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A right price for rice? Côte d'Ivoire insights into the welfare implications of the 'global food crisis'

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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 households are found to be hardest hit by a price shock, the poorest appear to be immune to it. When both cash and food crop production is taken into account, the negative impact becomes negligible. We find interesting income reallocations from richer to poorer households, which can potentially be generalised across similar African countries.

Keywords: food price crisis, welfare, Côte d'Ivoire

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1. Introduction

The welfare implications of the *global food crisis*[1] – a term popularly used to describe the rising trend of staple food prices – have been among the most high-profile areas of research and policy debate in the past few years. A number of policy research papers have indicated that as net buyers of staple food crops such as rice and wheat, poor countries – especially the poorest quintiles of their populations – are more likely to lose than gain from their rising prices.[2] While this analysis has focused on the immediate poverty implications of the change of staple food prices, medium-term projections have highlighted a 70 percent rise in food demand by 2050 (FAO, 2009). The media coverage of such projections has predicted a drastic increase in the incidence not only of hunger, but also of land scarcity, environmental degradation and scarcity-driven conflict.[3]

The potentially dismal effect of the rising food prices in recent years has recently been challenged by sceptics. In a provocative article, Swinnen (2011) raises the pertinent question of "what the right price of food is" and highlights pre-2008 mirror image examples of media coverage of disastrously *low* prices of food, that "threaten the food security of hundreds of millions of people in some of the world's poorest developing countries where the sale of commodities is often the only source of cash".[4] On a similar note, Aksoy and Isik-Dirmelik (2008) explore in depth the characteristics of net buyers and net sellers of food in nine low-income countries and find that, while the largest share of poor households are net buyers of food, approximately half of these households are only marginal net buyers and will not be significantly affected by rising food prices. Moreover, in rural areas, where food production is the main activity, the incomes of net buyers of food are found to depend crucially on the incomes from farming activities of net food sellers. These controversies in the literature highlight the continued need for research on this topic.

In their capacity of being among the least developed, net food importing, though predominantly agricultural, economies, the countries of the West African Economic and Monetary Union (WAEMU) provide an especially pertinent context to study the consequences of rising food prices. While tropical cash crops dominate the production and export side of their markets, skyrocketing demand for food crops, in particular rice, and the inability of local production to respond to it, has led to a dramatic surge of imports (FAOSTAT,[5]Diagana et al, 1999; Lançon and Benz, 2007). A spike in imported food prices in this context raises several immediate welfare-related questions. Is demand

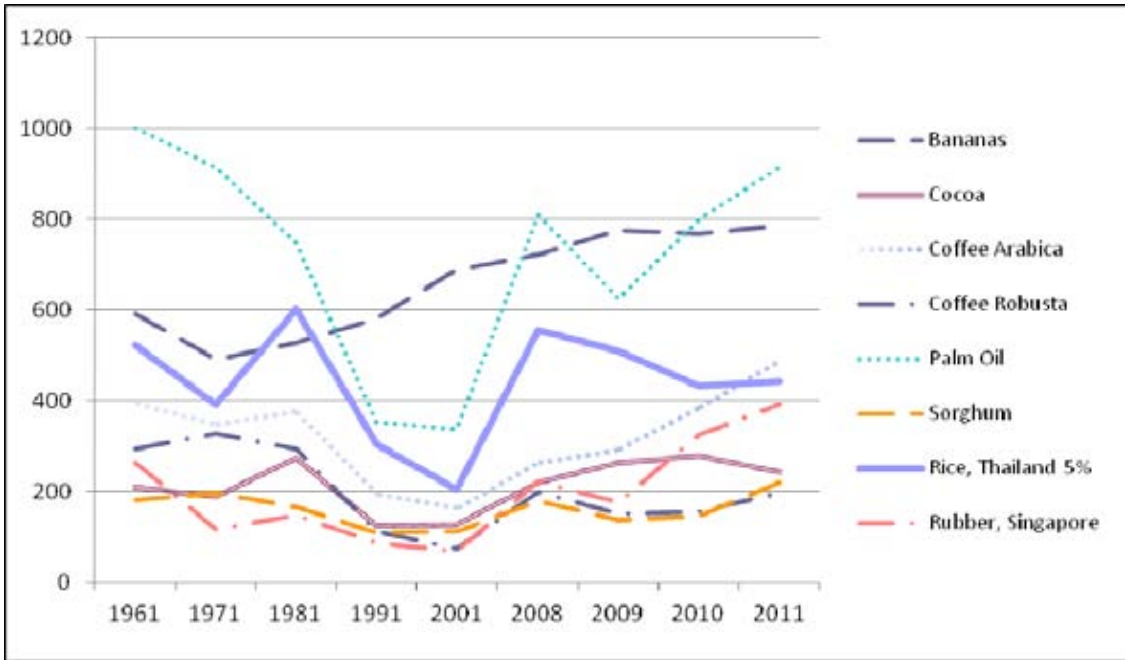
[1] For description and policy responses, see, for instance, http://www.worldbank.org/foodcrisis.
[2] See, for instance, the Policy Research Working Paper series 4738-4745 and similar FAO publications, such as Zezza et al (2008).
[3] See for instance the media center of FAO: http://www.fao.org.news/story/en/item/35571.
[4] FAO (2005): newsroom article, cited in Swinnen (2011): http://www.fao.org/newsroom/EN/news/2005/89721/index.html.
[5] http://faostat.fao.org/default.aspx

for imported staple food varieties sufficiently inelastic to justify welfare deterioration of the dimension highlighted at the outset of this paper, or could demand and supply of local staple food alternatives help smooth consumption? Can incomes 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 cash crop production?

Before starting to search for at least some answers to these complex questions, it would be instructive to take a brief look at the trend of food and cash crop prices over the past several decades, though bearing in mind that constraints in the price transmission mechanism make international food prices an imperfect proxy for either consumer or producer prices of agricultural commodities in domestic markets (Winters, 2004; Aker et al, 2011). This trend, highlighted in Figure 1, identifies a severe spike in rice prices during the commodity crisis of the 1970s and a long plateau in the 1980s and 1990s, followed by the spike of 2008 and relative levelling off in subsequent years. Note, however, that the CFA devaluation of the mid-1990s produced a formidable food price shock in the countries of WAEMU in the midst of the plateau of rice prices in the late 1990s and early 2000s (Diagana et al, 1999). Thus, while levelling off of prices in the immediate aftermath of the 2008 crisis seems at first sight to belie some of the recent media frenzy, the severe food price fluctuations over the decades, even at times of declining international food prices, emphasise the need for further analysis of the consequences of food price inflation.

To the best of our knowledge, only Diagana et al (1999) and much more recently Aker et al (2011) have put serious effort into investigating the response of consumption and imports to skyrocketing rice prices in West Africa. Using household-level consumption data from after the mid-1990s devaluation and relying on recall information from before the CFA devaluation of 1994 from four severely affected countries – Burkina Faso, Côte d'Ivoire, Mali and Senegal – Diagana et al (1999) test the hypothesis that in the face of rising prices of imported staple food items, such as rice, consumers would reallocate their baskets towards cheaper local cereals, like cassava, millet and locally produced rice. The conclusion they reach is in the negative. In Côte d'Ivoire, the consumption of rice after the devaluation remained at its pre-devaluation level of 66 percent of the total cereal intake, while that in Senegal and Mali increased by four and 12 percent, respectively. Only in Burkina Faso, the share of rice in total cereal consumption decreased by three percent. Aker et al (2011) confirm the general resilience of consumption to the high prices of imported rice during the 2008 crisis. However, they find a structural break and a tendency of consumers to relocate their baskets towards local rice and millet in the face of as dramatic a spike in imported rice prices as that of

Figure 1: International commodity price index, 1961-2011



Source: World Bank, Global Economic Monitor (GEM) Commodities: http://databank.worldbank.org/ddp/home.do?Step=3&id=4. The base year is 2005.

2008. In sum, although the literature tends to highlight an inelastic price elasticity of imported rice consumption in West Africa, arguably due to lower quality of local rice and other local cereals compared to imported rice, there is some indication that dramatic rice price spikes are likely to induce a reallocation of consumption to the benefit of both consumers and local food producers (Diagana et al, 1999; Lançon and Benz, 2007).

But even if consumption remains resilient to skyrocketing food prices, is reallocation of land from cash crop production to food crop production feasible and indeed desirable from a welfare perspective? Another look at the international commodity price indices in Figure 1 identifies a certain tendency for co-movement of the prices of food crops and traditional cash crops, such as coffee and cocoa, the disparity between which is only obvious in as extreme periods as that of the 2008 food price crisis. Furthermore, there is a clear upward trend in the prices of cash crops, especially high value crops, such as palm oil and bananas in recent decades, most notably since the early 2000s.

Research on the welfare implications of investing in traditional cash crop, as opposed to food crop production, reaches ambiguous conclusions. While cash crop production in Côte d'Ivoire in the 1980s improved the nutritional status of households across the income distribution and the negative cash crop price shock in the 1990s deteriorated household welfare, measured by variables such as household schooling, the allocation

of land out of major export crops into food crops was not found to have significant impact on child nutritional status (Sahn, 1990; Cogneau and Jedwab, 2012). At the same time, in Burkina Faso, cotton production served as a welfare buffer to households in the face of food price inflation, while child labour in predominantly food-producing households increased in the face of rising food prices (Grimm, 2008. In sum, we do not have clear priors on the impact of cash-versus-food-crop production on households in the face of rising food prices, in particular those of imported staple foods.

As far as we know, little systematic attempt has been made not only to identify the net consumers of imported varieties of key staple items such as rice, but also to study potential buffering effects of either food or cash crop production across the income distribution in a single affected context. Studies such as those of deJanvry and Sadoulet (2009) and Ferreira et al (2011) are among the few exceptions to the general trend of describing multi-country patterns or simulation of net welfare effects of the rise of one specific food price at a time, while considering both the demand and supply side of the market. However, they use as a case study large net producers and exporters of food – India and Brazil – where agriculture is characterised to a large extent by wage employment as opposed to small farmer cultivation. Both the international trade and agricultural structure characteristics of these settings are in sharp contrast to that of a typical small African economy.

To assess the welfare implications of the rice price shock in a small rice-importing West African economy – Côte d'Ivoire – as well as the potential consumption smoothing effect of alternative food or cash crop production, we perform a non-parametric analysis of net benefit ratios, as in Deaton (1988, 1989) and Budd (1993). We use representative household data from 2008. 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 question.[6] Since the value of this ratio is positive for net sellers of the commodity and negative for net buyers, non-parametric estimation of this ratio against the logarithm of per capita expenditures therefore helps us identify the winners and losers of a price shock across the welfare distribution of the country (Budd, 1993).

[6] 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 $\partial C = (x_i - q_i)\partial p_i \equiv (x_i - q_i)\partial p_i (yp_i / yp_i)$ 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.

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).[7] Hence, if we for 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 the ability of this group of people to smooth consumption through corresponding food or cash crop activities.

We find that while for middle-income households the negative welfare response to the changing price of rice is significant and not sufficiently alleviated by the consumption and production of alternative food varieties, the poorest households appear to be immune to food price shocks. Furthermore, when both cash and food crop production is taken into account, the negative impact of a food price shock becomes negligible. Finally, we find that staple food price shocks are likely to induce reallocation of income from households residing in relatively richer urban and Southern parts of the country towards relatively poorer rural and Northern parts of the country.

The rest of the paper is organised as follows. In Section 2, we present some details on the Côte d'Ivoire experience with food and cash crop production and imports. 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.

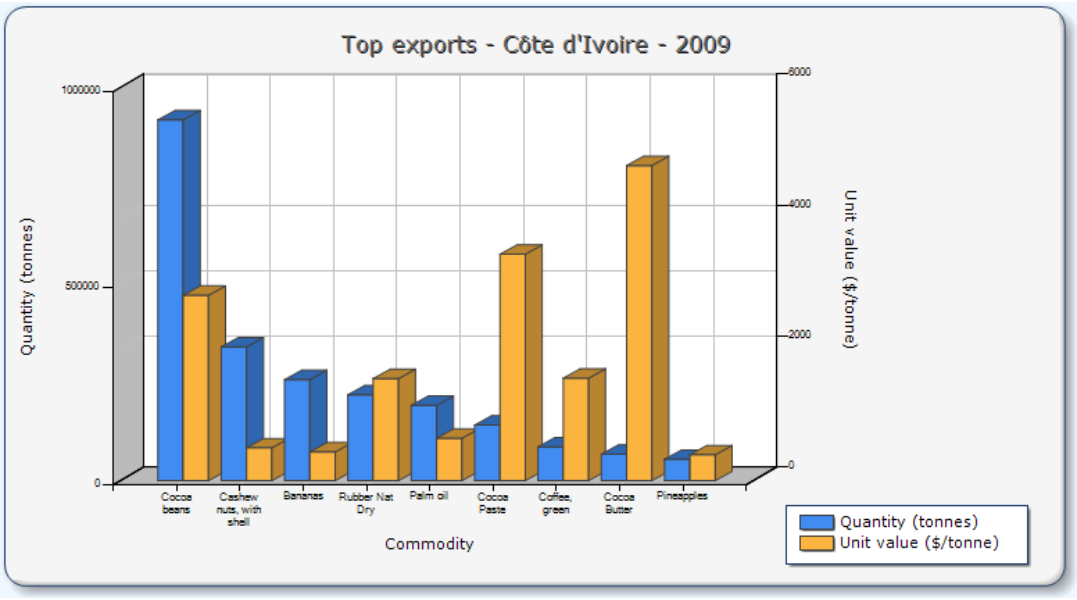
2. The story of food and other crops in Côte d'Ivoire

Since independence in 1960, Côte d'Ivoire's economy has been dominated by agriculture. As top producer and exporter of cocoa beans and one of the top ten producers and exporters of coffee in the world (for current agricultural trade statistics of Côte d'Ivoire, see Figure 2), it has seen its economic destiny shaped by external and internal factors influencing these two cash crop markets. Between independence and 1978, the boom in the international markets of cocoa and coffee led to economic boom, mostly based on investing in infrastructure the government surplus, accumulated through the difference between export prices and the price ceilings imposed on producers. While

[7] 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.

this period saw an annual GDP growth of about eight percent and phenomenal compared to neighbouring countries GDP per capita, this was also the starting point of a Dutch disease problem, marked by a 51 percent real currency appreciation and declining manufacturing sector (Cogneau and Mesple-Somps, 2002).

Figure 2: Top 10 exports of Côte d'Ivoire



Source: FAOSTAT: http://faostat.fao.org/default.aspx

While the boom in the international cocoa and coffee markets underlined the "miraculous" experience of Côte d'Ivoire in the 1970s, the collapse in these markets led to a reversal of fortune in the following decade. With a budget relying for 60 percent of its revenue on the value of exports and with an oil price imposing an even further budgetary pressure, the country slid down a spiral of debt accumulation, disinvestment and dropping GDP. A brief increase in the price of coffee and cocoa in the midst of comprehensive stabilisation programmes, designed by the Bretton-Woods institutions, led to a short-lived recovery in the late 1990s, followed by a permanent political and economic crisis ever since (Berthélemy and Bourguignon, 1996).

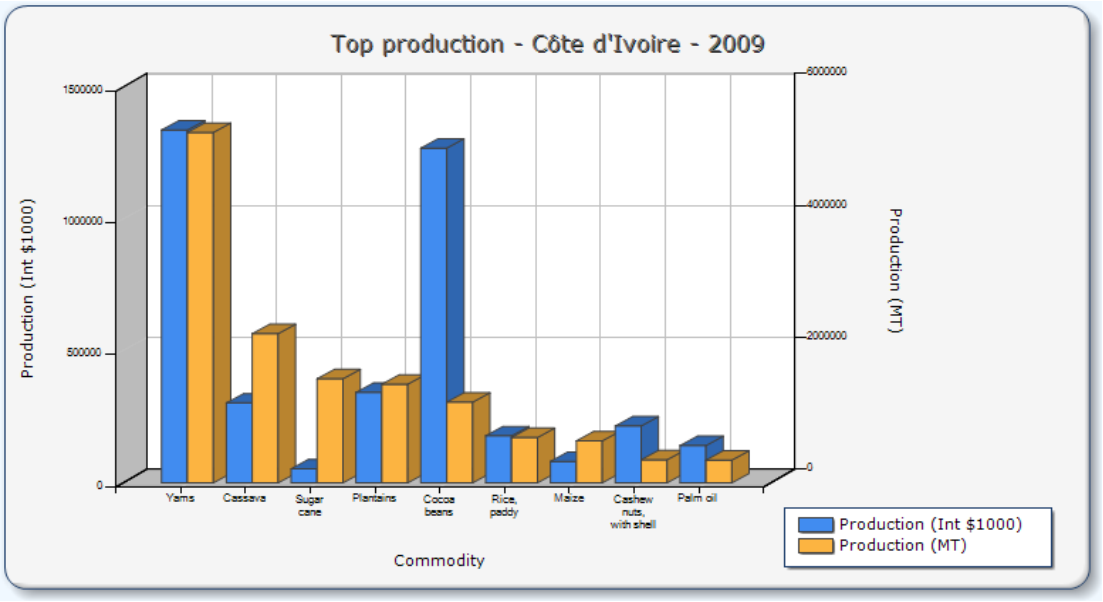
Cocoa and coffee have been the backbone of the Ivoirian economy and international market booms and busts have driven economy-wide upheavals. At the same time, the food market in Côte d'Ivoire has been marked by self-sufficiency in millet, sorghum and fonio and even oversupply of yams, cassava, plantain and maize, together with unsuccessful attempts by the government to stimulate rice production to the levels determined by an ever-increasing demand for rice (Diagana et al, 1999; Lançon and Erenstein, 2002). Unlike in countries like Nigeria and Senegal, where rice entered the diet only in the 1970s, rice consumption in Côte d'Ivoire has represented a significant part of the population's cereal intake ever since the 1960s and increased even further,

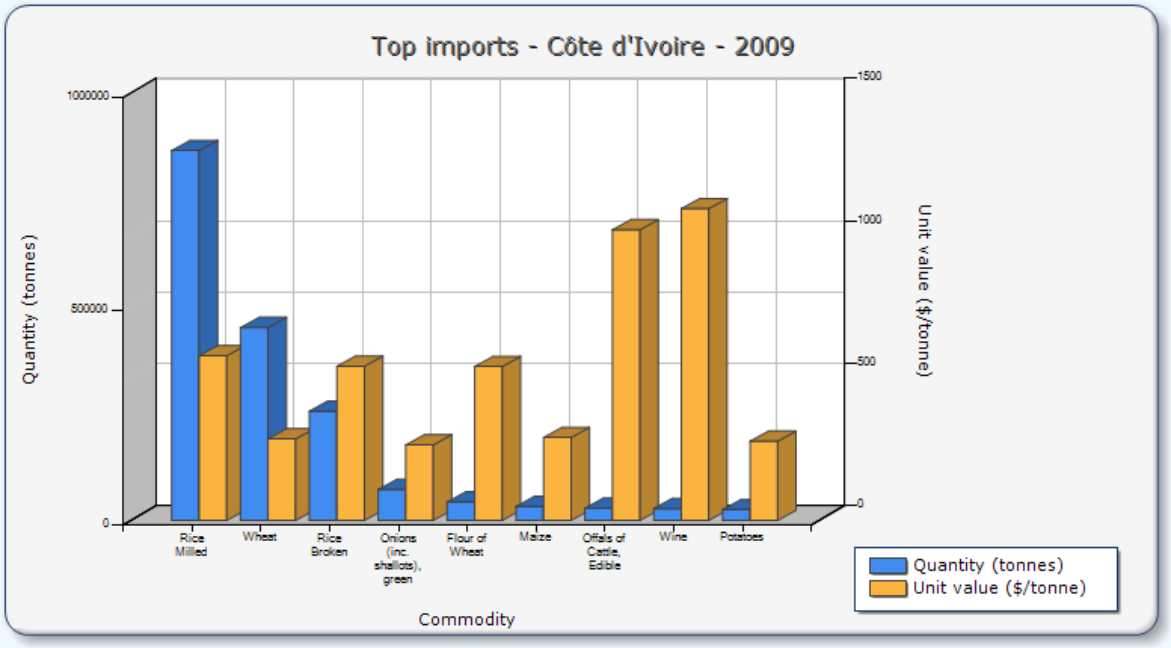
by approximately 15 percent, through the 1970s.The initial rise in demand translated into a dramatic increase in imports, from 33,900 tonnes in 1961 to 78,666 tonnes in the 1970s, after which the government launched an ambitious programme to develop irrigated schemes aimed at ensuring self-sufficiency. Although in 1974 the country became self-sufficient in rice for two years, in 1977 the project became bankrupt and was abandoned. Experts ascribe the failure of the government effort to launch rice production to its inability to resolve the dilemma of balancing producer support with low consumer prices under the constraint of limited financial resources (Lançon and Erenstein, 2002). By the early 2000s, with an area of 510,000 hectares devoted to rice, Côte d'Ivoire was among the largest producers of rice in Africa, but was also the fourth largest importer of rice in the world, with 80 percent of its imports coming from five Asian countries: Thailand, China, Pakistan, Vietnam and Japan. The self-sufficiency in local cereal alternatives to rice and the dependence on rice imports is highlighted in Figure 3.

The structural reforms of the 1990s saw a major shift of policy making, marked by external and internal liberalisation of the rice market. On the one hand, reduction of border controls as part of the WTO Agricultural Agreement led to increased competition from cheaper imports. On the other hand, structural reform entailed the transfer of rice import activities to the private sector and the liberalisation of the price of rice for mass consumption. Diagne et al (2003) studied the differential impact of internal and external liberalisation on the prices of local and imported rice and the respective quantities consumed. They found that the reforms had altogether a negative impact on both producers and consumers of rice. The two liberalisations, taken together, led to a 35 percent increase in the price of local rice and a 28 percent reduction in the consumption of local rice. At the same time, neither the producer price of local rice, nor the consumer price of imported rice were affected significantly, indicating that rice importers and retailers did not transmit to the consumers the benefits of lower tariffs and the elimination of restrictions on imported rice.

The story of food and cash crops in Côte d'Ivoire since independence highlights the unfortunate, though familiar fate of a resource-rich African country, plagued by Dutch disease, misconceived state-led development in the 1960s-1970s and a failed liberalisation process in the 1990s. Bearing in mind these policy trends and their food and cash crop market consequences, in what follows we will explore the potential welfare implications of international food price shocks at the level of the household and try to discuss, to the best of our ability, potential buffers in the form of cash crop, food crop production or alternative mechanisms.

Figure 3: Production and import statistics Côte d'Ivoire





3. Data and descriptive statistics

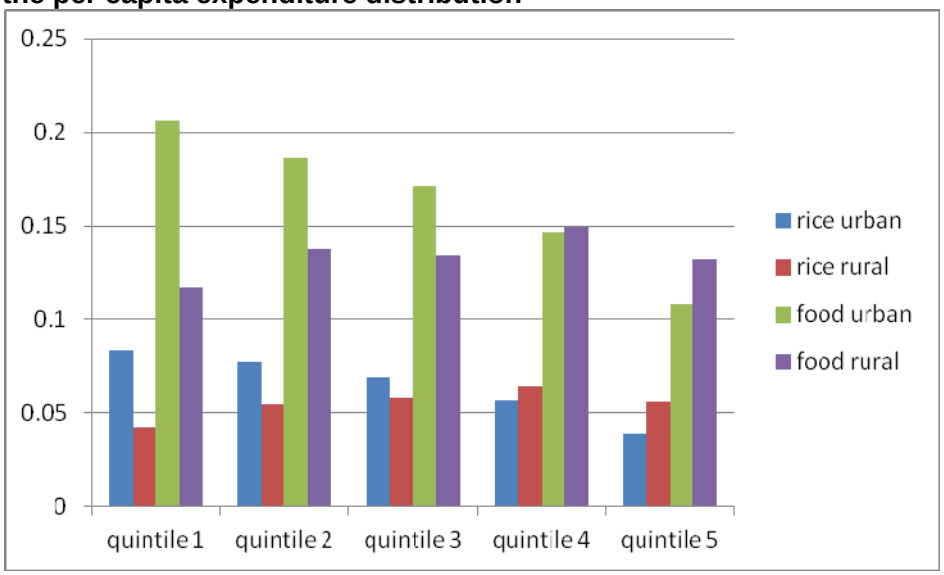
Our empirical analysis is based on the Côte d'Ivoire Living Standard Survey (CILSS), collected between June 2008 and September 2009 by the National Statistical Office of Côte d'Ivoire. This is a representative survey of 12,600 household from 630 clusters and contains the usual Living Standard Measurement 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 12,525 observations for our empirical analysis.

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 stylised literature in proxying income with total expenditures of the household. To account for the fact that poorer families are usually of larger size, we give preference to per capita expenditures as a relevant welfare measure.

Let us first consider the consumer side of the market. To assess the place of rice in households' consumer baskets, in Figure 4 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 distributions. 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 that poor rural households are more able 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 consumption smoothing via the production and consumption of local staple food alternatives in the face of rising rice prices.

Figure 4: Share of key staple food groups in total expenditures by percentiles in the per capita expenditure distribution



Source: own calculations, based on CILSS.

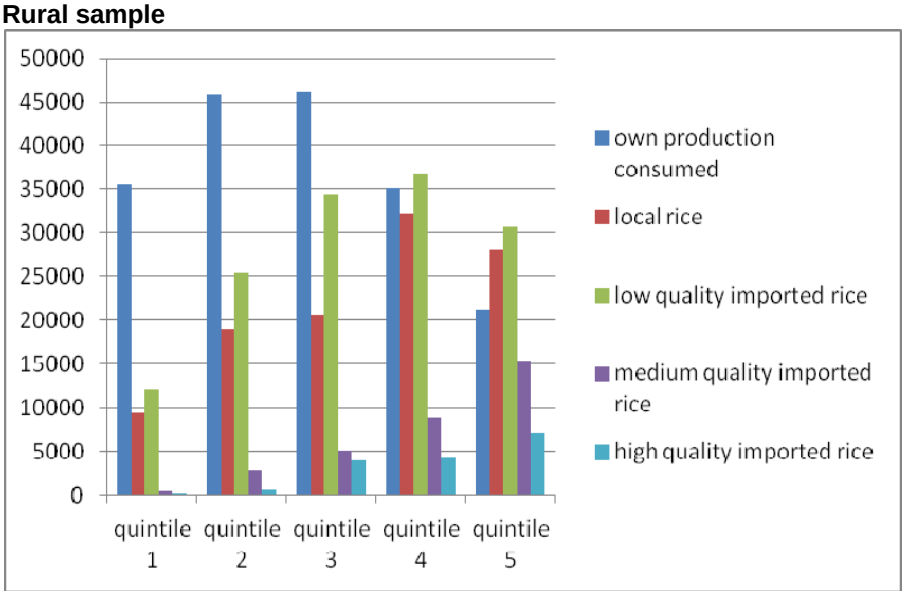
One interesting feature of our data set is that it allows us to distinguish across five different types of rice consumed: own rice produced, locally produced rice purchased by households, low quality imported rice, medium quality imported rice and luxury imported rice consumed. Figure 5 highlights the average expenditure values of all types of rice consumed across the urban and rural per capita expenditure quintiles. In the case of rural households, we observe a large self-subsistence potential among the poorest households and increasing dependency on purchased local and imported rice with the increase in per capita expenditures. By contrast, in urban areas, poor households are characterised by the greatest dependence on purchased rice, especially poor quality local and imported varieties. While in keeping with recent literature on urban agriculture in poor African countries,[8] we do observe a tendency for poor urban households to consume self-produced rice, and the average value of own production is significantly smaller than the average value of imported rice in the average consumer basket. This evidence provides some preliminary support for the vulnerability of urban households to food price shocks, highlighted in the literature (e.g. Zezza et al, 2008).

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 being involved in the production of varieties of food or cash crops. Figure 6 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 of being 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 rural expenditure percentiles. This pattern contrasts with the general pattern observed in Asian economies. Furthermore, although urban agricultural production is small, it is largest for the poorest urban percentiles and is dominated by food production.

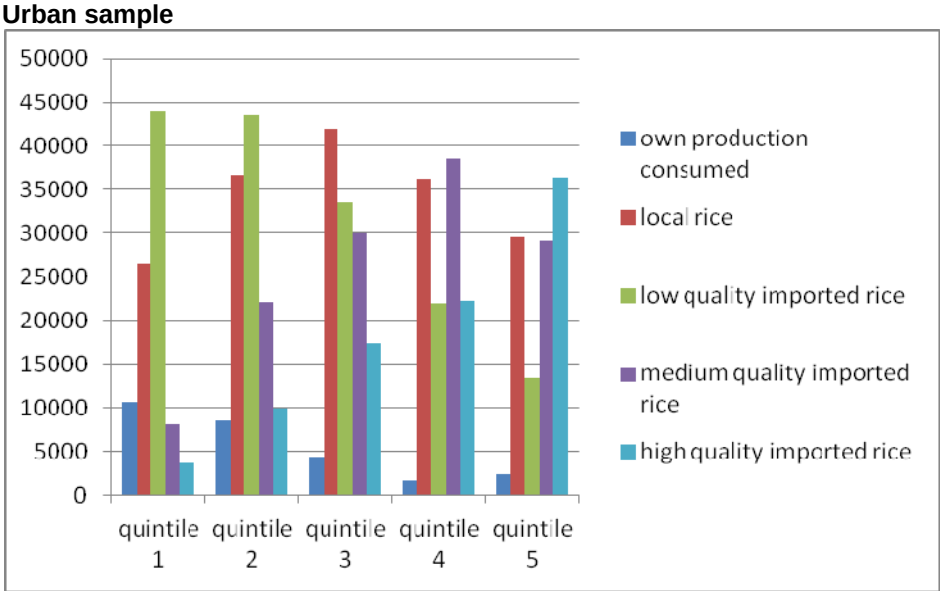
[8] See, for instance, Zezza and Tasciotti (2010).

Figure 5: Average values of types of rice consumed by expenditure quintiles

Rural sample

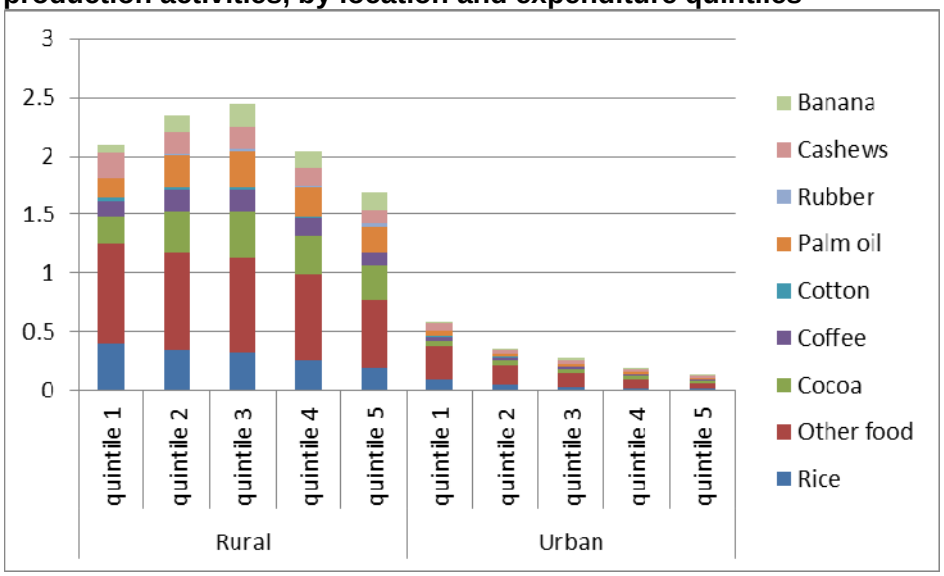


Urban sample



Source: own calculations, based on CILSS.

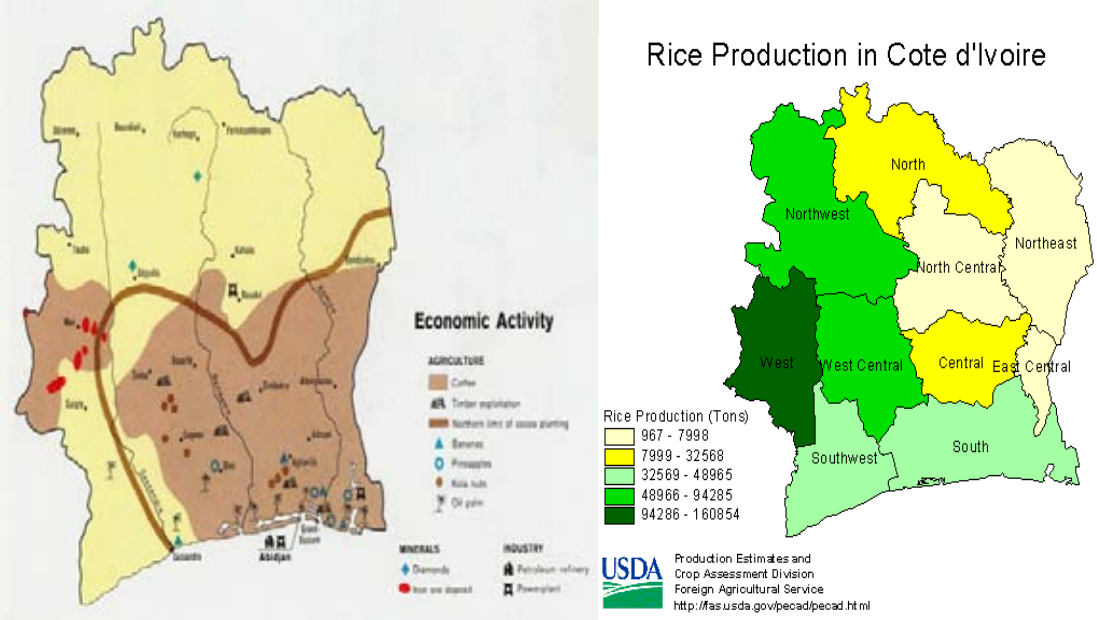
Figure 6: Average proportions of households undertaking food or cash crop production activities, by location and expenditure quintiles



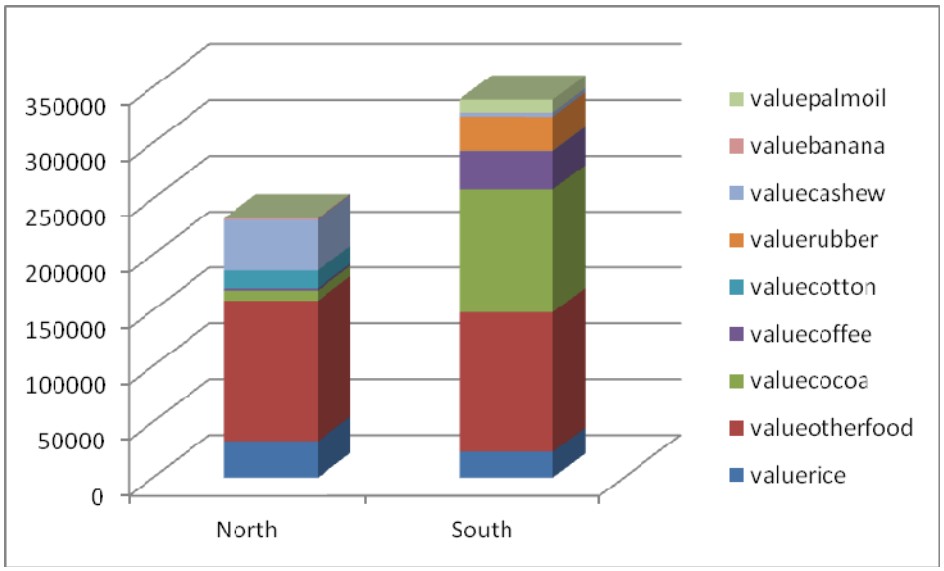
Source: own calculations, based on CILSS.

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 7, 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 than in 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 much more dispersed, though 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 therefore produce robustness checks, which take these regional patterns into account.

Figure 7: Geographic patterns of food and cash crop production



Regional distribution of agricultural production values



Source: own calculations, based on CILSS.

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

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)
While 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					
Non-agricultural 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

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 entrepreneurships 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 percent 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 that characterises Asian and Latin American agriculture (The World Bank, 2008).

To summarise, our preliminary descriptive statistics highlight trends that to at least some extent challenge some of the stylised facts on the disproportionally 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, especially lower quality imported 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. Non-parametric estimates of net benefit ratios

As indicated at the outset, 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 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 abilities of 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 non-parametric kernel analysis[9]

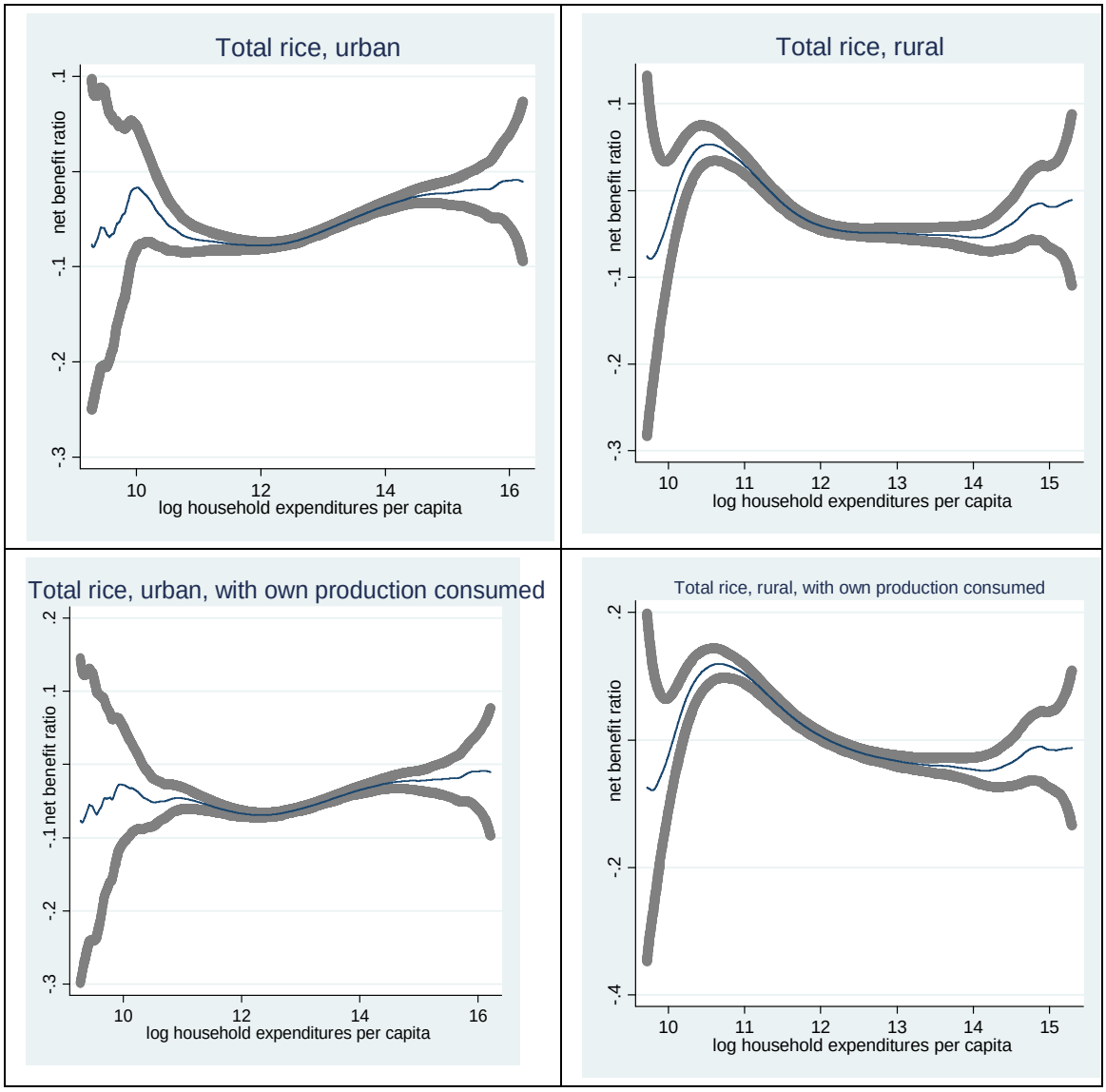
Figure 9 highlights the non-parametric estimates of the net benefit ratios of rice separately for the urban and rural sectors. The upper part of the diagram highlights the results based on the actual values of sales and purchases of all varieties of rice, while the lower part of the diagram highlights adjusted results using the value of own rice production consumed as part of the value of rice production. In keeping with Budd (1993), the latter results highlight the upper limit of potential gains from sales of own production for farmers in the face of rising rice prices. 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.

In the top left diagram, 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 precentiles of the per capital household expenditure distribution. The intervals where the net benefit ratios are negative and significant corresponds to the region between the third and fifth 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 logarithm of per capita expenditures. The net benefit ratios remain significant and move below the zero line in the intermediate ranges of the per capita expenditures distribution. They once again lose significance in the highest per capita expenditures percentiles.

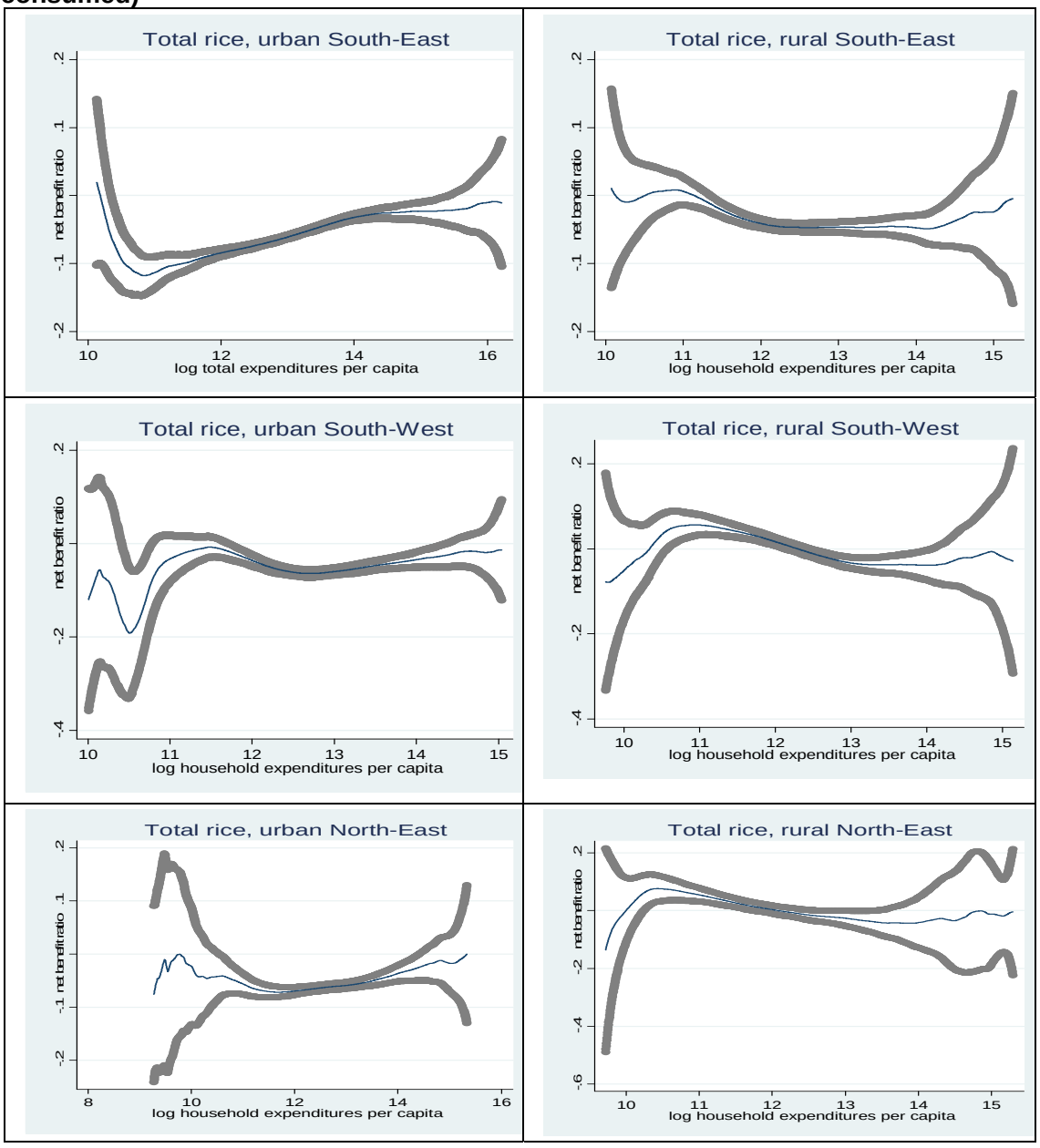
[9] For further details and mathematical exposition see Deaton (1988, 1989) and Budd (1993).

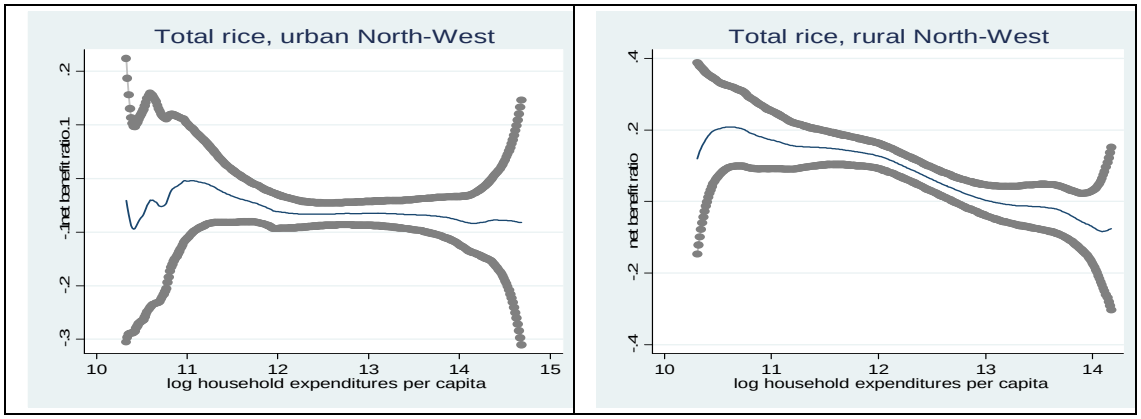
Figure 8: net benefit ratio estimates for rice, urban and rural samples



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

Figure 9: Regional patterns of net benefit estimates for rice (with own production consumed)





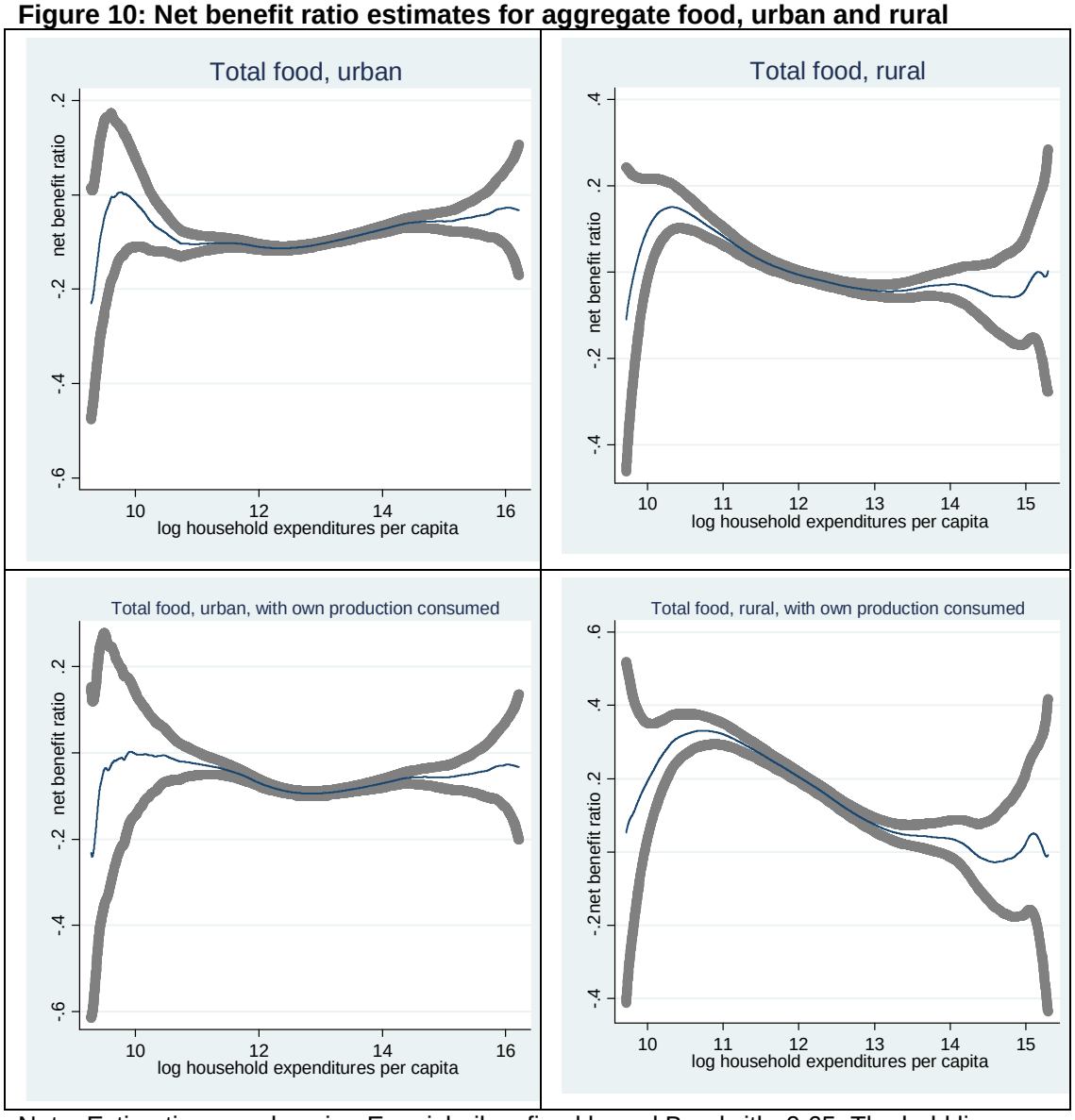
Note: Estimations made using Epanichnikov fixed kernel Bandwith=0.65. The bold lines are 95% confidence bands.

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 both the urban and rural per capita expenditure distributions; (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; and (iii) while everyone in the urban sector loses from an increase in rice prices, households belonging to the next-to-poorest rural percentile 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.

Looking at the lower part of Figure 8, we see that the negative effect is dampened significantly if we include own production consumed on the production side of our equation, especially for the rural sample, for which virtually the whole diagram moves above the zero line. A further experimentation with the regional implications of the food crisis highlights the expected largest gain from the price shock for the rice-producing rural north-west and south-west parts of the country, while the negative effect appears to be borne out by the urban populations of the south-east and north-east (Figure 9).

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. To reiterate, 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

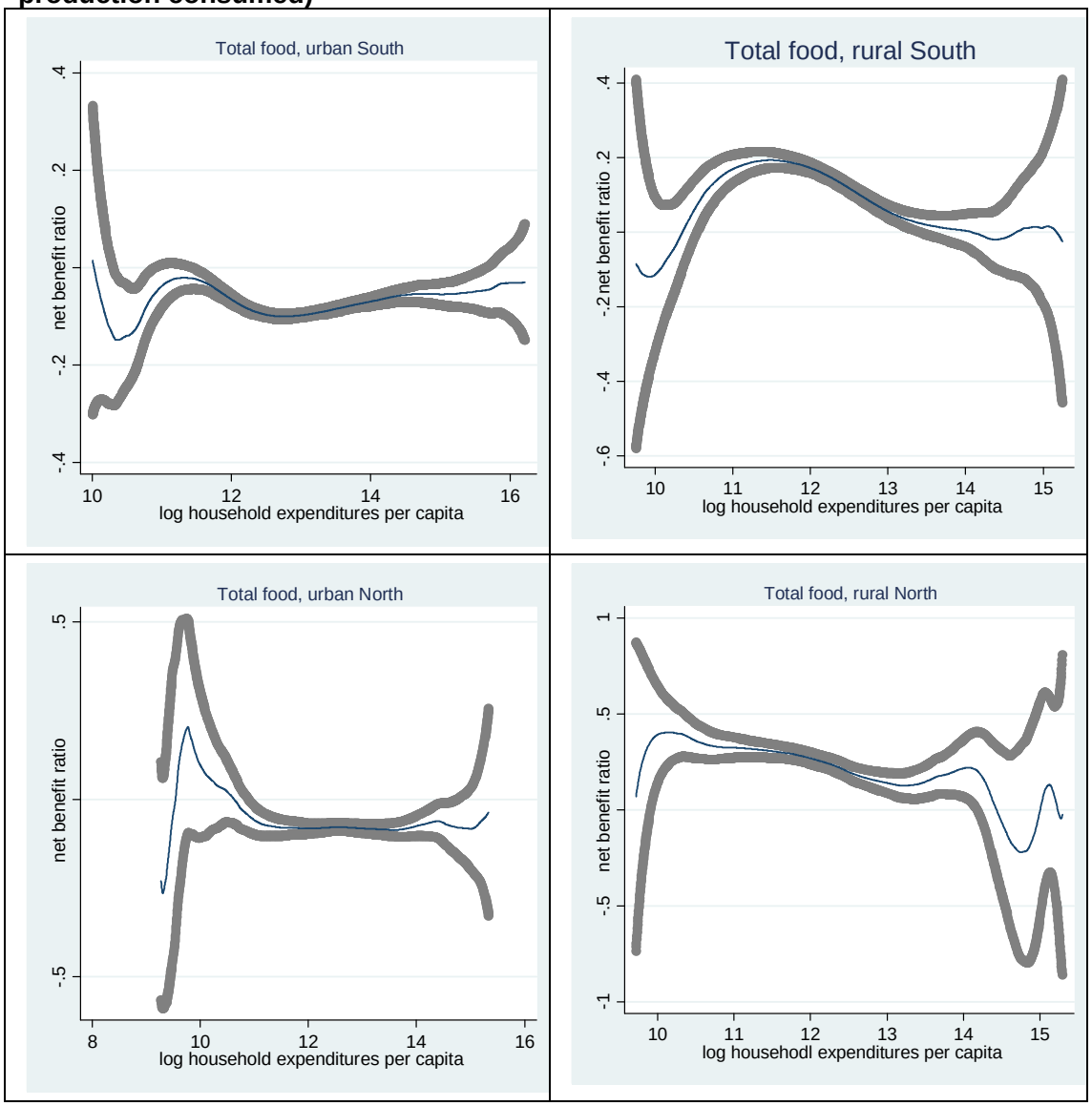
Figure 10: Net benefit ratio estimates for aggregate food, urban and rural



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

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. As before, we first highlight the results for the urban and rural sectors as a whole (Figure 10). Since the estimates for the north-west and north-east regions on the one hand, and the south-west and south-east regions, on the other hand, were not qualitatively different, in the next diagram (Figure 11) we then highlight the results from our estimates separately only for the northern and southern geographic regions.

Figure 11: Net benefit ratios for aggregate food, north and south (with own production consumed)

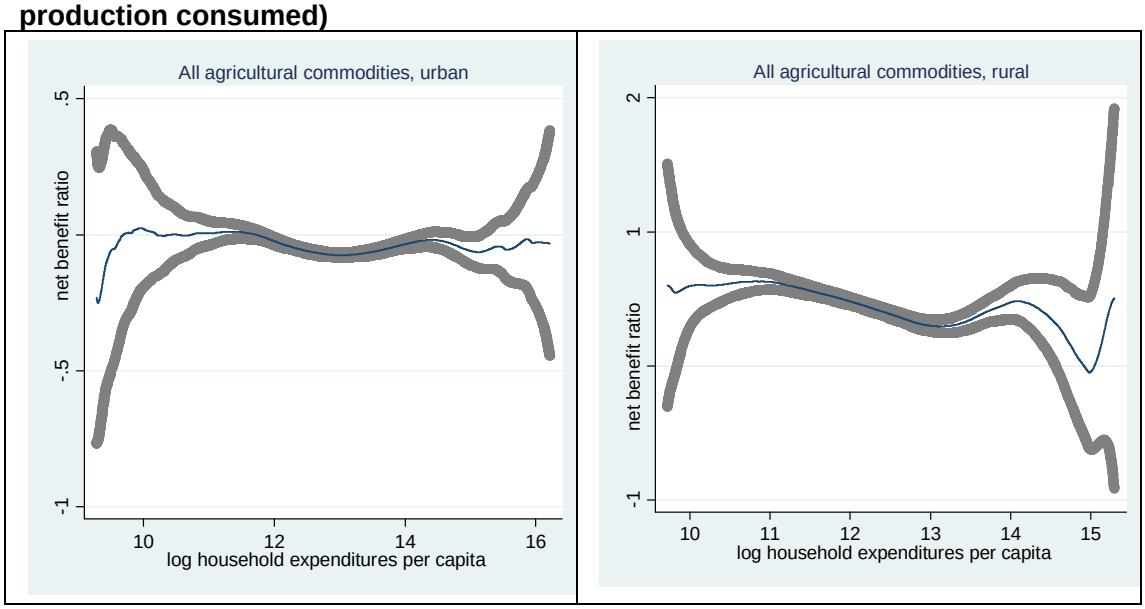


Note: Estimations made using Epanichnikov fixed kernel Bandwith=0.65. The bold lines are 95% confidence bands.

The diagrams in Figure 10 corresponding to the urban sample continue to lie below the zero-line, but are noticeably shifted upwards compared to those in Figure 8. By contrast, Figure 10 diagrams corresponding to the rural sector are now entirely above the zero-line and are sloping downwards, thus highlighting a significant net gain from food production among poorer households in rural areas. Overall, these figures indicate that the consumption and production of local food varieties is capable of both smoothing some of the effect of imported food shock across the urban and rural sectors and of significantly benefitting poorer rural households.

Looking once again at the regional distribution of the welfare effects, we see that the positive net benefit ratios are largest for the poorer food crop producing northern areas.

Figure 12: Aggregate agricultural commodity, urban and rural (with own production consumed)

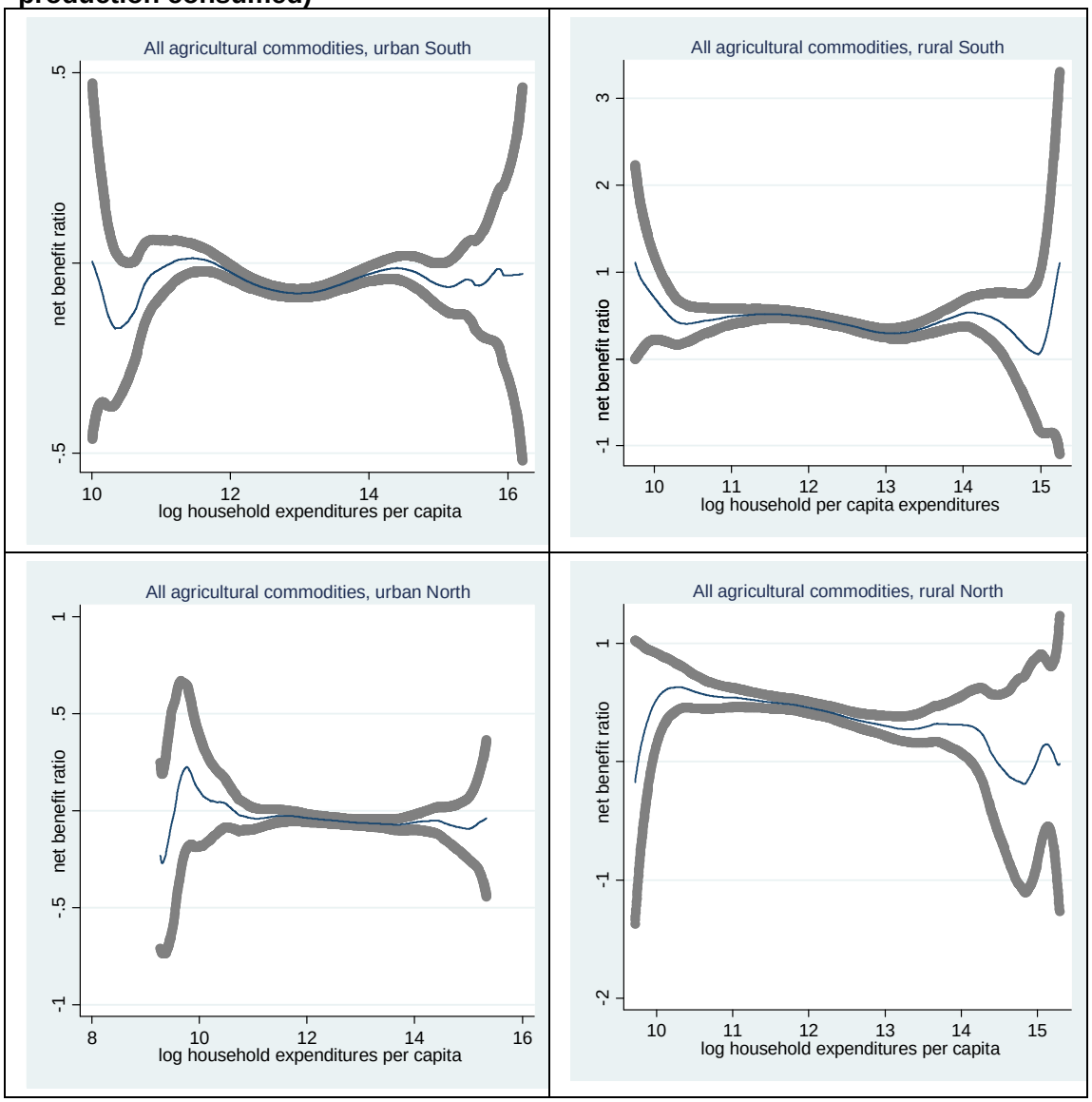


Note: Estimations made using Epanichnikov fixed kernel Bandwith=0.65. The bold lines are 95% confidence bands.

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 12, 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 urban and rural samples. Next, in Figure 13, we perform this exercise separately for the northern region and the southern region, which as indicated in Figure 7, are characterised by very different cash and food crop production patterns.

In Figure 12, we see that for the rural sample, the entire net benefit diagram lies above the zero-line. While a small portion of the diagram corresponding to the intermediate percentiles of the urban sample continues to lie below the zero-line, even for this sample the effect is almost entirely smoothed out. Finally, the results highlighted in Figure 13 indicate that once both food and cash crop production are taken into account, any negative implications of a price shock appear to be borne out by the relatively better-off middle class in the urban south of the country.

Figure 13: Aggregate agricultural commodity, north and south (with own production consumed)



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

5. Conclusions and discussion

The commodity price shock of 2007-2008 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 (World Bank); Zezza et al, 2008). This evidence clashed with contrasting findings of alternative sets of authors (e.g. Aksoy and Isik-Dirmelik, 2008; Headey, 2011; Verpoorten et al, 2012). Despite the recognised need of opening the black box of proliferating multi-country, typically simulation-based analyses (e.g. deJanvry and Sadoulet, 2008), the effort to understand the heterogeneous implications of a food price shock across groups of households in single affected contexts remains inadequate. 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 African economies.

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. Using a stylised methodology and representative household data from Côte d'Ivoire from the immediate aftermath of the price shock, namely end of 2008 and beginning of 2009, we first calculate welfare elasticities of 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 are taken into account. By basing our analysis entirely on actual values of sales and expenditures on food and other crops, as opposed to net-benefit related simulations, we attempt to avoid some of the criticisms to simulation-based research raised in the recent literature on the implications of price shocks (de Janvry and Sadoulet, 2008; Headey, 2011).

We find that while for middle-income households the negative welfare response to the changing price of rice is significant and not entirely smoothed out by the consumption and production of alternative food varieties, the poorest households appear to be immune to food price shocks. Furthermore, when both cash and food crop production is taken into account, the negative impact of a food price shock becomes negligible. Finally, we find that staple food price shocks are likely to induce reallocation of income from households residing in relatively richer urban and southern parts of the country towards relatively poorer rural and northern parts of the country.

Our analysis is not free from limitations and hence our results should be interpreted with caution. For example, given that we base our estimates on a household survey alone, it is impossible for us to find out to what extent external price shocks have been transmitted to individual producers and consumers and hence whether any government reactions to the price shock have been effective or whether any government intervention, for example in the food and cash crop marketing system, is needed to improve household welfare. We are only able to gain understanding of such influences from alternative studies (Diagne et al, 2003; Aker et al, 2011) as a backdrop to our analysis. Similarly, clubbing together groups of agricultural commodities conceals

complex and potentially interesting and policy-relevant cross-substitutions in consumption and production. At the same time, the fact that we work with the values of sales and food expenditures at the level of the household still allows us to make relevant conclusions about key welfare effects and corresponding viable strategies for households belonging to different strata of the welfare distribution, conditional on the (unobserved for us) environment in which they reside.

Bearing these limitations in mind, we can conclude with a fair amount of confidence that there is no convincing evidence in support of views favouring re-specialisation out of cash crops into food crops such as rice as a viable welfare-enhancing and inequality-reducing strategy. In particular, assuring self-subsistence in rice along the lines of already failed government policies should be looked upon with particular caution. Secondly, an important finding of our study is that, while the poor in both urban and rural areas appear to be immune to a staple food price shock, those most affected by rising food prices are households in the intermediate ranges of the welfare distribution, who rely most on non-agricultural livelihood strategies. Government effort in assuring productive employment opportunities (Dimova et al, 2010) and overcoming shortcomings in the food marketing mechanism (Diagne et al, 2003) should therefore be a priority. Finally, while a case study on Côte d'Ivoire does not allow us to make generalisations across a number of similar countries, information on food and cash crop production, import and export data (see for instance FAOSTAT[10]), as well as information on non-agricultural activities (e.g. from the RIGA[11] and 1-2-3[12] databases) suggests that many of the lessons learnt from this exercise are perhaps relevant across francophone African countries and beyond.

[10]http://faostat.fao.org/
[11]http://www.fao.org/economic/riga/riga-about/en/
[12]http://www.dial.prd.fr/dial_enquetes/dial_enquetes_enquete123.htm

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