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Self-reported food insecurity in Africa during the food price crisis

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ABSTRACT

This article analyzes data on self-reported food insecurity of more than 50,000 individuals in 18 Sub-Saharan African countries over the period 2005–2008, when global food prices increased dramatically. The average level of self-reported food insecurity was high but remarkably stable over time, at about 54%. However, this average hides large heterogeneity, both within countries and across countries. In eight of the sample countries, self-reported food security improved, while it worsened in the ten other countries. Our results suggest that heterogeneous effects in self-reported food security are consistent with economic predictions, as they are correlated with economic growth and net food consumption (both at the household and country level). Specifically, in the face of rising food prices, self-reported food security improved on average in rural households, while it worsened in urban households – a finding that holds when using global prices or domestic food prices. Improvements in food security over time were also positively correlated with net food exports and GDP per capita growth. While the self-reported indicator used in this paper requires further study and one should carefully interpret the results, our findings suggest the need for a critical evaluation of the currently used data and numbers in the public debate on food prices and food insecurity.

Introduction

The dramatic increases in food prices since 2006 have raised many concerns regarding the impact on the world's poor. Poor people, who spend a large share of their income on food, are said to suffer severely from food price increases. This, it is argued, is not only the case for poor urban consumers, but also for poor rural households and farmers, many of whom are argued to be net consumers and therefore suffering from higher prices (Barrett and Dorosh, 1996; Weber et al., 1988). FAO, USDA and World Bank estimates of the welfare impact of the 2007/2008 global food crisis conclude that somewhere between 75 and 160 million people were thrown into hunger or poverty (de Hoyos and Medvedev, 2009; USDA, 2009). Several studies focusing on Sub-Saharan Africa have also demonstrated strong negative welfare effects (Arndt et al., 2008; Wodon and Zaman, 2009).

These claims have not gone without challenge. A first critique relates to the apparent inconsistency of these claims with earlier arguments that poor farmers and rural households in developing countries suffered heavily from low global food prices, partly as a consequence of rich countries' agricultural subsidies (Swinnen and Squicciarini, 2012). A second critique relates to the fact that other factors than food prices can be more important determinants of food consumption in developing countries (Banjeree and Duflo, 2011). A third critique relates to the actual measurement of hunger and food security which underlies these arguments, and their determinants (Easterly, 2010[1]; Headey, 2011). A crucial issue with the hunger calculations is that they are typically not based on actual measurement but on simulations. One drawback of the simulation-based studies is that their country coverage may be limited and possibly not representative, in particular when the models do not include some large countries with many poor people. Another potential drawback is the ceteris paribus nature of the analyses.

While some of these studies have carefully pointed out the limitations of the simulation exercises, many of those who have used the results of these studies in the policy debate have not. For example, Will Martin and Hassan Zaman, in a response to Headey on Dani Rodrik's website, correctly point out the ceteris paribus nature of studies they and others have been involved in (see e.g. Ivanic and Martin, 2008; Wodon and Zaman, 2009) and they also stress

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URL: http://www.econ.kuleuven.be/licos (J. Swinnen).

[1] "Spot the made-up world hunger numbers" on Aidwatchers, 15th September, 2010 (can be accessed at: http://aidwatchers.com/2010/09/spot-the-made-up-world-hunger-numbers/).

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the limitations of looking at hunger or food security as welfare indicators, with poor people making costly adjustments to make up for increasing food prices.[2] For instance, it has been extensively demonstrated that, in order to meet their consumption needs, rural households may sell their productive assets such as seeds and livestock, thereby jeopardizing their future earnings prospects (Dercon, 2004; Poulton et al., 2006).

However, in much of the policy debates on the food crisis, the discussions have ignored the ceteris paribus assumption and the complex interactions between food prices and welfare, and have used the numbers from the simulation models as if they were actual changes in food security or poverty (see Swinnen (2011) for a review of statements and public arguments).

In a recent review of the issue, Headey (2011) not only points out important deficiencies but also proposes considering alternative measures which are based on ex-post observations instead of simulating from ex ante data. He analyzes self-reported food insecurity from the Gallup World Poll (GWP), a survey that has covered almost 90% of the developing world population over the period 2005–2010. His findings are strikingly different from those so far claimed. The GWP data indicate that although there was large variation across countries, global self-reported food insecurity fell sharply from 2005 to 2008, with estimates ranging from 60 to 340 million people (Headey, 2011). According to Headey (2011), the discrepancy between this finding and the results of the more commonly used simulation-based approach is likely to be due to the combination of the ceteris paribus assumption and the under-sampling of fast-growing large economies – China, India and Brazil – in the latter approach.

Given the dramatically different conclusions, and the potential implications for food and economic policies, it is important to further investigate this issue. In this paper we follow up on Headey's approach by using a self-reported food insecurity indicator from a different data source: the Afrobarometer (AB) surveys.[3] Analyzing a similar indicator from a different source is important to see to what extent these data confirm Headey's GWP data findings, or not.

There is an additional contribution. A limitation of the GWP data used by Headey (2011) is their aggregate nature, i.e. they provide only one figure for each country-year in the sample. This makes it impossible to distinguish between rural and urban areas, and to control for a number of individual level characteristics that may influence self-reported food insecurity. In contrast, the AB data is available at the individual level. The survey rounds of 2005 and 2008 include observations on approximately 50,000 individuals across 18 different Sub-Saharan African (SSA) countries, making it represent 56.3% of the population in SSA.

The next section presents the international and domestic food price data used in this study and gives an overview of the AB data on self-reported food insecurity in 2005 and 2008. In Self-reported food insecurity, 2005–2008, we study the change in self-reported food insecurity over this period and discuss the within- and between-country heterogeneity in the results. In Regression analysis, we verify the robustness of these results by means of a multivariate regression analysis. Discussion provides further discussion on three fronts. First, we assess the economic significance of the changes in self-reported food insecurity by providing estimates on the number of millions falling into or escaping food insecurity over the period under study. Second, we assess the external validity of the results by comparing characteristics of the in-sample SSA countries with the out-of-sample SSA countries. Finally, we verify the reliability of the AB self-reported food insecurity indicator by comparing it with a similar measure, i.e. the self-reported food insecurity in the GWP data, used in the paper of Headey (2011).

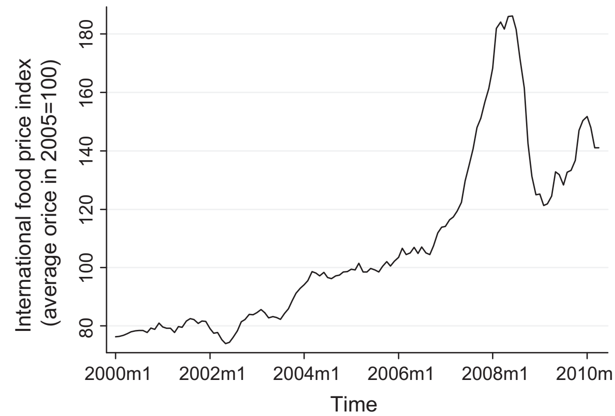

Fig. 1. The real international food price. *Notes*: The food price data is obtained from the FAO Food Price Index database. In calculating the FAO food price index, the FAO classifies 55 commodity quotations into 5 groups-meat, dairy, cereals, oil and fat and sugar and takes the average of these indices, weighting them by their average export shares over 2002–2004.

Data used

Food prices

We make use of international as well as domestic monthly food prices. The international food price data is obtained from the FAO Food Price Index database. Fig. 1 shows that this index increased dramatically from its (annual average) baseline level of 100 in 2005 to 167 in 2008.

The domestic food price data are taken from the ILO food index database[4]. Fig. 2 shows the evolution in domestic food prices for the countries in our sample. Although the price series do not display a clear spike (except for Kenya), we do find a rather strong upward trend, suggesting there is transmission from international to domestic prices. For the countries included in our sample, we find a positive and highly significant correlation of 0.64 between the FAO international food price index and the ILO CPI domestic food price indices between 2004 and 2009.[5] This is in line with the detailed price series analysis of 12 SSA countries by Minot (2011), who concludes that over the period June 2007–June 2008 staple food prices in these countries increased by 63% in US dollar terms, which represents 71% of the increase in the price on international markets (on average).

Self-reported food insecurity

To assess how rising international and domestic food prices affected self-reported food insecurity in SSA, we use the AB household survey data for the years 2005 and 2008.

[2] "Was the food price crisis of 2008 really a myth?", posted by Martin and Zaman on June 16, 2011 can be accessed at http://rodrik.typepad.com/dani_rodriks_weblog/2011/06/was-the-food-price-crisis-of-2008-really-a-myth.html.

[3] Afrobarometer is a research project funded by Institute for Democracy in South Africa, the Ghana Centre for Democratic Development and the Department of Political Science at the Michigan State University. The project seeks to explore public attitudes towards governance and socio-economic scenarios.

[4] The international Labor Office food price data is available at http://laborsta.ilo.org/ (by selecting consumer price indices – food indices)

[5] We exclude Cape Verde and Zimbabwe when calculating this correlation coefficient. For Cape Verde data is missing between 2000 and 2005 while Zimbabwe has missing data for August–December 2008, following a period of hyperinflation in 2007–2008. Both of these countries are also excluded from the domestic food price analysis presented in this paper.

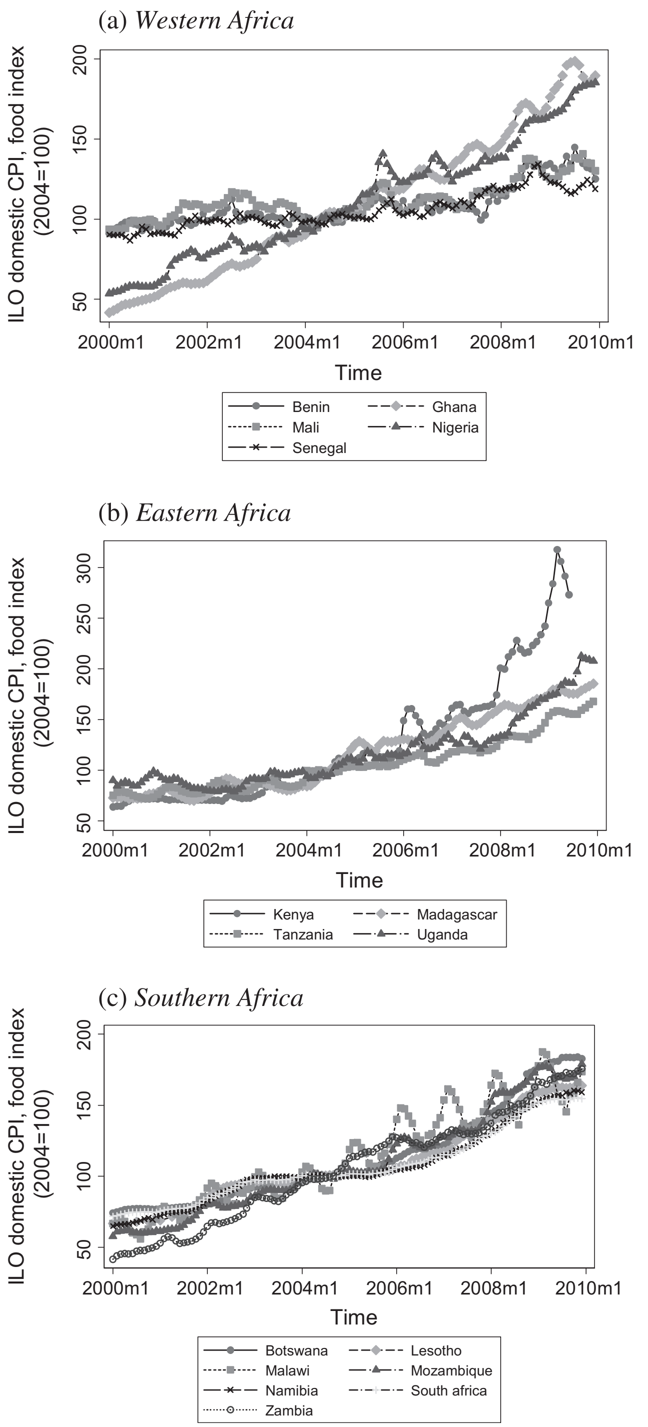

Fig. 2. Domestic food prices in sample countries. *Notes*: The domestic food price data is obtained from the ILO CPI food index. General information on the ILO consumer price indices can be found online (http://laborsta.ilo.org/applv8/data/bulcpie.html). Detailed information on the data sources for the CPI, the method of data collection and the weighs and composition of the included categories can be consulted per country on the LABORSTA website (by selecting consumer price indices – food indices). We changed the base year of the index from 2000 to 2004, the year preceding the first AB household survey. In Senegal the base year of the index changed from 2000 to 2005 in the year 2005 and in South Africa it changed from 2000 to 2008 in the year 2009. As information on the ratio between the price indices with different base years was not available, we extrapolated the average yearly change between December and January to obtain a conversion factor. Zimbabwe and Cape Verde are excluded from the analysis. Zimbabwe faced hyperinflation between 2007 and 2008, peaking at an estimated monthly rate of 79.6 billion percent in mid-November 2008 (Hanke and Kwok, 2009). Official price data for Zimbabwe is not available from August to December 2008. For Cape Verde data is missing between 2000 and 2005.

Table 1
Afrobarometer sample observations across country-years.

	2005		2008	
	Obs	% Rural	Obs	% Rural
Benin	1198	0.58	1200	0.59
Botswana	1200	0.57	1200	0.45
Cape Verde	1256	0.53	1264	0.4
Ghana	1197	0.53	1200	0.55
Kenya	1278	0.71	1104	0.78
Lesotho	1161	0.66	1200	0.74
Madagascar	1350	0.76	1350	0.76
Malawi	1200	0.86	1200	0.85
Mali	1244	0.73	1232	0.73
Mozambique	1198	0.57	1200	0.68
Namibia	1200	0.6	1200	0.64
Nigeria	2363	0.51	2324	0.51
Senegal	1200	0.59	1200	0.55
South Africa	2400	0.39	2400	0.34
Tanzania	1304	0.77	1208	0.74
Uganda	2400	0.7	2431	0.8
Zambia	1200	0.63	1200	0.63
Zimbabwe	1048	0.68	1200	0.63
Total	25,397	0.62	25,313	0.62

The eighteen countries which had nation-wide AB surveys are listed in Table 1. The survey respondents were selected using a random, stratified, multistage, national probability sample representing adult citizens aged 18 years or older. There are between 1104 and 2400 respondents for each country-year, allowing inferences to national adult populations with a margin of sampling error of no more than plus or minus 2.5% with a confidence level of 95%. In total, across the two survey rounds for the 18 countries, the dataset includes information on 50,710 respondents, of which the majority (62%) resides in rural areas. While the samples are representative for urban and rural populations, they are not necessarily representative for separate income strata within these populations.

In the AB surveys, the question on food insecurity is formulated as follows:

> "*Over the past year, how often, if ever, have you or anyone in your family gone without enough food to eat? 0 = Never, 1 = Just once or twice, 2 = Several times, 3 = Many times, 4 = Always*"

The exact phrasing of the question is important, an issue that is extensively discussed by Headey (2011). Phrases of interest include "over the past year", "you or anyone in your family", and "enough food to eat". The latter may be subjective, depending on the diet the respondent is accustomed to, which may include meat and other more expensive items for well-off individuals and may consist exclusively out of staple foods for poorer individuals. In principal, the phrase "you or anyone in your family" makes the question sensitive to unequal intra-household distribution of food. Finally, for the purpose of linking the self-reported measure with events that occurred, it is important to take account of the 12 month recall period ("over the past year").

The timing of the interview varied within and across survey rounds. Depending on the size of the country, each survey was implemented in periods ranging from 9 days (Cape Verde, May 2008) to 125 days (Nigeria, August–December 2005). In a regression analysis (reported in Regression analysis), we determine for each individual separately the 12-month recall period and the corresponding global and domestic food price inflation. Qualitatively we find the same results as those on the basis of summary statistics across 2005 and 2008 (reported in Self-reported food insecurity, 2005–2008).

To facilitate reading the data, we derive three binary indicator variables from the categorical answers. *Foodinsecurity1* indicates whether or not the individual experienced food shortages over the past year; it takes the value 1 for the categories 1–4 (1 = Just once or twice, 2 = Several times, 3 = Many times, 4 = Always) and zero otherwise, i.e. if the household never experienced hunger. A second indicator, *foodinsecurity2*, takes the value 1 for categories 2–4 and zero otherwise, capturing when individuals had gone without enough food more frequently than "just once or twice". A third indicator variable, *foodinsecurity3*, equals 1 when the households reported having gone without enough food "many times" or "always".

Changes in *foodinsecurity1* can be read as changes in the incidence of food insecurity, while increases in *foodinsecurity3* are likely to result from individuals moving from less severe (rather than no food insecurity) to more severe food insecurity. Therefore, to some extent, changes in *foodinsecurity3* can be interpreted as changes in the depth of food insecurity.

Self-reported food insecurity, 2005–2008

General numbers

Table 2 summarizes the frequency distribution of the answers. The descriptive statistics yield several important conclusions. First, in both years, more than half of all the respondents reported having gone without food at least once in the past 12 months prior to the interview and 16–17% did "many times" or "always".

Second, food insecurity is considerably larger for rural than for urban respondents. Only 39–41% of rural respondents never went without food, compared to 55–57% of urban respondents. Furthermore, rural respondents answered "many times" or "always" in approximately 20% of cases compared to only 10% for their urban counterparts. This is consistent with information from other sources indicating that food insecurity is much higher in rural than in urban areas (Weber et al., 1988; Smith et al., 2005).

Third, remarkably there are no dramatic shifts during the period of food crisis. Between 2005 and 2008, the share of respondents who reported never to have been without enough food decreased by only two percentage points (from 47.3% to 45.4%). Furthermore, this decrease was almost entirely due to a shift to the category of going without food just once or twice (increasing from 15.8% to 17.3%). In fact, very severe food insecurity slightly decreased over the period, with the share of respondents reporting going without food "many times" or "always" falling from 17.3% to 16.3%.

Thus, it seems that the incidence of food insecurity increased slightly, while the depth of food insecurity decreased slightly. This is also the pattern that emerges from Table 3, which summarizes the descriptive statistics for the three binary food insecurity variables, in Panel A, B and C, respectively. In line with Table 2, we find that *foodinsecurity1* slightly increased, *foodinsecurity2* remained basically unchanged and *foodinsecurity3* slightly decreased.

There may be several reasons why, in a period with high international food price inflation, we find only a relatively moderate increase (*foodinsecurity1, foodinsecurity2*) or even a decrease in the share of food insecure (*foodinsecurity3*). One potential reason is that many poor people are farmers who may have benefited from the high food prices. Another reason may be that price transmission was low, or was limited to urban areas. A third potential explanation is that the self-reported measure may be more stable than the food security estimates based on per capita consumption which are highly sensitive to small changes in food consumption for households near the food consumption cutoff. Finally, other important determinants may have influenced food security. For instance, several countries in the Sahel region of West and Central Africa which experienced drought in 2005 may have started out from a poor food security record in 2005, leading to a recovery in food security in 2008 (Kelly et al., 2008). On a more positive note, as is evident from Table 4, the countries in our sample experienced strong income growth, with above 3% annual average GDP per capita growth over the 2005–2008 period. Such rapid economic growth may have moderated the potential negative impact of rising food prices on food security.

In the words of Headey and Fan (2008, p. 387) "Essentially, the welfare effect of rising food prices at the urban, rural, or country level depends upon the number of people who are poor and vulnerable (just above the poverty line), whether those people are net buyers or net sellers of food, and whether they are marginal net sellers/buyers or significantly so." Although conceptually very transparent, at the micro-level the difficulty lies in measuring the extent to which rural and urban households are net sellers/buyers of food. This measurement issue, in particular the likely underreporting of household income in rural regions, may explain some contrasting results of recent cross-country poverty simulations.[6] Given these contrasting results and the various competing explanations for a low impact of the global rise in food prices on self-reported food insecurity, it is useful to further explore the heterogeneity in the change in self-reported data on hunger.

Table 3
Self-reported food insecurity, binary variables.

	2005	2008	% Change
Panel A: food insecurity 1 (at least once)			
Total	0.53	0.55	3.6
Urban	0.43	0.45	4.4
Rural	0.59	0.61	3.4
Net food imports >0% GDP	0.49	0.53	9.9
Net food imports <0% GDP	0.55	0.55	0.4
Panel B: food insecurity 2 (at least several times)			
Total	0.37	0.37	1.4
Urban	0.27	0.28	5.2
Rural	0.43	0.43	−0.2
Net food imports >0% GDP	0.34	0.36	4.7
Net food imports <0% GDP	0.39	0.38	−0.3
Panel C: food insecurity 3 (at least many times or always)			
Total	0.17	0.16	−5.2
Urban	0.10	0.11	7.8
Rural	0.22	0.20	−9.2
Net food imports >0% GDP	0.14	0.16	11.4
Net food imports <0% GDP	0.19	0.17	−13.0

Table 2
Share of respondents reporting having gone without enough food.

%	Total sample		Rural		Urban	
	2005	2008	2005	2008	2005	2008
Never	47.3	45.4	41.3	39.3	57.1	55.2
Just once or twice	15.8	17.3	15.6	17.7	16.2	16.6
Several times	19.6	21	21.4	23.3	16.6	17.3
Many times	12.8	12.7	15.9	15.4	7.7	8.4
Always	4.5	3.6	5.8	4.3	2.4	2.6
Obs	25,342	25,254	15,676	15,635	9666	9619
Column%	100	100	100	100	100	100

[6] For example, for two African countries, Ivanic and Martin (2008) find larger increases in rural than in urban poverty upon food price increases. These results are challenged by Aksoy and Isik-Dikmelik (2008), who assume that many of the poorest in rural areas are mostly net food sellers. Several detailed country case studies also reach the conclusion that, while the effect of world food prices is likely to be relatively modest for the country as a whole, the urban poor – rather than the rural poor – may be hardest hit by high food prices (Godsway et al. (2010) for Ghana; Ferreira et al. (2011) for Brazil; Arndt et al. (2008) for Mozambique).

Table 4
Characteristics of sample countries.

	Average annual GDP per capita growth 05–08 (%)	Net food imports as percent of GDP (average across 05–08)	Total population in 2005 (millions)	Average annual population growth 05–08 (%)	Poverty gap at $1.25 a day (PPP)%	ISO code
Benin	0.9	2.6	7.87	3.2	.	BJ
Botswana	1.8	3.1	1.84	1.4	.	BW
Cape Verde	5.1	13.0	0.48	1.5	.	CV
Ghana	4.1	−9.9	21.92	2.1	9.88	GH
Kenya	2.5	−3.4	35.82	2.6	16.91	KE
Lesotho	3.5	19.2[c]	2.00	0.9	.	LS
Madagascar	2.9	0.0	17.61	2.7	26.52	MG
Malawi	4.3	−9.8	13.65	2.8	32.31	MW
Mali	2.3	−0.4	11.83	2.4	18.79	ML
Mozambique	5.2	1.9	20.83	2.4	25.13	MZ
Namibia	2.5	−1.9	2.01	1.9	9.45	NA
Nigeria	3.5	2.3	140.88	2.4	28.66	NG
Senegal	1.4	4.5	11.28	2.6	10.8	SN
South Africa	3.3	−0.3	46.89	1.2	3.27	ZA
Tanzania	4.2	−3.6	39.01	2.8	28.1	TZ
Uganda	5.3	−4.8	28.70	3.3	19.11	UG
Zambia	3.4	−0.6	11.74	2.4	34.89	ZM
Zimbabwe	−5.2[a]	−9.8	12.48	−0.1	.	ZW
Average	3.3[b]	−1.0	23.71	2.2	20.29	

Notes: The country level variables are calculated using World Bank's WDI indicators; we classify a country as a net agri-food importer (exporter) if the value of annual agri-food imports was larger (smaller) than the value of annual agri-food exports, on average for the period 2005–2008 (for more details, see footnote 7 in text).
[a] Data available only for 2005.
[b] Zimbabwe excluded.
[c] Data available only for 2000–2004.

Heterogeneous results

Rural versus urban areas

The results in Table 3 suggest that rural respondents are on average benefiting from high food prices and experience an improvement in food security, whereas urban households are worse off. The rural–urban difference in the change in self-reported food insecurity is largest for very severe food insecurity (*foodinsecurity3*), for which Table 3 indicates a decrease of 9.2% in rural areas and an increase of 7.8% in urban areas, suggesting that the depth of food insecurity increased substantially in urban areas while decreasing substantially in rural areas. For *foodinsecurity2*, the difference is smaller, with a drop of −0.2% in rural areas and a rise of 5.2% in urban areas. *Foodinsecurity1* increased in both rural and urban areas, although more so in the latter (4.4% versus 3.4% in rural areas).

Fig. 3a visualizes the rural–urban difference in the change in *foodinsecurity1* during the period 2005–2008, depicting the change of *foodinsecurity1* in urban areas on the horizontal axis and the change in rural areas on the vertical axis. On average, urban food insecurity increased more than rural food insecurity, as is shown by the fitted line which lies below the 45°-line. However, many country data points lie close to the 45°-line, indicating that, in those countries, the proportional change in *foodinsecurity1* was similar across rural and urban areas. Noteworthy exceptions, where food insecurity increased much more in urban areas, are Benin and Senegal (denoted by the ISO-codes BJ and SE respectively).

Fig. 3b and c depict the rural–urban difference for the change in *foodinsecurity2* and *foodinsecurity3*, respectively. The average result is qualitatively the same as in Fig. 3a: the fitted line is flatter than the 45° line indicating that, on average, the depth of food insecurity increased more in urban than in rural areas. Again, the results are very different across countries with some of the country data points lying close to the 45° line, while others (e.g. Senegal and Benin) lying far below the 45° line.

Importing versus exporting countries

A second interesting distinction can be made between net importers and net exporters of agri-food products. We classify a country as a net agri-food importer (exporter) if the value of annual agri-food imports was larger (smaller) than the value of annual agri-food exports, on average for the period 2005–2008.[7] The commodities considered include both staple foods and other agri-food commodities such as sugar, tobacco and high-value horticultural exports. Because income effects come through both staple food and non-staple food price effects, we think it is important to consider all agri-food trade. However, in a robustness check, reported in Further checks, we use an alternative measure that only considers imports and exports of staple foods. The results are comparable.

Table 4 shows that, in the sample countries, net agri-food imports as a share of GDP over the 2005–2008 period was on average slightly negative (−1%) – meaning that the countries were on average small agri-food exporters – but varied between -9.9% in Ghana and 13% for Cape Verde.

Table 3 indicates that, on average, self-reported food insecurity increased considerably for agri-food importers, across all three binary variables, while respondents in agri-food exporting countries reported that their food insecurity situation was stable (*foodinsecurity1*) or improved (*foodinsecurity2* and *foodinsecurity3*).

Fig. 4a shows a strongly positive relationship between the change in *foodinsecurity1* between 2005 and 2008 and the share of net agri-food imports in GDP. There is also a positive relationship with the change in *foodinsecurity2* and *foodinsecurity3*, be it less strong (see Fig. 4b and c).

This pattern is consistent with the intuition of increasing global agri-food prices benefiting net exporters more (or hurting them less) than net importers. The result may be exacerbated because the transmission from international to domestic prices is stronger for food importing countries: the correlation between the domestic and international food prices amounts to 0.73 for net food importing countries versus 0.54 for net food exporting countries. This could be because food exporting countries may have food stocks that can be used to moderate or at least postpone the transmission of global price increases. The lower correlation may also result

[7] Except for Lesotho for which, due to unavailability of data, we use the figures for the period 2000–2004.

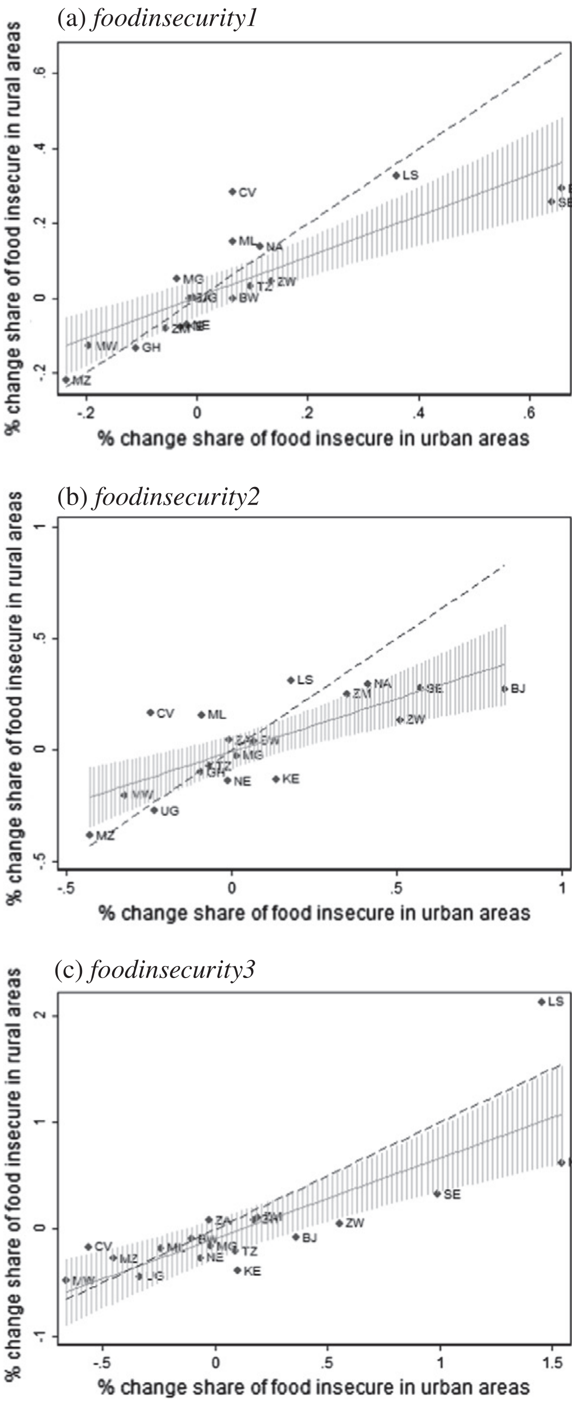

Fig. 3. The change in urban and rural food insecurity over 2005–2008. *Note*: The ISO-codes, listed in Table 4, are used to label the country data points; the dashed line is the 45° line; the spikes indicate the confidence interval.

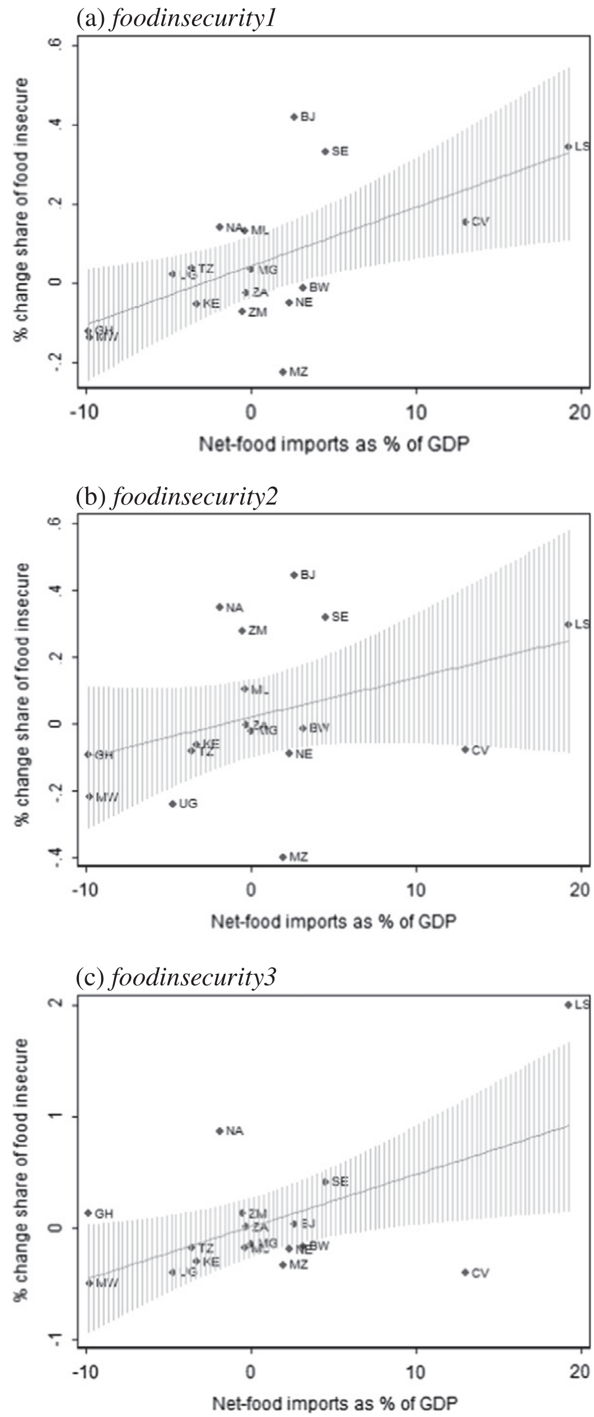

Fig. 4. The share of net agri-food imports in GDP and the 2005–2008 change in food insecurity. *Note*: The ISO-codes, listed in Table 4, are used to label the country data points; the dashed line is the 45° line; the spikes indicate the confidence interval. Net food imports are defined as in Table 4.

from policy interventions as many food exporters have introduced export constraints during the price spikes to prevent domestic food shortages and price increases.

GDP per capita growth

Table 4 shows that, in our sample of countries, annual GDP per capita growth over 2005–2008 ranged between a low of 0.9% (or −5.2% when including Zimbabwe) and a high of 5.3% for Uganda. Given this heterogeneity across countries, and the presumption that income matters for food insecurity, we expect to find a corresponding large cross-country variation in the change in self-reported food insecurity.

We indeed find large differences. For instance, Benin, a poor growth performer in the period under study (0.9%), tops the list for the change in *foodinsecurity1* with a 41.7% increase in the share of respondents going without food at least once. Mozambique, which had a very good growth record (5.2%), displays the largest decrease in *foodinsecurity1* (−22.5%). Fig. 5a shows the overall relationship between GDP per capita growth and the change in food insecurity for the countries in our sample. The relationship is strongly negative, indicating that, on average, *foodinsecurity1* increased in countries with relatively low economic growth. Some country data points lie far above the fitted line, indicating that food insecurity increased much more than predicted based on the average relationship. Not surprisingly, these data points include Senegal, Lesotho and Cape Verde, the three countries with the highest reliance on food imports in our sample.

Fig. 5b shows a very similar pattern for the relation between GDP per capita growth and changes in *foodinsecurity2*. However, Fig. 5c shows only a very weak correlation between GDP growth and the change in *foodinsecurity3*. This suggests that, at least in the short run and for the countries in our sample, GDP per capita growth is more strongly correlated with the change in the incidence of hunger than with the change in the depth of hunger.

Education level

Educational attainment of the respondent is yet another significant aspect lending heterogeneity to food insecurity. In the absence of income data in the AB, educational attainment provides a useful cue for income as the relation is shown to be strong and highly significant (Griliches and Mason, 1972; Card, 1999). About six in ten respondents have completed primary education, while four in ten have received no formal education or only some primary education. Fig. 6a compares the change in *foodinsecurity1* by these categories, which are depicted on the horizontal and vertical axis, respectively. Fig. 6b and c provide the same comparisons but for the subsamples of rural and urban respondents respectively. In all three (Fig. 6a–c) the fitted line lies below the 45°-line, indicating that self-reported food insecurity increased more among the educated respondents. This pattern is qualitatively the same when looking at *foodinsecurity2* and *foodinsecurity3* (not reported).

One explanation may be that there are more net food consumers among the relatively well educated, while net food producers make up the majority of the uneducated. However, this explanation can only apply to the rural areas, not to the urban areas, where basically everybody – both educated and uneducated – are net food consumers. Another explanation may relate to the subjective nature of the measure of self-reported food insecurity, i.e. the educated may be more likely to self-report a change in food insecurity, for reasons related to behavior and social norms, or because their consumption basket consists of more traded food items.

Gender

Finally, we study heterogeneity across the gender of the respondent. A recent study by Kumar and Quisumbing (2011) on the gendered impact of the 2007–2008 food price crisis on poverty perception and consumption by Ethiopian households finds that female-headed households are more vulnerable to food price changes and are more likely to have experienced a food price shock in 2007–2008, mainly because they have fewer resources, have fewer years of schooling, and have smaller networks. Our findings from the self-reported food insecurity measure are in line with their study. Fig. 7 demonstrates that the change in food insecurity during the period 2005–2008 for all severity levels was greater for female-headed than for male-headed households.

Regression analysis

Baseline results

We check whether the above results hold in a multivariate analysis, i.e. when entering several potential determinants at the same time; when using global as well as local food prices; and when properly accounting for the 12-month recall period. As explained above, the question on food insecurity was asked with respect to "the past year", and the timing of the interviews varied within each survey round. We now account for the 12-month recall period, by determining for each individual the exact survey date, the 12-month recall period and the corresponding mean food prices. We use both global and domestic food price indices, because – although price transmission was rather high – it was not complete. Domestic prices – and local food security – may also be affected by local events such as bumper crops or crop failures, which are not captured by international prices.

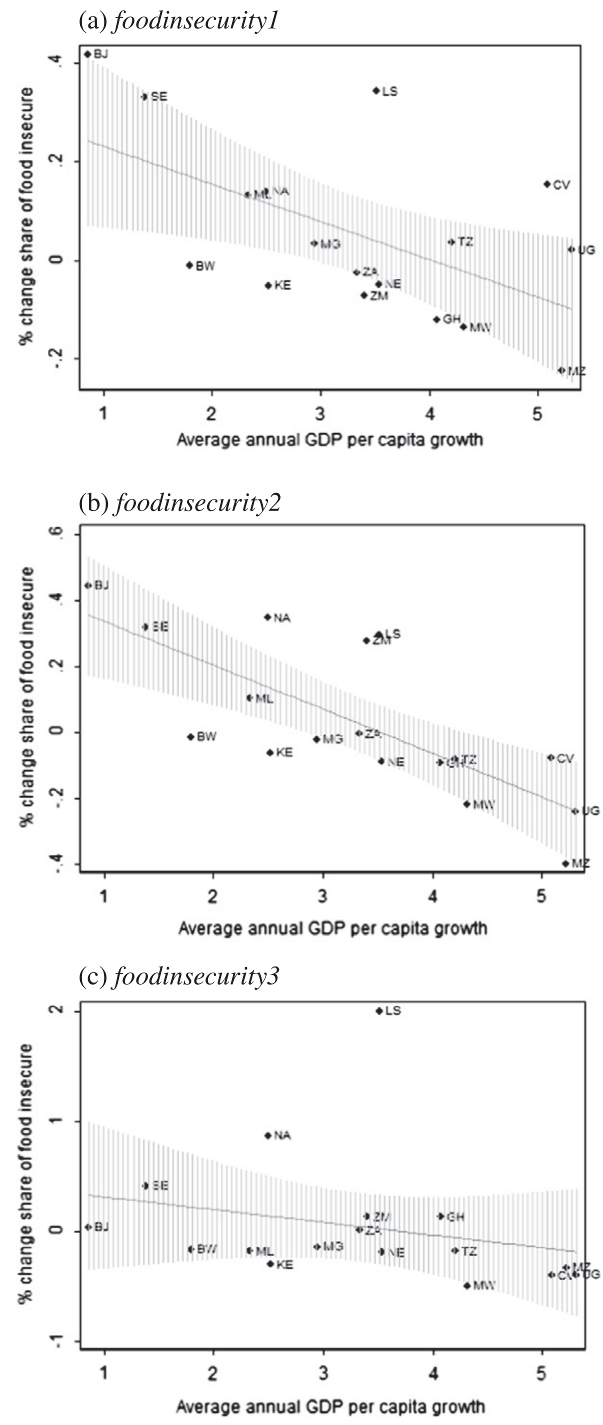

Fig. 5. GDP per capita growth and the 2005–2008 change in food insecurity. *Note*: The ISO-codes, listed in Table 4, are used to label the country data points; the dashed line is the 45° line; the spikes indicate the confidence interval. Zimbabwe is left out because it has data available only for 2005.

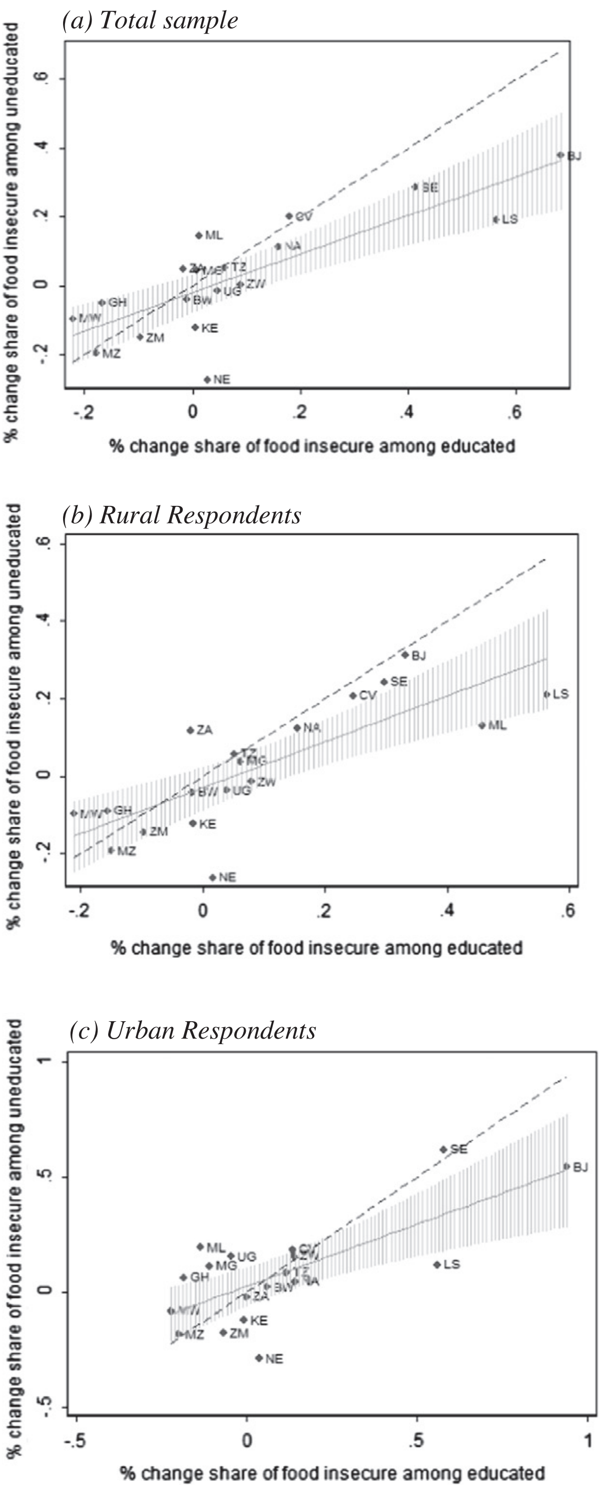

Fig. 6. Change across 2005–2008 in food insecurity (*foodinsecurity1*) by education. *Note*: The ISO-codes, listed in Table 4, are used to label the country data points; the dashed line is the 45° line. The category "uneducated" include those with no, informal or incomplete primary education.

In a probit model, we regress self-reported food insecurity on the average international and domestic food price index over the past year from the date of interview. The results, presented in Table 5, Panel A confirm our previously reported descriptive statistics. The estimated coefficient on the 12-month average international price index is significantly positive when explaining *foodinsecurity1* and significantly negative when explaining *foodinsecurity2* and *foodinsecurity3*. More precisely, we find that a 1% increase in the mean international price level of the past year increases the incidence of food insecurity by 2.7% (*foodinsecurity1*) but decreases the probability of a respondent being severely food insecure (*foodinsecurity3)* by 4.9%.[8]

In Panel B of Table 5 we repeat the analysis using domestic prices and find that the above results remain valid: the 12-month average domestic price is significantly positive when explaining *foodinsecurity1* and significantly negative when explaining *foodinsecurity3*; it is negative but not significant when explaining *foodinsecurity2*. In terms of the quantitative effects, we find that a 1% increase in the mean domestic price level of the past year increases the incidence of food insecurity by 8.5% (*foodinsecurity1*) but decreases the probability of a respondent being severely food insecure (*foodinsecurity3*) by 4.6%.

In Table 6, we check the robustness of our rural-versus-urban result when controlling for country fixed effects as well as the respondent's educational attainment. We do so because education may play a role in the self-reported assessment of food insecurity, e.g. educated respondents which are concentrated in urban areas may be more (or less) inclined than non-educated respondents to report a change in food security. To control for this, the regression analysis includes a variable indicating whether the respondent lives in an urban or rural area, whether the respondent has finished primary education as well as the interaction terms of these two variables with the 12-month average of the food price index.

Even when controlling for the possible impact of education on self-reported food insecurity, we find confirmation that urban respondents are more vulnerable to an increase in food prices: in Panel A of Table 6, the interaction term between the urban indicator variable and the international food price index indicates that, for a 1% increase in the food price level, the probability of becoming food insecure (*foodinsecurity1*) is on average 2.9% higher for an urban respondent than for a rural respondent. For *foodinsecurity2* and *foodinsecurity3* this difference in probability is 5.6% and 6.6%, respectively. These regression results are in line with our descriptive results, and tilt the balance in favor of the claims that rural respondents on average benefited (suffered less) from the food crisis, even though they might be worse off in level terms to begin with.

Panel B of Table 6 repeats the analysis with domestic prices. We find that the above results remain: compared to rural respondents, urban respondents report a larger increase in food insecurity following an increase in domestic food prices. The interaction term between the urban indicator variable and the domestic food price index indicates that, for a 1% increase in the food price level, the probability of becoming food insecure (*foodinsecurity1*) is on average 2.2% higher for an urban respondent than for a rural respondent. For *foodinsecurity2* and *foodinsecurity3* this difference in probability is 5.8% and 7.5%, respectively.

The results are consistent with arguments that food security in urban households is, on average, more sensitive to prices increasing (and decreasing) as urban households are mostly consumers while rural households are both consumers and producers. For the average rural household the net effect of price changes will therefore be smaller than for the average urban household – both when prices increase and when they decrease[9].

Finally, since the country-level covariates, i.e. real GDP per capita growth and the share of net food imports as a percentage of GDP, are positively correlated (with a correlation coefficient of 0.15), we check the robustness of our results with respect to these variables

[8] This effect is the average marginal effect (over all countries) derived from changes in the *z*-score of the probit regressions.

[9] See Swinnen (2011) for a conceptual framework on this.

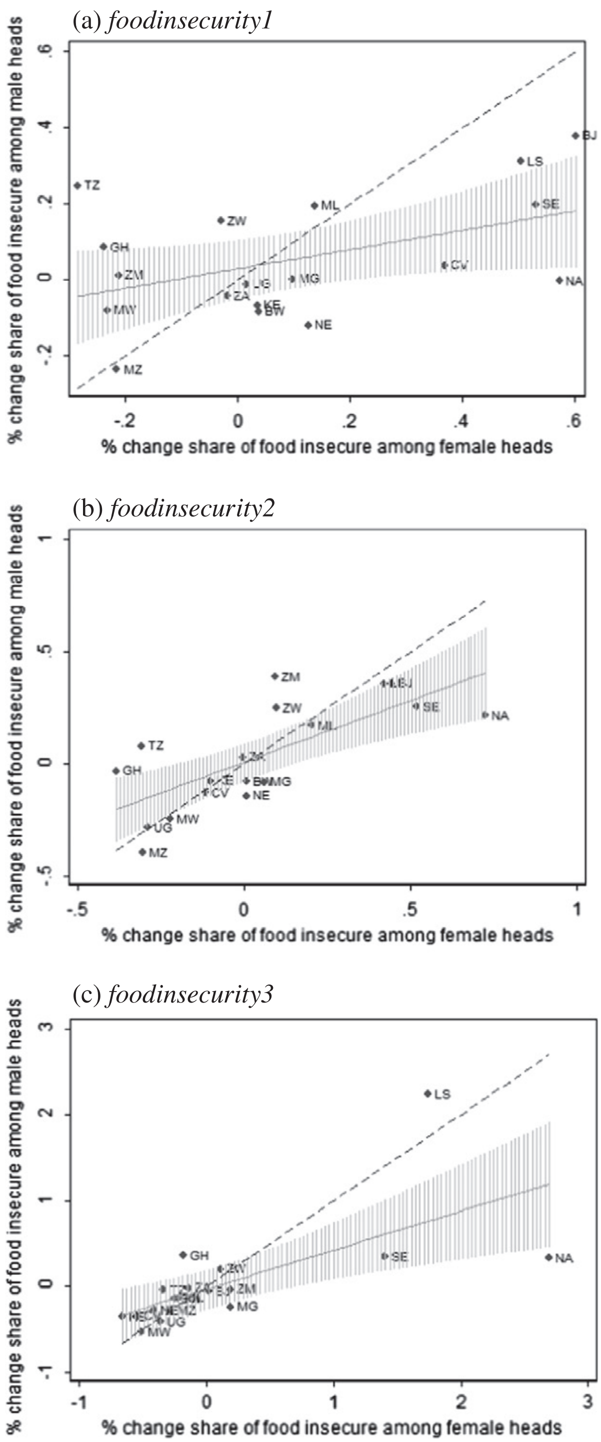

Fig. 7. Change in food insecurity across 2005–2008 by gender of the household head. *Note*: The ISO-codes, listed in Table 4, are used to label the country data points; the dashed line is the 45° line.

by including them jointly as explanatory variables. We also include the interaction term between the share of net food imports as a percentage of GDP and the food price index. The results displayed in Panel A of Table 7 are in line with our claims above, i.e. we find a significantly positive relationship between income growth in a country and the food security of its respondents, whereas a higher dependence on food imports of a country decreases the probability of its respondents becoming more food secure, on average, with rising international prices. We also repeat this regression when including the interaction between the food price index and GDP per capita (not reported). Our results remain.

In Panel B, we replicate these estimations using domestic prices. We find the same significant and negative relationship between income growth and food insecurity. We do not, however, find evidence for a positive interaction effect between domestic food price increases and the net food importing status of a country. This is not surprising as, contrary to international prices, there is no apparent reason for a differential impact of a domestic price increase across food importing and exporting countries.

Further checks

We run a number of robustness checks.[10] Below, we discuss the outcome of these checks. The full results can be consulted in the online appendix.

First, we perform a joint regression in which we include *all the regressors* from Tables 5–7. Our conclusions remain valid, both when using international and domestic food prices.

Second, we repeat all regressions using the *maximum food price* over the past 12 months instead of the mean food price. Again, all our main findings remain valid.

Third, we repeat the analysis in Tables 5–7 *controlling for baseline poverty* during the first AB survey round, using the poverty gap at $1.25 a day (PPP)%, which is available from the World Development Indicators for 11 of the 18 countries in our sample. The results again confirm our baseline findings. We also find that respondents of countries with a higher poverty gap have a higher average level of self-reported food-insecurity.

Fourth, we use an *alternative definition of agri-food import and export*. In the analysis above, a country is classified as a net agri-food importer (exporter) if the value of annual agri-food imports was larger (smaller) than the value of annual agri-food exports, on average for the period 2005–2008. This definition also considers commodities which are not staple foods such as sugar, tobacco, and high-value horticultural exports. Hence, several countries which are classified as net agri-food exporters according to this definition are not net exporters of staple foods. To construct a staple-food importer (exporter) measure, we used data from COMTRADE on the imports and exports of wheat, maize, rice, sorghum and millet. The correlation of this measure of net food imports and the measure used above is 0.51. Yet, according to this new measure, only Zambia can be classified as a net exporter of staple foods for the period 2005–2008. When interacting the new measure of net food imports (as a share of GDP) with the mean logged international food price over the past 12 months (as in Panel A of Table 7), the result that net food importing countries suffer more (benefit less) becomes less strong, suggesting that the trade deficit/surplus in itself is more important than the composition of the traded food.

Finally, we repeat the estimations underlying Table 6 *for agri-food exporting and food importing countries separately*.[11] We do so in order to shed further light on the mechanisms that underlie our heterogeneous results across urban and rural respondents. When using international food prices, we find that only in the subsample of food exporting countries food security of urban respondents is, on average, significantly more influenced by international food price changes than that of rural respondents.[12] This finding is consistent

[10] Several of these robustness checks were suggested by two anonymous reviewers of this journal.

[11] Using the same definition of net-importers and – exporters as in Food importing versus food exporting countries.

[12] When using domestic food prices, the results are similar: urban respondents are found to be more vulnerable than rural respondents in the case of food-exporting countries, although the difference becomes smaller. In the case of food-importing countries, no significant difference is detected.

Table 5
Accounting for individual-level 12-month recall period.

Dependent variable	(1) Foodinsecurity1	(2) Foodinsecurity2	(3) Foodinsecurity3
Panel A: using international price data			
Mean (log) price past year	0.0691**	−0.0576**	−0.196***
	(0.0278)	(0.0283)	(0.0331)
Constant	−0.244*	−0.0483	−0.0081
	(0.1350)	(0.1380)	(0.1610)
Observations	50,596	50,596	50,596
McKelvey and Zavoina's R^2	0.000	0.000	0.002
Panel B: using domestic price data			
Mean (log) price past year	0.213***	−0.0201	−0.192***
	(0.0336)	(0.0343)	(0.0408)
Constant	−0.934***	−0.2440	−0.0756
	(0.1620)	(0.1650)	(0.1960)
Observations	45,836	45,836	45,836
McKelvey and Zavoina's R^2	0.001	0.000	0.001

* Standard errors in parentheses $p < 0.1$.
** Standard errors in parentheses $p < 0.05$.
*** Standard errors in parentheses $p < 0.01$.

Table 6
Analyzing the differential impact on urban and rural respondents.

Dependent variable	(1) Foodinsecurity1	(2) Foodinsecurity2	(3) Foodinsecurity3
Panel A: using international price data			
Mean log price past year	0.137***	−0.102**	−0.322***
	(0.0488)	(0.0478)	(0.0526)
Urban	−0.611**	−0.992***	−1.652***
	(0.2950)	(0.3070)	(0.3770)
Urban × Mean log price past year	0.0737	0.150**	0.284***
	(0.0607)	(0.0632)	(0.0776)
At least primary	−0.3220	−0.957***	−1.452***
	(0.2960)	(0.2970)	(0.3460)
At least primary × Mean log price past year	−0.0150	0.109*	0.217***
	(0.0608)	(0.0611)	(0.0712)
Constant	−0.2460	0.568**	0.862***
	(0.2380)	(0.2340)	(0.2570)
Country fixed effects	Yes	Yes	Yes
Observations	50,470	50,470	50,470
McKelvey and Zavoina's R^2	0.152	0.155	0.153
Panel B: using domestic price data			
Mean log price past year	−0.0020	−0.183***	−0.352***
	(0.0626)	(0.0610)	(0.0677)
Urban	−0.5140	−1.002***	−1.824***
	(0.3590)	(0.3740)	(0.4630)
Urban × Mean log price past year	0.0546	0.156**	0.327***
	(0.0747)	(0.0778)	(0.0964)
At least primary	−0.3260	−0.676*	−0.889**
	(0.3590)	(0.3590)	(0.4220)
At least primary × Mean log price past year	−0.0111	0.0533	0.1010
	(0.0747)	(0.0746)	(0.0876)
Constant	0.4270	0.934***	0.958***
	(0.2970)	(0.2890)	(0.3210)
Country fixed effects	Yes	Yes	Yes
Observations	45,719	45,719	45,719
McKelvey and Zavoina's R^2	0.104	0.111	0.105

* Standard errors in parentheses $p < 0.1$.
** Standard errors in parentheses $p < 0.05$.
*** Standard errors in parentheses $p < 0.01$.

with the argument that the difference between urban and rural households in terms of their status as net food consumers is strongest in net food exporting countries. In these countries, the average rural household is more affected by the price effect on the production (and thus income) of the household than in food importing countries where many rural households may closer resemble urban households as net food consumers.

Discussion

Accounting for population size

How can we translate these figures in numbers of people falling into or escaping food insecurity? Table 4 shows that the sample countries are very different in terms of population size, varying

Table 7
Analyzing the effect of relevant country-level variables.

Dependent variable	(1) Foodinsecurity1	(2) Foodinsecurity2	(3) Foodinsecurity3
Panel A: using international price data			
Mean log price past year	0.0379	−0.0985**	−0.230***
	(0.0383)	(0.0388)	(0.0447)
Net agri-food imports/GDP (%)	−0.171***	−0.108*	−0.144*
	(0.0630)	(0.0641)	(0.0752)
Mean log price last year × Net food imports/GDP (%)	0.0368***	0.0245**	0.0327**
	(0.0122)	(0.0124)	(0.0145)
Per capita GDP growth	−0.0033	−0.0248***	−0.0368***
	(0.0057)	(0.0058)	(0.0068)
Constant	−0.2500	0.0473	0.0967
	(0.1800)	(0.1820)	(0.2100)
Country-fixed effects	Yes	Yes	Yes
Observations	41,014	41,014	41,014
McKelvey and Zavoina's R^2	0.089	0.086	0.090
Panel B: using domestic price data			
Mean log price past year	−0.145***	−0.252***	−0.412***
	(0.0479)	(0.0484)	(0.0572)
Net agri-food imports/GDP (%)	0.0491	0.163**	0.160*
	(0.0728)	(0.0745)	(0.0887)
Mean log price last year × Net food imports/GDP (%)	−0.0069	−0.0287**	−0.0269
	(0.0143)	(0.0146)	(0.0174)
Per capita GDP growth	−0.0152***	−0.0356***	−0.0503***
	(0.0054)	(0.0055)	(0.0064)
Constant	0.530**	0.665***	0.828***
	(0.2190)	(0.2210)	(0.2600)
Country-fixed effects	Yes	Yes	Yes
Observations	38,715	38,715	38,715
McKelvey and Zavoina's R^2	0.062	0.069	0.070

* Standard errors in parentheses $p < 0.1$.
** Standard errors in parentheses $p < 0.05$.
*** Standard errors in parentheses $p < 0.01$.

from less than one million for Cape Verde to more than 140 million inhabitants in Nigeria. In the above individual-based analyses, the size of the respondent's country, in terms of population, is disregarded. In order to assess the numbers of people falling into or escaping food insecurity, we need to account for population size.

First, we repeat the same analysis as above – calculating the proportional change in self-reported food insecurity – but now using population-weights that give a higher weight to more populous countries. Second, we estimate the changes in terms of absolute numbers of people falling into (or escaping) food insecurity, both when assuming zero population growth, and when taking population growth between 2005 and 2008 into account.[13]

The results are given in Table 8. The first column gives the proportional change in food insecurity for the unweighted data, repeating the results reported in the last column of Table 3. The second column gives the population-weighted proportional change in food insecurity. The results are very different. The population-weighted data show a much stronger decrease in food insecurity than the unweighted data. Weighting by population leads to a proportional decrease of 2.3%, 6.8% and 17.3%, compared to a proportional increase of 3.6% and 1.4% and decrease of 5.2% for *foodinsecurity1*, *foodinsecurity2* and *foodinsecurity3*, respectively. This stems from the fact that especially countries with a large population experienced an improvement in food security. For instance, Nigeria weighs heavily in our sample with its 140 million inhabitants, and experienced a strong reduction in all three binary food insecurity indicators (−4.9%, −9.2%, −19.3%).

The population-weighted results imply that several millions of people escaped food insecurity: −5.62 million, −10.60 million and −12.20 million for *foodinsecurity1*, *foodinsecurity2* and *foodinsecurity3* respectively. These figures, reported in the third column of Table 8, are obtained by multiplying the population-weighted relative changes of column 2 by the 2005 population in our sample countries.

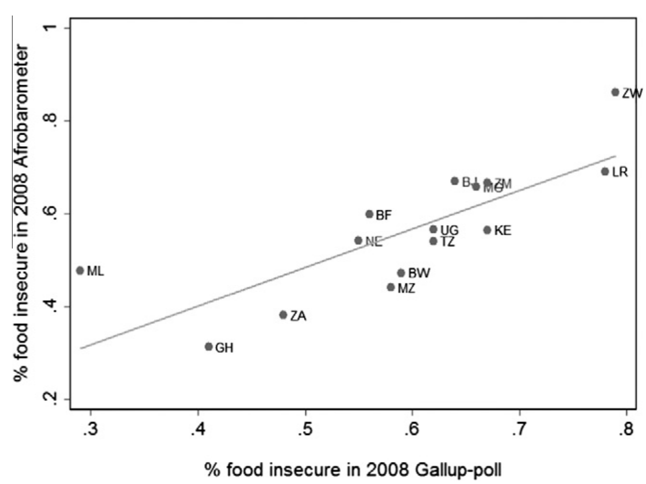

Fig. 8. Comparison of country-wise changes in 2008 self-reported food insecurity: AB versus GWP.

Accounting for population growth

So far, in our calculation – as in other studies estimating the effect of price changes on food security – we have assumed constant population over the period 2005–2008. In reality, population grew on average by 2.2% annually across our sample countries. To account for population growth, we take the difference between the

[13] The population weights used reflect the number of people residing in a country in 2005. The calculations for the urban and rural subsamples make use of information on the size of the urban and rural population of the country, taken from the WDI 2010.

Table 8
Changes in food insecurity over the period 2005–2008, taking population into account.

	Proportional change (%)		Changes in absolute numbers	
Population weighted	No	Yes	Yes	Yes
Population growth taken into account	No	No	No	Yes
Panel A: food insecurity 1 (at least once)				
Total	3.6	−2.3	−5620,035	9990,000
Urban	4.4	0.2	−84,856	7930,000
Rural	3.4	−2.9	−4758,582	2140,000
Panel B: food insecurity 2 (at least several times)				
Total	1.4	−6.8	−10,600,000	−752,000
Urban	5.2	0.6	120,645	4890,000
Rural	−0.2	−9.0	−10,209,799	−5770,000
Panel C: food insecurity 3 (at least many times or always)				
Total	−5.2	−17.3	−12,200,000	−8450,000
Urban	7.8	−0.9	−176,667	1480,000
Rural	−9.2	−21.5	−11,653,631	−9930,000

Notes: In the scenario where population growth is assumed to be zero (column 3), the change in the population-weighted fraction of food insecure is multiplied by the corresponding population in 2005 (total, urban or rural) and summed over all countries. When population growth is taken into account on the other hand, we take the difference between the share of food insecure in 2008 (derived using population weights) times the population in 2008 (total, urban or rural) and the corresponding term but for the year 2005.

Table 9
Comparison of country characteristics.

Average, 2002–2008 (unless otherwise indicated)	In-sample SSA countries	Out-of-sample SSA countries
Real GDP/capita (constant 2000 US$)	928.9	987.2
GDP per capita growth (Annual%)	2.62	2.05
Inflation, GDP deflator (Annual%)	18.04	10.07
Net agri-food imports/GDP (in percentage terms)	0.2	1.6
Number of years of civil war 2002–2008	7	37
Population (2005, in million)	427	332
Malnutrition prevalence, height for age (% of children under 5)	43.96	41.50
Malnutrition prevalence, weight for age (% of children under 5)	21.96	26.85
Depth of hunger (kilocalories per person per day)[a]	234.72	269.62
Number of countries	18	29
Number of low income countries	9	17

[a] Mean of 2002 and 2006 (2007 and 2008 missing).

share of food insecure in 2008 (derived using population weights) times the population in 2008 and the corresponding term but for the year 2005. The results are reported in column four.

Logically, both the absolute number of food secure and the absolute number of food insecure people increased, as both groups increased with population growth. However, despite population growth, we find that the number of people who experienced regular food shortages (measured by *foodinsecurity2* and *foodinsecurity3*) was lower in 2008 than in 2005 – with −0.75 million and −8.4 million respectively. For *foodinsecurity1*, we find that the number of food insecure increased by 9.99 million. However, the absolute number of *food secure* increased by even more, given their increasing share in the population and the fact that they make up almost half of the population.

External validity of the results

Another important question is how representative these results are for the whole of SSA? Sub-Saharan Africa counts 47 countries, totaling a population of 759 million (on average in 2005–2008). The AB sample across the 18 countries is representative for a population of 427 million, or around 56% of the SSA total population.[14] To gauge whether this is a particular subsample of the SSA population, we compare a number of relevant characteristics of the included and excluded countries.

[14] All population figures are calculated from WDI indicators (World Bank, 2008)

Table 9 shows that the sample represents SSA to a good extent in the relevant economic characteristics: GDP per capita, GDP per capita growth, malnutrition prevalence and depth of hunger.[15] However, the in-sample countries had higher inflation and were on average relying more heavily on food imports than the out-of-sample SSA countries, suggesting that the in-sample countries may have suffered more (benefited less) from the food price crisis than the out-of-sample countries. On the other hand, the latter had on average a much larger number of conflict events over the period, which are likely to have negatively affected food security. This might explain why they were not surveyed in the first place.

Comparison with Gallup World Poll (GWP) data

The results above show that the changes of the self-reported indicators between countries (e.g. food importing – food exporting) and within countries (e.g. urban–rural) are consistent with intuition. As a further test of the reliability of our self-reported food insecurity indicators, the AB self-reported food insecurity measure is compared with a similar measure, i.e. the self-reported food insecurity in the GWP data, used by Headey (2011). The 2005 GWP data does not include information for SSA countries, but

[15] Depth of hunger indicates how much food-deprived people fall short of minimum food needs in terms of dietary energy. The food deficit, in kilocalories per person per day, is measured by comparing the average amount of dietary energy that undernourished people get from the foods they eat with the minimum amount of dietary energy they need to maintain body weight and undertake light activity

the 2008 GWP provides aggregate country-level data for 15 SSA countries that are also included in the AB.

The food insecurity question included in the 2008 GWP is very similar to the one in the AB survey (Headey, 2011): "Have there been times in the past 12 months when you did not have enough money to buy the food that you or your family needed?" A simple yes/no answer is recorded. We compare this measure with the foodinsecurity1 indicator derived from the 2008 AB.

The comparison results in very similar figures of average food insecurity across both data sources, with on average 56% of respondents reporting being food insecure in the 2008 AB sample and 59% in the 2008 GWP sample. The correlation coefficient between the AB and GWP country figures of self-reported food insecurity is as high as 0.78. Fig. 8 illustrates the strong relationship between both measures with a plot of the AB and GWP country-level data points.

In sum, the comparison shows that the indicators from both surveys are very similar, thus providing some support to the reliability of a self-reported food security measure.

Conclusion

This paper studied the evolution of self-reported food insecurity in SSA across the period 2005–2008, a period with a dramatic global rise in food prices. Despite a strong increase of the international food price index, and a considerable transmission to domestic prices, we have found only a small increase in the incidence of food insecurity (as measured by *foodinsecurity1*), and even decreases in the depth of food insecurity (as measured by *foodinsecurity3*).

This finding does not support the widely advocated view that the international food price spikes of recent years have led to strongly increased food insecurity in Sub-Saharan Africa. In particular, food security apparently improved for net food producers in our sample, both at the micro-level (among rural households) and macro-level (among net food exporting countries). Although rural respondents report much higher levels of food insecurity than urban respondents in all three survey years, the rural–urban gap became narrower over the period 2005–2008, as urban food insecurity increased and rural food insecurity declined on average. We also find that it is highly likely that strong GDP growth over the recent years has improved food security in a large number of SSA countries, compensating a possible negative impact of food price increases even on net food consuming households.

This paper may raise more questions than it answers. There is uncertainty about the quality and accuracy of our key indicator of food security. Lack of detailed domestic prices – disaggregated across rural and urban areas – hampers a detailed analysis of the underlying reasons for the heterogeneous results across rural and urban respondents. Because of the strong co-movement between food prices and general consumer prices (in particular energy costs), we can also not exclude that our results are driven by general consumer prices rather than food prices alone. In addition, whereas the average patterns remain robust throughout our analysis, there is large heterogeneity across countries. All these issues would benefit from more research. For example, the cross-country heterogeneity could be further investigated on the basis of data on the nature and distribution of country-level income growth, urban–rural price transmission, the exact composition of food imports and exports, and household coping mechanisms.

Nevertheless, the fact that our analysis suggests that food security did not increase (dramatically) – even in very poor African countries – supports the argument that there is need for a careful re-evaluation of existing measures and methodologies, and of the use of the results of various approaches in the public debate. To precisely identify the contributions of different factors (food prices, income growth, energy prices, etc.) on food security in the world, one probably needs a combination of various methodologies. The advantage of simulation models is that it allows showing the mechanism of how various factors affect food security, welfare and poverty. The advantage of survey based approaches is that they allow to measure actual changes in food security levels. Both have their role and should be used appropriately.

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