The global food crisis: disaster, opportunity or non-event?

Household level evidence from Côte d'Ivoire

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Abstract

Using 2008 LSMS data for Côte d'Ivoire, we study the welfare implications of the price increase of key imported staple food – rice – and consider the consumption smoothing effect of locally produced food and cash crop varieties. While middle income urban households are adversely affected by rising rice prices, relatively poor rural households benefit. Availability of local staple crops leads to further income redistribution from net consumers towards net producers of staples. By contrast, the ability to generate income from tropical cash crops improves not only the welfare of rural households, but helps smooth the consumption of urban households.

Key words: food price crisis, welfare, Côte d'Ivoire

Acknowledgement

We thank Armando Barrientos, Michael Grimm, Derek Headey, David Hulme, Johan Swinnen and participants at a Brooks World Poverty Institute seminar for helpful comments. Financial support from the British Academy is gratefully acknowledged.

Introduction

The rise of global food prices by approximately 50% in 2008 stimulated heated academic and policy debate on the welfare implications of dramatically fluctuating prices. According to FAO (2008) estimates, rising prices plunged over 24 million additional people in Sub-Saharan Africa into hunger, increasing the number of undernourished in the region to a record 236 million. While a number of earlier cross-country and/or simulation-based academic studies were quick to support this evidence by predicting severe negative implications of rising food prices on the welfare of the poorest population strata of underdeveloped food-importing countries (e.g. Policy Research Working Paper series 4738-4745 (World Bank); Zezza et al, 2008), others warned against oversimplifications and underlined the continued need to explore the complex implications of food prices on both the supply and demand side of the market, preferably in single affected contexts (Aksoy and Isik-Dikmelik, 2008; deJanvry and Sadoulet, 2008; Swinnen, 2011).

Recent research has attempted to reconcile the differences in academic and policy debate by compiling careful cross-country and case study analyses in special issues of journals and edited book volumes¹ and deriving generalizable messages on the implications of the food crisis. The prevailing cross-national message emanating from this fast growing literature is that while net exporters of both food and other commodities are likely to gain from the commodity price boom, poor countries, especially conflict states and small islands, as well as those relying on cash crop production are likely to be adversely affected (Headey and Fan, 2008). The microeconomic evidence is much more mixed and context specific. However, the literature has seen a gradually developing policy consensus in favour of

¹ See for instance the special issue on the causes and effects of the 2008 food crisis in *Agricultural Economics*, 39, 2008; the Aksoy and Hoeckman (2010) edited volume on food prices and rural poverty and the collective volume on rice price issues, edited by Dawe (2008).

provision of the right incentives to increase food availability and the related (progressive) redistribution policies (Haq et al, 2008; Ng and Aksoy, 2008; Dessous et al, 2008).

The welfare ameliorating rationale behind the policy prescription of enhancing food availability that comes out of macro-level research is hard to dispute conceptually, but can be questioned in terms of its realism. Even aside from numerous general analyses on the barriers to a successful green revolution (Evenson et al, 2003; Johnson et al, 2003), there are detailed historical accounts of failure of food importing African countries to respond successfully to previous food price spikes by boosting rice and/or wheat production (Lançon and Erenstein, 2002; Lançon and Benz, 2007; WARDA, 2005). In Côte d'Ivoire, the most ambitious 1970s program, geared towards self-sufficiency in rice via heavy subsidization of local rice producers, led to successful two-year increase in local production to the level of total demand, but ended in bankruptcy and was abandoned by 1977 due to an inability to resolve the dilemma of balancing producer support with low consumer prices under the constraint of limited financial resources. By contrast, the falling prices of export crops in the 1980s unleashed the structural reforms of the 1990s, leading to a dramatic shift in policy making towards external and internal liberalisation of the rice market. However, recent research suggests that the reforms had an altogether negative impact on both producers and consumers of rice, mainly due to monopolization of the rice imports by politically powerful elites and the inability of local producers to keep up with better quality imports (Diagne et al, 2003).

Given the constraints to enhancing (temperate zone) food production in response to rising food prices in Africa and beyond, the immediate food-crisis related policy instrumentarium gets restricted to redistributive policies, which lay open important micro-level dilemmas. Stylized economic theory suggests that in a less developed, largely agricultural, economy resource poor and risk averse owners of small land plots specialize in

subsistence farming and are only able to become commercial farmers after land and other resource ownership reaches a certain threshold (Dimova et al, 2012). Under the assumption that commercial farmers produce the expensive food crop while the poor are either not involved in agricultural production or are resource constrained, rising prices are likely to increase the income gap, hence justifying the policy of downward redistribution.

This raises two important conceptual issues. To begin with, for a downward redistributive policy to be effective in a stylized less developed country environment, characterised by high income inequality, a large enough mass of resources should be reallocated from the relatively better-off part of the population to the voluminous worse-off part of the population. Considering the difficulties of taxing the richest top percent to assure a critical revenue mass, a workable policy would most likely involve taxing the incomes of the middle class (Alesina and Rodrik, 1994; Persson and Tabellini, 1994; Perotti, 1992), but aside from efficiency issues, this brings out the question of fairness and the possibility of taxing those who are already deprived in relative terms (Milanovic, 2005).

Secondly, to the best of our knowledge, case study research aimed at identifying the net losers and winners from rising food prices focuses exclusively on food exporting countries, whereby the agricultural item consumed by net food buyers is the same as that produced by commercial farmers (Ferreira et al, 2011; de Janvri and Sadoulet, 2009; Warr, P., 2008; Benson et al, 2008). This leaves out of focus the conceptually more intricate case of commercial farming, based on tropical cash crop production and subsistence farming based on local food varieties such as yams, cassava and plantains. This case characterises the

majority of the most vulnerable part of the world, which is dependent on imports of temperate climate type staples, such as rice and wheat².

On the one hand, if commercial farmers are net buyers of food and tropical cash crop prices do not keep up with the prices of food, a food price spike is likely to result in an automatic downward reallocation of resources from the presumably richer cash crop producing farmers towards the poorer local food producers, even if resource constraints prevent the transition of the latter from self-subsistence into commercial farming. Government incentives to enhance food production may induce (large) cash crop producers to reallocate land out of cash into food crops, but there is no clear indication that such reallocation is ex-ante advisable. Although Sahn (1990) finds that the reverse scenario of allocation of land from food crops to major cash crops should generally have positive impact on child nutritional status in Côte d'Ivoire, Cogneau and Jedwab (2012) warn against the negative impact of volatile relative prices of cash crops on a varieties of measures of household welfare.

On the other hand, the stylized literature focusing on identifying the net winners and net losers from rising food prices tends to ignore the possibility of reallocation of consumption out of more expensive food items into cheaper varieties (Ferreira et al, 2011). When countries are net importers of temperate zone agricultural staples and net producers of a range of local cereal varieties, this omission may have important welfare implications. To the best of our knowledge, only Diagana (1999) and Aker et al (2011) have taken this issue seriously into account in the West African context. While the analysis of the food price

² For example, according to the latest FAOSTAT (2010) statistics, the top agricultural imports for Africa as a whole are wheat, palm oil and rice, while the top exports are a variety of tropical cash crop products, such as cocoa, beans, tobacco, coffee, tea and cotton, oranges and rubber. At the same time, top agricultural products involve local food crop varieties such as cassava, yams and plantain. These patterns are fairly consistent across individual countries.

inflation effect of the 1994 devaluation, performed by the former set of authors concludes that rice intake across a number of West African countries remained unchanged in the face of rising prices, more recent studies emphasize the possibility of greater willingness of consumers to switch to local staple food varieties as in the context of dramatic price shocks such as those of 2007-08, suggesting that dramatic reversals of agricultural production policies may not be needed (Aker et al, 2011). However, more research is needed to resolve these controversies in the literature.

We revisit these issues by focusing on the following research questions:

- Is demand for imported staple food varieties sufficiently resilient to the rise in their prices to cause welfare deterioration of the dimension highlighted in various policy circles, or could demand and supply of local staple food alternatives help smooth consumption, thus making reallocation of wealth and stimulation of temperate zone food production unnecessary?
- Can income from appropriate activities, such as tropical export crop production, be used to smooth consumption and hence, is it feasible, and indeed desirable, for producers to increase food crop production, possibly at the expense of tropical cash crop production?
- Are poorer or richer households more affected by either of these scenarios?

In its capacity of being among the least developed, net food importing, though predominantly agricultural economies, with comparative advantage in cash crops such as cocoa, palm oil, rubber, cotton and coffee, Côte d'Ivoire represents an especially interesting context for this study. While tropical cash crops dominate the production and export side of its market, skyrocketing demand for food crops, in particular rice, and inability of local

production to respond to it led to a dramatic surge of imports. Despite pre-emptive government interventions in the form of border controls and direct price regulations, the average annual food price index (with base year 2000) increased from 117.51 in 2006 to 137.78 in 2008 and 142.28 in 2009, before falling back to 109.14 in 2010. Following riots and violence in the streets of Abidjan, President Gbagbo embraced a policy of self-sufficiency in the key imported staple food-rice (Moseley et al, 2010). We use this setting as a pertinent context for exploring the questions raised above.

The rest of the paper is organized as follows. In section 2, we discuss our methodological strategy and constraints. Section 3 describes our data and descriptive statistics. In Section 4 we highlight the results from our non-parametric analysis on the welfare implications of rice price shocks. Section 5 concludes.

2. Methodological constraints and strategy

While the theoretical framework for analyses of the impact of price shocks on households' net consumption is fairly stylized and not subject to analytical debate, data limitations pose severe constraints on careful empirical attempts to answer even the most obvious question on whether substitutability between different food varieties can smooth the consumption of households in the face of major price shocks. The obvious methodological tool would be the system of demand equations, the unbiased estimation of which is typically constrained by the availability of high quality price data. While numerous studies have attempted to overcome this constraint by deriving own and cross-price elasticities of demand from information on unit values, i.e. expenditures divided by quantities consumed, recent

research has indicated that such elasticity estimates may be biased, with the bias not entirely alleviated even when high quality price data is available (McKelvey, 2011).

A further constraint is the appropriate timing of available detailed household surveys. To the best of our knowledge, only Ecker and Quaim (2010) have benefitted from the availability of high quality price data and have estimated a demand system of equations that takes seriously into account the possibility that a price shock on specific food groups could induce reallocation of consumption and nutrition. However, their analysis is based on a single cross-section of data and corresponding simulations that assume unchanging food and nutrient elasticities, despite the possibility that a severe price/and or economic shock may induce a structural break and hence change consumer behaviour (Aker et al, 2011; Dessus et al, 2008).

Given the virtual impossibility of obtaining panel data from a developing country, which spans the period of the price shock, contains high quality price data and accounts for the possibility of changing price elasticities of demand, the literature has relied on either (i) simulations based on Computable General Equilibrium Models, or (ii) studies trying to identify the impact of the price increase of a particular food item, e.g. rice or wheat, on the welfare of net buyers and net sellers of that food item. In addition to avoiding the above mentioned data limitations, these approaches allow the researcher to consider the impact of a price shock on both the demand and the supply side of the food market.

In view of the usual criticism of computable general equilibrium model research for being black box type of analysis, we build upon the literature using net benefit ratio as a measure of the effect of a price shock (Deaton, 1988, 1989; Budd, 1993). The convenient property of the net benefit ratio, i.e. the income generated from selling a commodity less the total value of purchases of the commodity divided by total household expenditures, is that it

represents the elasticity of real income with respect to the price of the commodity in question³. Since the data available to us is from the peak food crisis period in Côte d'Ivoire, namely between June of 2008 and September of 2009 (see figure 1), we avoid the problem of relying on arbitrary international price increases as a basis for simulation analysis and use the net benefit ratio itself as a proxy of welfare changes in response to a price shock (Dessus et al, 2008; Ferreira et al, 2011). The value of this ratio is positive for net sellers of the commodity and negative for net buyers and hence non-parametric estimation of this ratio against the logarithm of per capita expenditures helps us identify the winners and losers of a price shock across the welfare distribution of the country, while avoiding the problem of imposing a rigid functional form for this relationship (Budd, 1993).

In an attempt to answer the research questions asked at the outset of this paper, we perform this exercise across three groups of commodities (i) rice, (ii) aggregate food including rice, millet, cassava, taro, sweet potato, maize, yams and vegetables and (iii) aggregate agricultural commodity including both the food crops in (ii) and the key cash crops of Côte d'Ivoire: cocoa, coffee, cotton, palm oil, cashews and banana. Although a composite “food” price, and even less so a composite “aggregate agricultural commodity” price does not exist, this method is acceptable because the estimates are based on actual sales and expenditure values from the underlying individual crops (Budd, 1993)⁴. Hence, if we for

³ Consider the amount of compensation needed to maintain a household's real income in the face of a price change. For a price change of ∂p , the compensation is

$\partial C = (x_i - q_i) \partial p_i \equiv (x_i - q_i) \partial p_i (y p_i / y p_i)$ where x and q are consumption and production of good i .

Rearranging yields $(\partial C / y) [\partial p_i / p_i]^{-1} = p_i (x_i - q_i) / y$, where the left-hand side is the elasticity of real income with respect to the price change and the right-hand side is the negative net benefit ratio.

⁴ As indicated by Budd (1993) there is also a theoretical justification for interpreting these results as welfare elasticities to the change in the price of the aggregate good, so long as the price ratios of its components remain unchanged.

instance find that the net benefit ratio of rice is significantly negative for a specific demographic group, but the net benefit ratio of either the aggregate food or the aggregate agricultural commodity for the same demographic group is either insignificant or positive, we interpret it as ability of this group of people to smooth consumption through corresponding food or cash crop activities. We avoid the problems associated with calculating individual own and cross price elasticities and focus on welfare implications directly.

The recent literature on the implications of rising food prices emphasizes the need to take into account the secondary general equilibrium effects that rising food prices would have on welfare via the labor market (Ravallion, 1990; Ferreira et al, 2011). While this effect is important to consider in settings like India and Brazil, where agricultural production relies predominantly on the wage-earning labor force, the effect is likely to be insignificant in the case of Côte d'Ivoire (and other similar African countries), where production relies almost exclusively on traditional family farms that buy and sell food and other agricultural commodities. According to our data, the average number of people employed in the agricultural sector is 4 and approximately 60% of the farmers employ less than 2 workers, while approximately 20% of the farmers employ no workers at all.

3. Data and descriptive statistics

Our empirical analysis is based on the Côte d'Ivoire Living Standard Survey (CILSS), collected between June of 2008 and September of 2009 by the National Statistical Office of Côte d'Ivoire. This is a representative survey for 12600 household from 630 clusters and contains the usual for Living Standard Measurement Surveys information on household structure, income, expenditures, labour market characteristics, assets and agricultural

production. After accounting for missing observations and clear discrepancies in the data, we are left with 12525 observations for our empirical analysis. The timing of the survey is ideal, as it captures the peak of the price spike (Figure 1).

<<< Insert Figure 1 about here>>>

As household welfare in the face of rising food prices is crucially dependent on the position of the household in the income distribution, as well as on its consumer, producer and labour market characteristics, we first take a look at simple descriptive statistics of all our main variables of interest. We follow the stylized literature in proxying income with total expenditures of the household. To account for the fact that poorer families are usually of larger sizes, we give preference to per capita expenditures as a relevant welfare measure.

<<< Insert Figure 2 about here>>>

Let us first consider the consumer side of the market. To assess the place of rice in households' consumer baskets, in Figure 2 we highlight separately the share of rice and the share of all staple foods, including rice, millet, cassava, taro, sweet potato, maize, yams and vegetables, in total expenditures by quintiles of the rural and urban per capita expenditure distributions⁵. In the case of urban households, we observe the usual Engel curve type tendency for expenditures on food to decrease with welfare. The pattern is reversed in the case of rural households, indicating a better ability for poor rural households to smooth their consumption streams in the face of rising food prices through subsistence agriculture. Most importantly, while expenditures on rice are substantial across per capita expenditure quintiles, the expenditure shares of other staple foods dominate, suggesting a possibility for

⁵ Quintiles are calculated for the per capita income distribution of a country as a whole and we look at the implications of the price spike on household belonging to its relevant quintiles and residing either in rural or urban areas. However, the results do not change dramatically if we split the samples into an urban and rural one and calculate separate quintiles for these two samples.

consumption smoothing via the production and consumption of local staple food alternatives in the face of rising rice prices.

<<< **Insert figure 3 about here**>>>

To assess the ability of households to smooth consumption through alternative income generating activities, we next take a look at the probability of different types of households to be involved in the production of varieties of food or cash crops. Figure 3 shows the average proportions of households that undertake production of either food or cash crops, once again across per capita expenditure quintiles and separately for the urban and rural samples. For the rural sector we see that while, understandably, the probability to be involved in food production decreases gradually with the increase in per capita expenditures, the probability of being involved in cash crop production is not significantly different across the per capita expenditure quintiles in the rural sector. This pattern contrasts with the general pattern observed in Asian economies, as well as several African economies like Malawi, characterised by a dualistic agricultural sector, marked by small food producers and large tropical cash crop producers. Furthermore, although urban agricultural production is relatively small, it is largest for the poorest urban percentiles.

<<< **Insert figure 4 about here**>>>

As a word of caution, we would have to note that the simple allocation of households into urban and rural samples conceals an important regional segmentation of production. As indicated in Figure 4, the production of cash crops other than cotton is concentrated in the southern (forest) areas of the country and hence the ability to smooth consumption through cash crop production should be expected to be higher in the south compared to the north. While rice production is much more dispersed, it is most significant in the extreme west,

followed by the north-west and then by the extreme southern regions of the country. By contrast, alternative local food crop production is mostly prevalent in the Northern Savana. These patterns are supported by our data, showing dominance of food crop production in the North and cash crop production in the South. In our empirical analysis we produce separate estimates for the Northern and Southern regions of the country.

<<< Insert Table 1 about here>>>

To complete our descriptive analysis, Table 1 highlights some demographic characteristics, such as age, education and labour market characteristics of the head of household, as well as non-agricultural wage income, land size and geographical location of households belonging to different per capita expenditure quintiles. The characteristics for which we do not find significant qualitative differences across the rural and urban samples are reported for the sample as a whole at the top of the table, while several interesting rural-urban comparisons are highlighted at the bottom of the table.

These statistics are consistent with previous research and anecdotal evidence. As expected, welfare is positively correlated with education, especially at the highest education levels, and negatively correlated with household size and female headship. The quality of jobs, e.g. civil servant and white collar employment increases with welfare, but represents a small proportion of the occupational distribution. The majority of non-agricultural jobs are in the form of self-employment activities. However, while the proportion of the self-employed increases with welfare in the rural sector, the opposite is true for the urban sector. This supports the previous finding that many of the small urban entrepreneurship in West Africa are in the form of low quality and relatively low paying jobs in the informal economy (Dimova et al, 2010).

While farmer is the main occupation of the majority of heads of households in the rural sector, the proportion of farmer head of households in both the urban and rural sectors decreases with per capita expenditures. Interestingly, as large a proportion as 22% of the poorest urban heads of household report farmer as their primary occupation. This is consistent with the above mentioned potential of poor urban households to smooth their consumption in the face of rising food prices. Another very interesting characteristic is that land size decreases with welfare. This is consistent with the evidence of small (own) farm cultivator activities across relatively less well-off households in Africa and contrary to the evidence of large land ownership and employer-employee based cultivation, characterising Asian and Latin American agriculture (The World Bank, 2008).

To summarize, our preliminary descriptive statistics highlight trends that challenge some of the stylized facts on the disproportionately negative implications of rising prices of food on the poor, cited at the outset of this paper. While in keeping with Engel law, poorer households, especially those in urban areas devote higher proportions of their incomes to the purchase of rice than richer households, poorer households, including those in urban areas are also at least marginally involved in the production of both food and cash crops, which provide at least some buffer in the face of food price shocks. Urban households in the intermediate ranges of the per capita expenditure distribution, who are also large consumers of highly priced cereals, tend to rely to a larger extent on non-agricultural income than households in the lowest and highest ranges of the expenditure distribution. These characteristics show that proper identification of the welfare implications of a food price shock is perhaps more complex than suggested by some of the policy related literature and media uptake.

4. Nonparametric estimates of net benefit ratios

As indicated earlier in our empirical analysis we first calculate net benefit ratios, equal to net sales (total value of sales less total value of purchases) of agricultural commodities, namely rice, food and the aggregate agricultural commodity, divided by total household expenditures. We then regress these net benefit ratios on the logarithm of per capita expenditures to assess the welfare implication of a price shock and related consumption smoothing opportunities for either alternative food production or cash crop production for different groups of the household welfare distribution. Given the difficulty in specifying functional forms for econometric estimations, we follow the popular practice in this literature and apply a nonparametric kernel analysis⁶

<<<< Insert figure 5 about here>>>>

Figure 5 highlights the nonparametric estimates of the net benefit ratios of rice separately for the urban and rural sectors. The middle line in the diagram represents the actual net benefit ratio, while the two lines surrounding it encompass the confidence intervals. Our focus is on whether the intermediate line is significantly below or above zero and whether the confidence interval is narrow enough to highlight values that are significantly different from zero.

We see that the confidence interval for the poorest urban percentile is too large for the values of the net benefit ratio to be significantly different from zero. The net benefit ratios are negative and significant in the interval between logarithm of per capita household expenditures of about 11 and logarithm of per capita household expenditures of about 14. They are once again insignificant in the top percentiles of the per capital household

⁶ For further details and mathematical exposition see Deaton (1988, 1989) and Budd (1993).

expenditure distribution. The intervals where the net benefit ratios are negative and significant corresponds to the region between the 3rd and 5th quintile of the per capita income distribution, highlighted in our descriptive statistics. They therefore correspond to the set of households for which incomes from non-farm activities are among the highest.

For the rural sample, we observe a transition from insignificant to positive and significant net benefit ratios when moving from the poorest to the next to poorest percentiles in the per capita expenditure distribution in both the North and the South. In the North, the net benefit ratios become insignificant after logarithm of per capita household expenditures of around 13, which falls in the intermediate ranges of the welfare distribution. In the South, the net benefit ratio estimates drop below zero in the intermediate ranges of the per capita expenditure distribution and become insignificant in the highest per capita expenditure percentiles.

If we were to interpret these results in terms of welfare elasticities to price changes (Deaton, 1988, 1989; Budd, 1993), we would reach the following conclusions: (i) those hardest hit by an increase in rice prices belong to the intermediate quintiles of the per capita expenditure distribution in the urban sector and in the Southern rural sector, (ii) the effect of a price shock is insignificant for the poorest and richest quintiles of both the urban and rural per capita expenditure distributions. (iii) while everyone in the urban sector loses from an increase in rice prices, households belonging to the next to poorest rural percentiles (in both the Northern and the Southern areas) gain. Furthermore, while the negative effect of a price increase decreases with welfare in the urban sector, in the rural sector, the negative effect increases with welfare. In sum, we observe some potential reallocation of income from richer to poorer households in the rural sector and from households in the urban to households in the rural sector on account of an increase in rice prices.

<<<< **Insert figure 6 about here**>>>>

As a next step in our analysis we follow the innovation proposed by Budd (1993), highlighted at the outset of this paper and compare the net benefit ratios of the aggregate food category, including rice, millet, cassava, taro, sweet potato, maize, yams and vegetables. This captures the possibility of substitution of consumption from rice, which has become more expensive, into alternative staples, thus generating overall food price inflation (Aker et al, 2011; Headey et al, 2008). However, given that our aggregate food category includes components to which the international price shock may not have been transmitted sufficiently, we abstain from interpreting our results as elasticities of welfare to the rise in aggregate food prices, but simply focus on whether the benefits from selling food exceed the losses from buying food and compare the net benefit ratio diagrams to those based on rice alone.

We see that compared to the diagrams in Figure 5, the significant portions of the net benefit estimates for the two rural samples are now entirely above zero line. In both cases, the lines are downward sloping and significant between the next to poorest percentile in the per capita expenditure distribution and logarithm of per capita expenditures of around 13, which lies in the intermediate ranges of the per capita expenditures distributions. They are insignificant for the poorest and the richest households. By contrast, the diagrams corresponding to the urban samples are not dramatically different from those in Figure 5. In fact, the diagram corresponding to the Southern sample moves further downwards in the intermediate per capita expenditures section.

Taken together, the results for the urban and the rural samples grant some support to the perception that rising prices of imported staples induce some reallocation of consumption towards local staples and/or get transmitted to the local staple food market to the benefit of local net producers and at the expense of local net consumers. Given that rural areas are

characterised by greater incidences of poverty, this indicates that there is downward reallocation of wealth on account of rising global food prices.

<<<< **Insert Figure 7 about here** >>>>

Finally, given that tropical cash crops are the primary export base of not only Côte d'Ivoire but also other countries in the sub-region, let us explore in some detail the potential of cash crop production to provide a buffer to households against skyrocketing food prices. In Figure 7, we perform the same experiment as above but now club together all food crops and cash crops considered earlier and estimate the net benefit ratio of this aggregate category separately for the two geographical regions and urban and rural locations. We find that, not surprisingly, the estimates for both rural samples are shifted upwards even further. In addition, the negative impact of the price shock is significantly smoothed away in both urban sectors, especially in the Northern part of the country, with only a small portion of the intermediate part of the (mostly Southern) per capita expenditure distribution continuing to bear the brunt of the shock.

Conclusions and discussion

The commodity price shock of 2008 stimulated heated academic and policy debates on the welfare implications of commodity price changes, with particular focus on and concern for the poorest population strata in some of the poorest food importing countries in the world. On one side of the spectrum, researchers and policy analysts found significant negative implications of rising food prices on the welfare of the poorest population strata in both urban and rural settings of poor food importing countries (e.g. Policy Research Working

Paper series 4738-4745; Zezza et al, 2008). By contrast, opinion pole based studies indicated that the effect of the price shock may be negligible even in vulnerable food importing countries (Headey, 2011; Verpoorten et al, 2012), while others highlighted a possibility of inequality reducing reallocation of resources in rural areas (Aksoy and Isik-Dikmelik, 2008). Despite the recognized need of opening the black box of proliferating multi-country, typically simulation-based analyses, the effort to understand the heterogeneous implications of a food price shock across groups of households in single affected contexts remains inadequate (e.g. deJanvry and Sadoulet, 2008). Much of the emerging research in this direction is focused on large food exporting countries like India and Brazil, whose agricultural production and trade characteristics differ starkly from those of small food importing and tropical cash crop exporting African economies. This comprises a large part of the poorest and most vulnerable to commodity price shocks part of the world.

In this paper we contribute to the literature on the welfare implications of food price shocks, by exploring in some detail the potential welfare implications of price shocks affecting a key imported staple food-rice and considering the crisis alleviation potential of locally produced food and cash crop varieties. We focus on a poor country, which is highly dependent on imports of temperate zone staples, is self-sufficient in local staple varieties like yams, cassava and millet, and has comparative advantage in tropical cash crops. These conceptually important and policy relevant structural characteristics have so far been ignored in the food price crisis literature. Using a stylized methodology and representative household data from Côte d'Ivoire from the peak of the food crisis period, we first calculate welfare elasticities of changing rice prices across household welfare quintiles and then observe how our net welfare measures change when production and consumption of alternative varieties of agricultural commodities – both local staples and tropical cash crops - is taken into account.

We find that while for middle-income households the negative welfare response to the changing price of rice is significant, the poorest urban households are not affected, while the next to poorest rural households benefit. When alternative staple crops are taken into account, the benefits for poor and middle income rural households increases, while those for the middle income Southern urban households go down, implying some transmission of the global food price shock into the local staple market to the benefit of local net producers and at the expense of local net consumers. The ability to generate income from tropical cash crops not only improves further the welfare of rural households, but helps smooth the consumption of urban households.

The evidence on downward reallocation of resources in favour of poor and middle-income rural households is not surprising in view of the conceptual framework for an African economy, highlighted at the outset of this paper, and our evidence of higher propensity of relatively worse off farmers in rural areas to be not only food, but also cash crop producers. Our more interesting finding is that accounting for tropical cash crop production results in smoothing out some of the effect of the crisis even among urban dwellers. At least some of this evidence is supported by the structural finding highlighted in Table 1, whereby approximately 22% of the urban inhabitants report farming as their main occupation and the corresponding proportion among the middle income urban residents is between 7% and 10%. This evidence is consistent with the evidence of “urban agriculture” in Africa, highlighted by Zezza and Tasciotti (2010), as well as the evidence of involvement of 6% of the urban dwellers in sharecropping activities that we find in our data set.

A further explanation could be the involvement of urban dwellers in income generating agricultural marketing activities, which we can capture only indirectly in our data set. For example, we find that on average 30679 CFA of value of agricultural production is

reported by urban households for whom the main occupation of the head of household is not in farming activities. This is about half of the total value of urban agricultural production and about one sixth of the value of rural agricultural production. Approximately 52% of the respondents reporting this value report self-employment of the head of household as main occupation. While we don't have information on the nature of self-employment, anecdotal evidence suggests that these could be marketing jobs that are linked to agricultural production. In a way this gives us evidence on potential secondary channels of the effect of a price shock on welfare, without applying the secondary effect type methodology discussed in our methodological section.

Our results have interesting policy implications in view of some stylized policy prescriptions, discussed at the outset. To begin with, we do not find solid evidence in support of the need of redistributive government policies in response to price spikes, moreover that post-2008 food price time series do not show solid support to long term projections of dramatically rising food prices, such as those of FAO (2009). While price volatility may highlight a need of pursuing strategies of enhanced food production, in a context where country based comparative advantage is in cash crops, while food crop production advantages are in local food varieties as opposed to temperate zone food varieties, the possible reallocation of production (and government incentives thereof) out of cash crops into food crops should be examined in care, especially in view of lack of academic evidence that such change of policy and production focus may be warranted. Our empirical results for Côte d'Ivoire, together with food price stabilization after the 2008-2009 spike, except for a short period in 2011 (see Figure 1) certainly do not highlight a need of urgent action.

Indeed, the evidence presented in our paper, past research on the appropriate mix of food and cash crop activities and evidence on failed attempts by the government of Côte

d'Ivoire to stimulate welfare enhancing temperate zone food crop production suggest that assuring productive non-agricultural employment opportunities to cater to the needs of the most affected middle-income urban population (Dimova et al, 2010) and overcoming shortcomings in the food marketing mechanism (Diagne et al, 2003) should therefore be a priority. Focusing on the urban middle-class part of the population is consistent with the conceptual and empirical evidence related to the side effects of redistribution, highlighted at the outset of this paper. While a case study on Côte d'Ivoire does not allow us to make generalizations across a number of similar countries, information on food and cash crop production, import and export data (see for instance FAOSTAT), as well as information on non-agricultural activities (e.g. from the RIGA and 1-2-3 data bases) suggests that many of the lessons learnt from this exercise are relevant across Francophone African countries and beyond. To the extent that Côte d'Ivoire is representative of the more urbanized part of the sub-continent, we assume that the negative implications of the food crisis will be more stifled elsewhere, e.g. in Burkina Faso.

REFERENCES

Aker, J., S. Block, V. Ramachandran and C.P. Timmer (2011). West African experience with the world rice crisis 2007-2008. Center for Global Development Working paper 242: http://www.cgdev.org/files/1424823_file_Aker_Ramachandran_Block_Timmer_West_Africa_FINAL.pdf

Aksoy, A. and A. Isik-Dikmelik (2008). Are low prices of food pro-poor? Net food buyers and sellers in low income countries. *World Bank Policy Research Working Paper 4642*, The World Bank.

Aksoy, A. and Hoeckman, B. (2010). Food prices and rural poverty. The International Bank for Reconstruction and Development. *The World Bank*.

Alesina, A. and D. Rodrik (1994). Distributive politics and economic growth. *Quarterly Journal of Economics* 108, 465-490.

Benson, T, S. Mugarura and K. Wanda (2008). Impacts in Uganda of rising global food prices: the role of diversified staples and limited price transmission, *Agricultural Economics*, 39, supplement 513-524.

Budd, J. (1993). Changing food prices and rural welfare: A nonparametric examination of the Côte d'Ivoire. *Economic Development and Cultural Change*, 41(3), 587-603.

Cogneau, D. and R. Jedwab (2012). Commodity Price Shocks and Child Outcomes: The 1990 Cocoa Crisis in Cote d'Ivoire", *Economic Development and Cultural Change*, forthcoming.

Deaton, A. (1988). *The Analysis of Household Surveys. A Microeconomic Approach to Development Policy*. The John Hopkins University Press.

Deaton, A. (1989). Rice prices and income distribution in Thailand: A Non-parametric analysis. *Economic Journal*, 99, 1035.

DeJanvry, A. and E. Sadoulet (2008). Methodological note: Estimating the effects of the food price surge on the welfare of the poor. ARE, University of California at Berkeley: <http://are.berkeley.edu/~esadoulet/papers/FoodPriceMethodologyDec08.pdf>

DeJanvry, A. and E. Sadoulet (2009). The impact of rising prices on household welfare of India. Working Paper, Institute for Research on Labor and Employment, UC Berkeley: <http://are.berkeley.edu/~esadoulet/papers/IndianFoodPricesMar09.pdf>

Dessus, S, Herrera, S. and de Hoyos, R. (2008). The impact of food inflation on urban poverty and its monetary cost: some back-of-the-envelope calculations. *Agricultural Economics*, 39, supplement 417-429.

Diagne, A., M. Kane, K. Scylla and A. Toured (2003). Impact économique et environnementale de la libéralisation du commerce sur la filière riz en Côte d'Ivoire. West Africa Rice Development Association Working Paper: <http://www.warda.cgiar.org/workshop/RicePolicy/Diagne/Diagne.Cote%20d'ivoire.paper.pdf>

Diagana, B, F, Akindés, K. Savadogo, T. Reardon and J Staatz (1999). Effects of the CFA franc devaluation on urban food consumption in West Africa: overview and cross-country comparison, *Food Policy*, 24(5), 465-478.

Dimova, R., Gangopadhyay, S., Michaelowa, K. and Weber, A. (2012). Ganyu labor in Malawi. Understanding rural labor supply strategies. Mimeo, The University of Manchester, the University of Zurich and India Development Foundation.

Dimova, R., C. Nordman and F. Roubaud (2010). Allocation of labor in urban West Africa: Insights from the pattern of labor supply and skill premiums. *Review of Development Economics*, 14(1), 74-92.

Dawe, D. (2008). The rice crisis. Markets, policies and food security. The Food and Agriculture Organization of the UN and Earthscan.

Ecker, O. and M. Quaim (2011). Analysing the nutritional impact of policies: An empirical study of Malawi. *World Development*, 39(3), 412-428.

Evenson, R and Gollin, D. (2003). Assessing the impact of the Green Revolution 1960-2000. *Science* 300, 758-762.

FAO (2008). The state of food insecurity in the world 2008. Food and Agricultural Organization of the UN: <ftp://ftp.fao.org/docrep/fao/011/i0291e/i0291e00.pdf>

FAO (2009). How to feed the world in 2050. www.fao.org/fileadmin/.../How_to_Feed_the_World_in_2050.pdf

Ferreira, F. , A. Fruttero, P. Leite, L. Lucchetti (2011). Rising food prices and household welfare. Evidence from Brazil in 2008. *Policy Research Working Paper 5652*, The World Bank.

Haq, Z., N. Nazli and K. Meilke (2008). Implications of high food prices for poverty in Pakistan, *Agricultural Economics*, 39, supplement 477-484.

Headey, D. and Fan, S. (2008). Anatomy of a crisis: the causes and consequences of surging food prices. *Agricultural Economics*, 39, supplement 375-391.

Heady, D. (2011). Was the global food crisis really a crisis? Simulations versus self-reporting. IFPRI Discussion Paper 01087, International Food Policy Research Institute (IFPRI). Washington D.C. <http://www.ifpri.org/sites/default/files/publications/rb17.pdf>

Johnson, M, Hazell, P., Gulati, A. (2003). The role of intermediate factor markets in Asia's Green revolution: Lessons for Africa? *American Journal of Agricultural Economics*, 85(5), Proceedings Issue, 1211-1216.

Lançon, F. and O. Erenstein (2002). Potential and prospects for rice production in West Africa. *Paper presented at the sub-regional workshop on harmonization of policies and coordination of programmes on rice in the ECOWAS sub-region*, Ghana. <http://www.hubrural.org/IMG/pdf/potential-and-prospects-for-rice-production-wa.pdf>

Lançon, F. and H. Benz (2007). Rice imports in West Africa: trade regimes and food policy formulation. *Paper presented at the 106th conference of the EAAE*: <http://ageconsearch.umn.edu/bitstream/7906/1/pp07la02.pdf>

McKelvey, C. (2011). Price, unit value and quality demanded. *Journal of Development Economics* 95 (2), 157-169.

Milanovic, B. (2005). *Worlds Apart. Measuring International and Global Inequality*. Princeton University Press.

Moseley, W. Carney, J. and Becker, L. (2010). Neoliberal policy, rural livelihoods, and urban food security in West Africa: a comparative study of the Gambia, Côte d'Ivoire, and Mali. *Proceedings of the National Academy of Sciences of the USA*. 107(13), 5774-5779.

Ng, F. and Aksoy, A. (2008). Food price increases and net food importing countries: lessons from the recent past. *Agricultural Economics*, 39, supplement 443-452.

Perotti, R. (1992). Income distribution, politics and growth. *American Economic Review*, 82, 311-316.

Persson, S. and G. Tabellini (1994). Is inequality harmful for growth? *American Economic Review* 84, 600-621.

Ravallion, M. (1990). Rural welfare effects of food price changes under induced wage responses: Theory and evidence from Bangladesh, *Oxford Economic Papers*, 42(3), 474-485.

Sahn, D. (1990). The Impact of Export Crop Production on Nutritional Status in Côte d'Ivoire. *World Development*, 18(12):1635–1653

Swinnen, J. (2011). The right price of food. *Development Policy Review*, 29(6), 667-688.

Verpoorten, M., A. Arora and J. Swinnen (2012). Self-reporting food insecurity in Africa during the food price crisis. LICOS Discussion Paper Series 303: <https://www.econ.kuleuven.be/licos/DP/DP2012/DP303.pdf>

WARDA (The Africa Rice Centre)(2005). Rice Policy and Food Security in sub-Saharan Africa. Proceedings from a workshop held on 7-9 November 2005, Cotonou, Benin.

Warr, P. (2008). World food prices and poverty incidence in a food exporting country: a multihousehold general equilibrium analysis from Thailand, *Agricultural Economics*, 39, supplement 525-537.

The World Bank (2008). Agriculture for Development. *World Development Report*, 2008.

Zeza, A., B. Davis, C. Azzarris, K. Covarubia, L. Tasciotti, G. Anriquez (2008). The impact of rising food prices on the poor. *ESA Working Paper 07-08*, FAO: <ftp://ftp.fao.org/docrep/fao/011/aj284e/aj284e00.pdf>

Zeza, A. and L. Tasciotti (2010). Urban agriculture, poverty and food security: Empirical evidence from a sample of developing countries. *Food Policy*, 25(4), 265-273.

Figure 1: Monthly food price indexes of Côte d'Ivoire before, during and after 2008-2009

Source: FAOSTAT

Figure 2: The share of key staple food groups in total expenditures by percentiles in the per capita expenditure distribution

Source: own calculations , based on CILSS

Figure 3: Average proportions of households undertaking food or cash crop production activities, by location and expenditure quintiles

Source: own calculations, based on CILSS

Figure 4: Geographic patterns of food and cash crop production

Regional distribution of agricultural production values

Source: own calculations, based on CILSS

Table 1: Demographic characteristics

	1	2	3	4	5
Demographic characteristics					
Male head	0.8144 (0.3888)	0.8036 (0.3974)	0.8099 (0.3924)	0.7996 (0.4004)	0.7972 (0.4021)
Age head	45.5992 (14.7720)	44.4192 (14.6745)	42.6559 (13.9380)	40.2455 (13.5611)	38.5525 (12.5069)
Household size	6.5142 (3.5999)	5.6563 (3.3156)	4.8491 (3.2565)	3.8299 (2.6548)	2.5717 (2.0708)
Education of head of household					
Elementary education	0.1637 (0.3701)	0.2251 (0.4178)	0.2220 (0.4156)	0.2092 (0.4068)	0.2004 (0.4004)
University education	0.0028 (0.0528)	0.0044 (0.0661)	0.0172 (0.1299)	0.0423 (0.2013)	0.1102 (0.3132)
Occupation of head of household					
Civil servant	0.0032 (0.0564)	0.0099 (0.0994)	0.0240 (0.1529)	0.0599 (0.2373)	0.0850 (0.2790)
White collar	0.0092 (0.0954)	0.0216 (0.1453)	0.0479 (0.2136)	0.0639 (0.2446)	0.1242 (0.3298)
Blue collar	0.0335 (0.1801)	0.0715 (0.2576)	0.1126 (0.3161)	0.1293 (0.3356)	0.1473 (0.3545)
Self-employed	0.1633 (0.3697)	0.2555 (0.4362)	0.2998 (0.4583)	0.3333 (0.4715)	0.3377 (0.4730)
Farmer	0.6535 (0.4760)	0.4782 (0.4996)	0.3329 (0.4714)	0.2156 (0.4113)	0.1417 (0.3488)
Household resources					
Nonagricultural wage income	353583.2 (1763563)	607460.6 (2447371)	769401.4 (2912330)	816320.2 (1397786)	1765802 (9665916)
Land size (hectares)	60424.35 (1570716)	71404.09 (2200205)	27138.73 (707758)	10344.78 (279780)	14173.12 (367074.7)
Household location					
Rural	0.7745 (0.4180)	0.5912 (0.4917)	0.4615 (0.4986)	0.3222 (0.4674)	0.2251 (0.4178)
South	0.5010 (0.5001)	0.6443 (0.4788)	0.7134 (0.4523)	0.7509 (0.4326)	0.8052 (0.3961)
Key Rural-Urban Highlights					
Key occupations rural					
Self-employed	0.0941 (0.2921)	0.1412 (0.3483)	0.1412 (0.3485)	0.1882 (0.3911)	0.2330 (0.4229)
Farmer	0.7740 (0.4184)	0.7303 (0.4440)	0.6972 (0.4597)	0.6025 (0.4896)	0.4878 (0.5000)
Key occupations urban					
Self-employed	0.3845 (0.4867)	0.4114 (0.4923)	0.3959 (0.4892)	0.3741 (0.4841)	0.3589 (0.4799)
Farmer	0.2150 (0.4110)	0.1004 (0.3006)	0.0790 (0.2699)	0.0593 (0.2363)	0.0388 (0.1932)
Land size rural					
	47694.84 (646798.4)	113570.8 (2427342)	25927.7 (367088.1)	23456.79 (655568.8)	7390.5 (180492.7)

Note: the figures in brackets are standard deviations

Figure 5: net benefit ratio estimates for rice, urban and rural samples

Note: Estimations made using Epanechnikov fixed kernel Bandwidth=0.65. The bold lines are 95% confidence bands.

Figure 6: Net benefit ratios for aggregate food by geographic area

Note: Estimations made using Epanichnikov fixed kernel Bandwidth=0.65. The bold lines are 95% confidence bands.

Figure 7: Aggregate agricultural commodity by geographic area

Note: Estimations made using Epanichnikov fixed kernel Bandwidth=0.65. The bold lines are 95% confidence bands.