POVERTY IMPACT OF THE FOOD CRISIS ON POVERTY IN CAMBODIA

VU, LINH HOANG

Vietnam Japan University, VNU

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Linh Hoang Vu

Vietnam Japan University, VNU

Email: vhlinh76@gmail.com

ABSTRACT

This paper has examined the impacts of recent food price increases, especially cereal price increases, on Cambodian households. A large percentage of Cambodian households are net food consumers even in rural areas, where 80 percent are net food consumers and 61 percent are net cereal consumers. These households will have lower levels of welfare from increases in food prices.

Estimates based on household survey data indicates that, when food prices increase uniformly by 10 percent, the welfare of the average household (as measured by consumption expenditure) falls by 2.3 percent and the national poverty rate rises by 1.4 percentage points. When cereal prices increase (uniformly) by 10 percent, the average household's welfare increases by 0.67 percent and national poverty rate falls by 0.34 percentage points. Using actual price changes that occurred in 2008, this paper finds that, holding all else constant, those price increases reduced average household welfare by 0.89 percentage points. In addition, those price increases raised the poverty headcount rate by 3.2 percentage points. On the other hand, holding other prices constant, the actual increases in cereal price alone raised average household welfare by 3.7 percent in 2008, and reduced the poverty headcount rate by 0.2 percentage points during the same period. Thus, it is the increases in prices of *non-cereal* foods that led to major negative impacts on household welfare and poverty in Cambodia. This is the case because most of Cambodians are net consumers of non-cereal foods.

1. Introduction

Cambodia faced an increase in the rate of inflation in 2008. The inflation rate was 19.7 percent in 2008, the highest since 1995. Food price hikes account for most of this increase in inflation. The inflation rate for food increased from 10 percent in 2007 to 33 percent in 2008, accounting for 73 percent of the inflation rate in 2007 and 72 percent in 2008. Of particular concern are the increases in the prices of rice and more generally, of cereal. In Phnom Penh, rice prices increased by 70 percent, and cereal prices by 56 percent in 2008, according to data from National Institute of Statistics.

While prices have recently declined somewhat, they are expected to remain high in the near future. Cambodia is highly vulnerable to food price increases and similar shocks, particularly in rural areas, due to its low income, which results in a large proportion of poor, food- insecure households. Cambodia's National Institute of Statistics (NIS) estimates that 23 percent of Cambodia's population was undernourished or food deprived in 2004. Higher levels of food insecurity were observed in rural areas (24 percent), and in the lowest income quintile (69 percent) than in urban areas (22 percent) and in the highest income quintile (0 percent) (NIS 2007). An average Cambodian household spent 64 percent of its total consumption expenditure on food in 2007, which implies that Cambodian households are highly vulnerable to food price increases. The poor are particularly vulnerable to food price increases as 73 percent of total expenditure among the lowest quintile is spent on food (Knowles 2008).

An important policy issue for Cambodia is the impact of the recent food price crisis on household welfare and poverty in Cambodia. The impact of higher food prices on welfare is strongly influenced by the patterns of household incomes and expenditures. Net food sellers (households that sell more food than they buy) will benefit if their selling prices are higher, while net food consumers (households who buy more food than they sell) will lose. In addition, higher food prices may induce consumers to shift their food consumption to cheaper food sources and consume less-balanced diets, resulting in long-run health risks and lowering their nutrition status.

Of particularly concern is the impact of food prices on poverty. The effect of increased food prices on poverty is determined by the location of net buyers and net sellers of food in the distribution of income, which may be very different in rural and urban areas. The existing literature has found mixed results. Ivanic and Martin (2008) examine the impacts of higher prices of staple foods on poverty in nine low-income countries. They show that increased food prices will lead to poverty increases in most of their surveyed countries. Deaton (1989) used non parametric techniques to study the effect of a hypothetical change in rice prices on the distribution of income in Thailand. He found that higher rice prices benefit rural households at

all levels of income, especially middle- income rural households. Ravallion and Van de Walle (1991) estimated the impact on poverty of food price increases in Indonesia. They found that a 10 percent increase in the price of food increased the rate of poverty. Vu and Glewwe (2008) studied the impact of rising food price on poverty in Vietnam and found that a 10 percent increase in the food prices would raise poverty rate, but only slightly. Yet, it would reduce the welfare of 56 percent of Vietnamese households.

In Cambodia, there is little evidence on the impact of food price increases on poverty and welfare. A Computable General Equilibrium (CGE) model for the Cambodian economy has simulated the impact of higher rice prices in the medium term (ODI, 2008). A simulated 26 percent increase in the price of rice results in a 13 percent increase in rice production and more than an 80 percent increase in rice exports. Net rice producers are better off, with incomes rising by nearly 4 percent, while the income of net rice buyers falls by 2 percent. Overall, higher rice prices reduce household spending on other goods and services, depressing GDP by 0.2 percent. In their study of the impact of food prices on poverty in nine developing countries, including Cambodia, Ivanic and Martin (2008) found that a 10 percent increase in the price of food would raise the poverty rate by 0.3 percentage points in Cambodia. A 10-percent increase in the price of rice would raise the poverty rate by 0.5 percentage points.

This paper analyzes the impact of rising food prices on poverty and household welfare in Cambodia, using the 2007 Cambodian Socio-economic Survey (CSES 2007), a national survey of over 3000 households that was conducted in 2007. The structure of the paper is as follows. Section 2 describes the methods used and the data. Section 3 summarizes current levels of poverty and household welfare in Cambodia. Section 4 presents estimates of the impacts of a general increase in the prices of food commodities in general, and of cereals in particular, on Cambodian households' welfare and poverty. The analysis pays particular attention to the impacts of cereal prices, because cereals are the most important food category for Cambodian households. In particular, cereal is consumed in 99.8 percent and produced by 64 percent of all Cambodian households. Section 5 examines the impact of potential financial support on poverty rates as well as the changes in impact depending on the accuracy of targeting. Section 6 concludes the paper.

2. Methods and Data

This section presents the methods used in this paper to estimate the short-term effect of increased food prices on household welfare in Cambodia. In order to assess the impact of changes in food prices on household welfare, one must assess changes in households' expenditure brought about by those food price changes. In this paper, the most important variable for assessing changes in household welfare is a household's *net* food consumption,

which is defined as food production minus food consumption. This implies that the monetary values of household welfare include imputed values of household self-produced consumption as well as food received by barter or as gifts[1].

To assess the impact of changes in food prices on household welfare, this paper uses a simple methodology first used by Deaton (1989). The impact of price changes on household welfare is estimated by the compensating variation, i.e. the amount of money needed to keep the household's utility level equal to its previous level of utility before the increase in food prices. One can use a household profit function to represent a household's production activities, and an indirect utility function to characterize its level of welfare. When food prices increase, the (implicit) profits increase for a household that produces any amount of food. Yet to maintain its previous utility level, the household must also increase its spending on food. The welfare change of the household is calculated as the increase in the household's profits minus the change in expenditure level needed to maintain its previous level of utility in response to a change in food prices. The welfare change can be expressed as a percentage of household real expenditure. This paper considers only the immediate impact of food prices on welfare. Responses from the consumer side, such as switching among food items if their prices do not change at the same rate, and from the producer side, such as increasing production or changes in the prices of supply inputs, are ignored. Although these changes can play an important role, they are relatively complicated and so are beyond the scope of this paper.

Following Deaton (1989), the paper uses the indirect utility function to express household welfare (utility)

$$U_h = \varphi(\omega T + b + \pi; p_c) \tag{1}$$

U_h is the utility of household h, which is a function of (total) income and a vector of prices of all goods purchased p_c; ω is the wage rate, T is the total time available to all household members, b is non-labor income, and π is the household's profit from its agricultural or non-agricultural household business.

The profit (π) in equation (1) is, by standard economic theory, a function of the prices of both the inputs used and the outputs produced by the household's production activities. A standard property of the profit function is that small changes in prices of commodities produced by the household change profits in proportion to the amount sold:

$$\Delta\pi = y_i \Delta p_{pi} \text{ which implies } \Delta\pi/\Delta p_{pi} = y_i \tag{2}$$

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[1] An alternative is assessing welfare change based on net food sales, i.e. food sales minus food purchases. However, there are no existing data on crop sales that permit us to estimate food sales.

where p_{pi} is the producer's price and y_i is the amount of commodity i produced by the household. The expression in equation (2) is the immediate change in profit for a one unit change in the price of the output y_i. The intuition is very simple. If the household is currently producing y kilograms of food i, for example, a one thousand *Riels* (VND) increase in the price of food i will increase that household's profits by y thousand *Riels*[2].

Next, consider what happens to profits from a change in the price of consumed goods.

$$\Delta\pi/\Delta p_{ci} = \Delta\pi/\Delta p_{pi} \times \Delta p_{pi}/\Delta p_{ci} = y_i \Delta p_{pi}/\Delta p_{ci} \qquad (3)$$

The fraction $\Delta p_{pi}/\Delta p_{ci}$ represents the relative change of the producer price to consumer price. Many authors (for example, Deaton 1989) assume that $\Delta p_{pi}/\Delta p_{ci}$ equals to unity. However $\Delta p_{pi}/\Delta p_{ci}$ can differ from unity in certain circumstances, for example if the government uses price controls in the consumer market and/or the producer market. Thus, when examining data from any country, a one-to-one change in consumer and producer prices must be checked, and not simply assumed.

Roy's identity implies that

$$q_i = -(\Delta\varphi/\Delta p_{ci})/(\Delta\varphi/\Delta b) \qquad (4)$$

where q_i is the household's (gross) consumption of commodity i

Making the standard assumption that households maximize their utility yields the following first order condition, which shows the impact of an increase in the consumer price of good i on household utility.

$$\frac{\Delta U_i}{\Delta p_{ci}} = \frac{\Delta\varphi}{\Delta b} \times \frac{\Delta\pi}{\Delta p_{ci}} + \frac{\Delta\varphi}{\Delta p_{ci}} = \frac{\Delta\varphi}{\Delta b}\left(\frac{\Delta\pi}{\Delta p_{ci}} - q_i\right) = \frac{\Delta\varphi}{\Delta b}\frac{(y_i \Delta p_{pi} - q_i \Delta p_{ci})}{\Delta p_{ci}} \qquad (5)$$

where the second equality is obtained using equation (4). Equation (5) implies that, if p_{ci} increases, utility can remain unchanged only if the household has a change in income, denoted by ΔB_i, sufficient to maintain its previous level of welfare (i.e. to keep its utility constant).

Therefore, equation (5) indicates that the change in total expenditure that is needed to maintain the previous level of utility from changes in the prices of n goods:

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[2] In 2008, one U.S. dollar was equal to about 4,000 Riels at the official exchange rate, so in practice in Cambodia, a small change in a price is often considered to be a change of 1000 Riels.

$$\Delta B = \Delta C - \Delta Y = \sum_{i=1}^{n}(q_i \Delta p_{ci} - y_i \Delta p_{pi}) = \sum_{i=1}^{n}(p_{ci} q_i \Delta \ln p_{ci} - p_{pi} y_i \Delta \ln p_{pi}) \quad (6)$$

in which ΔC is the change in expenditure and ΔY the change in production value brought about by changes in food price. The second equality in this expression is very intuitive. For any good i, the amount of money needed to compensate for a change in the consumer price of that good and in the producer price of that good is the difference between the change in the money needed to maintain the initial consumption of that good minus the change in the value of the production of that good. Summing over i goods, we have the equation (6).

And if we represent the change in income (ΔB) as a fraction of household expenditure (X), we have the net welfare change:

$$\Delta \ln B = \sum_{i=1}^{n}\left(w_i \Delta \ln p_{ci} - \left(\frac{p_{pi} y_i}{X}\right)\Delta \ln p_{pi}\right) \quad (7)$$

where w_i is the budget share of commodity i and ($p_{pi}\, y_i\, /X$) is the production of food item i as a fraction of total household expenditures. In our estimation, w_i is the share of purchased values of food item i, excluding consumption from own production. The reason is that the Cambodia's data do not include data of consumption from own production for crops.

Equation (7) is similar to the result in Deaton (1989) but it is more flexible since it allows the change in consumer price to differ from the change in the producer price.

If one wants only to assess the impact of a change in the price of a single good i, for example a change in the price of rice, equation (7) simplifies

$$\Delta \ln B_i = w_i \Delta \ln p_{ci} - \left(\frac{p_{pi} y_i}{X}\right)\Delta \ln p_{pi} \quad (8)$$

To summarize, equations (7) and (8) show the immediate and direct impact of a change in the prices of **all food** and the price of **a single food item**, respectively. In practice, producers may also respond to food price changes by changing food production activities, such as by increasing production of food items whose prices increase and reducing production of items whose prices decline. To calculate the effect of price change on food production, however, one needs to know the (supply) price elasticity of the production of different food crops. A further complication is that food price changes may lead to changes in the prices of agricultural inputs such as fertilizers and agricultural labor, lowering the real income of food producers. For simplicity, the supply-side effect from food price increases is ignored in this paper. Thus, this paper examines only the immediate effect of changes in food prices on household welfare.

Similar analyses have been done by Friedman and Levinsohn (2002), and in Minot and Goletti (2000), Glewwe and Vu (2008), and Vu (2008).

Following Deaton (1989), in addition to the above calculations, this paper applies non-parametric methods to investigate the impact of changes in food price on welfare. As Deaton (1989) argued, non-parametric techniques such as density estimation and locally weighted regression provide intuitively clear graphical descriptions of the impacts of changes in food prices on different groups of households. Non-parametric techniques have also been used in, *inter alia*, Budd (1993) and Barrett and Dorosh (1996).

Based on the calculation of changes in household welfare after food price increases, one can calculate the poverty impacts of food price increases. For simplicity, it is assumed in this paper that the poverty line based on consumption expenditures remains the same after the price hike. This paper looks only at the direct and immediate impacts of food price increases on poverty. Thus, the indirect effects of changes in food prices, such as increasing agricultural wages and the prices of agricultural inputs, are not estimated in this paper[3].

Finally, consider the data used. This paper uses the 2007 Cambodian Socio-Economic Survey (CSES 2007) to assess the impact of changes in food prices on household welfare and poverty rates. The CSES 2007 is a nationally representation household survey with detailed information on household activities and characteristics. It includes 3593 households, of which 2398 are in rural areas and 1195 are in urban areas. Seventy eight percent of these households are engaged in farming activities, including 64 percent who grow cereals, and 63 percent who grow rice.

3. Poverty, Food Consumption and Production in Cambodia

3.1 Poverty and household welfare in Cambodia

The poverty line used in this paper was estimated by staff at the World Bank. It corresponds to the expenditure required to purchase 2,100 calories per person per day, plus an allowance for essential non-food expenditures. This poverty line for Cambodia was first calculated in 1993/94 and has been updated for inflation in 1997, 1999, 2004, and 2007 poverty profiles (Knowles 2008). The updated poverty lines for 2007 is estimated to be 3,092 Riels per capita per day for Phnom Penh, 2,704 for other urban areas and 2,367 for rural areas. Poverty rates are calculated by comparing the estimates of per capita expenditure per day in current Riel for each individual in the sample with the updated poverty lines, assuming equal distribution of expenditure within households.

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[3] In a later version, we would like to include the effect of food prices on poverty by increasing agricultural wages, which was done by Ivanic and Martin (2008).

Table 1 presents estimates of poverty based on these poverty lines for different groups of households using three poverty measures (see Foster, Greer, and Thorbecke 1984). The first index, P0, is the <u>poverty headcount:</u> the percentage of people whose expenditures fall below the poverty line. The second index, P1, is the (normalized) <u>poverty gap</u>, defined as the average gap between a person's per capita consumption expenditure and the poverty line (with a value of zero assigned to all individuals above the poverty line). This shows the average depth of poverty. The third index, P2, is the <u>poverty severity index,</u> which is defined as the average of the squared poverty gap, which gives greater weight to larger poverty gaps.

Table 1 indicates that about 30.1 percent of the population in Cambodia live below the poverty line. The poverty rate is the lowest in Phnom Penh, where only 0.8 percent of the population is poor. In contrast, nearly 35 percent of the population living in rural areas is poor. Thus, poverty in Cambodia is largely a rural phenomenon, as 92 percent of the poor people live in rural areas.

Poverty is much more common among the farmers than among the non-farmers: the headcount poverty rate is 35.9 percent among farmers but only 7.8 percent among non-farmers. The headcount poverty rate among the farmers who grow cereal is 38.2 percent, a little higher than that among the farmers in general, suggesting that on average, cereal growing farmers are poorer than other farmers. The headcount poverty rate among ethnic minorities is 35 percent, somewhat higher than the 30.0 percent rate among the Khmer people.

[Insert Table 1 here]

The last column in Table 1 is the mean of real expenditure per capita for each group. The real expenditure per capita is the total household real expenditure divided by the number of persons in the household. Cambodia's urban population, especially in Phnom Penh, has, on average, a much higher standard of living than its rural population. The average expenditure per capita in Phnom Penh is more than 3.5 times higher than that of the rural areas. The income gap among the quintiles is also remarkable. The mean expenditure per capita of the highest expenditure quintile is 8 times higher than that of the lowest expenditure quintile.

Figure 1 shows the distribution of living standards, as measured by per capita expenditures, separately for households in Phnom Penh, other urban areas and rural areas. The graphs are the density functions of the logarithm of expenditure per capita, estimated by kernel smoothing. As in Deaton (1989), the paper uses the logarithmic transformation of real expenditure per capita because the distribution of real expenditure per capita is strongly

positively skewed. The standard of living in Phnom Penh is, on average, much higher than that in other urban areas and in the rural areas.

[Insert Figure 1 here]

3.2 Food production and consumption in Cambodia

From the 2007 CSES, one can calculate food production and consumption in Cambodia. In the 2007 CSES, households were asked which food items (among 20 items) they consumed in the previous seven days, and the values of those food items. The collected data are then converted into annual food consumption (by multiplying by 52.14) and daily food consumption (by dividing by seven) of the households. On the production side, household food production is defined as the aggregate value of crops (except non-food industrial crops), livestock and fish and seafood produced during the previous 12 months. Net food production for each household is estimated as its food production minus its food consumption.

There are several limitations with the data and the approach used in this paper. First, food consumption data are collected based on a 7-day recall survey while food production is based on annual data. Thus, there might be some measurement errors in estimating net food production. For example, some food items that are not consumed regularly might be under-reported. On the other hand, some food items that are seasonally consumed might be over-reported if the household was interviewed during the season of high consumption . In addition, some households may over-report their consumption of expensive food items such as fish and meat to impress the interviewer. Moreover, the questions on food consumption ask only for the value of consumed food, and not for the consumed quantity[4]. Measurement errors may have been reduced if there had been a question on the quantity of food consumed, which could have been used to check the plausibility of the reported values of food consumed.

There are also some limitations with the production data. Most importantly, there is no question on crop sales, making it impossible to calculate how much of food production each household sells in the market and how much is kept for home use or other purposes (e.g. gifts, payments.) In addition, some sale prices reported by households are clearly out of range,

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[4] More specifically, households are required to remember the quantity of consumed food, then how much of the consumed quantity was purchased, and how much was received as payment in kind or from own production. Then they are asked to "convert" these amounts into values. Thus, it requires a lot of mental calculation on the parts of the interviewees, and may lead to more incorrect answers.

indicating some measurement errors. The outliers in sale prices are adjusted to correct for measurement errors in this paper[5].

Table 2 shows the expenditures for different food items as percentages of total food expenditure. Overall, cereal and fish are the two most popular food items, accounting for 22.4 percent and 20.3 percent of total household food expenditure, respectively. Meat and poultry accounts for 13.5 percent of total household food expenditure while food away from home (FAFH) and prepared food makes up 9.3 percent, and vegetables 8.3 percent, of total household food expenditure. Phnom Penh residents spend more on either fish or meat and poultry than on cereal, while rural households spend more on cereal than on fish, meat and poultry. Phnom Penh residents also spend as much as 17.7 percent of their food budget for FAFH and prepared food. In contrast, rural dwellers spend only 6.1 percent of their food budget for FAFH and prepared food.

[Insert Table 2 here]

Grouped by quintiles, the lower income quintiles spend relatively more on cereals and fish, and less on meat and poultry, dairy products, fruit, drink and FAFH and prepared food than the higher income quintiles. Thus, an increase in the prices of cereals would affect lower income households relatively more. In contrast, an increase in the prices of meat, drink or outside eating will affect higher income households relatively more.

The last row in Table 2 shows expenditure on food as a percentage of total household expenditure. An average Cambodian household spends almost two thirds (62.5 percent) of its expenditure on food, indicating that Cambodian households are highly vulnerable to food price increases. Rural households and lower-income households are particularly likely to be vulnerable. An average rural household spends 65.4 percent of its expenditure on food, while Phnom Penh and other urban households spend 43.0 percent and 57.1 percent, respectively. Households in the poorest quintile spend nearly three fourth (71.3 percent) of their expenditure on food. Thus, an increase in food prices, and especially cereal prices, would strongly affect the consumption choices of poorer households.

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[5] If the price of a single food item in a household is reported than 4 times of the median price of this food item, it is "corrected" by using the median price instead of the reported price.

For the population as a whole, food purchases accounts for 83 percent and home produced food for 17 percent of total food consumption. Urban households rely much more on food purchases (99.6 percent for Phnom Penh and 93.1 percent for other urban households) than rural households (76.4 percent). The households in the poorest quintile depend the least on food purchases (64.2 percent), while those among the richest quintile depend the most (95.5 percent).

Figure 2 shows non-parametric kernel regressions of the percentage of household expenditure spent on food on the logarithm of household expenditure per capita. The slopes in Figure 2 are negative which is consistent with Engel's Law that the food budget declines as living standards increase. For the poorest households in the bottom-expenditure quintile, over 65 percent of household expenditure is devoted to food.

[Insert Figure 2 here]

Turning to the production side, Table 3 shows the prevalence of farming and rice farming in Cambodia. About 70 percent of Cambodian households are engaged in farming, and about 64 percent grow rice. In rural areas, 90 percent of households work in farming activities and 75 percent are rice farmers. Although the farming population in Phnom Penh is very small, accounting for only 3 percent of the population, over a half of the urban population other than Phnom Penh has farming activities.

Turning to the expenditure quintiles, poor people are more likely to be farmers and to be rice farmers. Among the poorest 40 percent of the population, about 95 percent are farmers and 80 percent are rice farmers. In contrast, among the richest 20 percent of the population, only 37 percent are farmers and only 26 percent are rice farmers.

The Khmer are more likely to be farmers and rice farmers than ethnic minority households. The ethnic minorities include relatively well-off ethnic minorities (i.e. the Chinese and the Vietnamese), who live mainly in plain areas, and poorer ethnic minorities such as the Lao and the Cham, who live mainly in hilly and mountainous areas. About 79 percent of the Khmer are farmers and 64 percent are rice farmers, while 72 percent and 54 percent of the ethnic minority households are farmers and rice farmers, respectively.

Poor households are more likely to work in agricultural activities than non-poor households. About 95 percent of the poor are farmers and 82 percent are rice farmers. In contrast, 73 percent and 57 percent of the non-poor are farmers and rice farmers, respectively.

Based on both production and consumption data, Table 4 summarizes annual food production and consumption by different socio-economic groups. The average household in

Cambodia produces 2.1 million Riels worth of food per year and consumes 4.5 million Riels worth of food per year, and thus is a net consumer of 2.4 million Riels (about $600) worth of food per year. Even in rural areas, an average household was a net consumer of 1.4 million Riels worth of food in 2007. In general, higher-expenditure households and non-poor households have higher net food consumption than lower-expenditure and poor households, respectively.

[Insert Table 3 here]

On the other hand, an average household in Cambodia is a net producer of 155 thousand Riels worth of cereals in 2007. In Phnom Penh and other urban areas, an average household is a net consumer of cereal (values of 1,208 and 727 thousand Riels, respectively); while in rural areas, an average rural household is a net producer of 414 thousand Riels worth of cereals. On average, households in all quintiles, except quintile 5, produce more cereal than they consume.

[Insert Table 4 here]

4. Food Price Increases and Poverty Impacts

Since 2007, Cambodia has experienced a rise in food prices. Although the inflation rate in 2007 was not high, at 5.9 percent, food prices increased by 10 percent in 2007, accounting for over 70 percent of the rise in general (food and non-food) price index. In 2008, food prices increased more sharply, by 33 percent, and the inflation rate reached the highest level since 1995 of 19.7 percent. Rice prices increased even more dramatically in 2008, from 1511 Riels/kg in January 2008, to 2,602 Riels/kg in April and 2,874 Riels/kg in August, before falling somewhat to 2,525 Riels/kg in December, 2008.

Figure 3 shows the changes in general consumer price index, food prices, cereal prices and rice prices in 2007 and 2008. During that two-year period, Cambodia's food prices increased by 45 percent, cereal prices by 87 percent, and rice prices doubled. Most of these price increases occurred in 2008.

[Insert Figure 3 here]

In this context, an assessment of the average impact, as well as the distributional impacts, of food prices on poverty and household welfare in Cambodia is needed to help formulate an effective policy response.. Table 5 begins this assessment by providing information on the distribution of net food consumers among all households, as well as mean

net benefit ratios. A household is a net food consumer if the value of its food production is lower than the value of its food consumption. The net benefit ratio is defined as net food (cereal) production (that is, production minus consumption) divided by among total food (cereal) consumption. In the analysis of this paper, due to the unavailability of producer prices, producer prices and consumer prices for food/cereals are assumed to rise at the same rate. Thus, the higher a household's net benefit ratio is, the more that household can gain from an increase in the prices of food. Overall, 82.7 percent of the households in Cambodia are net food consumers and 66.9 percent are net cereal consumers. Thus, an increase in food prices would have negative impacts on the welfare of about 83 percent of Cambodian households. Likewise, an increase in cereal prices would have a negative impact on the welfare of two thirds of Cambodian households. Even in rural areas, an increase in the prices of food (cereals) leads to lower welfare among 80 percent (61 percent) of rural Cambodian households.

[Insert Table 5 here]

The net benefit ratios show that on average, all household groups have worsened welfare if all food prices increase by the same percentage. The average net benefit ratio of food is -0.35, implying that if food prices increase by 10 percent, household food consumption expenditure would decrease, on average, by 3.5 percent in the whole country assuming no reallocation of non-food expenditure to food expenditure. However, the relative impacts of food price increases differ across groups. In Phnom Penh and other urban areas, the impacts are severe, but the impacts are less severe in rural areas. Poor households also suffer less than non-poor households in relative terms: the average net benefit ratio of food is -0.45 for non-poor households, but only -0.06 for poor households.

In sharp contrast to the food benefit ratio, the average *cereal* net benefit ratio for the whole country is positive, at 0.51 percent, indicating a rise in average household welfare when cereal prices increase. On average, the value of this benefit equals 5.1 percent of expenditure on cereal in response to an increase of 10 percent in cereal prices. Yet, the average household in Phnom Penh and in other urban areas would experience a reduction in welfare when cereal prices increase. The poor would gain relatively more than the non-poor: a 10-percent increase in cereal prices lead to an increase of 11.7 percent in average cereal expenditure of poor household and 2.6 percent of non-poor households.

To estimate the impacts of food price increases and cereal price increases on household welfare and poverty, this paper assumes the following scenarios:

(1a) Food prices increase by 10 percent.

(1b) Food prices increase as in 2008. More specifically, it is assumed that cereal price increased by 55.81 percent; tuber, pulse and legumes by 12.50 percent; vegetables by 29.86 percent, fruit by 13.16 percent, livestock products by 9.03 percent, fish and seafood by 10.53 percent, and other food products by 15.02 percent. The food CPI increases by 33 percent.

(2a) Cereal prices increase by 10 percent. The prices of non-cereal prices are unchanged

(2b) Cereal prices increase by 55.81 percent as in 2008. The prices of non-cereal prices are unchanged.

Table 6 summarizes the welfare impacts of these food price and cereal price increases in these scenarios. On average, a 10-percent increase in all food prices (**Scenario 1a**) leads to a welfare reduction of 2.3 percent of total consumption expenditure among Cambodian households. The reduction is highest in Phnom Penh areas (4.3 percent) and lowest in rural areas (1.9 percent). Not only non-farmer but also farmers have lower welfare, because an average farmer is a net consumer of food. Non-farmer welfare falls by 5.2 percent and farmer welfare by 1.5 percent. Among the quintile groups, the richer quintiles suffer higher welfare reductions than lower quintiles. A typical household in quintile 1 suffers 0.8 percent of welfare reduction, while the corresponding number for a household in quintile 5 is 3.6 percent. Likewise, the average non-poor household would experience a higher welfare reduction (2.8 percent) than would an average poor household (0.9 percent).

[Insert Table 6 here]

In **Scenario 1b** (simulated scenario for food price increase in 2008), the adverse impacts on household welfare are less severe. The reason is that although food price index increased by 33 percent in 2008, this price hike was mostly due to cereal price increase. Yet, an average Cambodian household is a net cereal seller while being a net food consumer. Thus, the negative impact from the food price increase is partly compensated by the welfare improvement from the increase in cereal prices. Overall, average household welfare would reduce by 0.9 percent due to food price increase in 2008 in Scenario 1b. The average welfare of households in Phnom Penh and other urban areas would decrease by 8.4 percent and 8.6 percent, respectively while household welfare of those in rural area will increase by 0.9 percent. The average welfare of poor households would increase by 2.2 percent and that of non-poor households would reduce by 2.0 percent. In addition, 77 percent of all households would have lower welfare than before due to the direct impacts of food price increases in 2008, including nearly 100 percent of the households in Phnom Penh, 92 percent in other urban areas and 73 percent in rural areas. This occurs because these households are net consumers of food,

thus their real purchasing power falls when food prices increase. In sum, a general increase in food prices would have negative impacts on the welfare of most Cambodian households.

Now turning to **Scenario 2a** to examine the impacts of a hypothetical 10 percent increases in cereal prices on household welfare assuming unchanged non-cereal food prices. While an increase in food prices as a whole leads to a decrease in average household welfare, an increase in cereal prices alone actually leads to an increase in average welfare. Average household welfare would increase by 0.7 percent from a 10-percent increase in cereal prices. While the average resident in Phnom Penh and in other urban areas would experience a loss of welfare from cereal price increases, by 0.6 percent and 0.7 percent respectively, rural household would gain a 1 percent increase in their welfare. The Khmer (ethnic majority) households would, on average, gain by 0.7 percent increase in welfare, while the average ethnic minority household, who is less engaged in farming than the Khmer, would lose by 0.4 percent of their household welfare. Only the highest income group- quintile 5- would suffer welfare reduction of 0.3 percent. Those in quintile 2 would gain the most (1.6 percent), followed by quintile 1 (1.3 percent).

Scenario 2b shows that the actual increase of 56 percent in cereal prices in 2008 would, on average, increase household welfare by 3.7 percent. Households in Phnom Penh and in other urban areas would, on average, see their welfare fall by 3.2 percent and 4.0 percent, respectively, while rural households would experience an average gain of 5.4 percent.

Although average household welfare would increase due to cereal price increases, Table 6 indicates that over two thirds of Cambodian households would have lower welfare because these households are net consumers of cereals. The losers from an increase in cereal prices include 99.5 percent of Phnom Penh households, 84.5 percent of other urban households and 61.2 percent of rural households. Even among cereal farmers, the percentage of losers is considerable: nearly one half of cereal growers are net cereal consumers and would lose from an increase in cereal prices. Across income quintiles, quintile 5 has the highest percentage of households whose welfare would fall due to cereal price increases. Yet, even among the poor, the percentage of losers is high: 62.6 percent of households in quintile 1 and 60.1 percent of households in quintile 2 would have lower welfare than before due to an increase in cereal prices.

Table 7 shows the estimated impacts of food and cereal price increases on poverty. A 10 percent increase in food prices would increase headcount poverty rate by 1.4 percentage points, and the poverty gap by 0.6 percentage point. Poverty would rise not only in Phnom Penh and other urban areas but also in rural areas, since a large number of rural dwellers are net food consumers. A 10-percent increase in food prices would benefit the poorest households in

quintile 1 by helping 1.7 percent of the households in that quintile escape poverty. Yet, it will make 8.8 percent of the households in quintile 2, the next poorest households, fall into poverty.

[Insert Table 7 here]

The increase in food prices, as in 2008, would make the headcount poverty rate in Cambodia rise by 3.2 percentage points. Therefore, it could undermine Cambodia's recent achievements in poverty reduction. The poverty gap could also increase by 1.8 percentage points as a result of the increases in food prices in 2008.

On the other hand, the increases in cereal prices in Cambodia in 2008, holding other prices constant, appear to have slightly beneficial impacts on poverty. The headcount poverty rate would fall by 0.3 percentage points if cereal prices rise by 10 percent. If cereal prices increase by 56 percent, as in 2008, the headcount poverty rate would decrease by 0.2 percentage points. For these two scenarios, urban poverty would increase, respectively, by 0.1 percentage points and 0.2 percentage points in Phnom Penh and by 0.7 percent and 3.5 percent in other urban areas. In contrast, rural poverty would fall by 0.5 and 0.7 percentage points in Scenario 2a and 2b, respectively. The impacts on the poverty gap are insignificant in Scenario 2a. In Scenario 2b, the poverty gap would increase by 0.8 percentage points. Thus, although in Scenario 2b, the headcount poverty rate would fall, poverty gap would increase due to cereal price increases.

The results in Table 6 and 7 may appear puzzling, in that an increase in food prices as a whole reduces overall welfare and increases poverty while an increase in cereal prices increases overall welfare and slightly reduces poverty. The explanation for this is that the average household in Cambodia is a net food consumer (by 2.4 million Riels/year), yet it is also a net cereal producer (by 155 thousand Riels/year). In other words, while Cambodians produce more cereal than they consume, they consume more other foodstuffs (such as meat, fish) more than they produce.

5. Conclusion

This paper has examined the impacts of recent food price increases, especially cereal price increases, on Cambodian households. About 83 percent of Cambodian households are net food consumers and 67 percent are net cereal consumers. Even in rural areas, 80 percent are net food consumers and 61 percent are net cereal consumers. These households will have lower levels of welfare from increases in food prices (assuming that producer and consumer prices increase at the same rate).

Estimates based on household survey data indicates that, when food prices increase uniformly by 10 percent, the welfare of the average household (as measured by consumption expenditure) falls by 2.3 percent and the national poverty rate rises by 1.4 percentage points. When cereal prices increase (uniformly) by 10 percent, the average household's welfare increases by 0.67 percent and national poverty rate falls by 0.34 percentage points. However these impacts would be different if producer and consumer prices increase at different rates. If consumer prices increase at a lower rate than producer prices, welfare benefits are higher and poverty reduction is greater. On the other hand, if consumer prices rise faster than producer prices, the positive impacts of the price changes on welfare and poverty reduction are smaller.

Using actual price changes that occurred in 2008, this paper finds that, holding all else constant, those price increases reduced average household welfare by 0.89 percentage points. In addition, those price increases raised the poverty headcount rate by 3.2 percentage points. On the other hand, holding other prices constant, the actual increases in cereal price alone raised average household welfare by 3.7 percent in 2008, and reduced the poverty headcount rate by 0.2 percentage points during the same period. Thus, it is the increases in prices of *non-cereal* foods that led to major negative impacts on household welfare and poverty in Cambodia. This is the case because most of Cambodians are net consumers of non-cereal foods.

It is also the case that most Cambodian households experienced reductions in welfare due to food price increases. More specifically, a uniform increase in both consumer and producer food prices would make 83 percent of households worse off. A uniform increase in both consumer and producer cereal prices would make 67 percent of households worse off. Thus, although the average welfare would increase if cereal prices increase, two thirds of households have lower welfare than before. With a uniform percent increase in the price of cereals, nearly 100 percent of Phnom Penh residents, 85 percent of other urban households and 61 percent of rural households would experience reductions in their household welfare.

Finally, the reader should keep in mind that there are several limitations of this paper. First, it does not examine the production response to increases in the prices of food and cereal.. That is, this paper assumes that, in the short term, farmers cannot expand their agricultural production in response to food price increases. This assumption would not hold in the longer term, when farmers may expand their production to take advantage of higher prices. On the other hand, the prices of agricultural inputs may also increase, reducing farmers' profits. Yet, agricultural wages may also increase, raising disposable incomes of some poor landless agricultural workers. Second, data limitations do not allow for a full exploration of the relationship between consumer and producer prices. More sophisticated analysis, based on reliable consumer and producer price data, would be useful for further studies on the impact of food price increases on household welfare in Cambodia.

Acknowledgements

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TABLES

Table 1: Poverty Measures and the Distribution of Poverty

	Share of Population	Poverty index			Contribution to poverty			Per capita expenditure (,000 Riels/day)
		P0	P1	P2	P0	P1	P2	
All	100	30.14	7.22	2.58	100	100	100	4.96
Phnom Penh	9.63	0.83	0.08	0.01	0.27	0.11	0.05	13.32
Other urban	10.05	21.85	5.33	2.01	7.28	7.42	7.84	6.98
Rural	80.32	34.70	8.31	2.95	92.45	92.48	92.11	3.71
Non farmer	20.61	7.80	2.01	0.87	5.33	5.74	6.96	10.22
Farmer	79.39	35.94	8.57	3.02	94.67	94.27	93.05	3.60
Not growing cereals	35.51	15.50	3.75	1.44	18.26	18.47	19.80	7.67
Growing cereals	64.49	38.21	9.12	3.20	81.74	81.54	80.19	3.48
Ethnic majority	97.72	30.03	7.17	2.56	97.35	97.11	97.19	4.97
Ethnic minorities	2.28	34.99	9.15	3.18	2.65	2.89	2.82	4.89

Table 2: Expenditures for Different Food Items (as Percentages of Food Expenditure) (%)

	All	Phnom Penh	Other urban	Rural	Q. 1	Q.2	Q. 3	Q. 4	Q. 5
Cereal	22.42	12.84	20.01	25.59	36.73	29.08	24.76	20.33	15.78
Fish	20.31	15.72	17.28	22.19	22.61	24.08	23.24	22.22	15.83
Meat & poultry	13.50	15.78	14.65	12.64	9.37	12.08	13.37	14.11	14.99
Dairy products	4.10	4.89	5.50	3.61	2.46	2.98	3.66	3.92	5.30
Oil and fats	2.32	1.88	1.97	2.50	2.60	2.65	2.66	2.43	1.89
Tuber, pulse , and legumes	1.55	1.51	1.16	1.63	1.32	1.43	1.77	1.61	1.53
Vegetables	8.27	7.97	6.84	8.62	8.93	8.87	8.91	9.03	7.12
Fruit	5.29	7.82	5.66	4.51	2.94	3.72	4.37	5.09	7.11
Drink	5.31	6.98	6.67	4.59	2.73	3.41	3.96	4.82	7.69
FAFH & prepared food	9.26	17.69	13.57	6.06	2.24	3.44	4.94	8.48	15.91
Other foods	7.67	6.92	6.70	8.06	8.08	8.24	8.35	7.98	6.85
Food budget	62.5	43.0	57.1	65.4	71.3	68.6	65.0	60.5	47.1
% of food purchased	83.0	99.6	93.1	76.4	64.2	72.5	77.1	82.4	95.5

Note: Q.1, Q.2, Q.3, Q.4, Q.5: Quintile 1, Quintile 2, Quintile 3, Quintile 4, Quintile 5.

Table 3: Distribution of farming and rice farming households in Cambodia

	Percentage who are farmers	Percentage who are rice farmers
All	78.5	63.7
Phnom Penh	2.8	0.5
Other Urban	57.6	31.8
Rural	89.5	74.7
Quintile 1	95.7	82.7
Quintile 2	94.2	79.2
Quintile 3	87.6	70.8
Quintile 4	78.3	60.2
Quintile 5	36.5	25.7
Ethnic majority	78.6	64.0
Ethnic minority	72.3	54.2
Non-poor	72.5	57.2
Poor	94.7	81.7

Table 4: Annual Food Production and Consumption by Household Groups (thousand Riels and %)

	Food prod.	Food cons.	Net food consumtion	Cereal prod.	Cereal cons.	Net cereal cons.
All	2,100	4,496	2,395	1,163	1,008	-155
Phnom Penh	73	9,483	9,411	10	1,218	1,208
Other urban	1,412	5,924	4,513	458	1,185	727
Rural	2,411	3,763	1,352	1,378	963	-414
Non-farmer	0	7,163	7,163	0	1,098	1,098
Farmer	2,676	3,764	1,088	1,482	983	-498
Not growing cereal	745	6,044	5,300	0	1,029	1,029
Growing cereal	2,871	3,615	743	1,825	996	-828
Majority	2,107	4,497	2,391	1,179	1,009	-171
Minorities	1,851	4,434	2,583	537	988	451
Quintile 1	2,190	2,513	323	1,359	923	-436
Quintile 2	2,571	3,185	614	1,663	926	-737
Quintile 3	2,254	3,623	1,369	1,118	897	-221
Quintile 4	2,265	4,792	2,527	1,110	974	-136
Quintile 5	1,220	8,371	7,152	564	1,321	757
Non-poor	2,035	5,179	3,144	1,060	1,040	-19
Poor	2,279	2,626	347	1,446	921	-525

Table 5: Percentage of Net Food Producers and Net Benefit Ratio

	% of net food consumers	% of net cereal consumers	Net benefit ratio (all food)	Net benefit ratio (cereal)
All	82.7	66.9	-0.35	0.51
Phnom Penh	99.7	99.5	-0.99	-0.99
Other urban	92.4	84.5	-0.67	-0.52
Rural	79.6	61.2	-0.24	0.80
Non-farmer	100.0	99.8	-1.00	-1.00
Farmer	78.0	57.9	-0.17	0.92
Not growing cereal	95.0	99.8	-0.82	-1.00
Growing cereal	75.7	48.2	-0.08	1.36
Majority	83.1	66.7	-0.35	0.53
Minority	69.6	77.4	-0.30	-0.35
Quintile 1	75.2	62.6	-0.05	0.94
Quintile 2	77.7	60.1	-0.12	1.23
Quintile 3	82.1	60.9	-0.35	0.39
Quintile 4	85.3	67.0	-0.47	0.36
Quintile 5	93.3	84.1	-0.75	-0.40
Non-poor	85.1	68.5	-0.45	0.26
Poor	76.2	62.6	-0.06	1.17
Phnom Penh non-poor	99.7	99.5	-0.99	-0.99
Phnom Penh poor	90.8	99.8	-0.84	-1.00
Other urban non-poor	94.4	85.9	-0.70	-0.55
Other urban poor	83.9	78.1	-0.56	-0.38
Rural non-poor	81.4	61.0	-0.33	0.58
Rural poor	75.6	61.4	-0.02	1.29

Table 6: Welfare Impacts of Food Price Increase and Cereal Price Increase

	Food price increase		Cereal price increase		Percentage of worse-off households		
	(1a)	(1b)	(2a)	(2b)	(1a)	(1b)	(2a& 2b)
All	-2.26	-0.89	0.67	3.71	82.7	76.9	66.9
Phnom Penh	-4.25	-8.35	-0.58	-3.25	99.7	99.9	99.5
Other urban	-3.86	-8.64	-0.71	-3.98	92.4	91.6	84.5
Rural	-1.85	0.89	0.97	5.42	79.6	72.5	61.2
Non-farmer	-5.15	-11.04	-0.93	-5.17	100	100.0	99.8
Farmer	-1.47	1.90	1.10	6.15	78.0	70.5	57.9
Not growing cereal	-4.61	-11.68	-1.19	-6.62	95.0	98.7	99.8
Growing cereal	-0.93	5.25	1.72	9.59	75.7	64.4	48.2
Majority	-2.28	-0.78	0.69	3.87	83.1	76.8	66.7
Minority	-1.74	-4.98	-0.38	-2.12	69.6	79.7	77.4
Quintile 1	-0.80	3.16	1.25	6.97	75.2	69.4	62.6
Quintile 2	-1.32	4.27	1.59	8.89	77.7	72.0	60.1
Quintile 3	-2.48	-1.91	0.51	2.84	82.1	72.3	60.9
Quintile 4	-3.08	-3.52	0.27	1.51	85.3	80.3	67.0
Quintile 5	-3.63	-6.44	-0.30	-1.65	93.3	90.4	84.1
Non-poor	-2.78	-1.96	0.40	2.24	85.1	78.8	68.5
Poor	-0.85	2.18	1.39	7.74	76.2	71.3	62.6
Phnom Penh non-poor	-4.24	-8.31	-0.57	-3.19	99.7	100.0	99.5
Phnom Penh poor	-5.46	-16.04	-2.36	-13.2	90.8	90.8	99.8
Other urban non-poor	-3.86	-7.94	-0.59	-3.29	94.4	91.8	85.9
Other urban poor	-3.84	-11.55	-1.25	-7.00	83.9	90.8	78.1
Rural non-poor	-2.39	-0.13	0.70	3.90	81.4	73.6	61.0
Rural poor	-0.63	3.30	1.59	8.86	75.6	69.8	61.4

Table 7: Impacts on Poverty of Food/Cereal Price Increases (Percentage Points)

	Initial rate (%)		Food price change				Cereal price change			
			+10% (1a)		As in 2008 (1b)		+10% (2a)		As in 2008 (2b)	
	P0	P1	P0	P1	P0	P1	P0	P1	P0	P1
All	30.14	7.22	1.44	0.56	3.16	1.78	-0.34	-0.03	-0.20	0.70
Phnom Penh	0.83	0.08	0.19	0.05	0.23	0.16	0.07	0.02	0.19	0.12
Other urban	21.85	5.33	2.42	0.68	4.92	2.35	0.70	0.23	3.46	1.45
Rural	34.70	8.31	1.46	0.61	3.29	1.91	-0.52	-0.06	-0.70	0.68
Non-farmer	7.80	2.01	0.97	0.44	2.99	1.28	0.24	0.12	1.13	0.73
Farmer	35.94	8.57	1.56	0.60	3.21	1.91	-0.49	-0.06	-0.54	0.69
Not growing cereal	15.50	3.75	2.20	0.68	6.55	2.56	1.38	0.28	3.92	1.74
Growing cereal	38.21	9.12	1.02	0.50	1.29	1.35	-1.29	-0.19	-2.46	0.13
Majority	30.03	7.17	1.47	0.58	3.09	1.79	-0.40	-0.02	-0.32	0.70
Minority	34.99	9.15	0.28	0.01	6.26	1.22	2.35	-0.07	5.18	0.60
Quintile 1	100	29.19	-1.69	1.25	-6.51	3.73	-1.57	-0.25	-7.25	1.16
Quintile 2	30.26	1.25	8.75	1.28	21.65	4.23	0.13	0.17	7.22	2.03
Quintile 3	0.04	0.00	0.10	0.01	1.08	0.06	0.04	0.00	0.15	0.01
Quintile 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Quintile 5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-poor	0.00	0.00	3.69	0.10	8.09	0.58	1.26	0.01	4.25	0.23
Poor	100	24.3	-3.77	1.28	-8.27	4.20	-4.04	-0.47	-10.50	1.43

FIGURES

Figure 1: Density Distribution of Living Standards
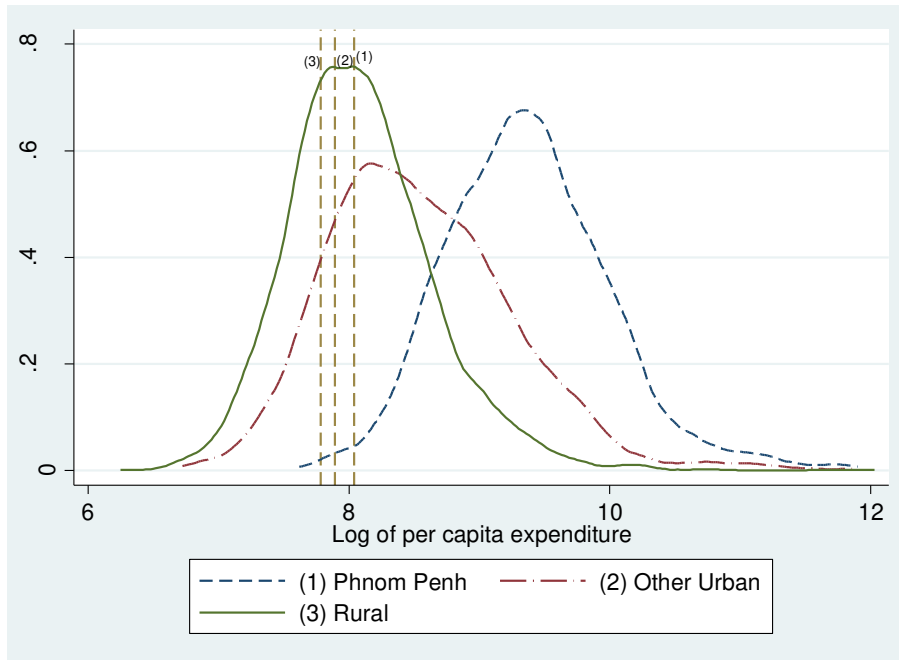
Note: (1) (2) (3) are the poverty lines for (1) Phnom Penh, (2) Other urban areas, and (3) Rural areas, respectively

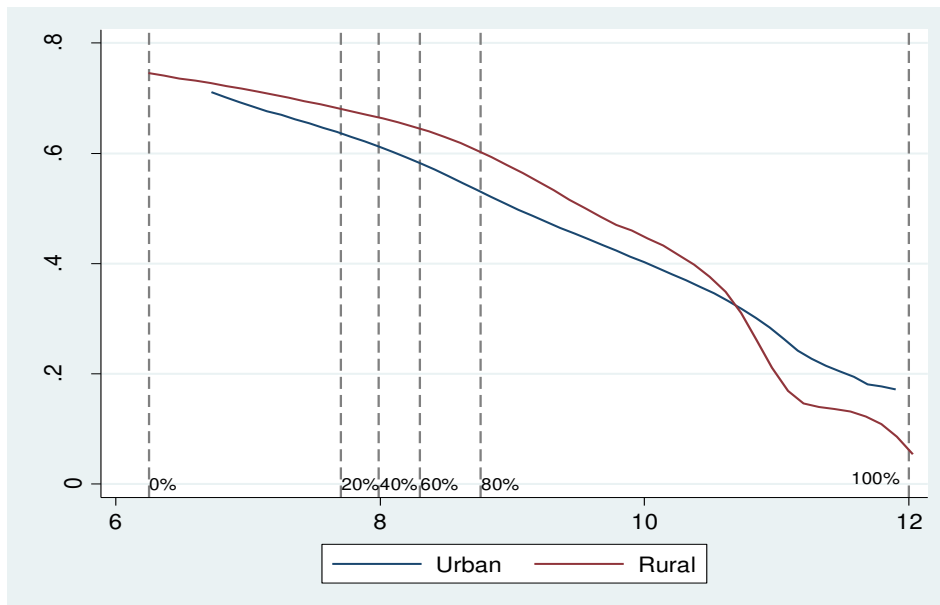.**Figure 2: Density Estimation of Share of Household Expenditure Spent on Food**
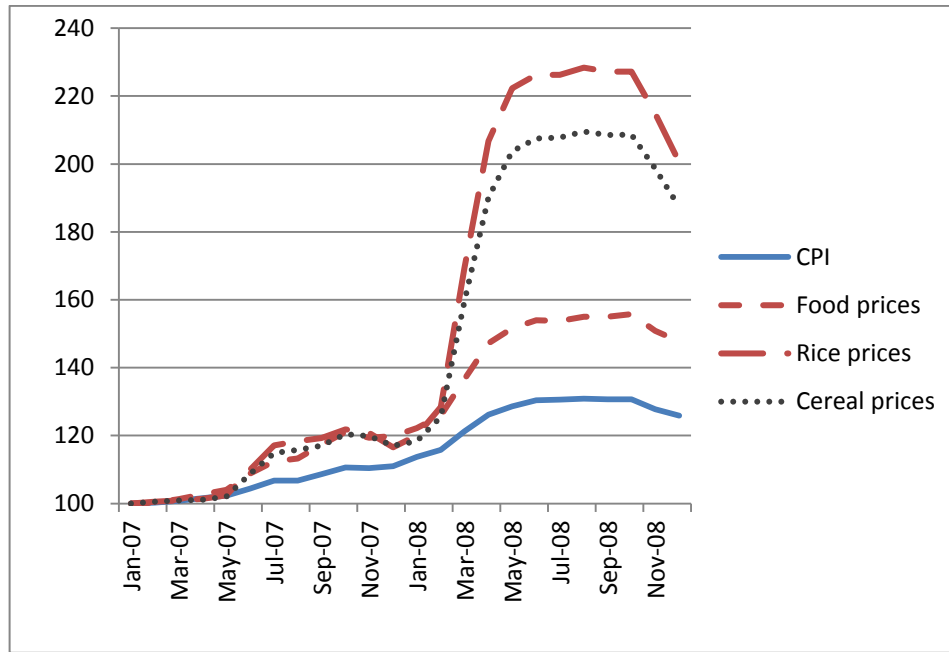
Figure 3: Inflation, food prices, cereal prices and rice prices 2007-08

Source: National Institute of Statistics data. Rice prices are the weighted average of the prices of rice, quality No. 1 and rice, quality No. 2. Cereal prices are the weighted average of the prices of cereals.