Philippines

Distributional impact of the 2008 rice crisis in the Philippines

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Abstract

The rice crisis of 2008 posed tremendous challenges to Philippine policy-makers. They had to grapple with ensuring an adequate supply of rice by importing rice in times of rising international prices. At the same time, they had to maintain domestic rice prices relatively stable. This study examines the distributional impact of the 2008 rice crisis in the Philippines at the household level. Using non-parametric regressions, it maps the relative vulnerability of various household groups across per capita expenditure according to the gender of the household head, income decile, geographical region, agricultural household indicator, and whether the household is urban or rural. Using the actual change in domestic rice prices at the farm gate and retail levels, the study then examines the changes in household welfare for various household groups. The analysis shows that the most severely affected household groups include poor, urban, female-headed, and non-agricultural households. This finding could be instrumental in helping the government target beneficiaries with poverty-alleviating response programmes under similar circumstances in the future.

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1 Introduction

The year 2007 marked the beginning of the crises of the 3 F's: food, fuel, and finance. These disturbances were largely unanticipated and had serious effects across many nations. South-East Asia, which had endured a debilitating financial crisis in 1998, emerged largely unscathed from the 2007 crisis, but it did suffer from the effects of the food crisis, particularly in the rice sector.

As in other Asian countries, rice is the most politically sensitive issue in the Philippines in terms of food prices. The dramatic spike in international prices of rice that started in 2007 and peaked in 2008, and its consequent effect on domestic prices, became a major concern for Philippine policymakers for a number of reasons.

First, rice is the staple food for the majority of Filipinos. It accounts for more than a third of the average calorie intake of the population. In addition, rice is a major food expense, accounting for 13.1 per cent of total household spending and a third of total food consumption.

Second, the rice production industry is a significant economic sector in the country. As of 2007, around 11.5 million farmers and family members – representing approximately 22 per cent of the rural population – depended on growing rice for their livelihood. In 2010, the rice sector accounted for 15.5 per cent of the country's value added in agriculture and 3.5 per cent of the gross domestic product (GDP) (NSCB, 2013).

Third, changes in rice prices affect general inflation, as rice accounts for 9.4 per cent of the consumer price index.

The rice crisis presented tremendous challenges to Philippine policymakers. Since rice plays a central part in the political economy, stabilizing rice prices ranks as one of the government's highest policy objectives. Perennial shortfalls in domestic rice production are addressed by having recourse to imports year after year. Although many programmes aimed at improving agricultural productivity, the Philippines by and large continues to be a rice importer. For this reason, access to the world rice market is an important consideration for the government. Thus, when the world rice markets started to tighten in the lead-up to 2008, policymakers felt the need to step up imports in order to secure the rice supply. Some observers (Dawe and Slayton, 2010) claim that the timing and volume of the purchases, particularly when carried out against the backdrop of increased imports by other countries, further tightened the world rice supply and exacerbated the price hike in the international market.

In light of these developments, the trade-off faced by Philippine policymakers was not easy. First, there were cost considerations associated with importing rice. As the world rice supply was tightening, international prices were likewise increasing, and this would, through the pass-through mechanism, stimulate local price increases. On the other hand, a decision not to import would increase the probability of a rice shortage in the domestic market. If and when a rice shortage were to occur, rice prices would definitely spike and political turmoil would likely result, a highly undesirable scenario.

Policymakers opted to import in 2008. By their action, they revealed their preference for avoiding a rice shortage in the domestic market. However, this had a cost – price hikes. While it may not be entirely clear to what extent Philippine imports may have contributed to the rise in world prices, the world rice market indeed felt pressure, considering that the Philippines was the world's biggest importer at that time.[1] World rice prices rose from a monthly average of USD 360 per metric ton in January 2008 to USD 770 per metric ton in May 2008. Between March and September 2008, local retail prices jumped by close to 40 per cent.

The uptick in domestic rice prices had profound consequences in terms of poverty, as the poor invariably bear the brunt of food crises. Since as much as 40 per cent of incomes of the poor are spent on staples, a large price increase leaves a deep dent in their purchasing power (Dawe and Slayton, 2010). For households in the lowest income levels in the Philippines, for instance, rice accounts for 60 to 65 per cent of calorie intake. Because crises are by nature unexpected, there is little scope for the poor to substitute other staples for rice. Therefore, there are concerns that food crises may plunge more people into poverty, in addition to exacerbating the hunger and malnutrition of those who are already poor (Heady and Fan, 2008).

2 Research objectives

This study examines the effects of the rice crisis on public welfare. Such effects animate much of the political economy of stabilizing prices. In particular, the study investigates the distributional impact of the 2008 rice crisis in the Philippines on real incomes at the household level. There is

[1] According to the International Rice Research Institute (IRRI, 2013), the Philippines and Nigeria were the world's largest importers of rice in 2008. Each country accounted for 26.2 per cent of total world rice imports. For the IRRI World Rice Statistics, see *http://ricestat.irri.org:8080/wrs2/entrypoint.htm.*

much ambiguity about this issue because increases in rice prices have different welfare effects on households depending on whether the increases affect net producers or net consumers of rice. This study uses the net benefit ratio introduced by Deaton (1989) to analyse the relative vulnerability of different household groups to increases in rice prices. The specification of the household groups includes gender, urbanity, and agricultural traits.

The distributional effect has been a topic of interest among observers. For instance, Reyes *et al.* (2009), using non-parametric estimations of data from the 2006 Family Income and Expenditure Survey (FIES) in the Philippines, found that the impact of rice price increases varied across different household groups (income levels, sector of employment, level of urbanity, and geographical location). In a related work, Balisacan *et al.* (2010) asserted that, because the bottom two deciles of the Philippine population were net rice consumers, they were hurt more by the rice crisis than were those who were relatively better off.

This study closely follows Reyes *et al.* (2009), but differs in the specification of the rice crisis period – from March to September 2008 when domestic prices of rice rose by an average of more than 30 per cent per month – as well as in the choice of household groups.[2]

The study also looks into the gender dimension of poverty during the rice crisis. Many studies have delved into the disadvantages faced by women in many aspects of well-being, including education, health, and survival (World Bank, 2001; Klasen and Wink, 2003). From their findings arose the concept of the "feminization of income poverty", which means that poverty is more frequent in female-headed households than in male-headed households (Chant, 2008). Along this line, the current study examines the extent to which female-headed households were vulnerable to the rice crisis compared to male-headed households.

During the crisis period, domestic price increases of rice differed markedly at the retail and farm gate levels. This had consequences for the magnitude of welfare changes accruing to either net consumers or net producers

[2] The study by Reyes *et al.* (2009) covers the period 2006–2008. Consequently, their magnitude of rice price increases at the retail and farm gate levels differs from the present study. They employed the 2006 FIES, while this study uses the 2009 FIES. This study uses the specification of the household groups from Reyes *et al.* (2009) but includes the gender of the household head as an additional household group characteristic. Moreover, the specification of the net benefit ratio in this study differs from that of Reyes *et al.*, who had access to figures on actual quantities of rice consumed and produced by households.

of rice at the household level. This study conducts a simulation to quantify the change in welfare measured by compensating variation, and taking into account the differential between retail and farm gate prices. The welfare analysis is disaggregated by gender of the household head, level of urbanity (urban and rural), agricultural household indicator (agricultural and non-agricultural activity), income decile, and geographic region.

How can the knowledge of households that were most or least affected by crisis-induced price hikes be useful for policy purposes? A study of the distributional effects of the 2008 rice crisis could help policymakers identify the type of households and the geographic locations most affected by the crisis. This could lead to better targeting policies towards those segments of the population that are most in need of assistance, and could improve the effectiveness of such assistance. It could also help determine the welfare or social costs of the government's decision to massively import rice during 2007 and 2008, a decision which sparked increases in rice prices.

For example, in order to mitigate the negative effects of the increase in rice prices, the government turned to the distribution of rice at subsidized prices through the National Food Authority (NFA). Apparently, the extent of NFA operations was quite limited due to constraints in the volume and distribution of subsidized rice. Knowing which segments of the population are the most vulnerable could help ensure that subsidized rice supplies be allocated more effectively in the future. In addition, examining the impact of the rice crisis at the household level could help create a profile of the households that suffered the most, and thus help direct remedial programmes and other poverty-alleviating measures towards these households in the future.

The following section offers a brief description of the 2007–2008 international rice crisis. The study then goes on to outline the methodology and summary statistics, report the empirical results and their interpretation, and provide conclusions and examine policy implications.

3 International rice crisis

The price spike during the 2007–2008 food crisis was the largest price shock since the world food crisis in 1973–1975 (Timmer and Dawe, 2010). Although the food crisis affected a number of commodities, including wheat and maize, the sharpest increase in prices occurred in the rice market. Dawe and Slayton (2010) reported that in a span of six months from

October 2007 to April 2008, the world price of rice tripled, from USD 335 to over USD 1,000 per metric ton, a world record high in nominal terms.[3]

It is important to frame the world rice crisis against the backdrop of market conditions in 2007–2008. During this period, the total production of milled rice in the world amounted to 432.6 million metric tons. However, as Briones (2012b) indicated, world trade in rice is quite meagre, as only 7 per cent of total production (about 30 million metric tons) is traded in international markets. In comparison, 11 per cent of total wheat and 18 per cent of total corn production is traded internationally. Given the thinness of world volumes, surges in import volumes or sudden contractions of export supply can potentially cause swings in rice prices.

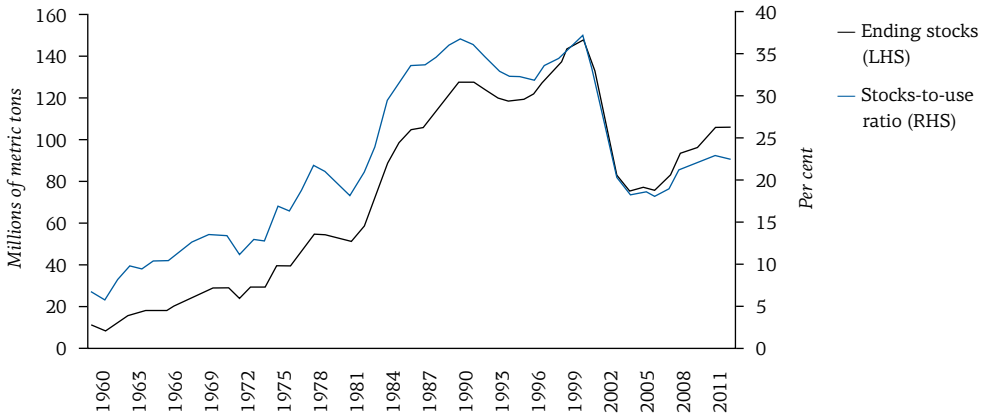
Volatility in prices can be avoided if there are enough rice stocks to cushion the impact of a supply or demand shock. But was the size of rice stocks in 2007–2008 sufficient to act as an effective buffer? Figure 1 shows the level of rice stocks in the world market from 1960 to 2008 in terms of ending stocks and the stocks-to-use ratio.[4] As can be seen, both measures were at record lows during 2007–2008. This suggests that the world rice market is quite vulnerable to price shocks in the face of sharp changes in trade volumes.

Although a number of possible causes have been put forward to explain the 2007–2008 rice crisis, it is generally held that the cause was fundamentally different from that of the food crisis of 1972–1973, which was largely rooted in a weather phenomenon ("El Niño") that severely affected food production (Timmer and Dawe, 2010).

[3] This refers to the price of the rice variety Thai 100% B.

[4] Ending stocks give the total amount of rice the world has in stock at the end of the marketing year, i.e. the amount of rice in the world less the total amount of rice consumed. The stocks-to-use ratio gives the ending stocks as a percentage of the total stocks of rice consumed by all countries. The two measures reflect the effects of both supply and demand factors during the year and are useful indicators of price movements. In general, a lower ending stock (or stocks-to-use ratio) results in higher prices, and vice versa.

Figure 1 World rice market – Ending stocks and stocks-to-use ratio, 1960–2012



Source: Authors' estimations, based on USDA (2013).
Note: LHS stands for left-hand scale, RHS for right-hand scale.

No supply shock of such proportions took place in 2007–2008. Rather than a natural disaster, the world market was hit by artificial scarcity (Timmer, 2010) caused by a confluence of low global rice stocks, hoarding of rice supplies by consumers, farmers, and traders, and *ad hoc* responses of governments to fears of impending rice shortages. When traditional rice-exporting countries like India and Vietnam instituted export bans, a spirit of uncertainty pervaded the international rice markets. Importers, on the other hand, jostled to stabilize their own markets as international rice supplies rapidly thinned. Sarris (2010) stated that when market agents realize that buffers in global markets are too low to assure adequate supply flows, they start to behave atomistically to ensure the supply flow in their own domestic markets. This "herd" behaviour creates panic buying and hoarding, even when the underlying conditions do not justify it, and thus leads to price spikes. Such surge in prices was graphically manifested in the global rice crisis of 2007–2008.

Dawe and Slayton (2010) commented that the 2007–2008 rice crisis was not a failure of the free market to deliver optimal outcomes, but rather that government decisions were instrumental in fanning the crisis. Because the international rice market is thin, and governments play a large role in international trade, the market is particularly vulnerable to such panics and uncertainty.

4 Methodology and summary statistics

The methodology of this study closely follows the study by Deaton (1989) on the distributional consequences of rice price changes in Thailand following adjustments to an export tax. During the 2008 rice crisis, rice prices in the Philippines rose significantly. Given the standard framework, the welfare implications of the price change depend on whether the household is a net producer or a net consumer of rice.

The empirical methods used in this study allow for assessing distributional effects by identifying which households are affected by a shock in the price of rice. This assessment involves three steps. First, we provide a descriptive analysis of household characteristics through expenditure distributions of households across different groups: the total sample, female- and male-headed households, urban and rural households, and agricultural and non-agricultural households. This allows for assessing the well-being of various groups of households.

Second, we use non-parametric regressions to evaluate the relationship between per capita expenditure of households and the level of rice consumption and production. The objective is to evaluate how a change in the price of rice affects households, based on whether the households are net producers or net consumers of rice.

Third, we simulate the effects of the rice crisis on household welfare. While it is important to analyse the different channels through which households are affected, this study focuses on the price effects of the rice crisis. In particular, for each household, we estimate the compensating variation, which is the additional amount of money the household needs to remain at the same welfare level as before the crisis. The estimation incorporates the average price of rice before and after the 2008 crisis, and the difference in the rate of increase of the price of rice at the farm gate and retail levels. In addition, a non-parametric regression is used to examine the welfare effects of price changes triggered by the rice crisis on households with different levels of per capita expenditure.

Following the standard methodology for the analysis of the distributional impact of price changes, this study uses household data from the FIES,[5] which is a nationwide survey of households undertaken every three years by the National Statistics Office. The aim of the survey is to gather data on family income and expenditure that are representative of the country and

its administrative regions. Information gathered in this survey is used by the national authorities to construct the consumer price index and to assess human development, poverty, and standards of living, among others.

This study uses the 2009 FIES, since it is closer to the crisis year than the 2006 FIES. The 2009 FIES included the country's 17 administrative regions as its sampling domain and made use of an area sample design. The regions were stratified into non-overlapping subgroups called "strata",[6] with primary sampling units defined as a barangay[7] or a combination of barangays consisting of at least 500 households.

Table 1 shows the distribution of the households surveyed in 2009, disaggregated by gender of the household head, urbanity, agricultural household indicator, and administrative region. A total of 38,400 households were surveyed in the 2009 FIES. Note that a larger percentage of the sample is male-headed, rural, and non-agricultural.

Table 1 Structure of the sample

Household group	Number of observations	Share in the sample (per cent)
All households	38,400	100.00
Gender of household head		
Male	30,585	79.65
Female	7,815	20.35
Urbanity		
Urban	17,335	45.14
Rural	21,065	54.86
Agricultural household indicator		
Agricultural	9,944	25.90
Non-agricultural	28,456	74.10

[5] More details on the FIES are available at: *http://www.census.gov.ph/article/technical-notes-family-income-and-expenditure-survey-fies.*

[6] The fact that 452 strata only contain a single sampling unit may lead to missing standard errors in the estimations.

[7] A barangay is the smallest administrative unit in the Philippines. It corresponds roughly to a village or a district.

Household group		Number of observations	Share in the sample (per cent)
Region			
National Capital Region		4,285	11.16
Cordillera Administrative Region		1,581	4.12
I	Ilocos Region	2,277	5.93
II	Cagayan Valley	1,901	4.95
III	Central Luzon	3,028	7.89
IV-A	CALABARZON	3,661	9.53
IV-B	MIMAROPA	1,667	4.34
V	Bicol Region	2,212	5.76
VI	Western Visayas	2,592	6.75
VII	Central Visayas	2,526	6.58
VIII	Eastern Visayas	2,012	5.24
IX	Zamboanga Peninsula	1,655	4.31
X	Northern Mindanao	1,768	4.60
XI	Davao Region	2,151	5.60
XII	SOCCSKSARGEN	1,928	5.02
XIII	Caraga	1,568	4.08
Autonomous Region of Muslim Mindanao		1,588	4.14

Source: Authors' calculations, based on the 2009 FIES.
Note: Estimated number of households in the Philippines = 18,452,000; number of strata = 939; number of primary sampling units = 2,822. CALABARZON stands for Calamba, Laguna, Batangas, Rizal, and Quezon. MIMAROPA stands for Mindoro Occidental, Mindoro Oriental, Marinduque, Romblon, and Palawan. SOCCSKSARGEN stands for South Cotabato, Cotabato, Sultan Kudarat, Sarangani, and General Santos City.

Table 2 presents summary statistics for the main variables of interest using the entire sample.[8] The second column shows per capita expenditure of households, which is the variable used in this study as a measure for household well-being. To estimate per capita expenditure for each household, total expenditure is divided by the total number of members in the household. As shown in the table, a typical Filipino household has an annual per capita expenditure of Philippine pesos (PHP) 44,038.96, or USD 924.47.[9]

The last three columns of Table 2 show the rice consumption and income patterns of households. The share of rice expenditure (i.e. the budget share of rice) is calculated as the ratio of rice expenditure to the total expenditure of the household. While we can directly compute the budget share of

[8] See Annex 1 for the summary of key statistics across household groups.
[9] According to the Central Bank of the Philippines in 2013, the average exchange rate in 2009 was PHP 47.637 to USD 1.

rice from the 2009 FIES dataset, we cannot do the same for the rice income share because of the absence of data on income from rice production at the household level. As a proxy for income from rice, we use the household income from crop production net of the expenses from crop farming. To adjust for regional differences in the prevalence of rice production, we adjust the data by imputing a factor that is the share of rice in the total value of crop production per region. To illustrate, we define rice income using the following equation:

$$\textit{rice income} = k * \textit{net income from crop production} \quad (1)$$

where k is the ratio of rice production and total crop production in the region.[10] On average, a household spends 13.1 per cent of its budget on rice and earns 3.59 per cent of its total income from rice farming. One limitation of this method of constructing rice income is that it assumes the existence of a representative farmer.

Finally, the net income share of rice is calculated per household by taking the difference between its share of rice income and its share of rice expenditure. The average net income share of rice is –9.52 per cent, which means that a typical Filipino household is a net consumer of rice.

Table 2 Summary of key statistics

	Per capita expenditure (PHP)	Budget share of rice (per cent)	Income share of rice (per cent)	Net income share of rice (per cent)
25th percentile	17,895.60	5.98	0.00	–15.13
Mean	44,038.96	13.10	3.59	–9.52
75th percentile	50,701.67	18.21	1.83	–4.18
Standard deviation	53,086.21	9.29	8.24	10.77

Source: Authors' calculations, based on the 2009 FIES.
Note: Estimated number of households in the Philippines = 18,452,000; number of strata = 939; number of primary sampling units = 2,822.

[10] Data on the level of rice production per region were obtained from the Bureau of Agricultural Statistics (2013).

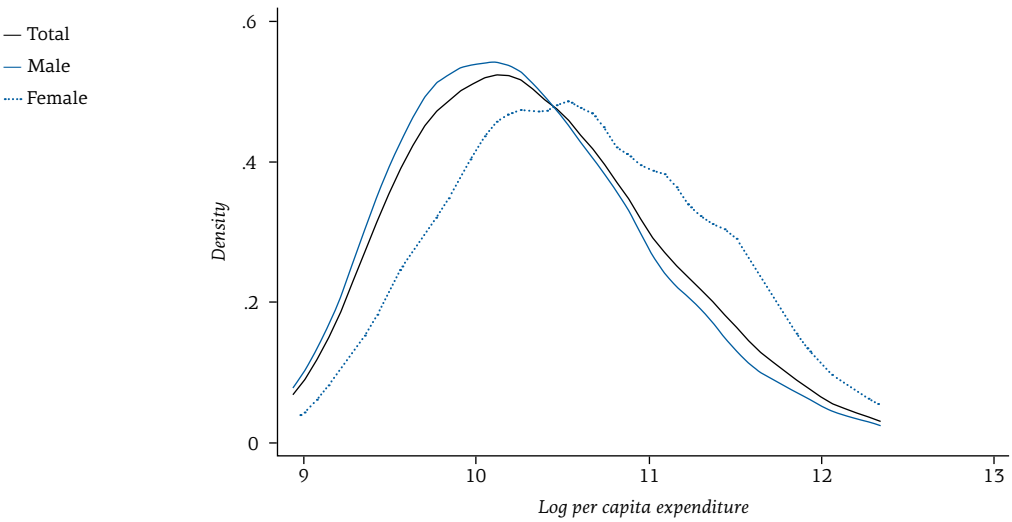
5 Empirical results

5.1 Kernel density estimations of expenditure

This section presents kernel density estimations of the log of per capita expenditure by household type in order to assess the living standards of households in terms of expenditure.[11] The analysis uses the log of per capita expenditure as a variable for household welfare.

Figure 2 shows that the log of per capita expenditure seems normally distributed at the national level and across the gender of the household head. The density of female-headed households is shifted to the right relative to the density of male-headed households. This suggests that female-headed households are, on average, richer than male-headed households.

Figure 2 Expenditure distribution by gender of household head



Source: Authors' estimations, based on the 2009 FIES.

[11] Annex 2 presents the expenditure distributions across regions.

It is important to see this result in the context of the relationship between gender and poverty. The literature review by Lampietti and Salker (2000) reveals that there is a significant variation in the nature and extent of gender inequality across countries, thus making it impossible to generalize the welfare disparities between women and men. Marcoux (1998), Chant (1997), and Rosenhouse (1994) stress that evidence on the poverty status of female-headed households in comparison to male-headed households is ambiguous. Moreover, they argue that the evidence surrounding the incidence of poverty in female-headed households is country-specific and case-specific. In Viet Nam and Thailand, for example, Klasen *et al.* (2011) find that female-headed families are better off than male-headed families in terms of current consumption, while UNCTAD (2011) reports that this is not the case in Cape Verde.

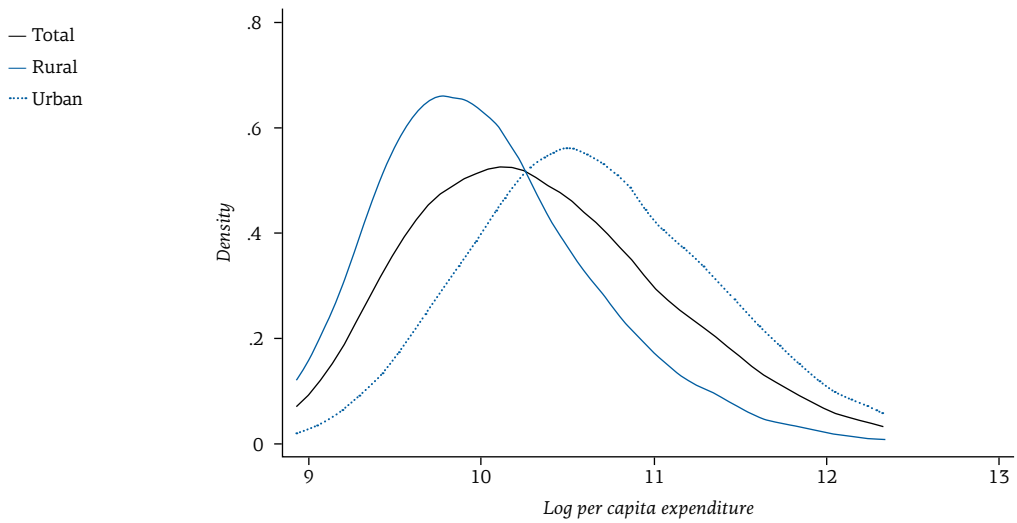
The poverty status of female households in the Philippines clearly differs from that of Cape Verde, as shown by several studies. Schelzig (2005) finds that both the incidence and the severity of poverty among female-headed families in the Philippines are lower. Balatibat and Nierras (2005) find that female-headed families are not poorer than male-headed households. According to UNESCAP (2010), poverty among female-headed households was consistently 14 to 15 percentage points lower than that of the male-headed households during the period from 1985 to 1994. Bernardino (2011) corroborates these findings by asserting that 42 per cent of female-headed households in the Philippines belong to the richest 30 per cent of the income distribution, while only one-fifth belong to the poorest 20 per cent.

Chant (2006) conducted one-on-one interviews and focus groups with 223 respondents from low-income groups in three countries – the Gambia, Costa Rica, and the Philippines – between 2003 and 2005. The finding was that poverty is more likely to afflict male-headed households than female-headed households in the case of the Gambia and the Philippines. Intal (1994) attributes this to higher educational attainment, smaller family size, and female-biased employment demand in the formal sector, particularly in the export sector. The findings with regard to the differences in distribution of per capita expenditure for male- and female-headed households in 2009 in the current study are therefore consistent with the literature.

Figure 3 presents the expenditure distribution of households by level of urbanity. It shows that the distribution of urban households relative to that of rural households is shifted to the right. This means that, on average, urban households are richer than rural households. It is not difficult to imagine why this is so, since there are more opportunities to earn a living in

urban areas. Also, the distribution for rural households is right skewed, indicating that a large portion of rural households are poor.

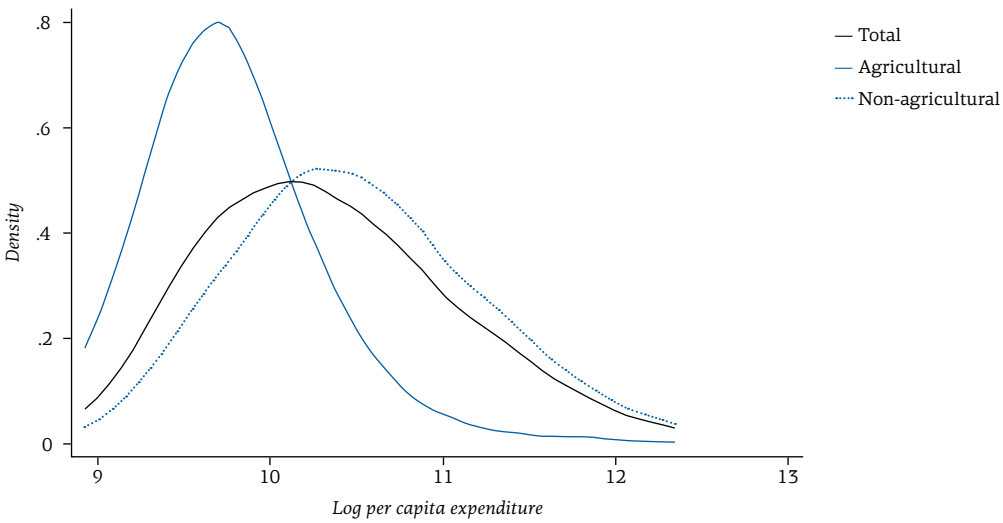
Figure 3 Expenditure distribution by level of urbanity



Source: Authors' estimations, based on the 2009 FIES.

Finally, Figure 4 presents the expenditure distribution of agricultural and non-agricultural households. On average, non-agricultural households are relatively richer than agricultural households, as evidenced by the plot lines in the figure. Moreover, the right skewedness of the distribution of agricultural households suggests that the majority of agricultural households have low levels of expenditure.

Figure 4 Expenditure distribution by agricultural household indicator



Source: Authors' estimations, based on the 2009 FIES.

5.2 Non-parametric regressions

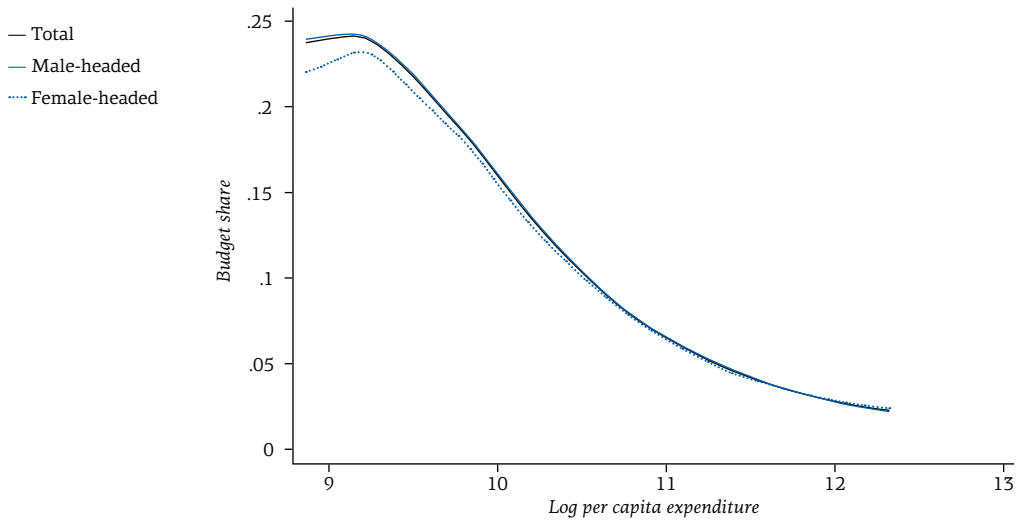
This section presents non-parametric regressions on the log of per capita expenditure of the following: (a) the share of rice in total expenditure, (b) the share of rice in total income, and (c) the net share of rice in total income. These regressions will help explain the distributional effects of shocks in the price of rice while taking into account the disparities in living standards based on the gender of the household head, the level of urbanity, and the agricultural/non-agricultural household indicator.

Figure 5 presents the result for the share of rice in total expenditure. The share of rice in total expenditure at the left tail of the distribution is almost 25 per cent and decreases significantly as one moves from poorer to relatively better-off households. This behaviour is expected and consistent with Engel's Law, as it implies that the budget shares of relatively more expensive food items and other non-food items increase with the level of expenditure. Also, the budget share of rice is slightly lower for female-headed households, but the difference vanishes for richer households.

Reyes *et al.* (2009) show that the share of rice in total expenditure decreases as income increases. Their findings show that there are more net rice

consumers (84.7 per cent of households) than there are net producers (12.8 per cent) in the Philippines, thus indicating that there are more households that will be negatively affected by the increase in rice prices.[12] They obtain the same results when the data are disaggregated by urbanity, income decile, and region.[13]

Figure 5 Budget share of rice and per capita expenditure by gender of household head



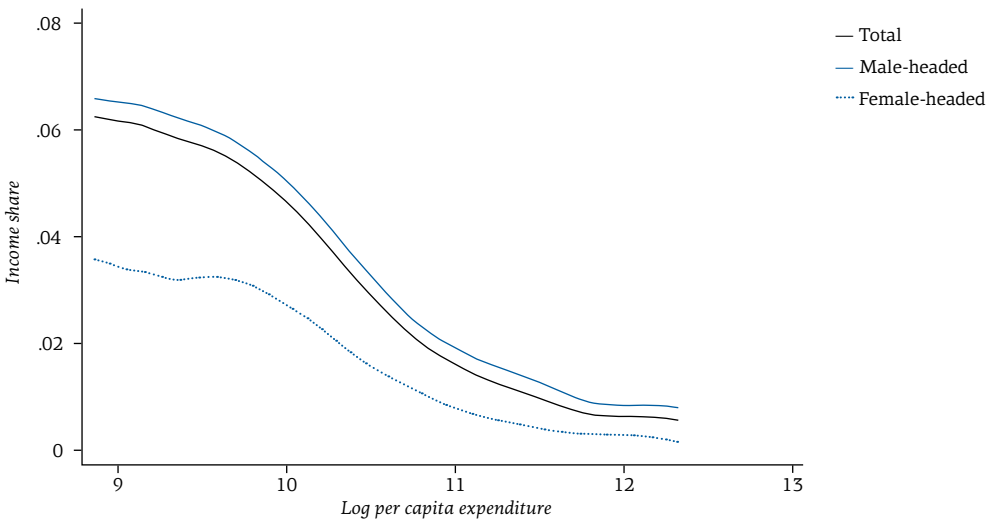
Source: Authors' estimations, based on the 2009 FIES.

In terms of rice production of households, the share of rice in total income declines with the level of well-being, as evidenced in Figure 6. However, on average, rice income is much lower in female-headed households than in male-headed households. This suggests that female-headed households may have other sources of income aside from rice production. Note that the gender-related difference is most pronounced for poor households and becomes smaller as expenditure increases.

[12] In contrast to our constructed indicator for the income share of rice, Reyes *et al.* (2009) used the actual rice income from the 2006 FIES. However, this variable is not readily available to the public in the 2009 FIES..

[13] Annex 3 presents the non-parametric regressions on the log of per capita expenditure of the share of rice in total expenditure and the share of rice in total income by level of urbanity and agricultural household indicator.

Figure 6 Income share of rice and per capita expenditure by gender of household head

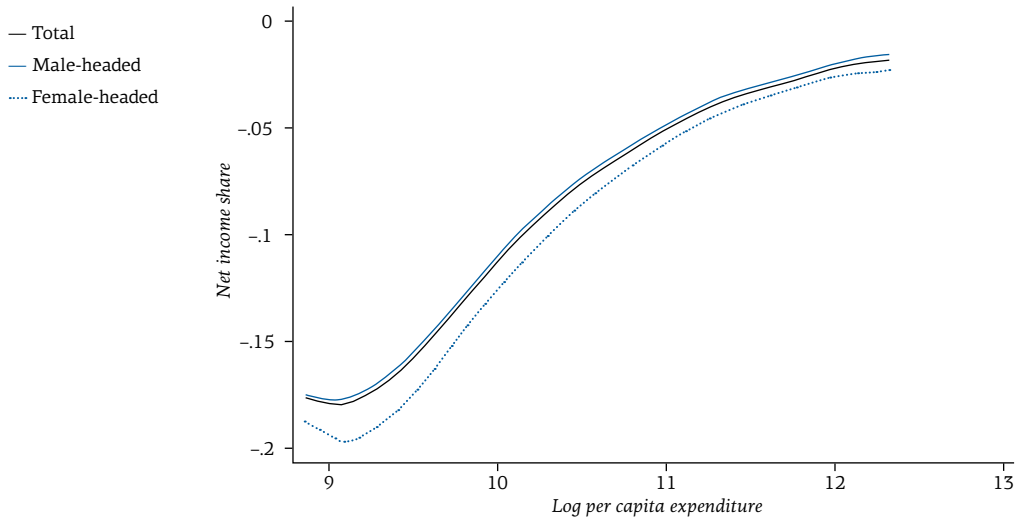


Source: Authors' estimations, based on the 2009 FIES.

In order to see the short-term impact of a rice price shock on households with different expenditure levels, we estimate a non-parametric regression of the net income share of rice, which is the equivalent of the net benefit ratio (NBR) of Deaton (1989). Furthermore, to see the difference in consumption and production patterns across household types, we present the regressions separately by gender of the household head, level of urbanity, and agricultural household indicator.

The result by gender of the household head is presented in Figure 7. On average, the net income share of rice stands at –9.52 per cent, indicating that Filipino households are mostly net rice consumers. On average, the net share of rice in total income for both male- and female-headed households is negative across all levels of per capita expenditure. For households at the lower tail of the income distribution, net rice income is approximately –20 per cent and becomes less negative as one moves from poorer to richer households. This suggests that an increase in the price of rice is highly regressive; that is, an increase in the price of rice would hurt the poor more. Moreover, we can see that at each level of per capita expenditure, female-headed households have a slightly lower (i.e. more negative) net income share of rice compared to male-headed households.

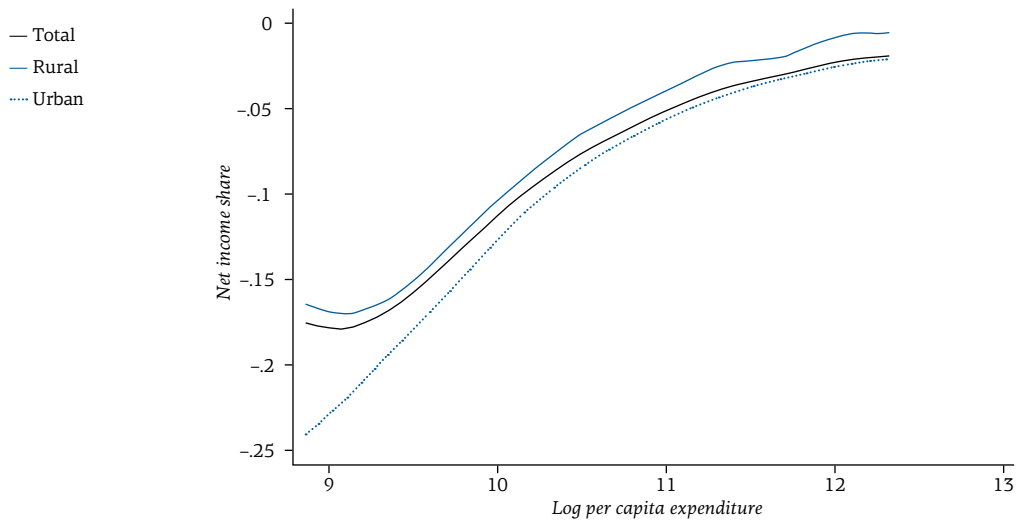
Figure 7 Net income share of rice and per capita expenditure by gender of household head



Source: Authors' estimations, based on the 2009 FIES.

Figure 8 shows that the regressive pattern holds at the urban and rural levels. Also, the net share of rice in total income is lower for poorer urban households, which means that an increase in the price of rice would have a more negative impact on them.

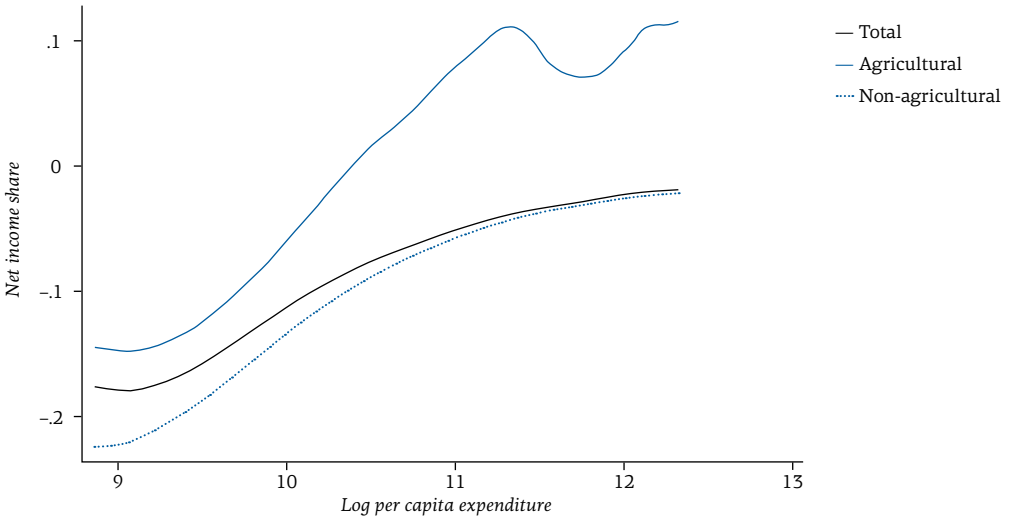
Figure 8 Net income share of rice and per capita expenditure by level of urbanity



Source: Authors' estimations, based on the 2009 FIES.

The regression for non-agricultural households in Figure 9 is similar to that for urban households, but slightly more negative. Interestingly, while the net income shares of agricultural households at lower levels of per capita expenditure are negative, those at higher levels of per capita expenditure are positive. This means that poorer agricultural households are more likely to be net consumers of rice and thus would be worse off if the price of rice were to increase. Conversely, richer agricultural households tend to be net producers of rice and thus would be better off if the price of rice were to increase.

Figure 9 Net income share of rice and per capita expenditure by agricultural household indicator



Source: Authors' estimations, based on the 2009 FIES.

These findings for the agricultural and non-agricultural cases are consistent with Fujii (2013), who finds that agricultural households are less vulnerable than non-agricultural households. In general, poorer households are more vulnerable than wealthier ones to food inflation.

6 Simulations

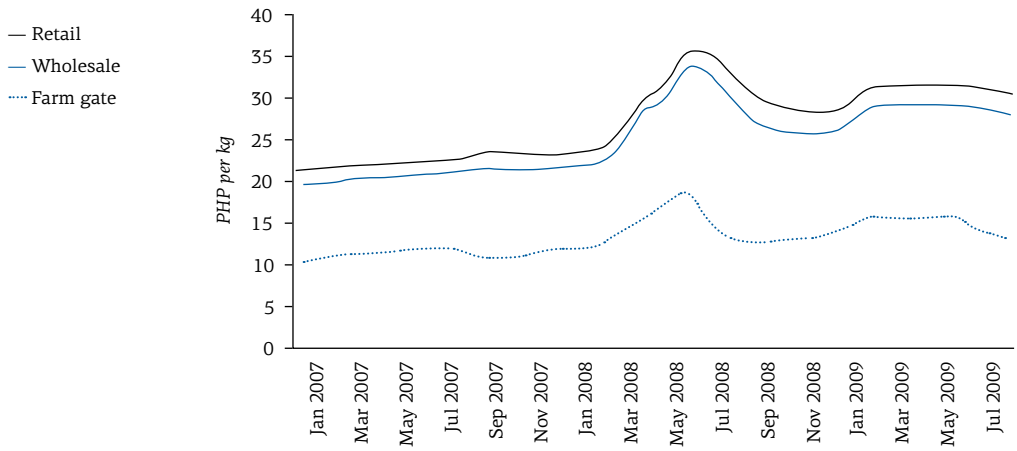
The non-parametric regression results presented above are useful for describing the profile of households that are likely to be vulnerable to shocks in rice prices. However, they do not allow for seeing the extent of the impact of the 2008 rice crisis on household welfare. That is, the previous regressions do not account for the actual price increase and the imperfect transmission of the price increase during that rice crisis episode.

6.1 Imperfect transmission of prices during the 2008 rice crisis

Figure 10 presents the trend in domestic rice prices in PHP from 2007 to 2009.[14] The trends are broadly similar at the wholesale, retail, and farm gate levels, but farm gate prices are significantly lower than the other two, which are similar to each other.

Following Balisacan *et al.* (2010), we divide the period considered into three phases: pre-crisis (January 2007 to February 2008), crisis (March 2008 to September 2008), and post-crisis (October 2008 to August 2009). In the pre-crisis phase, the prices averaged PHP 22.54 per kilogram (kg) at the retail level, PHP 20.82 per kg at the wholesale level, and PHP 11.32 per kg at the farm gate level. During the crisis, average retail prices of rice rose by 39.77 per cent (to PHP 31.50 per kg), wholesale prices increased by 40.47 per cent (to PHP 29.25 per kg), and farm gate prices by 34.12 per cent (to PHP 15.18 per kg). At the peak in June 2008, retail prices were higher by 51.78 per cent, wholesale prices by 54.97 per cent and farm gate prices by 59.05 per cent than the prices in February 2008.[15] Prices started to decline in July and stabilized in October 2008. Note that the prices in the post-crisis phase were higher relative to those in the pre-crisis phase.

Figure 10 Monthly trends in retail, wholesale and farm gate rice prices, January 2007 – August 2009 (PHP per kg)



Source: Authors' estimations, based on data from the Bureau of Agricultural Statistics (2013).
Note: Wholesale and retail prices – regular milled rice; farm gate price – palay (paddy) other variety, dry (converted to 14 per cent moisture content).

In analysing the distributional impact of the actual price shock of 2008, we incorporate the imperfect transmission of price from the pre-crisis phase (January 2007 to February 2008) to the crisis phase (March 2008 to September 2008).

Let the rate of increase of rice prices at the retail level be x and the rate of increase at the farm gate level be y. Suppose that in a certain geographical region, the former exceeds the latter, that is, $x > y$. Because the difference in the price increase rates is already known *ex post*, one can establish that the magnitude of y is a fraction of x, say, $y = ax$ where a is a constant. In the next subsection, we will include this constant a as a scale effect when we compute the net difference between the share of rice in the food budget and in total household income.

Table 3 shows the average rate of change in national and regional farm gate and retail prices during the pre-crisis and crisis phases. In the far right column, which gives the ratio of the average rates of change in farm gate and retail prices, one sees that the ratio is below 1 at the national level. This means that the retail price transmission to farm gate prices was imperfect. In particular, retail prices increased more rapidly than farm gate prices during the rice crisis. Across regions, the transmission varied. For instance, similar to that of the national level, the Caraga, Central Visayas, and Northern Mindanao regions had ratios below 1. However, for the Autonomous Region of Muslim Mindanao, the Cordillera Administrative Region, and Eastern Visayas, the ratio was above 1, which means that in those regions, the increase in farm gate prices was greater than the increase in retail prices.

[14] Data on rice prices were collected from the Bureau of Agricultural Statistics, which distinguishes three types of rice prices: farm gate, wholesale, and retail. Such data series are available from 1990 to 2012. For the trends at the wholesale and retail levels, we use monthly wholesale and retail prices of regular milled rice, while for the trends at the farm gate level we use the farm gate prices of palay (paddy, other variety, dry).

[15] The rice prices at the retail, wholesale, and farm gate levels are nominal. To lend perspective, in June 2008, retail prices were higher by 51.78 per cent compared to February 2008 prices. For the same period, the increase in the consumer price index was 5.15 per cent.

Table 3 Average rate of change of national and regional farm gate and retail prices during the 2008 rice crisis

Region	Change in farm gate price (per cent), *y*	Change in retail price (per cent), *x*	*a = y/x*
All regions	34.12	39.77	0.8580
National Capital Region	..	44.95	1[§]
Cordillera Administrative Region	47.16	43.58	1.0821
I Ilocos Region	37.77	45.72	0.8261
II Cagayan Valley	37.64	42.81	0.8793
III Central Luzon	36.39	42.71	0.8520
IV–A CALABARZON	36.91	42.70	0.8642
IV–B MIMAROPA	32.62	37.67	0.8660
V Bicol Region	33.43	39.66	0.8431
VI Western Visayas	27.69	33.48	0.8271
VII Central Visayas	28.14	41.68	0.6751
VIII Eastern Visayas	40.17	39.17	1.0257
IX Zamboanga Peninsula	31.16	40.57	0.7681
X Northern Mindanao	30.78	41.32	0.7448
XI Davao Region	33.62	39.84	0.8438
XII SOCCSKSARGEN	25.49	33.71	0.7562
XIII Caraga	24.86	39.93	0.6227
Autonomous Region of Muslim Mindanao	37.89	33.98	1.1152

Source: Authors' calculations, based on the average farm gate prices of palay (paddy, other variety, dry) and average retail prices of rice (regular milled rice) from the Bureau of Agricultural Statistics (2013).
Note: Prices changes refer to the growth rate of prices between the pre-crisis phase (January 2007 to February 2008) and the crisis phase (March 2008 to September 2008).
Two dots (..) indicate that data are not available.
[§] Data on farm gate prices for the National Capital Region are not available as the volume of rice production in this region is negligible. We therefore assume that at any point in time there is no disparity between the retail and farm gate prices in the National Capital Region.

6.2 Welfare effects of the 2008 rice crisis

To quantify the effect of the 2008 rice crisis, we use a benefits/costs variable, *BC*, defined by the equation:

$$BC = (as - s^{*})\, d\ln(p) \qquad (2)$$

where s is the share of rice farming in total income, s^{*} is the share of rice in total expenditure, p is the retail price of rice, $d\ln(p)$ is the percentage change in the retail price of rice and a is the ratio of the average rates of change in farm gate and retail prices, as defined in the previous subsection. Because, for the majority of the regions, the growth rate of retail prices is higher compared to farm gate prices, the benefits/costs variable may be smaller than it would be if prices accruing to producers and consumers had similar growth rates. Interestingly, since the differential growth rates of farm gate and retail prices vary across regions, benefits/costs ratios vary across regions as well.

Hence, similar to the NBR used by Deaton (1989), the benefits/costs variable quantifies the variations in rice consumption and production patterns across households. In addition, the measure takes into account different levels of heterogeneity – that is, the difference in the rates of increase of prices across provinces, and the difference at the farm gate *vis-à-vis* the retail level. Similarly, Reyes *et al.* (2009) introduced an innovation in computing the NBR by using different magnitudes for the increase in retail prices and the increase in farm gate prices. They were able to calculate and compare the NBRs before and after the price increases because they had data on actual quantities of rice produced and consumed by the households. Unfortunately, this study could not use the same methodology because data in the 2009 FIES on quantities of rice produced and consumed are not available for public access.

Table 4 presents the estimations of the benefits/costs variable for various types of households. On average, households in the Philippines were negatively affected by the rice crisis, as indicated by a negative benefits/costs variable. Household groups with more negative average benefits/costs included male-headed, rural, non-agricultural, and lower-decile households. Finally, as reflected in the standard deviations in the far right column of Table 4, the spread of the distribution of the benefits/costs variable is greater for male-headed, rural, agricultural, and lower-decile households.[16]

[16] Annex 4 presents histograms of benefits/costs for various groups of households.

Table 4 Welfare effects of the 2008 rice crisis on various groups of households

Household group	25th percentile	Mean	75th percentile	Standard deviation
All households	–0.0614	–0.0400	–0.0183	0.0406
Gender of HH head				
Male	–0.0634	–0.0407	–0.0189	0.0422
Female	–0.0532	–0.0372	–0.0166	0.0338
Urbanity				
Urban	–0.0494	–0.0358	–0.0182	0.0294
Rural	–0.0734	–0.0441	–0.0185	0.0490
Agricultural HH indicator				
Agricultural	–0.0786	–0.0360	0.0035	0.0625
Non-agricultural	–0.0572	–0.0411	–0.0201	0.0313
National income decile				
1	–0.0883	–0.0545	–0.0189	0.0524
2	–0.0880	–0.0571	–0.0288	0.0485
3	–0.0831	–0.0549	–0.0318	0.0456
4	–0.0748	–0.0498	–0.0300	0.0433
5	–0.0677	–0.0465	–0.0298	0.0390
6	–0.0574	–0.0399	–0.0263	0.0353
7	–0.0482	–0.0329	–0.0229	0.0322
8	–0.0398	–0.0280	–0.0190	0.0265
9	–0.0321	–0.0221	–0.0150	0.0232
10	–0.0207	–0.0140	–0.0090	0.0186
Region				
National Capital Region	–0.0331	–0.0249	–0.0139	0.0149
Cordillera Administrative Region	–0.0484	–0.0241	–0.0101	0.0495
I Ilocos Region	–0.0727	–0.0455	–0.0219	0.0437
II Cagayan Valley	–0.0560	–0.0128	0.0269	0.0614
III Central Luzon	–0.0531	–0.0294	–0.0186	0.0475
IV–A CALABARZON	–0.0521	–0.0389	–0.0205	0.0261
IV–B MIMAROPA	–0.0731	–0.0443	–0.0188	0.0457
V Bicol Region	–0.0729	–0.0486	–0.0222	0.0394
VI Western Visayas	–0.0706	–0.0479	–0.0243	0.0357
VII Central Visayas	–0.0667	–0.0462	–0.0194	0.0438
VIII Eastern Visayas	–0.0851	–0.0544	–0.0238	0.0466
IX Zamboanga Peninsula	–0.0746	–0.0442	–0.0122	0.0501

Household group	25th percentile	Mean	75th percentile	Standard deviation
X Northern Mindanao	–0.0778	–0.0526	–0.0231	0.0415
XI Davao Region	-0.0662	-0.0475	-0.0248	0.0331
XII SOCCSKSARGEN	-0.0684	-0.0457	-0.0224	0.0352
XIII Caraga	-0.0950	-0.0697	-0.0412	0.0414
Autonomous Region of Muslim Mindanao	-0.0546	-0.0317	-0.0041	0.0389

Source: Authors' calculations, based on the 2009 FIES and Bureau of Agricultural Statistics (2013).
Note: HH stands for household.

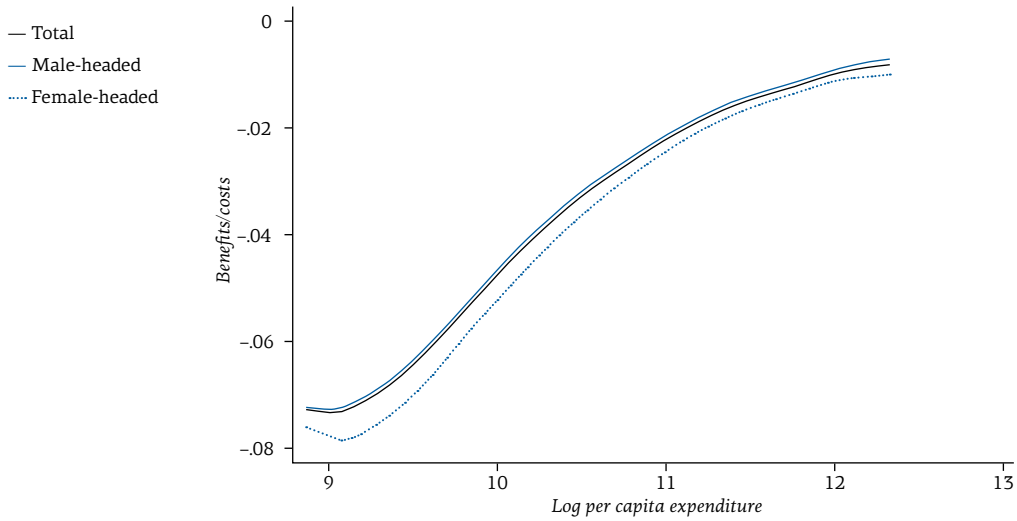
However, the differences across groups in this table only reflect the effects of the price changes owing to differences in per capita expenditure across groups, differences in rice production and consumption patterns, and in price increases across regions. Therefore, we cannot use this table to compare welfare effects across groups of households, such as between male- and female-headed households, at the same level of per capita expenditure. In the following section, the distributional analysis takes into account the well-being of the household – a factor that could determine whether a household would gain or lose from the rice price shock.

6.3 Benefits/costs and levels of household expenditure

It is also important to look at the distribution of the benefits/costs in different categories as measured by per capita expenditure. This yields results that are comparable to the regressions of the net income share of rice in Section 5.

Figure 11 shows the non-parametric regression results by gender of the household head. As expected, the benefits/costs variable is negative throughout the distribution and becomes less negative with higher expenditure levels. This means that higher prices due to the 2008 rice crisis hurt the poor the most. Moreover, the benefits/costs for female-headed households are lower than the benefits/costs for male-headed households. The effect of the 2008 rice crisis therefore seems to have been more detrimental to the female-headed households. The reason for this result is that female-headed households are more likely the net consumers of rice at all levels of per capita expenditure, as seen in Figure 7.

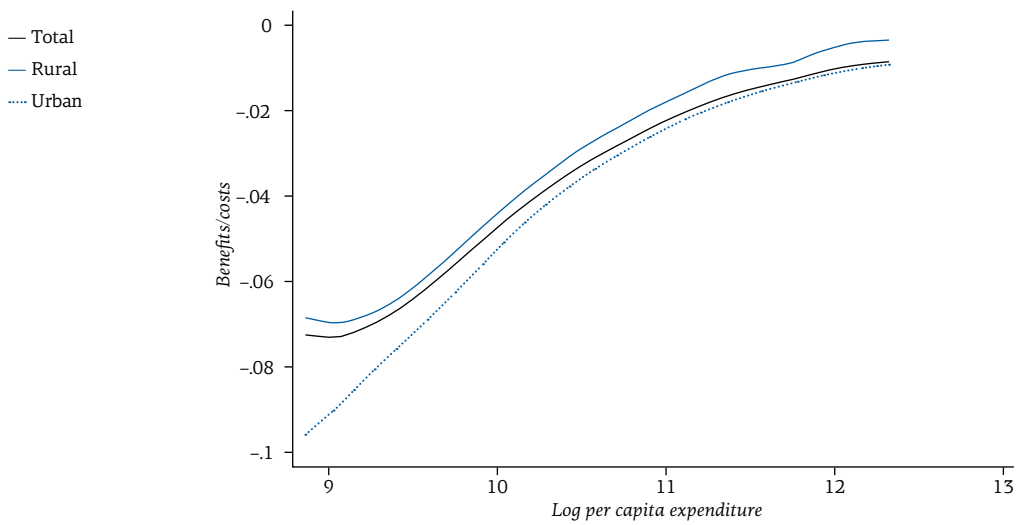
Figure 11 Benefits/costs and per capita expenditure by gender of household head



Source: Authors' estimations, based on the 2009 FIES and Bureau of Agricultural Statistics (2013).

As seen in Figure 12, the regressions estimated for urban and rural households likewise display a regressive trend. Urban households, on average, have a more negative benefits/costs variable across the spectrum. This suggests that urban households were worse off relative to the rural households.

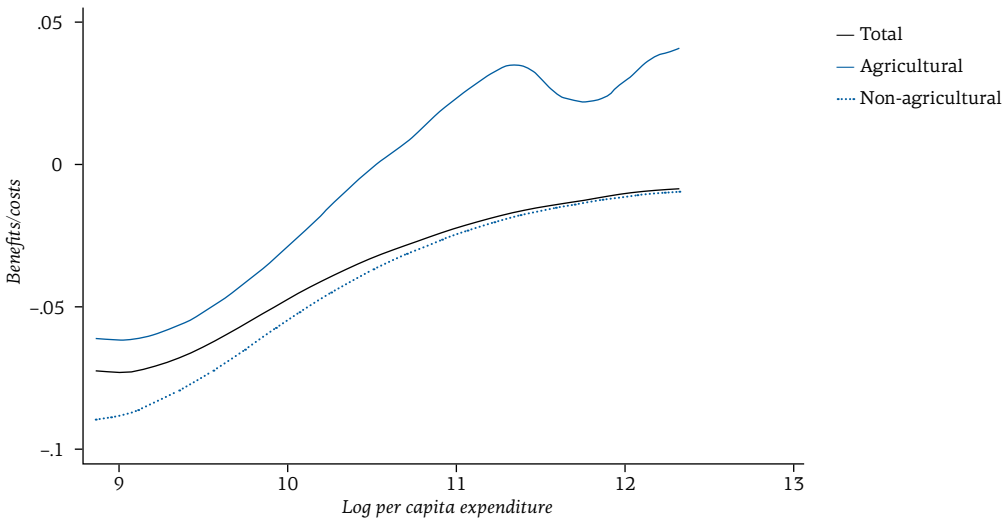
Figure 12 Benefits/costs and per capita expenditure by level of urbanity



Source: Authors' estimations, based on the 2009 FIES and Bureau of Agricultural Statistics (2013).

Finally, Figure 13 shows that across levels of expenditure, non-agricultural households have a lower benefits/costs variable, suggesting that they were more adversely affected than agricultural households. In addition, note that in the regression for agricultural households, households at the right tail of the distribution have a positive benefits/costs variable. This means that richer agricultural households gained from the rice crisis, as they are more likely the net producers of rice.

Figure 13 Benefits/costs and per capita expenditure by agricultural household indicator



Source: Authors' estimations, based on the 2009 FIES and Bureau of Agricultural Statistics (2013).

6.4 Who are the gainers and losers from the 2008 rice crisis?

Following Reyes *et al.* (2009), we use the plus or minus sign of the household benefits/costs variable, *BC*, to assess how the welfare of households has changed due to the 2008 rice crisis. If $BC > 0$, the household is defined as better off from the increase in the rice price and thus is a "gainer" in the rice crisis. Conversely, if $BC < 0$, the household is defined as worse off from the increase in the rice price and thus is a "loser" in the rice crisis. Note that the identification of gainers and losers does not take into account the magnitude of the gain or loss, but just the sign.

Table 5 presents the breakdown of the population in each sub-group into unaffected, gainers, and losers. Among households in the Philippines, 91 per cent were losers in the rice crisis while only 8.4 per cent were gainers and 0.6 per cent were unaffected. Regardless of the type of household,

those who were adversely affected by the rice crisis clearly outnumbered those who were better off. This result is consistent with the result of Reyes *et al.* (2009), who, based on the change in the NBR due to rice price changes, found that 85.5 per cent of households in the Philippines were negatively affected while only 12.1 per cent benefited during the crisis.

The far right column of Table 5 shows the proportions of households defined as losers in the rice crisis. As shown, female-headed, rural, non-agricultural, and higher-income households tend to have higher shares of losers relative to their counterparts. These results seem contradictory to the results in Table 4. Accordingly, based on the average values of benefits/costs, the better-off groups include female-headed, urban, and higher-income households. However, the distribution of benefits/costs in Annex 4 shows that losers in the female-headed, urban, and higher-income groups, although higher in terms of share, tend to have higher (i.e. less negative) values of benefits/costs variable relative to the losers in the male-headed, rural, and lower-income groups. One can also note from the standard deviation of the benefits/costs in Table 4 that the spread of the distribution of the variable for households in the lower-income brackets is wider, thus making it possible to have a higher share of households that end up as gainers from the price change (see Figure A4.4 in Annex 4).

Note also that the proportions of gainers among rural households (14.34 per cent) and agricultural households (26.59 per cent) were considerable. Moreover, there were a number of gainers in the lower-income deciles and in regions such as the Cagayan Valley, Autonomous Region of Muslim Mindanao, Cordillera Administrative Region, and the Zamboanga Peninsula. This suggests that there are a number of net sellers of rice in these groups.

Table 5 Proportion of unaffected, gainers and losers in the 2008 rice crisis by various groups of households (per cent)

Household group	Unaffected	Gainers	Losers
All households	0.6	8.4	91.0
Gender of household head			
Male	0.52	9.55	89.93
Female	0.86	4.13	95.01
Urbanity			
Urban	0.58	2.42	97.00
Rural	0.61	14.34	85.05

Household group	Unaffected	Gainers	Losers
Agricultural household indicator			
Agricultural	0.39	26.59	73.02
Non-agricultural	0.65	3.08	96.27
National income decile			
1	2.34	15.31	82.35
2	0.76	12.38	86.86
3	0.43	10.36	89.21
4	0.54	10.08	89.38
5	0.31	7.46	92.23
6	0.24	6.82	92.93
7	0.06	6.86	93.08
8	0.66	5.27	94.07
9	0.29	5.03	94.68
10	0.29	4.46	95.26
Region			
National Capital Region	0.83	0.10	99.07
Cordillera Administrative Region	0.06	18.68	81.26
I Ilocos Region	0.09	11.91	88.00
II Cagayan Valley	0.42	33.71	65.88
III Central Luzon	0.48	11.24	88.27
IV-A CALABARZON	0.35	1.56	98.09
IV-B MIMAROPA	0.17	12.92	86.90
V Bicol Region	0.27	8.07	91.66
VI Western Visayas	0.47	6.21	93.32
VII Central Visayas	1.57	9.68	88.75
VIII Eastern Visayas	0.22	8.82	90.96
IX Zamboanga Peninsula	1.74	16.76	81.50
X Northern Mindanao	1.18	7.84	90.98
XI Davao Region	0.84	5.23	93.93
XII SOCCSKSARGEN	0.35	7.00	92.65
XIII Caraga	0.25	3.06	96.69
Autonomous Region of Muslim Mindanao	0	22.24	77.76

Source: Authors' calculations, based on the 2009 FIES and Bureau of Agricultural Statistics (2013).
Note: In each row, the values sum to 100.

Table 6 presents, within each category, the breakdown of gainers, losers and unaffected into sub-groups. Most of the losers are located in urban and non-agricultural areas, while the gainers are in rural and agricultural areas. These results are not surprising, as most households in urban and non-agricultural areas tend to be net consumers of rice and those in rural and agricultural areas tend to be net producers of rice. Reyes *et al.* (2009) also reported a larger proportion of losers in urban areas.

The sub-set of gainers (third column in Table 6) shows that the proportion of households belonging to the lower-income deciles is higher, as they are likely to be net producers of rice.[17] Such results are comparable to the findings of Reyes *et al.* (2009).

Looking at regional patterns, most of the losers live in the National Capital Region, the regional grouping of Calamba, Laguna, Batangas, Rizal, and Quezon (CALABARZON), and Central Luzon. This finding is similar to that of Reyes *et al.* (2009). Most of the gainers live in Central Luzon, Cagayan Valley, Central Visayas, and the Autonomous Region of Muslim Mindanao. In contrast, Reyes *et al.* (2009) found that most of the gainers were situated in Central Luzon, Ilocos, Western Visayas, and the Cagayan Valley.

Table 6 Distribution of unaffected, gainers and losers in the 2008 rice crisis by various groups of households (per cent)

Household group	Unaffected	Gainers	Losers
Gender of household head			
Male	69.29	89.60	77.90
Female	30.71	10.40	22.10
Urbanity			
Urban	48.42	14.38	53.12
Rural	51.58	85.62	46.88
Agricultural household indicator			
Agricultural	14.80	71.64	18.17
Non-agricultural	85.20	28.36	81.83
National income decile			
1	39.54	18.22	9.05
2	12.85	14.73	9.54

[17] Balicasan *et al.* (2010) maintain that, because the poor generally devote higher shares of expenditure to cereals (mainly rice), they tend to be hit harder by a rice crisis. Their finding, however, is not strictly comparable with Table 6 because they did not include rice income in their framework.

Household group	Unaffected	Gainers	Losers
3	7.24	12.33	9.80
4	9.08	12.00	9.82
5	5.27	8.88	10.14
6	4.11	8.12	10.21
7	1.01	8.17	10.23
8	11.17	6.28	10.34
9	4.89	5.98	10.40
10	4.83	5.30	10.47
Region			
National Capital Region	18.71	0.16	14.52
Cordillera Administrative Region	0.17	3.88	1.56
I Ilocos Region	0.81	7.72	5.27
II Cagayan Valley	2.48	14.19	2.56
III Central Luzon	8.98	14.70	10.66
IV-A CALABARZON	7.59	2.42	14.05
IV-B MIMAROPA	0.93	4.92	3.05
V Bicol Region	2.64	5.57	5.84
VI Western Visayas	6.25	5.82	8.07
VII Central Visayas	19.74	8.58	7.26
VIII Eastern Visayas	1.73	4.92	4.68
IX Zamboanga Peninsula	10.53	7.16	3.21
X Northern Mindanao	9.04	4.24	4.55
XI Davao Region	6.78	2.98	4.94
XII SOCCSKSARGEN	2.55	3.61	4.42
XIII Caraga	1.07	0.93	2.71
Autonomous Region of Muslim Mindanao	0.00	8.20	2.65

Source: Authors' calculations, based on the 2009 FIES and Bureau of Agricultural Statistics (2013).
Note: Within each household category, the values in each column sum to 100.

7 Conclusions and policy implications

What was the distributional impact of the 2008 rice crisis in the Philippines? Following the methodology of Deaton (1989), this study mapped out the vulnerability of various household groups to rice price shocks through non-parametric regressions of the net rice share on per capital expenditure for different household groups.

At the national level, the measures of the net income share of rice for both male- and female-headed households are negative across all levels of per capita expenditure. The findings also show that for low-income households, net rice income is approximately –20 per cent and becomes less negative as one moves from poorer to richer households. This suggests that an increase in the price of rice is highly regressive – that is, it hurts the poor more, a finding consistent with Reyes *et al.* (2009) and Fujii (2013). In addition, female-headed households have a slightly lower net income share of rice, suggesting that they are more vulnerable compared to male-headed households.

For urban households, the net income share of rice is lower than that for rural households. Furthermore, it is much lower for poorer segments of urban households. This implies that a price shock has a more detrimental effect on the poor in urban areas.

For households in the agricultural sector, the outcome is mixed – poorer agricultural households are net consumers of rice while richer ones are net producers. Hence, price increases hurt poor agricultural households but benefit agricultural households with higher income. On the other hand, as households in the non-agricultural sector are generally net consumers of rice, they are more vulnerable to price shocks compared to households in the agricultural sector.

We carried out simulations on the benefits/costs variable (an indicator for the change in the NBR), given actual price changes at the farm gate and retail levels for each household during the 2008 rice crisis. The gainers and losers from the rice crisis could be identified by the sign of the benefits/costs variable (gainers for positive change, losers for negative change). We found that, on average, over 90 per cent of the households in the survey suffered a loss of welfare. The few that gained from the price shock were found mostly in the rural and agricultural sectors.

Although the overwhelming majority at each income decile experienced a loss in welfare, there were relatively more gainers among those in the lower-income deciles than in the higher-income deciles. An explanation is that those belonging to the higher-income deciles are net consumers of rice. Similarly, the majority of the households in all regions suffered a loss in welfare, while the regions with a substantial number of gainers were the Cagayan Valley, Autonomous Region of Muslim Mindanao, Cordillera Administrative Region, and the Zamboanga Peninsula.

The non-parametric regression of the benefits/costs variable on the log of per capita expenditure provided several results. First, conditional on the level of per capita expenditure, female-headed households are more vulnerable to changes in rice prices. This means that female-headed households suffered a greater loss of welfare from the crisis.[18]

Second, conditional on the level of per capita expenditure, the benefits/costs for urban households are lower than for rural households. Such results are not surprising given that urban households are more likely to be net consumers of rice than rural households.[19]

Third, conditional on the level of per capita expenditure, agricultural households suffered less than non-agricultural households. It is quite obvious that the rice producers would be in the agricultural sector and that the urban poor, with very little potential for gains from rice production, would be hit harder.

In the analysis of the impact on households by national income decile, we see that the decreases in the benefits/costs are greater for the lower-income deciles. The dispersions are also greater at the lower-income levels than the higher-income ones. Again, one implication is that the poorest of the poor suffer the brunt of the rice crisis.

The profile of gainers and losers is not entirely unexpected, as most households in urban and non-agricultural areas tend to be net consumers of rice, and those in rural and agricultural areas tend to be net producers. Thus, for targeting transfers, Philippine policymakers should be guided by the

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[18] There appears to be some tension between the absolute values of benefits/costs (Table 4, columns 2–4) and the non-parametric regression results of the net income share of rice and the log of per capita expenditure (Figures 7–9) with regard to identifying the most affected household groups. Considering the relative vulnerability of male- and female-headed households, we can say that, on average, male-headed households experienced a deeper welfare loss (negative benefits/costs) than female-headed ones. However, the benefits/costs variable for male-headed households has a greater dispersion, i.e. a higher standard deviation (Table 4, column 5, and Figure A4.1). In addition, controlling for per capita expenditure, female-headed households are found to have systematically lower benefits/costs (Figure 11).

[19] Given the average benefits/costs (Table 4, columns 2–4), rural households appear to suffer a greater loss in welfare than urban households. In addition, the standard deviation of the benefits/costs distribution for rural households is greater, but higher extreme values are found for urban households (Table 4, column 5; Figure A4.2). This implies that some urban households enjoyed particularly high benefits from the price increase, which pushed up the average. However, the proportion of losers in the rural sector is smaller than that in the urban sector (Table 5).

absolute magnitudes of the benefits and costs and by their distribution on the log of per capita expenditure.

By and large, the entire country suffered through the 2008 rice crisis, although a minority actually gained. As a short-term measure to help vulnerable households, Balicasan *et al.* (2010) advocate the expansion of conditional cash transfers, complemented with a targeted rice subsidy programme in depressed areas. These safety nets would help avoid hunger and poverty.

Indeed, policymakers are confronted with the challenge of designing an appropriate poverty-alleviating response in the event that a rice crisis occurs again. While it is desirable that all affected households have access to assistance programmes such as subsidized rice or conditional cash transfers, the government's resource constraints dictate that there ought to be strategic targeting of beneficiaries. Those that suffer most from the crisis ought to be prioritized by assistance programmes.

However, the effectiveness of assistance programmes is often compromised by leakage. Because of poor targeting of the beneficiaries, less-needy households may benefit from government assistance at the expense of more needy ones. Reyes *et al.* (2009) cite leakage as a reason why cheap subsidized rice from the National Food Authority does not always reach the poor. In addition, the lack of capacity of local governments to accurately identify households for conditional cash transfers limits the effectiveness of the safety net programme of the Department of Social Work and Development.

Hopefully, the findings of this study will help target government relief and safety net programmes in the event of future rice crises. Information about vulnerable household groups from the experience of the 2008 rice crisis in the Philippines may help in the identification of those segments of the population that deserve a higher priority in assistance.

Admittedly, even if this study can help improve the targeting mechanism of households that need assistance during food crises, the inadequacy of the available resources relative to the needs may compromise the effectiveness of such a mechanism. Given the extent of poverty in the Philippines, and the very limited participation of the NFA at present in the market in terms of procurement and buffer stocks, there seems to be very little scope for assistance. Thus, in addition to better targeting, there is a case for considering the expansion of the government budget directed to helping the poor cope with rice crises.

Balisacan *et al.* (2010) observe that the past implementation of the NFA's rice subsidy programme was not cost-effective. Thus, concomitant with expanded budgets for this programme, there is a need for better governance of the NFA.

Social safety net and rice subsidy programmes are only short-term measures, and policymakers also need to look at longer-term solutions. It should be borne in mind that policy options have accompanying costs. Having an idea of the welfare costs resulting from a crisis could help evaluate such policy options. Our findings about the impact of the 2008 rice crisis indicate that around 90 per cent of households experienced a reduction of welfare to varying degrees. Back-of-the-envelope estimations show that the government needs PHP 803 million worth of measures, such as cash handouts, to bring the welfare of households back to the pre-crisis level.[20] In absolute terms, the cost to society is very high. Thus, investing in crafting longer-term policy measures to prevent the crisis from recurring is worthwhile.

As a perennial task, policymakers should not abandon initiatives to solve the problem at its core – that is, to improve rice productivity. In fact, because of the structural problems in the rice sector, Balisacan *et al.* (2010) contend that a rice crisis in the Philippines would have occurred even in the absence of the global price shock. The factors that they cite are similar to those that afflict agriculture and the rural economy in the Philippines in general. One main constraint to Philippine agriculture is the productivity slowdown resulting from the lack of investment in the sector and in support services. Particularly lacking are investments in infrastructure, research, and institutions. In addition, assistance to farmers in terms of extension services is rather weak. Mismatches of the choice of rice variety with the soil type occur as well. Hence, when the global rice crisis broke, the Philippine domestic rice market, laden with problems of its own, was caught unprepared and adversely affected.

Is it a question of introducing new programmes and projects? Indeed, there are already existing programmes to improve rice productivity and enhance food security. For instance, the Agriculture and Fisheries Modernization Act contains provisions that rationalize production zones and their associated products. There is a need to streamline current programmes, strengthen their disciplines, and implement them effectively.

[20] To estimate this value, we compute the amount of cash each household must receive so that it would have zero benefits/costs.

The Philippine government has gone farther than simply improving NFA operations. In fact, it has embarked on a rice self-sufficiency strategy under the Food Staples Sufficiency Programme that envisioned a no-import target for 2013.[21] Since the crisis, the government has raised the NFA buying price of paddy to higher than pre-crisis levels. As a consequence of the supply response, the NFA has had to raise its procurement levels.

Some observers (Briones, 2012a) raise the point that self-sufficiency should be qualified by the "affordability" criterion. Others contend that there should be a distinction between food self-sufficiency and food self-reliance. Food self-sufficiency is associated with meeting food needs from local sources and minimizing dependence on trade. Food self-reliance, on the other hand, implies assuring food adequacy from both local and foreign sources.

The concept of food self-reliance is thus consistent with continued engagement of the country in international trade. Actually, the World Trade Organization's Agreement on Agriculture provides policy options for a country to support domestic production as part of the food security strategy, provided that certain conditions are met. Furthermore, Dawe and Slayton (2010) caution against blaming the free trade mechanism as the culprit behind the rice crisis. Both Clarete (2012) and Briones (2012a) reiterate that protectionist measures against rice imports may not be the optimal policy. Cooperation in assuring adequate levels of the world rice supply would be a promising way to build confidence. In this context, Sarris (2010) suggests the use of long-term supply contracts on rice between countries.

In the end, policymakers have to find a balance between producer and consumer interests in rice policy. Given the enormity of the social and financial cost of another rice crisis, Philippine policymakers should direct their efforts towards improving rice productivity. Because instituting reforms takes time, they should also make every effort to enhance international cooperation to stabilize the supply of internationally traded rice. These are, by no means, easy tasks.

[21] The government, through the NFA, imported 236,000 metric tons as of November 2013. Meanwhile, as the NFA distributed free rice in relief operations in some localities hardest hit by the Typhoon Yolanda, the buffer stock has dipped below the desired level. There are reports that the government may import rice again to replenish the rice inventory (Despuez, 2013).

Annexes

Annex 1 Summary of key statistics across groups of households

Table A1.1 presents the means of the key statistics for different groups of households.[22] In terms of per capita expenditure, female-headed, urban, and non-agricultural households are substantially richer than male-headed, rural, and non-agricultural households, respectively.

In terms of rice consumption patterns, male-headed, rural, and agricultural households have higher shares of rice expenditure relative to their counterparts.

The rice production patterns vary across groups of households. Male-headed, rural, and agricultural households derive higher shares of their income from rice farming than their counterparts.

Finally, we take a look at the net share of rice in the total income of households. Note that all mean values in this panel are negative, implying that, on average, households, regardless of type, are net consumers of rice. This suggests that they would be negatively affected by an increase in the price of rice. The more vulnerable groups include male-headed, rural and non-agricultrual households.

Table A1.1 Summary of key statistics for different groups of households

		Gender of HH head		Urbanity		Agricultural HH indicator	
		Male	Female	Urban	Rural	Non-agricultural	Agricultural
Per capita expenditure (PHP)	25th percentile	17,001.33	23,111.00	25,860.78	14,415.75	21,985.27	12,430.86
	Mean	40,210.56	58,293.46	59,129.08	29,046.06	50,647.97	21,459.63
	75th percentile	46,279.00	71,283.00	69,935.00	33,151.33	59,143.67	23,711.67
	Standard deviation	47,506.82	68,191.72	66,212.59	28,482.30	56,826.59	27,468.82
Budget share of rice (per cent)	25th percentile	6.50	4.52	4.59	9.33	5.39	12.67
	Mean	13.77	10.62	9.53	16.66	11.14	19.80
	75th percentile	19.09	14.53	12.59	22.73	15.14	26.58
	Standard deviation	9.45	8.21	6.97	9.93	7.84	10.67

[22] For the definitions of the key variables, refer to Section 4.

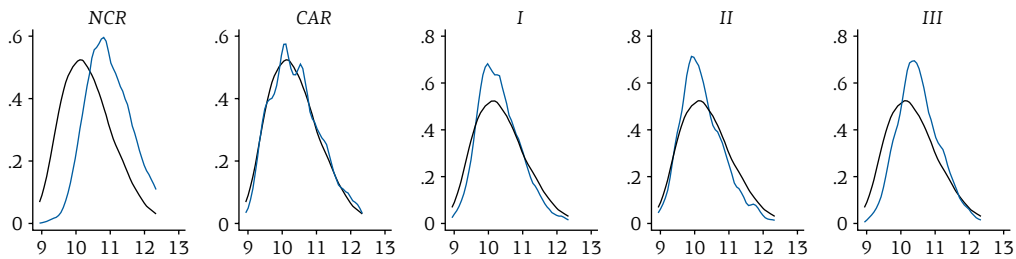
		Gender of HH head		Urbanity		Agricultural HH indicator	
		Male	Female	Urban	Rural	Non-agricultural	Agricultural
Income share of rice (per cent)	25th percentile	0.00	0.00	0.00	0.00	0.00	0.00
	Mean	4.10	1.66	0.97	6.19	1.18	11.81
	75th percentile	3.49	0.00	0.00	9.33	0.00	20.12
	Standard deviation	8.74	5.66	4.70	10.00	3.70	12.88
Net income share of rice (per cent)	25th percentile	–15.68	–13.01	–11.89	–18.29	–13.96	–19.59
	Mean	–9.67	–8.96	–8.56	–10.47	–9.97	–7.99
	75th percentile	–4.31	–3.87	–4.22	–4.05	–4.70	2.70
	Standard deviation	11.22	8.87	7.60	13.12	8.09	16.89

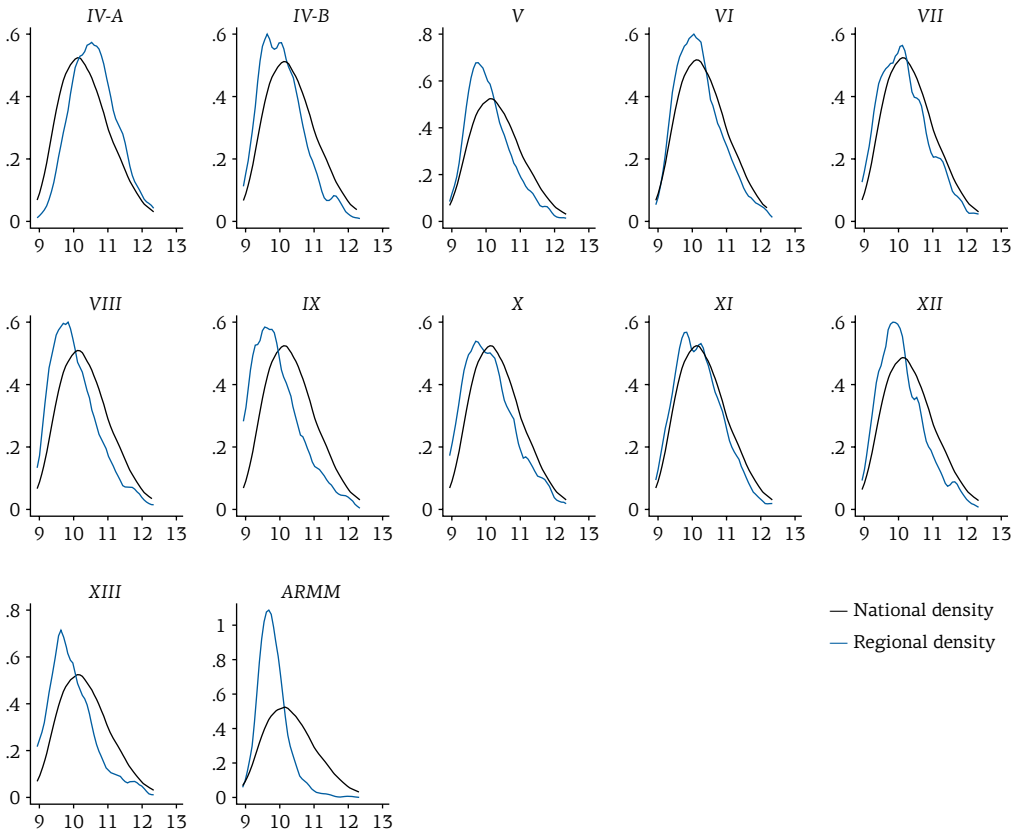
Source: Authors' calculations, based on the 2009 FIES.
Note: Estimated number of households in the Philippines = 18,452,000; number of observations = 38,400; number of strata = 939; number of primary sampling units = 2,822.

Annex 2 Kernel density estimations of expenditure by region

Figure A2.1 shows the distribution of expenditure across regions. Note that the following regions have distributions that are biased to the right: National Capital Region, Region III – Central Luzon, and Region IV-A – CALABARZON. This means that households located in these regions are better off relative to an average Filipino household. The regions with distributions that are biased to the left are Region II – Cagayan Valley, Region IV-B – MIMAROPA, Region V – Bicol, Region VI – Western Visayas, Region VII – Central Visayas, Region VIII – Eastern Visayas, Region IX – Zamboanga Peninsula, Region X – Northern Mindanao, Region XI - Davao, Region XII – SOCCSKSARGEN, Region XIII – Caraga, and the Autonomous Region of Muslim Mindanao. These regions have households that are relatively poorer compared to an average Filipino household.

Figure A2.1 Expenditure distributions by region





Source: Authors' estimations, based on the 2009 FIES.
Note: NCR stands for National Capital Region. CAR stands for Cordillera Administrative Region. ARMM stands for Autonomous Region of Muslim Mindanao.

Annex 3 Non-parametric regression results across groups of households

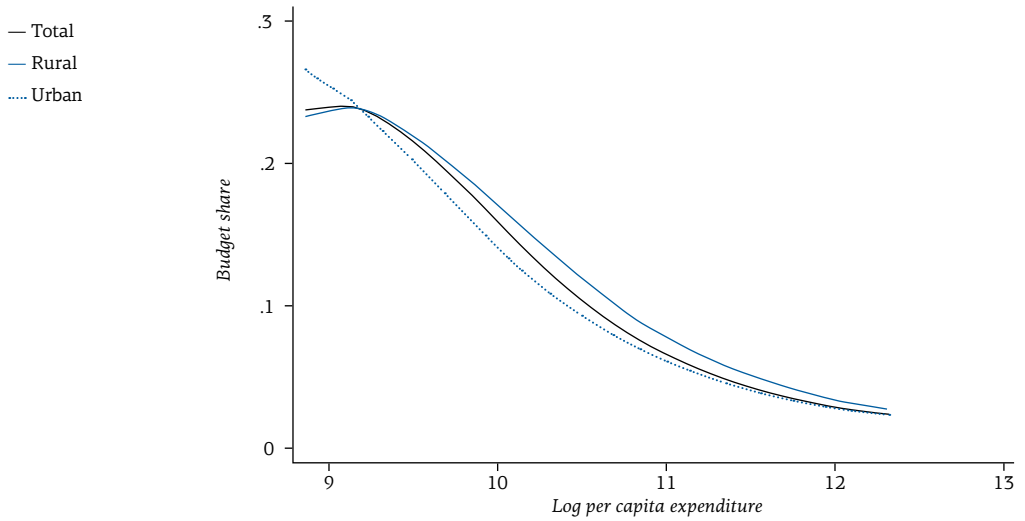
For various types of households, we present non-parametric regressions on the log of per capita expenditure of (a) the share of rice consumption in total expenditure, and (b) the share of rice production in total income.

Share of rice consumption in total expenditure

The rice expenditure pattern can vary across household types. Figures A3.1 and A3.2 show the results for urban/rural households and non-agricultural/agricultural households. Urban households have a declining rice budget

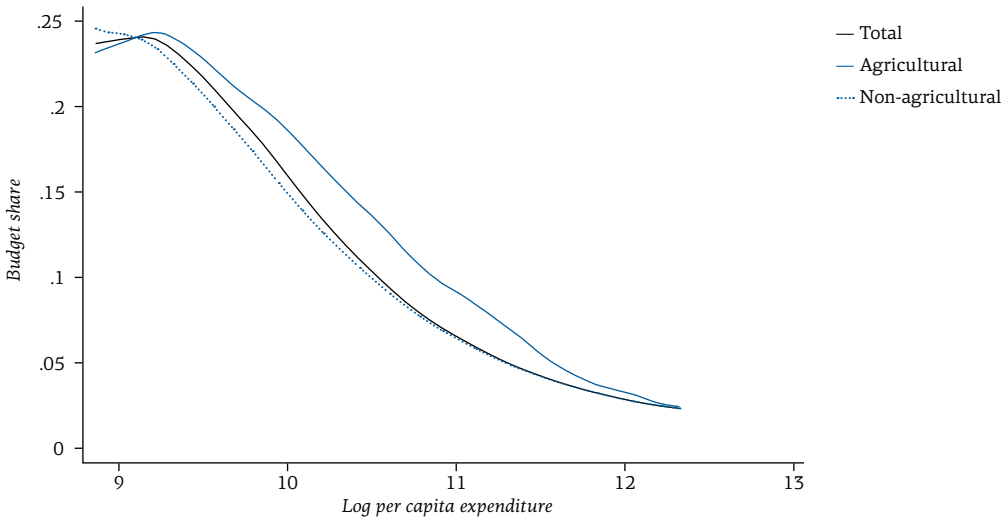
share across the spectrum. However, for rural and agricultural households, there is a slight hump for households with lower levels of expenditure. Rural or agricultural households at very low levels of expenditure are likely to increase the share of rice in their budget when their incomes rise. Since rice is a basic food item in a food basket of a typical household, it is reasonable to expect that the poorest rural or agricultural households would put a premium on rice over other expenditure items. However, with a significant increase in income, they would start spending more on other non-rice items. In the plot line for rural and agricultural households in Figure A3.1, this insight is reflected in the downward portion of the hill.

Figure A3.1 Budget share of rice and per capita expenditure by level of urbanity



Source: Authors' estimations, based on the 2009 FIES.

Figure A3.2 Budget share of rice and per capita expenditure by agricultural household indicator

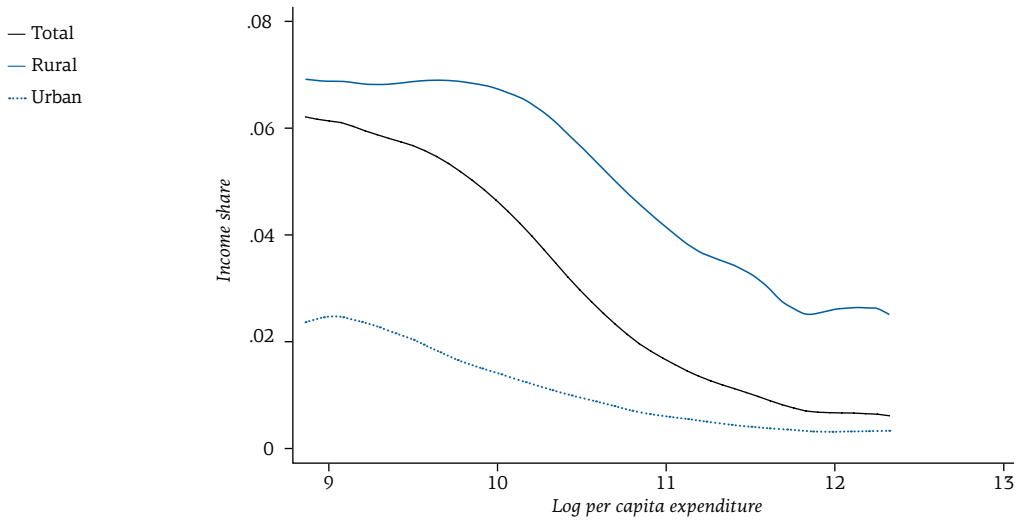


Source: Authors' estimations, based on the 2009 FIES.

Share of rice production in total income

The rice production pattern can also vary across types of households. For instance, Figure A3.3 shows that, in general, rural households have a higher income share of rice. This suggests that relative to urban households, rural households earn more of their income from rice production. For urban households, the share of rice in income is small, and as households become better off, it gets even smaller. In contrast, for rural households at low levels of expenditure, the share of rice in income tends to be relatively constant up to a given level of expenditure, and then it falls considerably.

Figure A3.3 Income share of rice and per capita expenditure by level of urbanity

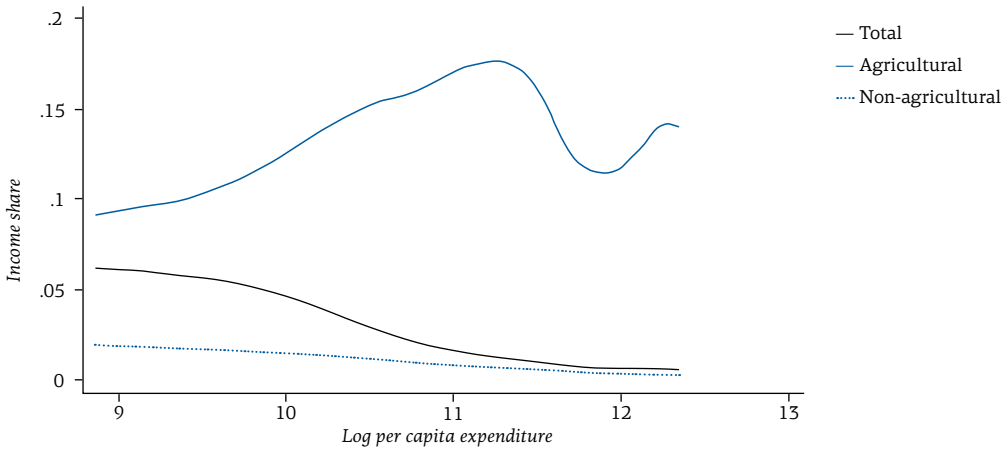


Source: Authors' estimations, based on the 2009 FIES.

The regression for non-agricultural households in Figure A3.4 indicates a small income share of rice and displays an almost flat trend. We can, however, see a much more interesting result when we look at the result for agricultural households. Unsurprisingly, across all levels of expenditure, the rice income share is higher in agricultural households than in non-agricultural households. While all of the regressions of rice income shares presented so far show a downward trend, the result for agricultural households shows an irregular pattern: as the level of expenditure increases, the share of rice in the income of agricultural households rises, declines, and then rises again.

[23] For the definition of the benefits/costs variable, refer to Section 6.2.

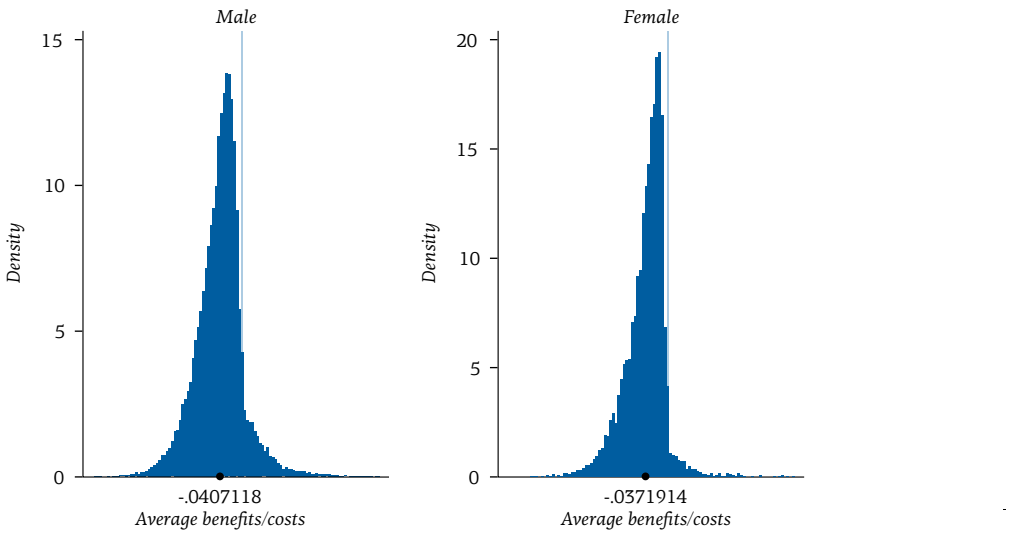
Figure A3.4 Income share of rice and per capita expenditure by agricultural household indicator



Source: Authors' estimations, based on the 2009 FIES.

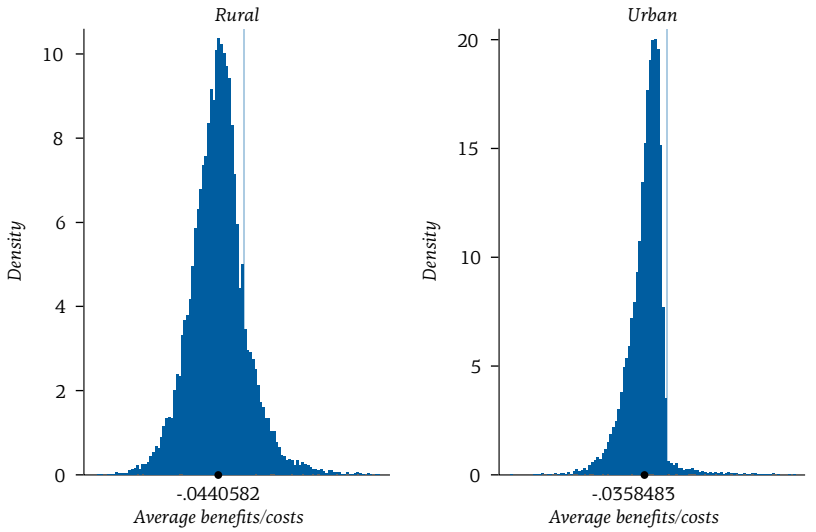
Annex 4 Histograms of the benefits/costs variable for various groups of households[23]

Figure A4.1 Histograms of the benefits/costs variable by gender of household head



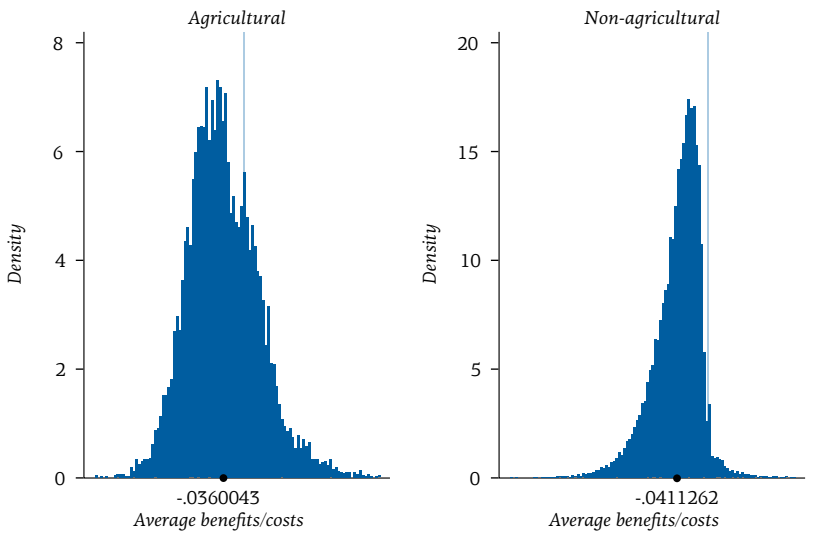
Source: Authors' estimations, based on the 2009 FIES.
Note: The vertical lines represent x = 0.

Figure A4.2 Histograms of the benefits/costs variable by level of urbanity



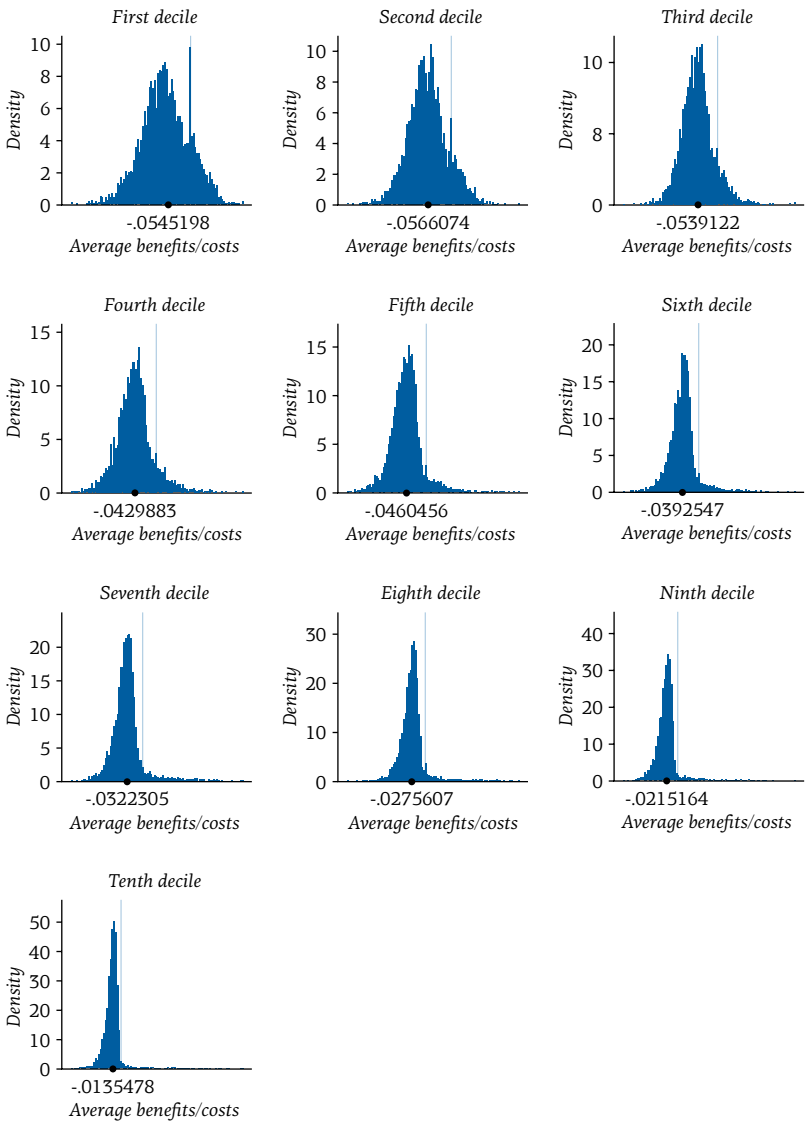
Source: Authors' estimations, based on the 2009 FIES.

Figure A4.3 Histograms of the benefits/costs variable by agricultural household indicator



 Source: Authors' estimations, based on the 2009 FIES.

Figure A4.4 Histograms of the benefits/costs variable by national income decile



Source: Authors' estimations, based on the 2009 FIES.

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