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IFPRI Discussion Paper 01245

February 2013

Impact of Food Price Changes on Household Welfare in Ghana

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IFPRI gratefully acknowledges the generous unrestricted funding from Australia, Canada, China, Denmark, Finland, France, Germany, India, Ireland, Italy, Japan, the Netherlands, Norway, the Philippines, South Africa, Sweden, Switzerland, the United Kingdom, the United States, and the World Bank.

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ABSTRACT

In the wake of the global food crisis of 2007–08 and additional price spikes since then, greater attention has been given to the welfare impact of food price increases in developing countries. The standard approach in this type of analysis, proposed by Deaton (1989), is based on income and expenditure data from household surveys. Given the widespread use of this method, it is important to revisit the assumptions behind it and examine the sensitivity of results to those assumptions. In this paper, we explore the distributional impact of higher maize, rice, and food prices in Ghana and analyze the robustness of those results to changes in several key assumptions.

The results suggest that higher maize and rice prices have a relatively modest short-term impact on national poverty but significant effects on specific groups of households. As expected, urban households lose from higher grain prices, but a surprisingly large share of rural households also lose because they are net buyers. The results also suggest that the current policy of protecting domestic rice producers with an import tax does not contribute to national poverty reduction, in spite of the fact that rice growers tend to be poor.

If we relax the assumption that households do not respond to the higher prices, the effects are more positive or less negative, but only modestly so. On the other hand, if we relax the assumption that producer and consumer prices rise by the same proportion, and instead assume a constant marketing margin, the results change substantially. Because producer prices now rise by a larger proportion than consumer prices, the impact of higher prices is much more positive. These findings highlight the need for more research on the effect of price spikes on marketing margins.

Keywords: food prices, welfare impact, maize, rice, Ghana, Africa

ACKNOWLEDGMENTS

This study was funded by the Policy and Research Division of the Department for International Development (DFID) of the United Kingdom under the project Assessing Impact of Increased Global Food Price on the Poor. Additional funding was provided by the World Bank through the COMESA–MSU–IFPRI¹ African Agricultural Markets Programme.

¹ Common Market of Eastern and Southern Africa, Michigan State University, and International Food Policy Research Institute.

1. INTRODUCTION

The global food crisis of 2007–08 was characterized by a sharp increase in food and other commodity prices on world markets. Between January 2007 and March 2008, the international prices of wheat and rice doubled, while the price of maize rose by 42 percent. Over this same period, the food price index of the Food and Agriculture Organization (FAO) increased by 61 percent. After declining in 2008 and 2009, the prices of rice and other commodities surged again in 2010–11 (FAO 2011).

These trends in world markets resulted in sharp increases in food prices in developing countries, although the degree of price transmission varied significantly. These food price spikes reduced the purchasing power of urban households and other net buyers of food, forcing them to decrease nonfood spending and shift to cheaper foods. Poor urban households were particularly affected because they spend a large share of their income on food. At the national level, food-importing countries faced balance-of-payment pressures as the cost of food imports rose, as well as budget pressure associated with the higher cost of food and nutrition programs. In dozens of countries, the high prices sparked demonstrations and sometimes riots (Benson et al. 2008).

Concern over the impact of recent spikes in food prices has provoked a large number of studies of the welfare impact of changes in food prices. Most of these studies have used the methodological approach proposed by Deaton (1989), which makes use of household survey data on income and expenditure patterns combined with either historical or assumed increases in food prices. Although variations on this approach were used occasionally before the food crisis (Budd 1993; Barrett and Dorosh 1996; Minot and Goletti 1998; Minot and Daniels 2005), its use expanded rapidly in the wake of the food crisis (Ivanic and Martin 2008; Arndt et al. 2008; Wodon and Zaman 2008).

This paper has two objectives. The first is to use the Deaton approach to simulate the impact of higher food prices on household welfare in Ghana. The second is to use the Ghana analysis to explore the sensitivity of the results to changes in the underlying assumptions. Given the widespread use of the Deaton method, it is important that researchers revisit some of the implicit assumptions behind the theory, along with the empirical implications of those assumptions.

Section 2 provides a review of the theoretical underpinning of the impact of price and income changes on welfare, as well as a review of recent empirical studies. Section 3 describes in more detail the data and methods used in this study. Section 4 presents the results of the analysis, and Section 5 summarizes and provides some discussion.

2. BACKGROUND

Conceptual Framework for Impact of Price Changes on Welfare

It is useful to begin with a review of the economic theory that links changes in prices to changes in household welfare. Food prices affect households both as consumers of food and as producers, and for our purposes, it is useful to separate these two effects. The welfare impact can be defined in terms of compensating variation (CV) or equivalent variation (EV). Here we focus on CV, though similar calculations could be used to derive EV. CV is defined as the negative of the amount of monetary compensation necessary to offset the effect of the price and income changes, leaving utility unchanged at its original level:²

$$CV = e(\mathbf{p}_0, u_0) - e(\mathbf{p}_1, u_0) + \pi(\mathbf{p}_1^p, \mathbf{w}_1) - \pi(\mathbf{p}_0^p, \mathbf{w}_0),$$

where $e(\cdot)$ is the expenditure function, p is a vector of consumer prices, u is utility, $\pi(\cdot)$ is the profit function for household productive activities, p^p is the producer price of goods and services the household sells (including labor), and w is the price of goods and services the household buys as inputs into productive activities (including labor), given a set of assets that are fixed in the short run. The subscripts refer to time: 0 is before the change and 1 is after the change.

We can approximate the impact of changes in the prices of consumer goods, household outputs, and household inputs using a second-order Taylor-series expansion around the original (before) points in the expenditure and profit functions:

$$\begin{aligned} CV = & \frac{1}{1!} \sum_{i=1}^N \frac{\partial e(p_{i0}, u_0)}{\partial p_i} (p_{i0} - p_{i1}) + \frac{1}{2!} \sum_{i=1}^N \sum_{j=1}^N \frac{\partial^2 e(p_{i0}, u_0)}{\partial p_i \partial p_j} (p_{i0} - p_{i1})(p_{j0} - p_{j1}) \\ & + \frac{1}{1!} \sum_{i=1}^M \frac{\partial \pi(p_0^p, w_0)}{\partial p_i^p} (p_{i1}^p - p_{i0}^p) + \frac{1}{2!} \sum_{i=1}^M \sum_{j=1}^M \frac{\partial^2 \pi(p_0^p, w_0)}{\partial p_i^p \partial p_j^p} (p_{i1}^p - p_{i0}^p)(p_{j1}^p - p_{j0}^p) \\ & + \frac{1}{1!} \sum_{i=1}^P \frac{\partial \pi(p_0^p, w_0)}{\partial w_i} (w_{i1} - w_{i0}) + \frac{1}{2!} \sum_{i=1}^P \sum_{j=1}^P \frac{\partial^2 \pi(p_0^p, w_0)}{\partial w_i \partial w_j} (w_{i1} - w_{i0})(w_{j1} - w_{j0}) \end{aligned}$$

The first row on the right side describes the impact of changes in prices of consumer good i on welfare, the second row gives the effect of changes in producer prices of commodity i on income, and the third row is the effect of changes in the price of input i on income. Using Shephard's lemma and Hotelling's lemma, these can be simplified as follows:

$$\begin{aligned} CV = & \sum_{i=1}^N Q_{i0} (p_{i0} - p_{i1}) + \frac{1}{2} \sum_{i=1}^N \sum_{j=1}^N \frac{\partial Q_i}{\partial p_j} (p_{i0} - p_{i1})(p_{j0} - p_{j1}) \\ & + \sum_{i=1}^M S_{i0} (p_{i1}^p - p_{i0}^p) + \frac{1}{2} \sum_{i=1}^M \sum_{j=1}^M \frac{\partial S_i}{\partial p_j^p} (p_{i1}^p - p_{i0}^p)(p_{j1}^p - p_{j0}^p) \\ & + \sum_{i=1}^P X_{i0} (w_{i1} - w_{i0}) + \frac{1}{2} \sum_{i=1}^P \sum_{j=1}^P \frac{\partial X_i}{\partial w_j} (w_{i1} - w_{i0})(w_{j1} - w_{j0}) \end{aligned}$$

where Q_{i0} is the consumer demand for good i , S_{i0} is supply of output i produced by the household, and X_{i0} is the demand for input i , all at time zero. This expression can be further simplified by dividing both sides by the original nominal income (Y_0), to express the welfare impact as a proportion of income, and

² It is defined as the negative of the amount so that the sign of CV is the same as the sign of the welfare change.

multiplying and dividing each row by the relevant price for that row. The result is conveniently expressed in terms of elasticities:

$$\begin{aligned} \frac{CV}{Y_0} = & \sum_{i=1}^N -q_{i0} \widehat{p}_i + \frac{1}{2} \sum_{i=1}^N \sum_{j=1}^N \varepsilon_{ij} \widehat{p}_i \widehat{p}_j + \sum_{i=1}^M s_{i0} \widehat{p}_i^p + \frac{1}{2} \sum_{i=1}^M \sum_{j=1}^M \theta_{ij} \widehat{p}_i \widehat{p}_j + \sum_{i=1}^P x_{i0} \widehat{w}_i \\ & + \frac{1}{2} \sum_{i=1}^P \sum_{j=1}^P \gamma_{ij} \widehat{w}_i \widehat{w}_j \end{aligned} \quad [1]$$

where q_{i0} is the budget share of consumer good i ($Q_{i0}p_{i0}/Y_0$), s_{i0} is the value of output i as a share of income ($S_{i0}p_{i0}^p/Y_0$), x_{i0} is the value of spending on input i as a proportion of income ($X_{i0}w_{i0}/Y_0$), ε_{ij} is the absolute value of the Hicksian elasticity of demand for good i with respect to the price of good j , θ_{ij} is the elasticity of supply of output i with respect to the price of output j , and γ_{ij} is the elasticity of demand for input i with respect to the price of input j . The “hat” operator indicates the proportion change in the variable.

The welfare effect proposed by Deaton (1989) and used in most applications is expressed as follows:

$$\frac{CV}{Y_0} = \sum_{i=1}^N (s_{i0} - q_{i0}) \widehat{p}_i \quad [2]$$

where $s_{i0}-q_{i0}$ is the net benefit ratio (NBR), defined as the value of net sales of commodity i as a proportion of household income. As Deaton (1989) notes, it can also be interpreted as the short-term elasticity of household welfare with respect to the price of commodity i . This expression is quite useful in applied policy analysis, particularly since it does not require any information on household responses to price changes. However, it is important to keep in mind the simplifying assumptions necessary to derive it from equation (1) above:

- That there is no change in input prices or that changes in input prices have a negligible effect on household income, thus eliminating the last two terms on the right side of the full version. For example, for households that buy or sell labor, it is assumed that there are no changes in wage rates.
- That consumers do not respond to the change in consumer prices or that the time frame is too short to reflect a demand response, thus removing the second term on the right side. In other words, equation (2) is based on a first-order Taylor-series expansion of CV, in contrast to the second-order expansion used in equation (1).
- That farmers do not respond to the change in producer prices or that the time frame is too short to reflect a supply response, thus excluding the fourth term on the right side.
- That the proportional change in consumer prices is equal to the proportional change in producer prices, allowing the first and third terms to be combined.

For empirical work, it is important to know if these simplifying assumptions have a non-negligible effect on the results. In other words, how much would the estimated welfare impact change if researchers took into account (for example) supply and demand response and possible differences between the proportional change in retail and producer prices? In this paper, we explore the sensitivity of estimated welfare impact to these assumptions in the case of Ghana.

Previous Research on the Welfare Impact of Food Price Changes

Deaton (1989) defined the net benefit ratio (NBR) as the ratio of a household's net sales of a commodity to household income. He used the NBR of rice in Thailand to simulate the impact of rice price changes on income distribution. The NBR of a commodity multiplied by the percent change in its price gives the first-order approximation of the change in consumer surplus and producer surplus, as defined above.

Of course, urban households in developing countries are almost always net food buyers, with poor urban household allocating a larger share of their income to food in general and staple foods in particular than do rural households. Thus, the relative impact of higher food prices is adverse for almost all urban households but more so for poor urban households. For rural households in developing countries, the situation is more complicated. Medium- and large-scale farmers are more likely to be net sellers, so they gain from higher prices. Small-scale farmers are often net buyers of staple food crops, relying on income from remittances, the sale of labor, or microenterprises to cover the cost of food purchases. Studies in Africa have indicated that in many cases more than half of rural households are net buyers of individual food crops (Weber et al. 1988; Barrett and Dorosh 1996; World Bank 2008).

Following the food crisis of 2007–08, a series of studies have examined the impact of higher food prices on income and poverty. Ivanic and Martin (2008) examined the welfare impact of higher food prices on households in nine developing countries using both hypothetical price increases (10 percent) and historical increases in world prices over the period 2005–07. A 10 percent increase in maize prices lowered poverty in four countries, increased poverty in another four, and had no effect on one. In Malawi and Zambia, 10 percent higher maize prices increased poverty by 4 percentage points, the most adverse impact among the nine countries under consideration. This is a reflection of the dominance of maize in the diet in these two countries. In Madagascar, a 10 percent increase in maize prices also increased poverty, but by only 0.2 percentage points. In contrast, a 10 percent increase in rice prices had small effects on households in Malawi and Zambia, increasing poverty by 0.0 and 0.1 percentage points, respectively, but a larger effect on households in Madagascar, increasing poverty by 2.5 percentage points. In all three of these countries, the adverse impact was greater for rural than urban households, reflecting the large number of poor net buyers in rural areas of these countries. The analysis also estimated the impact of the likely increase in unskilled wages as a result of higher food prices. In all three African cases, the wage effect partially offset the increase in poverty due to the higher food prices.

Arndt et al (2008) estimated the impact of higher food prices on poverty in Mozambique. Because the survey they used did not disaggregate agricultural sales by commodity, the simulation was for changes in all food prices. They estimated that a 10 percent increase in food prices would raise rural income by 1.0 percent and reduce urban income by 2.2 percent.

Wodon and Zaman (2008) estimated the impact of higher food prices on the poverty rates in 10 countries of Central and West Africa. They estimated that a 50 percent increase in food prices would increase the national poverty rate by 2.5 percentage points, taking into account changes in both consumer prices and farm income. There was considerable variation across countries, however. The increase in poverty ranged from around 1 percentage point in Nigeria and Ghana to more than 5 percentage points in Liberia and Niger. The impact was greater in Liberia and Niger because these countries are heavily dependent on food imports and have relatively few surplus farmers. In addition, these countries have high poverty rates, which implies that a significant portion of the population is near the poverty line and vulnerable to falling below it.

Other studies focused on the impact of higher food prices on food consumption. Cudjoe, Breisinger, and Diao (2008) carried out a demand analysis using survey data from Ghana and used the results to estimate the impact of historical food price increases on consumption of staple foods. This analysis did not take into account the effect of changes in farm income as a result of the higher food prices, which would partially offset these reductions in food consumption. Similarly, Ulimwengu, Workneh, and Paulos (2009) and Ulimwengu and Ramadan (2009) estimated the impact of higher prices on food consumption and welfare. However, these results did not consider the impact of higher grain

prices on the income of farmers, so they may overstate the adverse impact of food price increases. In effect, these studies used the first two terms of the full equation above, but not the others.

In summary, most studies have concluded that higher food prices lower real income and increase poverty in Africa. Somewhat surprisingly, higher food prices increase poverty not only in urban areas, but also in the rural areas of some countries, where a significant proportion of the poor are net buyers of staple foods. However, in some countries, higher food prices lower national poverty or have negligible effects on it.

3. DATA AND METHODS

This study uses household survey data for Ghana to explore the impact of domestic price changes on the real income of different types of households. The data and methods for this component are described below.

Household Survey Data

In order to simulate the impact of food price changes on different types of households, household survey data are needed. In this analysis, we make use of the 2005/06 Ghana Living Standards Survey, a nationally representative survey. Although this survey was conducted before the global food crisis, it provides information on the income and spending patterns of different types of households, which we use to infer the impact of higher food prices. The 127-page household questionnaire contained 12 modules covering information on the demographic characteristics of household members, education, health, employment, migration, housing, agriculture sources of income, expenditures, nonfarm activity, income transfers, and credit and savings. The fieldwork was implemented over 12 months, between September 2005 and September 2006.

The survey was conducted by the Ghana Statistical Service (GSS) in collaboration with the World Bank. A two-stage stratified random sampling design was adopted:

- In the first stage, the GSS selected 580 enumeration areas, as defined in the previous census.
- In the second stage, they selected 15 households in each enumeration area.

This design yielded a total sample of 8,700 households. By the end of the survey 8,687 households had been successfully interviewed.

Analysis of Household Welfare Impact

In the standard Deaton approach, expressed in equation (2), the household welfare effect of price changes can be estimated from information on the size of the price change, expenditure patterns, and the composition of income (particularly agricultural income). Our analysis focuses on the impact of the increase in the prices of maize, rice, and food over 2007–08 on the welfare of households. We start with estimates of the change in prices for maize, rice, and food commodities, and information on the income and consumption patterns of a sample of households. Our measures of the impact on household welfare are the first- and second-order approximations of compensating variation.

In this study, we simulate the impact of the historical nominal price changes in Ghana over the period June 2007 to June 2008. Separate simulations are carried out for the price increases in maize, rice, and overall food. In the case of maize and rice, the prices are the average monthly consumer prices in Accra. To measure price changes in food in general, we use the food component of the consumer price index, calculated by GSS. Our measure of welfare is per capita consumption expenditure (including the value of home consumption of food), so Y in the equations above is represented by household consumption expenditure.

The two main sources of uncertainty in these estimates are (1) the appropriate supply and demand elasticities to use in the second-order approximations and (2) the relationship between producer and consumer prices. Regarding the elasticities, most studies of this type calculate the first-order approximation in equation (2), which assumes no household response (see Deaton 1989; Ivanic and Martin 2008; Wodon and Zaman 2008). However, in the longer run, households are generally able to respond both as consumers and as producers, though price elasticities for staple foods are generally low. In this study, the base simulation assumes no household response (zero elasticities), which corresponds to the short-run impact. We also provide long-run estimates assuming own-price demand elasticities of -0.3 and supply elasticities of 0.3. Cross-price effects are assumed to be negligible.

The second issue is the relationship between consumer prices and producer prices. It is rarely possible to obtain both producer and consumer price data, particularly in Africa. The simplest assumption, and the one generally adopted in this type of study, is that both prices increase in the same proportion, equivalent to assuming a marketing margin that is a fixed proportion of the consumer price. However, it may be more realistic to assume a fixed marketing margin, which implies that the percent increase in producer prices will be greater than the percent increase in consumer prices. Dawe and Maltoglou (2009) argued that the estimation of the welfare impact of price increases is sensitive to assumptions about the marketing margin. If the consumer price is twice the producer price and the margin is fixed in absolute terms, the percent increase in the producer price will be twice the percent increase in the consumer price. In this study, the base simulation assumes equal percent changes in producer and consumer prices, but we also present results assuming that the percent increase in producer prices is double the percent increase in consumer prices.

Thus, for each commodity, we provide four estimates of the impact of higher prices:

- The base assumption is that households do not respond to higher prices and that producer and consumer prices rise by the same percentage (implying a fixed percent marketing margin).
- In simulation 2, we assume that households do not respond to higher prices and that the percent increase in producer prices is twice the percent increase in consumer prices.
- In simulation 3, we assume a household response to price changes (a demand elasticity of -0.3 and a supply elasticity of 0.3) and equal percent increases in producer and consumer prices.
- In simulation 4, we assume a household response to price changes, with the same elasticities, and a producer price increase twice that of consumer prices.

Although the methodological approach used in this study allows the simulation of impact on any household category that can be identified in the survey data, we focus on the following categories: location (rural or urban), sex of head of household, whether or not the household grows the commodity in question, region, income category, and farm size.

This approach also allows us to simulate the impact of price changes on average income and various measures of poverty and inequality. However, we focus our analysis on the effect of higher food prices on the incidence of poverty. The poverty rate is an intuitively understood measure, and calculation of other measures of poverty and inequality generally yield similar qualitative results.

4. RESULTS

In this section, we present the results of the simulations of the impact of higher food prices. As described in Section 3, we use household income and expenditure survey data to simulate the impact of food price increases on the real income (or purchasing power) of each household in the 2005/06 Ghana Living Standards Survey (GLSS). The results are then aggregated to different types of households, defined by location, income, farm size, and other characteristics. Maize is the most important internationally traded food, contributing 13 percent of the caloric intake in Ghana, and is second in overall importance behind cassava. Rice accounts for 7 percent of caloric intake (FAO 2008). Although rice is less important in terms of caloric intake than cassava, maize, yams, and plantains, its political sensitivity is magnified by the fact that Ghana imports most of its rice requirements and that rice is widely consumed in urban areas.

Welfare Impact of Higher Maize Prices

As described above, the net benefit ratio (NBR) is the value of net sales of a commodity as a percentage of household income. As discussed above, a positive NBR means that a household or group of households will gain from higher prices of the commodity in the short run, while a negative NBR means it will lose. The long-run effect will be somewhat less negative or more positive.

Table 4.1 shows the net position in maize of different types of households in Ghana. The last row in the table shows that, overall, maize accounts for 5 percent of household income and maize consumption represents 6 percent of the total. This implies an average NBR of -0.01, or -1 percent. The negative NBR is a necessary consequence of the fact that Ghana is a net maize importer. However, even if Ghana were self-sufficient in maize, the NBR would be slightly negative because the NBR is defined in value terms rather than quantity terms, and consumer prices are higher than producer prices. The last three columns indicate the proportion of households in each category that are net sellers, self-sufficient, and net buyers. In this context, self-sufficient households are those with zero net sales, either because they do not grow or consume maize or because they produce maize for their own consumption without any maize purchases or sales.³ Overall, 21 percent of the households in Ghana are net sellers of maize, 46 percent are net buyers (including most urban households), and 33 percent are self-sufficient.

For rural households, maize consumption represents 7 percent of income, while maize income accounts for 9 percent of the total. The NBR is negative, indicating that rural households are hurt by higher maize prices on average. However, the small value suggests that a 10 percent increase in maize prices would reduce the average welfare of rural households by 0.1 percent.⁴ Maize is less important in urban areas than in rural areas, both as a source of income and as a component in household expenditure.

It is not surprising that most urban households are net buyers and few (7 percent) are net sellers. Even among rural households, there are more net buyers of maize (39 percent) than net sellers (31 percent), a pattern found in other African countries as well (World Bank 2008). Rural net buyers of maize include households that rely on wage income, small business income, and income from cocoa and other cash crops (see Table 4.1).

The results also show that female-headed households have a more negative NBR than male-headed households, suggesting they are somewhat more vulnerable to increases in maize prices. According to the survey data, female-headed households are less likely to be net sellers and more likely to be net buyers compared with male-headed households. Nonetheless, the impact of maize price increases on female-headed households is modest. A 10 percent increase in maize prices would reduce the welfare of female-headed households by 0.3 percent.

³ In theory, households that buy and sell exactly the same amount of maize (in value terms) would also fall in this group, but this is unlikely in practice.

⁴ Because of rounding, the difference is not 0.2 percent.

Table 4.1—Net position in maize of different types of households in Ghana

Category of household	Percent of all households	Production ratio	Consumption ratio	Net benefit ratio	Net sellers	Self sufficient	Net buyers
		(fraction of income)			(% of households in category)		
Urban	43	0.01	0.03	-0.02	7	37	56
Rural	57	0.07	0.09	-0.01	31	31	39
Male headed	71	0.06	0.07	-0.01	24	33	43
Female headed	29	0.02	0.05	-0.03	13	33	54
Maize grower	41	0.12	0.10	0.02	51	20	29
Others	59	0.00	0.03	-0.03	0	42	58
Western	10	0.02	0.02	-0.01	16	37	47
Central	10	0.04	0.04	0.00	28	41	31
Greater Accra	17	0.01	0.02	-0.01	4	38	58
Volta	8	0.09	0.15	-0.06	20	15	65
Eastern	14	0.05	0.06	-0.02	23	26	51
Ashanti	17	0.03	0.02	0.01	25	35	40
Brong Ahafo	9	0.05	0.05	0.00	31	36	34
Northern	9	0.15	0.17	-0.02	33	31	36
Upper East	4	0.04	0.13	-0.09	9	33	57
Upper West	2	0.12	0.20	-0.09	12	36	52
Poorest quintile	20	0.09	0.12	-0.03	27	35	38
2nd quintile	20	0.06	0.08	-0.02	28	29	44
3rd quintile	20	0.04	0.05	-0.01	21	29	49
4th quintile	20	0.03	0.04	-0.01	16	33	51
Richest quintile	20	0.02	0.02	-0.01	10	41	50
No farm	41	0.00	0.03	-0.03	2	40	59
0.01 - 0.5 ha	19	0.05	0.07	-0.02	27	30	44
0.5 - 2.0 ha	17	0.07	0.09	-0.02	33	27	40
2 - 5 ha	15	0.12	0.10	0.01	40	29	31
More than 5 ha	8	0.11	0.09	0.02	41	31	28
Ghana	100	0.05	0.06	-0.01	21	33	46

Source: Authors' analysis of the 2005/06 GLSS data.

Less than half of Ghanaian households (41 percent) grow maize. Among these households, maize accounts for 12 percent of income and 10 percent of expenditure, yielding an NBR of 0.02. About half of the maize growers (51 percent) are net sellers, 20 percent grow only for their own consumption, and 29 percent purchase maize to supplement their own harvest. Among households that do not grow maize, the NBR is -0.03, indicating that a 10 percent increase in maize price would reduce their welfare by 0.3 percent (see Table 4.1).

Across the 10 administrative regions of Ghana, the Upper West and Upper East regions have the most negative NBRs (-0.09), followed by the Volta region. In all 3 of these regions, households that are net buyers of maize account for more than 50 percent of the total. Thus, these are the 3 regions most adversely affected by an increase in maize prices. The Upper East and Upper West regions are sparsely populated, containing just 4 percent and 2 percent of the national population, respectively. However, the result is still worrisome because the Upper East and Upper West are among the poorest regions of Ghana. Ashanti, Brong Ahafo, and the Central region have the largest NBRs (0.00 to 0.01), which indicate that they would not be adversely affected by a maize price increase.

The results are also presented by quintile of expenditure per capita. A clear pattern emerges, in which poor households are the most dependent on maize production but also rely more heavily on maize in their consumption basket. The net effect is that the NBR is somewhat more negative for the poorest quintile of households (-0.03) than for the richest (-0.01). This result implies that the adverse effect of higher maize prices is greatest on the poor, although the effect is fairly modest in both cases (see Table 4.1).

Finally, we see that the NBR varies across farm size categories. The importance of maize in income rises from 0 percent among nonfarmers to 11–12 percent among farmers with more than 2 hectares. The role of maize in expenditure is relatively constant across farm size categories, though lower in the nonfarm households, many of which are located in urban areas and thus have higher incomes. The net effect is that nonfarmers and small farms are adversely affected by higher maize prices, while farms with more than 2 hectares are positively affected by higher maize prices.

We now turn to the impact of the increase in maize price on poverty in Ghana. Between June 2007 and June 2008, the nominal consumer price of maize in Accra rose by 81 percent. If we assume a marketing margin that is a fixed share of the consumer price, then producer prices would have also increased by 81 percent. If we assume that the marketing margin is fixed and that producer prices are half of consumer prices, then the producer price would have increased by 162 percent. Table 4.2 shows the effect of higher maize prices on poverty in Ghana under different assumptions about the household response and about the margin between producer and consumer prices.

At the national level, an 81 percent increase in both consumer and producer prices of maize increases poverty by 0.6 percentage points in the short run, that is, from 24.4 percent to 25.0 percent. If we assume a fixed marketing margin so that producer prices rise more than consumer prices, the higher maize price actually reduces poverty by 1.2 percentage points. This is because the producer price increases (and hence the gains to producers) are twice as large. In the long run, the effects are more positive or less negative as households adapt to the price increases. For example, if producer prices rise more than consumer prices, the poverty rate falls by 2.1 percentage points in the long run.

Urban household lose in both the short and long run from higher maize prices, but the average losses are smaller in the long run. Rural households lose in the base simulation (no household response, equal percent increase in producer and consumer prices), but they gain in the long run and if producer prices rise more than consumer prices (see Table 4.2).

As mentioned above, female-headed households are more vulnerable to increases in maize prices than their male-headed counterparts. Poverty among female-headed households rises in three of the four simulations, while poverty among male-headed households falls in three of the four simulations. As noted above, female-headed households are less likely to grow and sell maize than male-headed households. However, it should be noted that female-headed households have a lower poverty rate (18 percent) than male-headed households (36 percent).

Not surprisingly, maize farmers gain from higher prices under all four alternative assumptions, with the decline in poverty ranging from 0.3 percentage points to 6.0 percentage points. In contrast, the poverty rate rises by 0.9 to 1.3 percentage points among other households, depending on the assumptions. It is worth noting that maize farmers are poorer than other households, but their poverty rate (36 percent) is similar to that of rural households in general (35 percent) (see Table 4.2).

Table 4.2—Impact on poverty in Ghana of maize price increases of 2007–08

	Initial poverty rate (percent)	Short-term change in poverty rate		Long-term change in poverty rate	
		81% increase in producer and retail maize price (pct point change)	81% increase in retail price, 162% increase in producer price (pct point change)	81% increase in producer and retail maize price (pct point change)	81% increase in retail price, 162% increase in producer price (pct point change)
Urban	10	0.5	0.1	0.3	0.0
Rural	35	0.7	-2.2	-0.2	-3.6
Male headed	36	0.3	-1.9	-0.4	-2.9
Female headed	16	1.3	0.5	0.9	0.0
Maize farmers	27	-0.3	-4.3	-1.5	-6.0
Others	18	1.3	1.1	1.2	0.9
Western	17	1.0	0.0	0.5	-0.4
Central	17	-0.3	-1.9	-0.6	-2.2
Greater Accra	7	0.5	0.5	0.4	0.3
Volta	31	3.6	0.4	2.0	-2.2
Eastern	15	0.8	-1.1	0.4	-1.8
Ashanti	19	-0.6	-1.8	-1.0	-2.4
Brong Ahafo	29	0.3	-1.6	-0.1	-2.8
Northern	54	-0.4	-6.4	-2.0	-8.4
Upper East	73	3.1	1.9	3.1	1.3
Upper West	89	1.9	-1.0	1.1	-1.7
Poorest	100	-0.9	-3.9	-1.3	-6.4
2nd quintile	24	3.6	-2.4	1.3	-4.1
3rd quintile	0	0.2	0.2	0.1	0.1
4th quintile	0	0.0	0.0	0.0	0.0
Richest	0	0.0	0.0	0.0	0.0
No farm	9	0.9	0.8	0.9	0.7
0.01-0.5 ha	26	1.4	-0.3	0.7	-1.4
0.5 - 2.0 ha	38	0.7	-1.8	0.1	-2.8
2.0 - 5.0 ha	41	-0.8	-5.1	-1.8	-7.4
Over 5 ha	41	-0.7	-5.4	-2.6	-6.6
Ghana	24	0.6	-1.2	0.0	-2.1

Source: Author's analysis of the 2005/06 GLSS data.

Note: Short-term impact assumes no response to new prices by households. Long-term impact assumes response.

The poverty impact is quite varied across regions. In the base simulation (short term, equal percent increase in consumer and producer prices), the poverty rate increases by more than 3 percentage points in Volta and the Upper East region, both of which have highly negative NBRs. On the other hand, the higher prices cause poverty to decline slightly (by less than a percentage point) in the Ashanti, Central, and Northern regions. Overall, poverty increases in 7 of the 10 regions. If we assume a fixed marketing margin, however, then poverty declines in most of the regions. In simulation 4 (long term, producer prices rising more than consumer prices), poverty declines by a full 8 percentage points in the Northern region, one of the poorest regions. On the other hand, higher maize prices increase poverty in the Upper East, an even poorer region.

Looking at the impact by expenditure quintile, we know from Table 4.1 that the poor are net buyers of maize, so it is not surprising that the second and third quintiles experience higher poverty in the base simulation. Since the poverty rate in the poorest quintile is already 100 percent, it cannot increase any further, but a few net sellers escape poverty with the higher maize prices. In fact, if producer prices rise more than consumer prices and households are able to respond to the higher prices (simulation 4), 6 percent of the poorest quintile escape poverty. The higher prices have no effect on the poverty rate among the top two quintiles because households in these categories are too far above the poverty line (see Table 4.2).

Finally, we examine the impact on households grouped by farm size. It is interesting to note that the poverty rate is higher among farmers with more than 2 hectares compared with those who have less than 2 hectares. This is because households with larger farms are concentrated in the north and other areas where the agricultural potential is low. The poverty rate among nonfarmers, who are net buyers, rises in all simulations, but because their initial poverty rate is low (9 percent), few households are pushed into poverty. Across all simulations, small farmers lose more (or gain less) than large farmers because they are more likely to be net buyers of maize. In the base simulation, farmers with less than 2 hectares lose, while those with more than 2 hectares gain from the higher maize prices. If producer prices rise more than consumer prices, all farm categories gain, but large farmers more so. In simulation 4, the poverty rate among farmers with more than 2 hectares falls by around 7 percentage points.

Welfare Impact of Higher Rice Prices

The net position in rice for different types of households in Ghana is shown in Table 4.3. In contrast to maize, which is grown by many households (41 percent) throughout Ghana as a subsistence crop, rice is grown by a relatively small number of households (5 percent) concentrated in the north, many of whom grow it as a commercial crop. Among rice farmers, rice accounts for 11 percent of income but rice consumption is just 6 percent of total consumption. Furthermore, 61 percent of rice farmers are net sellers, compared with just 51 percent for maize.

For both urban and rural households, rice consumption is equivalent to about 3 percent of income, so the urban NBR is -0.03 and the rural NBR is -0.02. Although rice is less important than maize in terms of both income and consumption, an increase in rice prices has a more negative impact on households than a similar increase in maize prices because the average “deficit” in rice is larger. Just 4 percent of rural households and 1 percent of urban households are net sellers and thus would benefit from higher rice prices.

The regional breakdown shows that rice production is concentrated in the three northern regions: Northern, Upper West, and Upper East. In these three regions, net rice sellers represent 10–20 percent of the households, compared with 0–3 percent in the other regions. The share of income from rice is also higher in these three regions, 2–4 percent compared with 0–1 percent in the other regions. Nonetheless, even in these three regions, the NBR is slightly negative (-0.01), suggesting that the negative effect of higher rice prices on consumers in these regions slightly outweighs the positive effect on rice growers. The NBR is more negative in the other regions of the country, ranging from -0.02 to -0.04 (see Table 4.3).

Commercial rice farmers are mostly found in the poorest income categories. Among the poorest quintile of households in Ghana, net sellers of rice are 9 percent of the total, compared with 1–3 percent in other quintiles. Nonetheless, because most of the households in the poorest quintile (60 percent) are net buyers, the NBR in rice for this group is negative, implying that they lose from higher rice prices, on average. The NBR does not seem to vary in a consistent way across income categories, which indicates that all income groups are hurt to roughly the same degree by higher rice prices.

Table 4.3—Net position in rice of different types of households in Ghana

Category of household	Percent of all households	Production ratio	Consumption ratio	Net benefit ratio	Net sellers	Self sufficient	Net buyers
		(fraction of income)			(% of households in category)		
Urban	43	0.00	0.03	-0.03	1	19	80
Rural	57	0.01	0.03	-0.02	4	20	75
Male headed	71	0.01	0.03	-0.02	4	22	74
Female headed	29	0.00	0.03	-0.03	1	15	84
Rice growers	5	0.11	0.06	0.05	61	15	24
Others	95	0.00	0.03	-0.03	0	20	80
Western	10	0.00	0.04	-0.04	1	10	89
Central	10	0.00	0.03	-0.03	0	13	87
Greater Accra	17	0.00	0.02	-0.02	2	23	75
Volta	8	0.00	0.03	-0.02	1	19	80
Eastern	14	0.00	0.03	-0.03	1	18	81
Ashanti	17	0.00	0.03	-0.03	1	16	82
Brong Ahafo	9	0.01	0.03	-0.02	3	21	76
Northern	9	0.02	0.03	-0.01	10	31	59
Upper East	4	0.04	0.05	-0.01	20	24	55
Upper West	2	0.02	0.03	-0.01	10	57	34
Poorest quintile	20	0.01	0.03	-0.02	9	31	60
2nd quintile	20	0.01	0.03	-0.03	3	17	80
3rd quintile	20	0.00	0.03	-0.03	2	16	82
4th quintile	20	0.00	0.03	-0.03	1	16	83
Richest quintile	20	0.00	0.03	-0.02	1	19	81
No farm	41	0.00	0.03	-0.03	1	21	78
0.01 - 0.5 ha	19	0.00	0.03	-0.03	2	14	84
0.5 - 2.0 ha	17	0.01	0.03	-0.02	4	20	77
2 - 5 ha	15	0.01	0.03	-0.02	5	22	73
More than 5 ha	8	0.01	0.03	-0.02	8	24	67
Ghana	100	0.00	0.03	-0.02	3	20	77

Source: Authors' analysis of the 2005/06 GLSS data.

The impact of higher rice prices on the poverty rate among different types of households in Ghana is shown in Table 4.4. The retail price of rice in Accra increased by almost 36 percent between June 2007 and June 2008. In the first and third simulations, we assume that both producer and consumer rice prices rise by 36 percent. In the second and fourth, we assume that the producer rice price rises by twice as much as the consumer rice price (71 percent).

We can draw three general conclusions from these results. First, higher rice prices lead to higher poverty. Almost all household types experience higher poverty rates as a result of higher rice prices, regardless of the assumptions used. Urban, rural, male- and female-headed, households in all 10 regions, and those in all 5 expenditure categories all lose from higher rice prices on average. The only groups for which a higher price of rice leads to lower poverty rates are rice farmers and farmers with more than 5

hectares of land. The poverty rate among rice farmers, which is quite high initially (70 percent), declines by between 1.4 and 2.5 percentage points, depending on the assumptions adopted.

The second conclusion is that the impact of rice price increases on poverty are relatively small. Only in two cases does the poverty rate rise more than a percentage point: in the Western region and in the second quintile. The Western region has the most negative NBR for rice, a result of high rice consumption and the negligible rice production in this region. The effect on the poverty rate for the second quintile is simply due to the fact that it has a large number of households near the poverty line.

Table 4.4—Impact on poverty in Ghana of rice price increases of 2007–08

	Initial poverty rate (percent)	Short-term change in poverty rate		Long-term change in poverty rate	
		36% increase in producer and retail rice price (pct point change)	36% increase in retail price, 71% increase in producer price (pct point change)	36% increase in producer and retail rice price (pct point change)	36% increase in retail price, 71% increase in producer price (pct point change)
Urban	10	0.3	0.3	0.3	0.3
Rural	35	0.5	0.4	0.5	0.4
Male headed	70	0.4	0.4	0.4	0.3
Female headed	22	0.5	0.5	0.5	0.5
Rice farmers	27	-1.4	-2.3	-1.5	-2.4
Others	18	0.5	0.5	0.5	0.5
Western	17	1.2	1.2	1.2	1.2
Central	17	0.6	0.6	0.6	0.6
Greater Accra	7	0.0	0.0	0.0	0.0
Volta	31	0.2	0.2	0.2	0.2
Eastern	15	0.2	0.2	0.2	0.2
Ashanti	19	0.6	0.6	0.6	0.6
Brong Ahafo	29	0.6	0.5	0.5	0.3
Northern	54	0.3	0.1	0.3	0.1
Upper East	73	0.2	0.0	0.2	0.0
Upper West	89	0.6	0.6	0.6	0.6
Poorest	100	0.0	0.0	0.0	0.0
2nd quintile	24	2.2	2.0	2.1	1.9
3rd quintile	0	0.0	0.0	0.0	0.0
4th quintile	0	0.0	0.0	0.0	0.0
Richest	0	0.0	0.0	0.0	0.0
No farm	9	0.2	0.2	0.2	0.2
0.01-0.5 ha	26	0.9	0.9	0.8	0.8
0.5 - 2.0 ha	38	0.6	0.6	0.6	0.6
2.0 - 5.0 ha	41	0.6	0.4	0.6	0.3
Over 5 ha	41	-0.2	-0.2	-0.2	-0.2
Ghana	24	0.4	0.4	0.4	0.4

Source: Authors' analysis of the 2005/06 GLSS data.

Note: Short-term impact assumes no response to new prices by households. Long-term impact assumes response.

The third conclusion is that the results are not very sensitive to the assumptions used. Short- and long-term simulations give similar results, and the impact is not very sensitive to the assumption about the relationship between producer prices and consumer prices. Assuming that the proportional increase in producer prices is twice as large as the proportional increase in consumer prices does, of course, increase the benefits to rice farmers, but they are such a small proportion of the total population (5 percent) that the aggregate effect is negligible.

Welfare Impact of Higher Food Prices

The net position in food for different types of households in Ghana is shown in Table 4.5. About 21 percent of the households in Ghana are net food sellers, while 79 percent are net buyers. This is not surprising given that food sales tend to be in unprocessed food crops, while food purchases include many processed and semi-processed food products. The net buyers pay for their purchases with the sale of cocoa and other nonfood crops, wage income, and nonfarm self-employment, among others. On average, food accounts for 36 percent of household income and food consumption represents 49 percent of the total. Thus, the average NBR is -0.13. This implies that a 10 percent increase in consumer and producer prices of food would reduce real income by 1.3 percent in the short run.

Table 4.5—Net position in food of different types of households in Ghana

Category of household	Percent of all households	Production ratio	Consumption ratio	Net benefit ratio	Net sellers	Self sufficient	Net buyers
		(fraction of income)			(% of households in category)		
Urban	43	0.15	0.42	-0.27	7	0	93
Rural	57	0.53	0.55	-0.03	31	0	68
Male headed	71	0.42	0.50	-0.07	25	0	75
Female headed	29	0.22	0.49	-0.27	12	0	88
Food producer	59	0.62	0.55	0.07	34	0	66
Other households	41	0.00	0.41	-0.41	1	1	98
Western	10	0.38	0.50	-0.12	24	0	75
Central	10	0.36	0.51	-0.15	23	0	77
Greater Accra	17	0.02	0.39	-0.37	3	1	97
Volta	8	0.34	0.54	-0.20	20	0	79
Eastern	14	0.33	0.54	-0.21	20	0	80
Ashanti	17	0.23	0.41	-0.19	18	0	81
Brong Ahafo	9	0.78	0.54	0.24	38	0	62
Northern	9	0.72	0.60	0.13	39	0	60
Upper East	4	0.51	0.61	-0.10	16	0	84
Upper West	2	0.87	0.61	0.25	28	0	71
Poorest quintile	20	0.61	0.55	0.06	36	0	63
2nd quintile	20	0.50	0.52	-0.03	26	0	74
3rd quintile	20	0.35	0.50	-0.15	20	0	80
4th quintile	20	0.23	0.47	-0.24	14	0	86
Richest quintile	20	0.14	0.43	-0.29	9	0	91
No farm	41	0.01	0.42	-0.41	2	1	98
0.01 - 0.5 ha	19	0.40	0.54	-0.14	23	0	77
0.5 - 2.0 ha	17	0.50	0.55	-0.05	26	0	73
2 - 5 ha	15	0.82	0.56	0.26	44	0	56
More than 5 ha	8	0.98	0.55	0.43	63	0	37
Ghana	100	0.36	0.49	-0.13	21	0	79

Source: Authors' analysis of the 2005/06 GLSS data.

The impact of higher food prices is more adverse in urban areas, where the food NBR of -0.27 means that a 10 percent increase in food prices results in a 2.7 percent reduction in real income in the short run. In rural areas, the food NBR is slightly negative (-0.03), implying a small but negative impact of higher food prices. Even in rural areas, two-thirds of households are net buyers of food.

Female-headed households are much more adversely affected by higher food prices than male-headed households. Although the food share in the budget is similar for the two groups, food production is a smaller share of income for female-headed households than for male-headed households (see Table 4.5).

A majority (59 percent) of Ghanaian households grow food, and among these households food production accounts for 62 percent of their income, but food consumption absorbs most of that, so that net sales are just 7 percent of income. Furthermore, among food growers, barely one-third are net sellers of food. For households that do not grow food (including most urban households), food consumption represents 41 percent of the budget, implying a large negative NBR.

In terms of the regional impact, higher food prices have the most negative impact on Greater Accra, where 97 percent are net buyers of food and a 10 percent increase in food prices would result in a short-term loss of 3.7 percent in welfare, measured in terms of real per capita consumption expenditure. The adverse impact would also be large in Volta and the Eastern region, among others. The only regions that would benefit from higher food prices in the short term are Upper West, Brong Ahafo, and the Northern region. These regions have a relatively high proportion of net sellers of food (28–39 percent), whose gains would outweigh the losses of the net buyers in those regions (see Table 4.5).

Looking at the results by income category, the poorest households gain slightly from higher food prices in the short run, while the highest-income households lose significantly. Although barely one-third of the poorest quintile are net sellers of food, their gains outweigh the losses of the net buyers so that the food NBR for the poorest quintile is positive (0.06), indicating a positive short-term impact from higher prices. As we move to the higher-income quintiles, the NBR turns increasingly negative and the proportion of net sellers of food declines. For the highest-income quintile, the average NBR is -0.29, implying that a 10 percent increase in food prices reduces the real income of this group by 2.9 percent.

Finally, there is a strong relationship between farm size and the impact of higher food prices. The proportion of net sellers of food rises from 2 percent among the nonfarmers to 23 percent among the smallest farmers to 63 percent among those with more than 5 hectares. Similarly, the NBR is -0.41 for nonfarmers but rises to 0.43 among those with farms of more than 5 hectares. It should be noted that 41 percent of the households in Ghana have no farm (mostly urban households), while only 8 percent have more than 5 hectares (see Table 4.5).

The impact of higher food prices on the poverty rate for different types of households in Ghana is shown in Table 4.6. Between June 2007 and June 2008, the food consumer price index in Ghana increased by 18 percent. The first and third simulations assume that the producer prices of food increased in the same proportion. In contrast, the second and fourth simulations assume that producer prices rose twice as much as consumer prices (36 percent), based on the assumption of a marketing margin fixed in absolute terms and the assumption that producer prices are half of consumer prices. As above, the first two simulations give the short-run impact, before households can respond to the higher prices, while the second pair give the long-run impact, assuming that households respond both as consumers and as producers.

In the short run, an 18 percent increase in both producer and consumer food prices increases national poverty by 0.9 percentage points, that is, from 24.4 percent to 25.3 percent. Although the long-run impact on poverty is similar, the results are quite different if we assume that consumer food prices rise by 18 percent and producer food prices increase by 36 percent. In this case, the national poverty rate actually declines by about 2 percentage points.

Table 4.6—Impact on poverty in Ghana of food price increases of 2007–08

	Initial poverty rate (percent)	Short-term change in poverty rate		Long-term change in poverty rate	
		18% increase in producer and retail food prices (pct point change)	18% increase in retail price, 36% increase in producer price (pct point change)	18% increase in producer and retail food prices (pct point change)	18% increase in retail price, 36% increase in producer price (pct point change)
Urban	10	1.1	0.6	1.0	0.5
Rural	35	0.7	-3.6	0.3	-4.0
Male headed	35	0.3	-2.7	0.1	-3.0
Female headed	9	2.1	0.3	1.8	0.0
Food producer	27	0.2	-4.3	-0.2	-4.7
Others	18	1.8	1.8	1.7	1.7
Western	17	1.4	-1.8	0.9	-2.2
Central	17	0.8	-1.8	0.2	-2.2
Greater Accra	7	1.1	0.6	1.1	0.6
Volta	31	2.1	-1.5	1.7	-2.1
Eastern	15	1.6	-0.1	1.6	-0.5
Ashanti	19	1.2	-1.1	1.0	-1.4
Brong Ahafo	29	-0.5	-5.1	-1.3	-5.5
Northern	54	-1.5	-7.0	-1.8	-7.1
Upper East	73	1.2	-1.3	1.2	-1.6
Upper West	89	-0.5	-4.1	-0.7	-4.4
Poorest	100	-2.1	-6.7	-2.4	-7.2
2nd quintile	24	6.4	-2.3	5.3	-3.4
3rd quintile	0	0.0	0.0	0.0	0.0
4th quintile	0	0.0	0.0	0.0	0.0
Richest	0	0.0	0.0	0.0	0.0
No farm	9	1.7	1.7	1.7	1.6
0.01-0.5 ha	26	1.9	-1.2	1.4	-1.9
0.5 - 2.0 ha	38	1.1	-2.8	0.8	-3.3
2.0 - 5.0 ha	41	-0.6	-6.6	-1.2	-6.8
Over 5 ha	41	-4.2	-10.5	-4.3	-10.7
Ghana	24	0.9	-1.8	0.6	-2.1

Source: Authors' analysis of the 2005/06 GLSS data.

Note: Short-term impact assumes no response to new prices by households. Long-term impact assumes response.

The results differ between urban and rural households. In urban areas, higher food prices increase poverty by 0.5 to 1.1 percentage points across all four simulations. In rural areas, greater food price increases raise poverty slightly if we assume that producer and consumer prices rise proportionally. However, if we assume that producer prices rise more than consumer prices, rural poverty declines by about 4 percentage points, that is, from 35 percent to 31 percent (see Table 4.6).

The simulations indicate that female-headed households are more vulnerable than male-headed households to increases in food prices. In the short run and with proportional increases in all food prices, the poverty rate among female-headed households rises by 2.1 percentage points, compared with just 0.3 percentage points among male-headed households. In the other simulations, the outcome is more positive for both, but male-headed households gain more (or lose less) than female-headed households. As noted above, however, female-headed households have a lower poverty rate (18 percent) than male-headed households (36 percent).

Food producers include most of the rural households and even some urban households. If producer and consumer prices both rise by 18 percent, the effect is close to zero because these households grow and consume similar quantities. If producer prices rise more than consumer prices, however, then the poverty rate falls by more than 4 percentage points, that is, from 35 percent to 30–31 percent. Households that don't produce food lose in all four simulations, with poverty rising by close to 2 percentage points (see Table 4.6).

The regions that are least negatively affected by higher food prices are the Northern, Brong Ahafo, and Upper West regions. These are the only regions with a positive NBR for food (see Table 4.5) and where poverty declines in the base simulation. The Volta, Eastern, and Western regions are the most adversely affected by the higher food prices. If producer prices rise more than consumer prices, the differences across regions are similar, but the overall impact is more positive. In this case, poverty declines in 9 of the 10 regions, the exception being Greater Accra. The positive impact is particularly notable in the Northern region, where poverty declines by 7 percentage points.

The impact of higher food prices varies widely across expenditure quintiles. The poorest quintile consists of 100 percent poor households, so the rate cannot increase. Some net sellers from this group gain from higher prices, so the poverty rate declines by 2–7 percentage points. The second quintile contains a large number of households near the poverty line. If the producer and consumer food prices both increase by 18 percent, the poverty rate increases by 5–6 percentage points because these households are net buyers of food. If the producer prices of food rise more than consumer prices, the poverty rate in this quintile declines by 2–3 percentage points. Higher food prices have no effect on the poverty rate among the households in the third, fourth, and fifth quintiles; any adverse effects on net buying households is not enough to push them below the poverty line (see Table 4.6).

Examining the impact by farm size category, nonfarmers lose from higher prices in all simulations. The poverty rate increases by about 1.7 percentage points in three of the four simulations, implying an increase in poverty from 9.0 percent to 10.7 percent. Among farmers, only those with more than 2 hectares gain if producer and consumer prices rise by the same proportion. If producer prices rise more than consumer prices, all farmer categories experience a reduction in poverty, though the effect is greatest for the larger farmers.

As expected, the impact of higher food prices is somewhat more positive in the long-run simulation, which allows farmers and consumers to respond to the new prices. However, the effect is fairly modest. In aggregate, higher food prices raise the poverty rate by 0.9 percent in the short run and 0.6 percent in the long run.

Finally, the results are fairly sensitive to the assumptions about the relationship between producer and consumer prices. If we assume that the margin between them is fixed, so that producer prices rise twice as much, in percentage terms, as consumer prices, then higher food prices cause the poverty rate to fall by 1.8 percentage points rather than increasing by 0.9 percentage points in the short run. In other words, the sign of the effect of food prices on the poverty rate depends on this assumption.

5. SUMMARY AND CONCLUSIONS

Effect of Higher Food Prices on Household Welfare in Ghana

This study uses household survey data from Ghana to examine the distributional effects of higher prices of maize, rice, and food in general. On average, maize accounts for 6 percent of expenditure and 5 percent of income in Ghana. This implies that the short-run effect of higher maize prices is slightly negative for households in Ghana. Retail maize prices rose by 81 percent over 2007–08. Our analysis indicates that an 81 percent increase in producer and consumer maize prices raises the poverty rate by 0.6 percentage points in the short run. This relatively small impact reflects the fact that the decrease in poverty among surplus maize farmers is roughly equal to the increase in poverty among net buyers of maize. The adverse effect on income and poverty is greatest for households in the Upper East, Upper West, and Volta regions; urban households; female-headed households; poor households; and those with small farms. Among these groups, the poverty rate rises by 0.1 to 3.6 percentage points in the base simulation. On the other hand, some groups actually benefit (on average) from higher maize prices, including maize farmers; farmers with more than 2 hectares of land; and those in the Central, Ashanti, and Northern regions.

In Ghana, rice is less important than maize in several ways. Rice accounts for 3 percent of consumption, compared with 6 percent for maize. The value of rice production is less than 1 percent of household income, compared with 5 percent for maize. Rice is grown by just 5 percent of Ghanaian households, compared with 41 percent who grow maize. In spite of this, the adverse impact of a given price increase is greater for rice than for maize because the average net benefit ratio (NBR) is more negative. This is a reflection of the fact that Ghana is essentially self-sufficient in maize but is a net importer of rice. It suggests that the aggregate gains to rice farmers from higher rice prices are significantly less than the costs to rice consumers. This is partly because the number of rice farmers is much smaller than the number of rice consumers, so the total gains to rice farmers from higher rice prices are significantly less than the total costs to rice consumers.

Retail prices of rice rose by 36 percent over 2007–08. Simulations of the rice price increase confirm that rice farmers benefit from a rise in price, but almost every other group (defined by location, sex of household head, region, expenditure quintile, or farm size) is negatively affected by higher rice prices. Although rice farmers are quite poor (70 percent are poor, compared with 35 percent of all rural households), so are many rice consumers (particularly in rural areas), so the net effect of higher rice prices is to increase poverty somewhat. The higher rice price raises the national poverty rate by 0.4 percentage points; for almost all groups, the increase in poverty is less than 1 percentage point. The same percent increase in rice price would have a more adverse effect than in maize price, but the rice price increase over 2007–08 was smaller (36 percent) than the maize price increase (81 percent) over that period.

Food production represents 36 percent of household income, while food consumption accounts for 49 percent of household expenditure. This means that the NBR is -0.13, implying that increases in producer and consumer prices would adversely affect household income in the short run. The adverse effect is greatest for urban households, female-headed households, households in Greater Accra, richer households, and those with small farms. A few groups would gain from higher food prices: food growers; households in the Brong Ahafo, Northern, and Upper West regions; and households with more than 2 hectares of land. Over 2007–08, the consumer food price index rose by 18 percent. If producer prices rose in the same proportion, national poverty would increase by about 1 percentage point.

Sensitivity of Results to Alternative Assumptions

The results summarized above are based on short-run simulations and assume that producer and consumer prices rise in the same proportion. We also explore the sensitivity of these results to alternative assumptions. We simulate the long-run impact of price increases by taking into account producer and consumer responses to higher prices. The short- and long-run impact of higher maize prices are fairly

similar, though the latter are more positive because they take into account household responses to the higher prices. Compared with the short-run impact, the long-run impact reduces the increase in poverty by less than 1 percentage point. In the long run, some consumers would respond to the higher prices by switching to root crops and other staples, while farmers would take advantage of higher maize prices by expanding production. In both cases, they would be somewhat better off in the long run than in the short run.

On the other hand, the results are quite sensitive to the assumption about the marketing margin, at least in the case of maize and overall food prices. If we assume a fixed marketing margin, producer prices rise more than consumer prices, and the impact of higher prices is significantly more positive. In the maize and food simulations, this assumption is enough to reverse the sign of the impact. In other words, with producer and consumer prices rising by the same proportion, the price increase results in a higher poverty rate, while assuming a fixed marketing margin means that higher prices lead to lower poverty.

Conclusions

The results presented in this study confirm our intuitive expectation that high food prices have significant effects on the well-being of households in SSA. Furthermore, the results agree with those of previous studies that higher food prices generally have an adverse effect on poverty in the region. However, the impact of higher food prices is more complex and varied than expected. Here we highlight five conclusions that can be drawn from the results.

First, the *average* effect of food price increases on households in Ghana is relatively small. For example, the 81 percent increase in maize prices that occurred over 2007–08 is estimated to have increased the incidence of poverty by less than 1 percentage point. Similarly, the 18 percent increase in food prices in general is estimated to have increased the poverty rate by about 1 percentage point. The explanation is that the negative effects on urban households and net buyers in rural areas is largely offset by the positive effects on net selling households.

Second, nonetheless, the impact on specific types of households can be relatively large. For example, the short-term effect of the higher food prices, assuming a fixed marketing margin, is to reduce poverty by 1.8 percentage points. However, the poverty rate falls by 7 percentage points among households in the Northern region and 10.5 percentage points among farmers with more than 5 hectares.

Third, the number of net sellers of each staple commodity is relatively small, even among rural households. For example, only 31 percent of rural households in Ghana are net sellers of maize, and only 4 percent of rural households are net sellers of rice. Furthermore, net sellers are much more common among the larger farmers. Among households with more than 5 hectares of farmland, 41 percent are net sellers of maize and 8 percent are net sellers of rice. This suggests that a policy of supporting commodity prices will disproportionately benefit larger farmers.

Fourth, the impact of a given food price increase on poverty is not necessarily proportional to its importance in the local economy. For example, maize is more important than rice in Ghana, whether measured by its caloric contribution to the diet or by the proportion of farmers who depend on it as a source of income. Nonetheless, household welfare and poverty are more sensitive to an increase in rice prices than to a similar increase in maize prices. This is because Ghana is almost self-sufficient in maize, so that the gains to producers from maize price increases largely offset the losses to consumers. In contrast, Ghana is a deficit rice producer, so the gains to farmers from a rice price increase are not sufficient to offset the losses to consumers.

Fifth, Ghana imposes an import tariff on rice in order to reduce import dependency, stimulate domestic production, and reduce poverty. Although the tariff may well achieve the first two objectives, the results of our analysis indicate that it is not likely to reduce poverty. Our analysis indicates that higher rice prices do reduce poverty among rice growers, and rice growers are considerably poorer than other rural households. However, just 5 percent of all households grow rice, and only 3 percent are net sellers of rice. Even in the Upper East region, which has the highest proportion of net rice sellers (20 percent), the number of net buyers of rice is greater (55 percent). At the national level, three-quarters of all rural

households are net buyers of rice. As a result, the benefits of rice import tariffs in terms of reducing poverty among rice farmers are more than offset by the negative effects of higher rice prices on urban households and net buying rural households. Overall, higher rice prices result in somewhat higher rates of poverty at the national level.

The analysis of rice prices assumes that domestic and imported rice are perfect substitutes and that rice prices are spatially integrated. Cudjoe, Breisinger, and Diao (2008) showed that rice markets in Ghana are relatively well integrated, but not perfectly. To the extent that local and imported rice are imperfect substitutes or that rice prices are imperfectly transmitted throughout the country, the argument for a rice tariff is even weaker. Under these conditions, a rice tariff would raise the price of imported rice, hurting consumers, but have a smaller effect in raising producer prices faced by rice farmers in the Upper East and elsewhere. In other words, the offsetting benefits of the rice tariff would be weaker in the case of imperfect substitution or poor market integration.

In addition, this study has some methodological implications for the analysis of food price changes in developing countries. First, most studies of this type examine only the short-term impact of higher food prices, before producers and consumers have time to adjust to the price change. In this study, we extend the analysis to include estimates of the long-term impact as well. As expected, the long-term impact of food price changes is more positive (or less negative) than the short-term impact. However, the difference between the two is relatively modest. This suggests that the short-term estimates are a reasonably good approximation of the impact in the medium and long term, at least for staple food crops, for which supply and demand are presumed to be relatively inelastic.

Second, many studies of this type assume that producer and consumer prices of food rise in the same proportion, implicitly assuming that the marketing margin is a fixed proportion of producer and consumer prices. In this study, we also explore the sensitivity of the results to an alternative assumption that the marketing margin is fixed in absolute terms. This implies that the percent change in consumer prices is smaller than the percent change in producer prices. This alternative assumption yields welfare effects that are more positive (or less negative) than the standard assumption. The empirical results of this study suggest that the difference can be significant, confirming the findings of Dawe and Maltsoglou (2009). In the case of an 18 percent increase in food prices, the standard assumption (proportional margins) predicts an increase in poverty of about 1 percentage point on average, while the alternative assumption (fixed margins) predicts a reduction in poverty of about 2 percentage points on average. This finding indicates that in order to improve our estimates of the effect of food price changes on household welfare, it would be useful to invest more effort in understanding the behavior of marketing margins during price spikes and in building separate producer and consumer price changes into the calculations. Although the Deaton (1989) model has proven to be a powerful tool in simulating the impact of price changes on households, it may be time to drop some of the simplifying assumptions that are built into this approach.

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