times P_2$

APPENDIX B: DESCRIPTIVE STATISTICS AND LIST OF COUNTRIES

Table B1: Descriptive statistics of variables included in the model of consumption

Variables	Obs	Mean	Sd Dev	Min	Max
log (Household Consumption per capita)	674	6.635	1.009	4.353	8.786
Number of price shocks	1088	1.347	1.036	0	4
Vulnerability index	666	2.129	1.286	0.0516	10
Aid-to-GDP	966	8.438	11.04	-0.128	103
Remittance-to-GDP ratio	806	3.235	5.480	0	42.21
log (GDP per capita)	979	6.863	1.097	4.381	9.199
Total population of 65 years old (%)	1046	4.951	3.045	1.848	17.38
GDP per capita growth volatility	953	3.644	4.049	0.0873	47.40
Rural population-to-total population	1086	56.40	20.57	6.510	95.43
Age dependency ratio	1046	75.69	17.92	38.77	116.01

TableB2 : Descriptive statistics of the variables included in the model of consumption instability

Variable	Obs	Mean	Std. Dev.	Min	Max
Instability of real household consumption per capita growth (*log*)	476	1.45	0.91	-1.69	5.09
Number of food price shocks	816	1.66	1.11	0	4
Remittance-to-GDP ratio	609	3.09	5.29	0	37.21
Aid-to-GDP ratio	718	8.61	10.87	-0.12	77.16
Instability of real GDP per capita growth rate (*log*)	734	1.09	0.81	-1.38	3.76
Government consumption-to-GDP	697	15.78	7.10	2.34	53.41
Initial real GDP per capita (*log*)	704	6.83	1.09	4.13	9.00
Private credit-to-GDP ratio	654	26.42	22.54	0	139.83
Trade openness	721	76.55	39.33	0.67	310.58
Financial openness	705	1.62	1.29	0.16	4.48

Table B3 : Countries by level of vulnerability

Vul<Median		**Median<=Vul<Vul$_{75}$**	**Vul>Vul$_{75}$**
Argentina	Latvia	Albania	Benin
Azerbaijan	Lithuania	Algeria	Burkina Faso
Belarus	Malaysia	Armenia	Cape Verde
Bolivia	Mauritius	Belize	Chad
Botswana	Mexico	Central African Republic	Egypt, Arab Rep.
Brazil	Morocco	Congo, Dem. Rep.	Eritrea
Bulgaria	Namibia	Cote d'Ivoire	Ethiopia
Cambodia	Panama	Guinea	Gambia, The
Cameroon	Paraguay	Jordan	Lao PDR
Chile	Peru	Kyrgyz Republic	Lesotho
China	Philippines	Lebanon	Malawi
Colombia	Poland	Madagascar	Maldives
Costa Rica	Romania	Mauritania	Mali
Croatia	Russia	Nicaragua	Mozambique
Cuba	Serbia	Pakistan	Senegal
Dominican Rep.	South Africa	Papua New Guinea	St Vincent and the Grenadines
Ecuador	Thailand	Sudan	Tajikistan
El Salvador	Tunisia	Swaziland	Timor-Leste
Gabon	Turkey	Syrian Arab Rep.	Togo
Guatemala	Ukraine	Tanzania	Yemen, Rep.
Honduras	Uruguay	Uganda	
India	Venezuela, RB		
Indonesia	Vietnam		
Iran, Islamic Rep.	Zambia		
Kazakhstan			
Kenya			

Note: Vul refers to the country specific mean of vulnerability, Median is the median of the distribution of countries according to their level of vulnerability, and Vul$_{75}$ is the 75 percentile of the distribution of the vulnerability index.