

Impact of the Rice Trade Policy Reforms on Household Welfare in the Philippines

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ABSTRACT

The effects of rice trade policy reforms on household welfare, as indicated by changes in consumer and producer prices, are analyzed using nonparametric regression and density estimation. Since many households in the Philippines are consumers and producers of rice, the net benefit ratio (NBR) was used to measure the change in household welfare given changes in prices. The impact of a policy change is not the same across different groups of households. Thus, varying welfare effects should be considered in designing policy interventions. Among the different rice trade policy scenarios, the elimination of quantitative restriction and full tariff reduction can lead to highest gains in household welfare in the long run.

INTRODUCTION

Trade liberalization has been one of the most important topics of development in the context of globalization. In the Philippines, rice is the most important agricultural crop and rice trade liberalization is both a political and an economic issue. Rice is consumed by more than 90 percent of households and the main source of livelihood of millions of farmers in the Philippines (NSO 2006). The government intervenes using different policy instruments in order to influence domestic prices of rice, and consequently affects household welfare.

Being the staple grain in the Philippines, rice was not tariffed during the Uruguay Round. The National Food Authority (NFA) has the first right to

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import rice in conformity with the country's food security policy. The current rate of duty on rice remains at 50 percent. Rice is exempted from the removal of quantitative restriction (QR) under Annex 5 of the World Trade Organization (WTO) agreement. The QR sets a limit on the volume of rice imports that may enter the country, thereby protecting the domestic rice sector from the inflow of imported rice varieties. It can also artificially create a "scarcity rent," which increases the local price of rice. Limiting imports below the free trade level can result in an increase in consumer prices, while domestic producers are protected against lower international prices.

In December 2006, the WTO approved the request of the Philippines to further extend its special treatment on rice until 2012, since the ten-year rice quota under Annex 5 of the WTO Agreement on Agriculture expired on 30 June 2005. In connection with this, Executive Order (EO) 627 was signed by the president on 15 June 2007 to reduce the most favored nation (MFN) rates on certain agriculture products (e.g., mechanically deboned meats). This is to compensate other WTO member countries for the requested seven-year extension of the special treatment on rice (Tariff Commission 2011).

This study aims to analyze the possible impact of changes in rice trade policies on household welfare using nonparametric techniques. The effects of trade policy reforms on household welfare are analyzed in terms of their impact, which channels through changes in producer and consumer prices. Those who are most affected and least affected by such policy reforms are identified by comparing the results among households by income, level of urbanization, and geographical location.

DATA AND METHODS OF ANALYSIS

This study employs nonparametric approach in determining the impact of policy reforms through price changes. This allows us to extract the rich information from the household data with minimum structural/model assumptions. A comparison of the effects of rice price changes brought about by the changes in policy is conducted based on the household's level of income, urbanization (rural vs. urban), and geographical location (16 regions). The price effects of the different policy scenarios are based on the results of the simulations conducted by Cororaton (2006) using a computable general equilibrium (CGE) model for the Philippines. Cororaton (2006) examined the effects of trade reforms on poverty, especially rural poverty. He adopted a two-step approach that used the simulation results of the Global Trade Analysis Project (GTAP) (Hertel et al. 2004) with regard to the possible effects of changes in world trading arrangements on Philippine foreign trade, and translated these to determine the impact on the local economy and poverty using a static one-period Philippine CGE model. Meanwhile, the net

benefit ratio (NBR) is used as the main indicator of change in household welfare given a change in price.

Data used

This study utilized household level data from the 2000 Family Income and Expenditures Survey (FIES) of the Philippines. The survey adopted a multistage stratified random sampling technique, with the *barangay* (smallest political subdivision in the country) as the primary sampling units. A total of 39,615 interviews distributed across different regions in the Philippines (Table 1) were completed.

Net benefit ratio (NBR)

The impact of rice trade policies on household welfare is assessed through movements in rice prices. The effects of these changes on real income vary depending on whether a household is a net producer or a net consumer. Thus, examining how the net positions (i.e., magnitude of net sales or purchases) of households vary across income distribution would also help in determining which groups of households are expected to gain or lose from rice price changes (Budd 1993).

Table 1. Distribution of sample households for 2000 FIES

Region	All	Urban (%)	Rural (%)
PHILIPPINES	39,615	59	41
1. Ilocos Region	1,887	50	50
2. Cagayan Valley	1,561	36	64
3. Central Luzon	3,770	75	25
4. Southern Luzon	6,168	65	35
5. Bicol Region	2,099	47	53
6. Western Visayas	3,014	50	50
7. Central Visayas	2,333	59	41
8. Eastern Visayas	2,252	52	48
9. Western Mindanao	1,678	41	59
10. Northern Mindanao	2,005	58	42
11. Southern Mindanao	2,032	59	41
12. Central Mindanao	1,706	48	52
13. National Capital Region (NCR)	4,141	100	-
14. Cordillera Administrative Region (CAR)	1,662	44	56
15. Autonomous Region in Muslim Mindanao (ARMM)	1,817	33	67
16. Caraga	1,490	53	47

Source: National Statistics office

To capture duality (i.e., both producer and consumer of rice) of households in the Philippines, the NBR, as defined by Deaton (1989), is computed for each household using the following formula:

$$NBR = \frac{p_i y_i - c_i q_i}{x_i} = \frac{p_i y_i}{x_i} - \frac{c_i q_i}{x_i}$$

where: p_i = producer price of palay
 y_i = volume of rice production
 c_i = consumer price of rice
 q_i = quantity of rice consumed
 x_i = total household expenditures

Note that this ratio has the desirable property of being a unitless measure. In simple terms, NBR is the value of net sales of rice as a proportion of income. The value of NBR is expected to be positive for net producers/net sellers of rice, and negative for those who are net consumers. Given an increase in rice prices, net producers would gain while net consumers would lose; the opposite would be true in case of a decrease in prices. The behavior of NBR across income distribution reflects how a change in prices affects households across income distribution.

The following key variables are also used in analyzing the welfare effects of price changes on different segments of the households:

- a. *Per capita expenditure*² (*PCE*): measure of household living standards; measured as the total household expenditure divided by the number of persons in the household;
- b. *Rice budget share* (*RBSHARE*): the share of rice expenditures to total budget; the second term in the *NBR* formula;
- c. *Producer* (*PROD*): indicates whether a household produces rice (*PROD*=1) or not (*PROD*=0); and
- d. *Seller* (*SELL*): characterizes whether a household sells rice (*SELL*=1) or not (*SELL*=0).

Parametric vs. nonparametric approach

Economic theory seldom provides information about the specific functional form of relationships among indicators (Ghosh et al. 1983). Functional form is crucial for empirical work, and strong assumptions such as linearity are in many cases theoretically impossible. Hardle and Linton (1994) noted that there is a

² In the literature, household expenditures, instead of income, is commonly used as a measure of household living standards due to life cycle considerations. Expenditure is a more reliable measure of living standards since it can be "smoothed" by the households in case they experience shocks, while household income may vary from year to year.

considerable cost associated with imposing the strong restrictions required for parametric methods.

Contrary to parametric modeling, nonparametric approach allows the data to determine the shape and relationships among the variables. It reduces the possible biases of parametric models by fitting a larger class of models. As such, it allows data to search the appropriate nonlinear forms that best describe them (Fan 2000). Another major advantage of nonparametric techniques is their ability to deliver estimators and inference procedures that are less dependent on functional forms. They are also very useful in exploratory data analysis and supplemental parametric procedures (Yatchew 1998).

Nonparametric techniques are also more appealing since they provide richer families of functions as well as more robust test in assessing the implications of economic theory. DiNardo and Tobias (2001) used local linear regression, a flexible method that estimated the function, f from the model $y_i = f(x_i) + \varepsilon_i$. This generalizes the standard linear regression model that assumed $f(x_i) = x_i\beta$.

Price effects of different trade policy scenarios

Analyzing the price effects of the different trade policy scenarios is important because the effect of rice trade liberalization on prices, and consequently on household welfare, depends on the extent to which trade is liberalized. Thus, this paper compares and analyzes the different trade reform scenarios as they affect consumer and producer prices and consequently household welfare. The price effects of these scenarios are based on the results of the simulations conducted by Cororaton (2006)³ using a CGE model for the Philippines. He estimated that, provided the Doha Development Agenda (DDA) is implemented, different policy scenarios would result in changes in consumer and producer prices in the long run as shown in Table 2. It is important to highlight that the elimination of QR could result in the largest reduction in rice prices.

RESULTS AND DISCUSSION

The first subsection focuses the discussion on how income is distributed based on geographical location and level of urbanization. The rice consumption and production patterns of different household groups are analyzed in the succeeding subsections. Note that the impact of any policy reform on a particular household can vary depending on the importance of rice for the household. If rice is not important in terms of expenditure or income, a price change is less likely to

³ Cororaton examined the effects of trade reforms on poverty based on the results of the GTAP (Hertel et al. 2004), and using a static one-period Philippine CGE model. He conducted a number of experiments to analyze various combinations of the DDA and free world trade with Philippine trade reform. The DDA for multilateral negotiations, which was launched by the members of the WTO in 2001, covers reduction of agricultural support policies, market access liberalization for goods and services as well as strengthening of WTO rules and dispute settlement procedures.

Table 2. Price changes in scenarios of trade reforms (based on CGE model)

Scenario	% Δ in Consumer Prices of Rice	% Δ in Producer Prices of Rice
1. No changes in Philippine trade policy	0.3	0.4
2. Full reduction in tariffs across sectors	-2.0	-3.0
3. Elimination of QR and full reduction in tariffs	-10.8	-12.1

Note: The consumer and producer prices of rice/palaya refer to the average for irrigated and nonirrigated palay.

Source: Cororaton (2006)

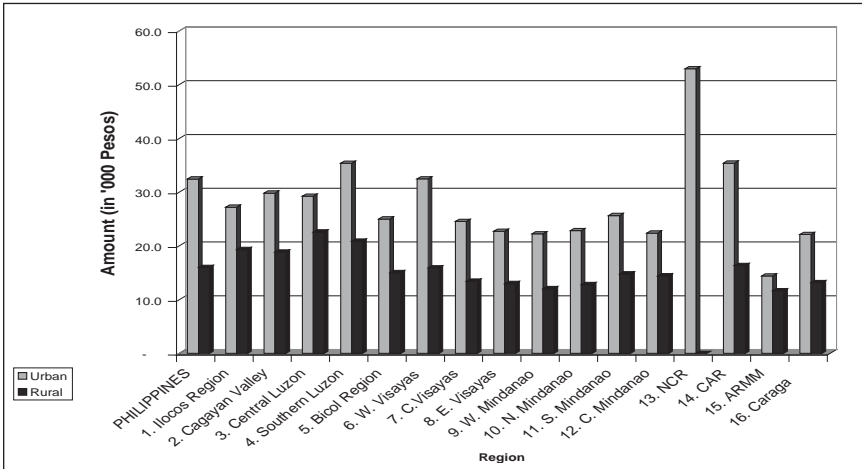
concern a household significantly. On the other hand, if rice is the primary source of income or the major item in the expenditure side, a change in rice prices may seriously affect a household's welfare. The final two subsections examine the patterns of NBR. Instead of merely focusing on the direction of change, a comparison of the expected magnitudes of the effects of different rice trade policy scenarios on household welfare is also presented.

Distribution of income

To analyze the impact of policy changes across different living standards and geographical location, it is important to examine the income distribution itself in both urban and rural household groups as measured by the PCE. An analysis of the regional inequalities in living standards is also important in understanding the likely differences in the effects of trade policy reforms based on geographical location. There are disparities in living standards across all regions in the Philippines as illustrated in Figure 1. Ignoring price differences, the National Capital Region (NCR) has the highest average living standard across all regions with an average annual PCE of PHP 52,949. This is more than thrice that of the Autonomous Region in Muslim Mindanao (ARMM), which has an average annual PCE of PHP 14,408 for all households. Note also that urban households in regions similar to NCR (i.e., Southern Luzon and Cordillera Administrative Region (CAR) – which includes Baguio City, a highly urbanized city in Northern Philippines) generally have higher living standards compared to those in other regions. In particular, the average PCEs of urban households in Southern Luzon and CAR are more than twice as large as those in ARMM.

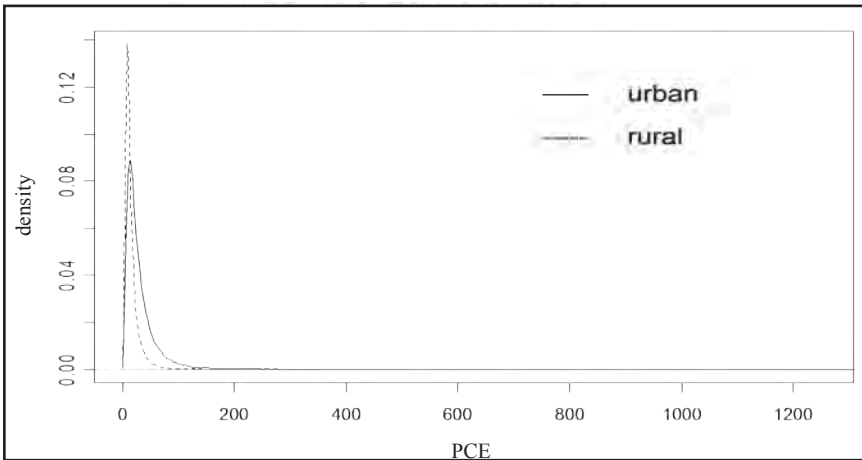
In the case of rural households, the living standards of those in Central Luzon and Southern Luzon are relatively higher compared to other regions in the country. The average rural households in Central Luzon have 94 percent higher PCE than those in ARMM, while those in Southern Luzon are 79 percent higher than their ARMM counterpart. These observations confirm the presence of inequalities in living standards across regions in the Philippines. Furthermore, Figure 2 highlights how living standard is distributed across households in urban and rural areas. The height of the curve corresponds to the number of observations

Figure 1. Average per capita expenditure (PCE), 2000 (by region, urbanity)



Source of basic data: 2000 Family Income and Expenditures Survey (FIES), National Statistics Office (NSO)

Figure 2. Estimated density functions of PCE in urban and rural areas, 2000



Note: PCE in thousand Philippine pesos (PHP)

Source of basic data: 2000 FIES, NSO

that fall into the band. Urban households have higher living standards compared to rural households. The modal PCE for urban households is higher compared to the mode for rural households, which is common among developing countries like the Philippines. The long upper tail of the distribution shows the presence of extremely rich households and illustrates the existence of inequality predominantly within urban households. Table 3 also shows that urban households have an average PCE of PHP 32,446 or about twice the average PCE of rural households. There is, however, a wider variation in PCE for urban households as reflected in the

Table 3. Distribution of PCE in urban and rural areas, 2000

Urbanization	Mean PCE	Standard Deviation	Coefficient of Variation	Minimum PCE	Maximum PCE	Poor Households (%)
Urban	32,446	40,944	1.26	1,566	1,780,613	17.0
Rural	15,993	17,254	1.08	1,852	1,255,645	47.1
Philippines	25,763	34,375	1.33	1,566	1,780,613	29.2

Note: PCE in thousand Philippine pesos (PHP).

Source of basic data: 2000 FIES, NSO

different measures of dispersion. The coefficient of variation for urban households is about 1.26, which is higher compared to rural households (1.08).

In 2000, the poverty incidence in the Philippines is estimated at 29.2 percent. There is a big disparity in poverty incidence between the urban areas (17.0 percent) and the rural areas (47.1 percent). Among the regions, ARMM (which is predominantly rural) hosted the most number of poor households. It is indeed evident that rural poverty is more widespread than urban poverty. Rice farmers, accounting for more than a quarter of the Philippine population, have a poverty rate of 41.1 percent compared to 27.1 percent for nonrice farmers. This further exhibited the vulnerability of rural households, particularly the rice farmers.

Rice consumption patterns

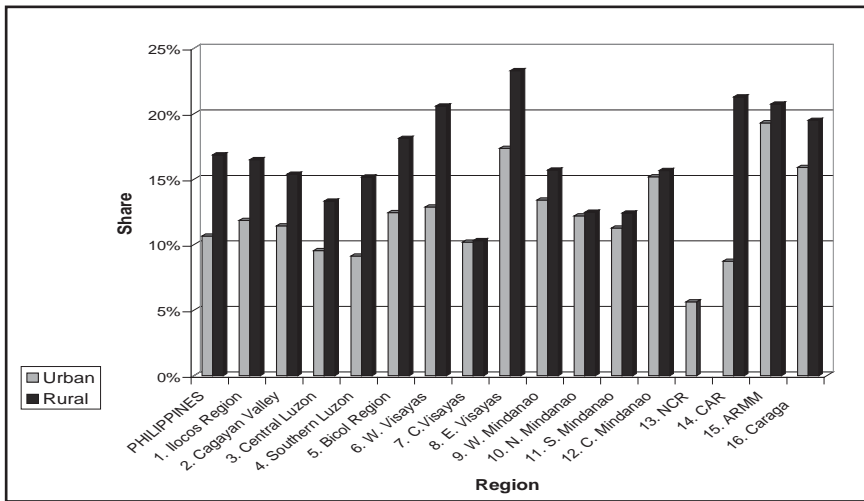
The 2000 FIES estimates that rice is consumed by more than 90 percent of households in the Philippines and accounted for 24 percent of total household expenditures. The average annual per capita rice consumption level is estimated to be 116 kilograms. There is also a great deal of variation across different household segments on the importance of rice in their budget and hence, of the extent to which households are affected by changes in prices. The average rural household in the Philippines spends more for rice consumption out of its total budget compared to the urban households (Table 4). Furthermore, Figure 3 shows that the average household in Eastern Visayas (dominantly rural) has the highest share of budget allotted to rice, while an average household in NCR (all urban) has the least share of rice expenditures to its total budget (RBSHARE). In general, the average RBSHARE in NCR is significantly less than in other regions. The constraints imposed by the demands of commuting to place of work and other lifestyle habits force some residents in NCR to cut consumption of milled rice and replace it with other (more handy) products such as bread and other cereal products (e.g., noodles, bread, cookies, and crackers). The growth of the fast food industry must have also affected the rice consumption patterns of NCR households (Ignacio 2005). Urban households in regions similar to NCR, including CAR and Southern Luzon, are following an almost similar pattern of rice consumption.

Table 4. Average RBSHARE (%) in urban and rural households, 2000

Urbanization	Mean	Std. Dev.
Urban	10.8	8.1
Rural	17.0	10.9
Philippines	13.3	9.8

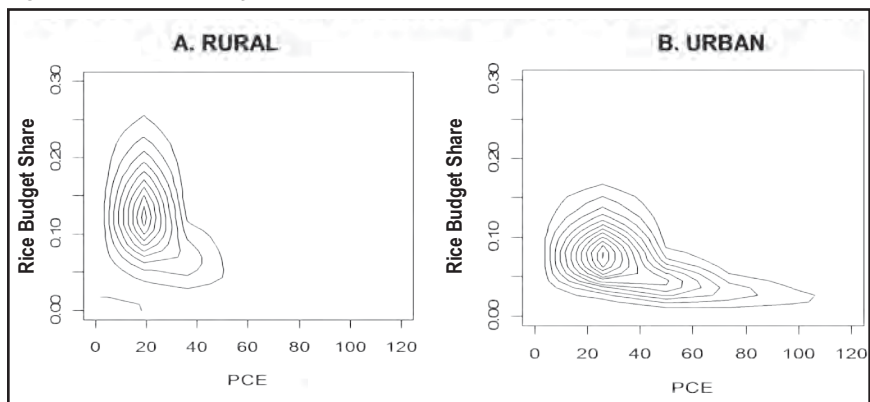
Source of basic data: 2000 FIES, NSO

Figure 3. Average budget share of rice in urban and rural areas, 2000



Source of basic data: 2000 FIES, NSO

Figure 4 exhibits the joint density of rice budget share and PCE for rural and urban areas. These contours are parallel to the smoothed histograms in a three-dimensional view. The heights of the histograms are the fraction of households at the levels of PCE and RBSHARE represented by the coordinates at the base. Thus, the points that are linked by a contour have the same density. The contour plots show that RBSHARE is generally higher for rural households as compared to urban households. In addition, it is clearly shown that urban households generally have higher PCE than those in the rural areas. The figure also illustrates the disparities within households living in rural areas. For example, among rural households with PCE of less than PHP 10,000, there are segments whose RBSHARE are as low as 2.0 percent and as high as 20.0 percent. Similar variation in RBSHARE is also true for urban households. Note that there are smaller contours that lie separately from the major contours, especially for rural households. These represent the “outliers” with respect to the main distribution.

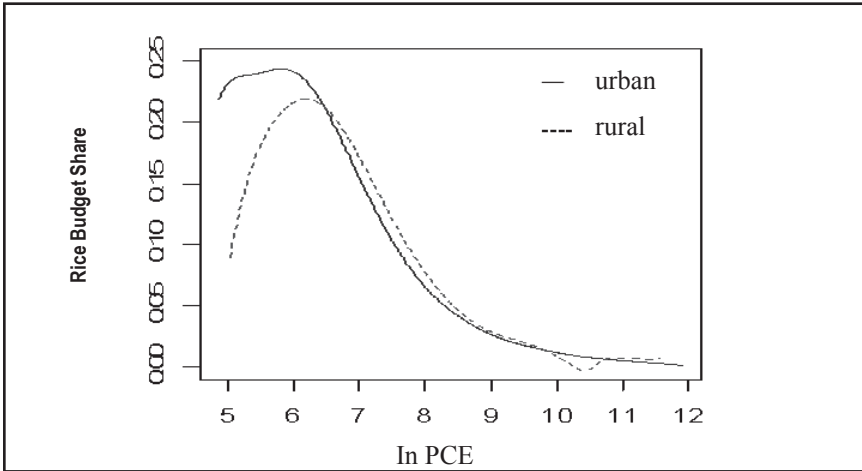
Figure 4. Bivariate density contours of RBSHARE and PCE in rural and urban areas, 2000

Note: PCE in thousand pesos

Source of basic data: 2000 FIES, NSO

The nonparametric regression of RBSHARE on PCE in rural and urban areas in Figure 5 also confirms that given the same level of living standards, RBSHARE is higher among rural households than those in the urban areas, particularly for those at the middle of the income distribution. However, we cannot directly conclude that this may be due to differences in prices, level of urbanization, or base incomes (i.e., rural households may have lower base incomes). The generally downward sloping curves for both groups of households confirm Engel's law that the RBSHARE decreases as living standards rise. The richest households allotted a considerably smaller proportion of their budget to rice compared to other households. However, in absolute terms, the amount they spend on rice may exceed those of the poorest households. The poor households, which are at the bottom of the expenditure distribution, show a very interesting pattern. For households with very low levels of income, the share of rice consumption increases with income until a certain level where the share of rice to total budget begins to drop. This pattern is clearly seen for both urban and rural households, but more especially for the latter group. Although this can possibly be due to the fact that there is a lesser number of observations for this extremely low income range, it also provides important information on rice consumption patterns of this group of households. This may imply that the poorest households are consuming other cereal products (e.g., instant noodles) or are eating less rice because they cannot afford it and some may even be suffering hunger. For this group of households, a unit increase in income would tend to increase their consumption of rice and hence, share of rice to total expenditures becomes larger. At the other end of the distribution, however, a flatter curve is observed for both rural and urban groups

Figure 5. Nonparametric regression of RBSHARE and PCE in rural and urban areas



Source of basic data: 2000 FIES, NSO

reflecting lower expenditure elasticity for richer households. This means that the share of rice to total budget does not change significantly as households become very rich.

Figure 5 also demonstrates the welfare effects of price changes, which operate through consumption. For instance, if farmers continue to receive the same price for production but consumer prices decrease, the poorest households will gain more compared to the richest households. In addition, those rural households near the edge of the poverty threshold and are highly vulnerable can experience either positive or negative effects. Although all of these results do not consider the possible response of the household's budget share to the change in price, it is expected that the responses of the different household income groups would not vary much. Therefore, the distribution effects of price change may not be affected (Deaton 1997).

Rice production patterns

We then examine rice production patterns and isolate the effects of changes in producer prices on household welfare. The 2000 FIES shows that rural farmers produced an average of PHP 34,783 worth of rice annually (Table 5). For rural farmers, income from rice production is about 50.8 percent of their annual total household income (expenditures). In the case of urban households, rice income share is generally less than that of rural households except for CAR and ARMM. Based on the average production, the two major rice-producing regions are Central Luzon and Cagayan Valley.

Table 5. Average annual rice production of farmers and rice income share, 2000

Region	Average Annual Household Rice Production (in pesos)		Average Share of Rice Production to Total Income (Expenditures) (%)	
	Urban	Rural	Urban	Rural
Philippines	42,513	34,783	47.7	50.8
1. Ilocos Region	24,057	21,820	30.8	29.8
2. Cagayan Valley	62,140	56,927	61.3	69.2
3. Central Luzon	65,467	60,016	58.6	62.4
4. Southern Luzon	46,586	48,431	53.8	60.0
5. Bicol Region	24,484	26,542	28.0	34.5
6. Western Visayas	26,513	26,873	27.2	42.4
7. Central Visayas	17,979	18,507	34.3	35.5
8. Eastern Visayas	25,024	20,399	31.6	40.8
9. Western Mindanao	27,052	22,524	38.7	48.7
10. Northern Mindanao	30,065	25,755	30.8	43.0
11. Southern Mindanao	51,501	42,294	50.5	57.3
12. Central Mindanao	46,377	44,190	69.1	77.9
13. NCR	52,089	-	9.7	-
14. CAR	43,307	25,083	47.4	40.0
15. ARMM	73,991	43,222	86.8	74.5
16. Caraga	45,671	37,766	57.3	67.7

Source of basic data: 2000 FIES, NSO

Table 6 shows the proportion of rice producers and sellers across different regions in the Philippines. About 16.3 percent of households in the country are involved in rice production, and a majority of them (i.e., 96.7%) sell their rice produce. The highest proportion of rice producers in a particular region are recorded for Cagayan Valley (38.6%), Ilocos Region (37.2%), and CAR (36.7%). Almost all of the rice producers in Cagayan Valley (99.9%) sell their rice produce. Although Central Luzon is considered to be one of the major rice-producing regions in terms of value of production, there is a lower proportion of rice producers in the region compared to other regions. This means that most of the rice producers in the area are operating on a large scale (i.e., relatively rich households).

In understanding the role of rice production income and how individual household is affected by price changes, it is important to examine who produces and sells rice. Figure 6 exhibits the estimates of the proportion of producers and sellers in rural and urban areas as a function of PCE. The solid line represents the proportion of households involved in producing rice while the broken lines stand for those who sell rice. As expected, the graphs show that the probability of being a producer is significantly higher in rural areas than in urban areas.

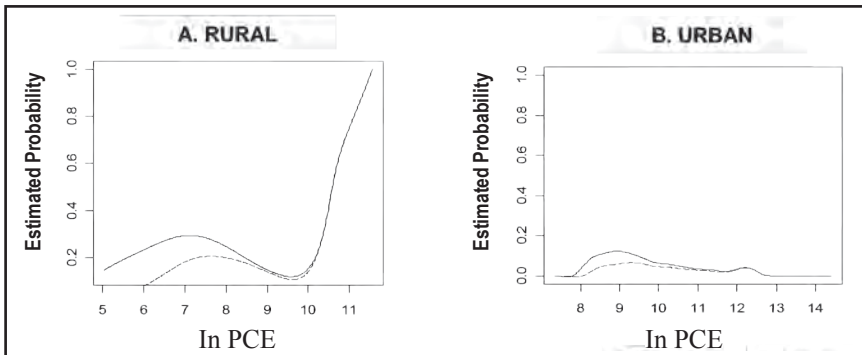
The pattern in rural areas shows that the proportion of households that produce rice increases up to a certain point and then declines, increases again

Table 6. Proportion of rice producers and sellers by region, 2000

Region	Proportion of Rice Producers (%)	Proportion of Rice Producers Who Sell Rice (%)
Philippines	16.3	96.6
1. Ilocos Region	37.2	98.9
2. Cagayan Valley	38.6	99.9
3. Central Luzon	17.6	99.7
4. Southern Luzon	10.5	96.9
5. Bicol Region	20.3	97.2
6. Western Visayas	25.0	96.8
7. Central Visayas	10.6	92.9
8. Eastern Visayas	22.7	87.8
9. Western Mindanao	19.6	95.3
10. Northern Mindanao	8.7	95.3
11. Southern Mindanao	7.2	91.8
12. Central Mindanao	24.9	97.2
13. NCR	0.2	100.0
14. CAR	36.7	97.8
15. ARMM	21.0	94.9
16. Caraga	25.8	96.7

Source of basic data: 2000 FIES, NSO

Figure 6. Probability of being a producer and net seller in rural and urban areas, 2000



Source of basic data: 2000 FIES, NSO

sharply toward the richest households where it reaches nearly 100 percent. In addition, the probability of being a seller is higher for rich households due to the fact that rich farmers in rural areas usually produce rice on a large scale and hence, can afford to sell more. On the other hand, the probability of being a producer in urban areas increases up to a certain level before it declines. This shows that there is less probability that middle-income and rich households are engaged in rice production since they have more opportunities to be involved in other

economic activities and do not need to rely on rice production income. Thus, the probability of being a seller in urban areas is very small in the middle-income and rich households. Although there are only a few farmers in the urban areas (5.3%), nearly all middle-income and rich farmers are selling their rice produce (Table 7). In general, about 96.6 percent of rice producers sell rice, while the rest do not sell their produce.

The entire rice farming sector will be negatively affected by a decrease in producer prices but note that there are varying effects on each farmer group. For the rural areas, the decrease in farm prices means that a large proportion of farmers can suffer since many of them are rice producers (27%) and a majority (about 96.7 %) actually sell their rice produce. Since poor farmers rely heavily on rice production as their major source of income, the magnitude of impact of price changes is expected to be more severe.⁴ In the case of urban areas, since the probability of being a producer and a seller is very small, they are not greatly affected by the decrease in producer prices as a whole. However, since nearly all urban rich farmers are net sellers, they are also expected to lose from such price changes.

Given the relatively higher proportion of rice producers in the rural areas as compared to urban areas, we focus on rural households to examine regional variations. In Central Luzon, which is one of the major rice-producing regions in terms of volume of production, the probability of being a producer is roughly the same for the poor and middle-income farmers. The presence of very rich farmers is also notable and has higher probability of being a producer and a seller. In general, nearly all farmers in the region are net sellers of rice. On the other hand, Cagayan Valley, which is another major rice-producing region, shows a seemingly different pattern. In particular, there are more poor households engaged in rice production compared to rich households.

Table 7. Proportion of rice producers and sellers by urbanity, 2000

Urbanization	Rice Producers (%)	Proportion of Rice Producers Who are Net Sellers (%)
Urban	5.3	96.5
Rural	27.0	96.7
Philippines	16.3	96.6

Source of basic data: 2000 FIES, NSO

⁴ It is important to note that in the Philippines, tenancy rates remain high (i.e., 50–70 percent as of 1997). Ownership of land is still concentrated among a few, whose major concern is controlling the use of their land and securing political power in the rural areas.

In the Bicol Region, as households become richer, the probability of being a rice producer (and also of being a net seller) becomes higher. In CAR, Central Visayas, Eastern Visayas, and Western Mindanao, however, the probability of being a rice producer is relatively higher for poor households. In addition, since most of the households are not net sellers of rice, a decrease in rice farm prices may not have significant effects on their welfare, holding other factors constant. In general, a relatively small proportion of households in Southern Luzon, Central Visayas, Northern Mindanao, and Southern Mindanao are rice producers. Households in Northern Mindanao have a very small probability of being a rice producer because farm households in the region are mostly engaged in corn production rather than rice production. Thus, a change in producer prices may not create a significant impact on the welfare of the households in the region. The pattern for Southern Mindanao is also quite interesting and different compared to other regions. Although the probability of being a producer is higher for the richest households in the region, majority of them are not net sellers of rice.

Net benefit ratios

The previous sections focused on rice consumption and rice production patterns separately. A more complete examination needs to incorporate both supply and demand sides of rice. The welfare effects of rice price changes largely depend on households' behavior with respect to the production, consumption, sales, and purchases of rice. Hence, the NBR is analyzed to determine the impact of price changes (resulting from policy reforms) on household welfare. Among all households, 81.1 percent were classified as net consumers of rice. This is higher than the proportion of net sellers of rice, which is only about 14.8 percent (Table 8). The remaining 4.1 percent of the households have equal production and consumption levels, i.e., their NBRs are equal to zero. In urban areas, about 92.8 percent of households are net buyers of rice, while only 5.5 percent are net sellers. This pattern is also true among rural areas where a large proportion of the

Table 8. Proportion of net consumers and sellers by urbanity, 2000

Urbanization	Net Consumers (%)	Net Sellers (%)
Urban	92.8	5.5
Rural	71.5	21.0
Philippines	81.1	14.8

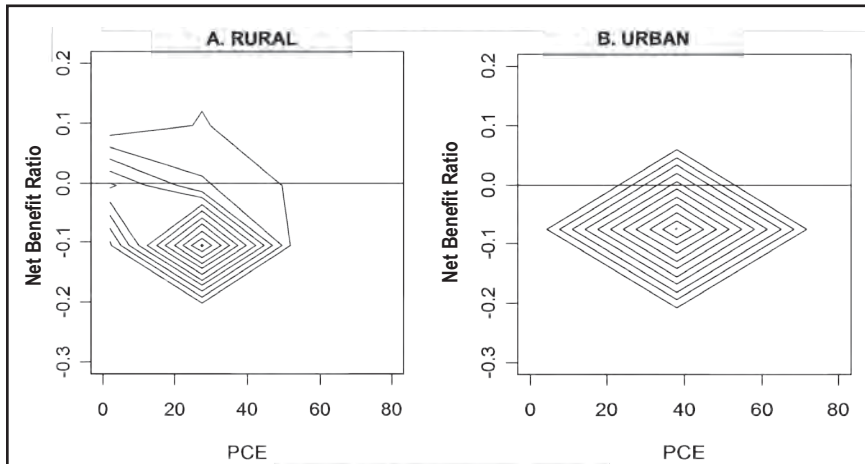
Source of basic data: 2000 FIES, NSO

households are considered net buyers. About 71.5 percent of rural households are net buyers, while 21 percent are net sellers. The presence of very few net sellers is further evidence that the Philippines is not rice self-sufficient.⁵ An increase in rice retail prices will generally result in welfare losses, holding other factors constant. On the other hand, a decrease in prices would generally benefit more households in both urban and rural areas.

Figure 7 shows the bivariate density contours of NBR and PCE for urban and rural households. The horizontal line represents the net purchase line, which divides net buyers and net sellers. Based on the pattern across living standards, it is clear that most households, whether in rural or urban areas, are net buyers of rice. Note that there are more net buyers in the middle part of the income distribution. This means that there are more middle-income households who would suffer more from an increase in domestic prices compared to the other groups of households. On the other hand, households would have higher benefits if there is a decrease in rice prices, holding other factors constant. The nonparametric regression of NBR on PCE also shows that all households across different income levels are expected to be net buyers of rice given the negative NBRs (Figure 8).

An assessment of the different household groups based on income deciles shows that households at the lowest income decile allot the largest proportion

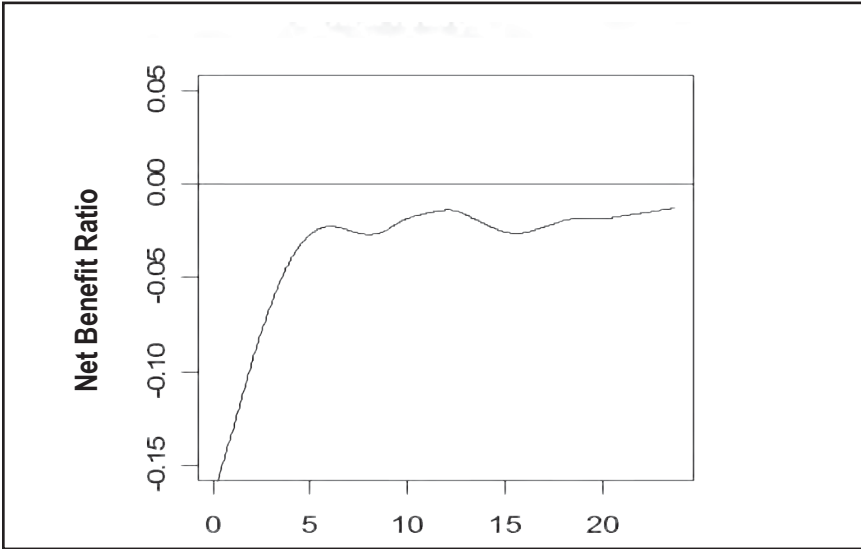
Figure 7. Distribution of NBR across different levels of living standards in rural and urban areas, 2000



Source of basic data: 2000 FIES, NSO

⁵ This means that domestic production could not sufficiently satisfy domestic rice consumption, hence the need for importation.

Figure 8. Nonparametric regression of NBR and PCE in all households



Note: PCE in thousand Philippine pesos (PHP).
Source of basic data: 2000 FIES, NSO

(18.8%) of their budget for rice (Table 9). The RBSHARE decreases as households move from a lower decile to a higher decile. This means that only a smaller proportion of the budget of richer households goes to rice, although the value is bigger in absolute terms. In terms of production, around 50 percent of income of rice producers comes from rice production. Households at the middle of the income distribution generally have the highest rice income share.

The largest proportion of consumers is recorded for those at the highest income decile. About 72.2 percent of households in the second decile are net consumers, while 89.8 percent of households in the tenth decile are net buyers. The largest proportion of net sellers, on the other hand, is reported for those at the second (15.1%) and third decile (14.9%). Although the average NBRs remain to be negative, there is an increasing trend as households move from one decile to a higher decile (Figure 9). Hence, given an increase in rice prices, richer households are least affected given the small share of rice in their budget.

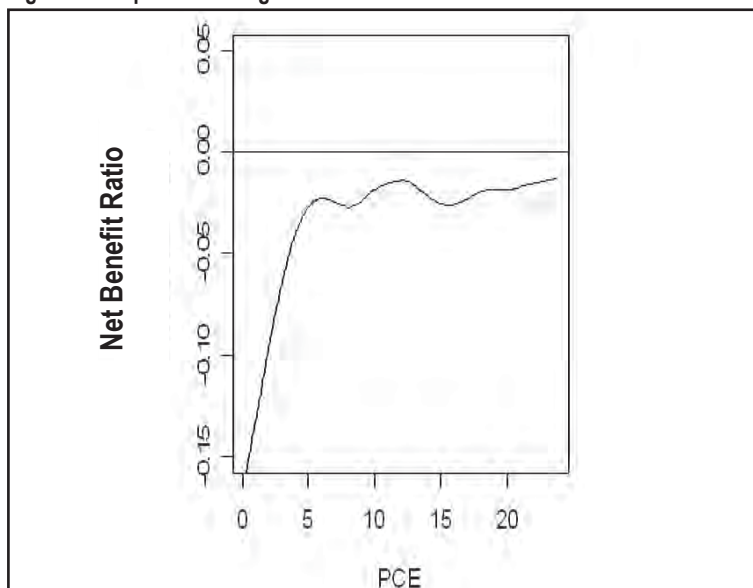
When results are disaggregated by level of urbanization, it is clear that NBRs for urban households are lower than those for rural households, implying that there are more net buyers in urban areas than in rural areas (Figure 10). Conversely, there are more net sellers in rural areas than in urban areas. The regression model for urban households is generally below the zero NBR line, except for a few relatively poor households. On average, urban households are

Table 9. Consumption and production patterns of households by income decile (2000)

National Income Decile	Average Rice Budget Share (%)	Average Palay Income Share of Rice Producers (%)	% Net Sellers (w/in Decile)	% Net Sellers (to Total HHs)	% Net Consumers	NBR
1	18.8	45.0	16.4	10.0	79.5	-0.11
2	11.9	46.1	23.8	15.1	72.2	-0.08
3	10.2	51.8	21.8	14.9	74.1	-0.08
4	9.1	54.9	19.5	13.5	76.5	-0.06
5	7.8	53.2	18.0	12.5	78.0	-0.05
6	6.8	57.3	14.3	9.7	81.6	-0.04
7	5.7	50.2	11.5	7.9	84.5	-0.04
8	4.6	49.0	10.1	6.7	85.8	-0.03
9	3.7	44.4	7.8	5.4	88.2	-0.03
10	2.6	36.2	6.2	4.1	89.8	-0.02
PHIL	13.2	50.0		14.9	81.1	-0.05

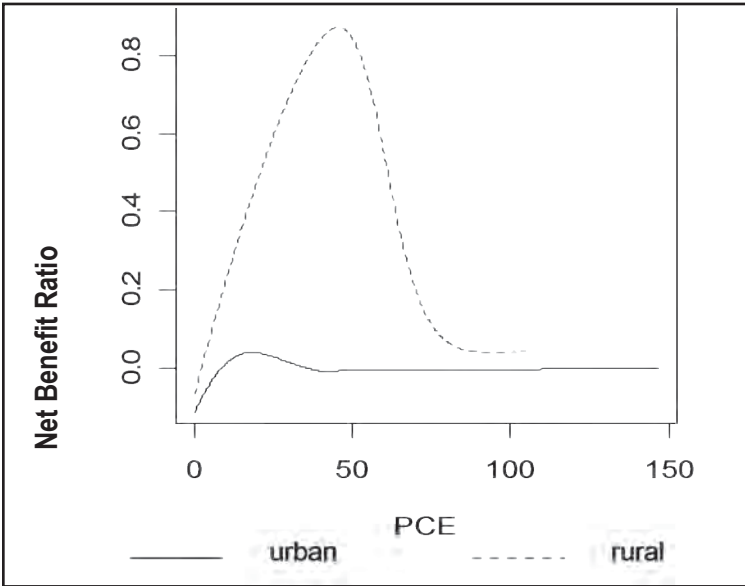
Note: 4.1 percent of the HHs are on the net purchase line (i.e., NBR=0)
 Source of basic data: 2000 FIES, NSO

Figure 9. Nonparametric regression of NBR and national income decile



Note: PCE in thousand Philippine pesos (PHP)
 Source of basic data: 2000 FIES, NSO

Figure 10. Nonparametric regression of NBR and PCE in rural and urban areas



Note: PCE in thousand Philippine pesos (PHP)
Source of basic data: 2000 FIES, NSO

expected to be net buyers and hence, lose from an increase in consumer price of rice but benefit from a decrease in price. The graph also shows that, since the poorest urban households have higher net purchases of rice relative to other households in urban areas, they may lose more from an increase in prices but benefit when there are lower prices. The regression model for rural households shows a different pattern. In particular, a positive slope is observed in the lower-income portion of the distribution. This trend continues up to a certain level at the middle part of the distribution; the slope then becomes negative in the upper end of the income distribution and eventually becomes flat. This structure implies that the poorest households in the rural areas generally benefit from higher prices of rice because they are net sellers of rice. It is important to highlight that the rural middle-income group has the highest NBRs, implying that they are the ones who would benefit more from an increase in prices.

Simulating net benefit ratios from different rice trade policy scenarios

The previous sections present the direction of the possible impact of an increase or decrease in price of rice. We now compare the magnitudes of benefits or losses from different rice trade policy scenarios that result in different levels of price changes. Note that the immediate effect of the removal of QR is to scale

up tariff; assuming full price transmission, domestic prices of rice will therefore increase proportionately. Since poor households are more vulnerable, they would experience negative effects in the short run. In addition, since most households in urban areas are net consumers of rice, their welfare losses are greater when compared to rural households.

This section focuses on the three rice trade reform scenarios presented earlier in Table 2, which are adopted from the results of the CGE model developed by Cororaton (2004). We analyze the impact of simultaneous changes in producer and consumer prices of rice. The impact on household welfare is analyzed based on the net benefit ratios for different scenarios. In Table 10, if the Philippines continues to implement its existing trade policy (Scenario 1), there would be potential welfare losses due to increases in both consumer and producer prices of rice. However, implementing trade reforms would be beneficial, particularly the elimination of QR and full tariff reduction (Scenario 3). This would result in a higher gain in welfare than simply reducing tariff across sectors (Scenario 2). The gain from Scenario 3 is more than thrice as large as the gain from Scenario 2. This implies that the removal of rice QR would create greater impact on household welfare. The decrease in prices resulting from such policy change is beneficial since a majority of households in the Philippines are net consumers. Lower rice prices are favorable to consumers because they increase real consumption, and at the same time reduce the nominal value of the poverty threshold.

The higher welfare gain from Scenario 3 remains true even if we disaggregate the results by urbanity. However, rural households are more significantly affected by changes in prices when compared with urban households. Scenario 3 will lead to about an 18.9 percent increase in welfare for rural households, while those in the urban areas will increase welfare by only about 12.7 percent. These figures are relatively higher compared to the effects of Scenario 2, which will result in welfare gains of about 8.2 percent and 3.5 percent for rural and urban households, respectively. In the case of Scenario 1, welfare losses are also higher for households in rural areas than those in urban areas. The results also clearly show that Scenario 3 would be the most beneficial option for rural households.

At the regional level, the results for CAR are notable. Unlike in other regions, Scenarios 2 and 3 will lead to relatively huge welfare losses, while Scenario 1 will result in welfare gains. This is explained by the fact that almost all farmers, especially in the rural areas in CAR, are net sellers of rice. On the other hand, the gains from Scenario 2 and Scenario 3 are largest for Central Mindanao. Central Mindanao does not experience huge losses because lower prices would adversely affect only a few producer households in the region. This is also related to the fact that the region is one of the corn-producing regions in the country. Since most of the farmers are producing corn rather than rice, rice price increases will not

Table 10. Average welfare changes (%) due to different trade reforms, 2000

	Scenario 1 Doha reforms without changes in Philippine trade policy	Scenario 2 Full tariff reduction across sectors	Scenario 3 Elimination of QR and full tariff reduction
Philippines	-5.4	4.4	14
Urbanization			
1. Urban	-4.5	3.5	12.7
2. Rural	-9.2	8.2	18.9
Region			
1. Ilocos Region	-6.6	5.6	15.5
2. Cagayan Valley	-1.6	0.6	9.0
3. Central Luzon	-6.2	5.2	15.0
4. Southern Luzon	-5.2	4.2	13.7
5. Bicol Region	-4.7	3.7	13.0
6. Western Visayas	-5.1	4.1	13.6
7. Central Visayas	-4.4	3.4	12.6
8. Eastern Visayas	-4.4	3.4	12.7
9. Western Mindanao	-4.8	3.8	13.1
10. Northern Mindanao	-4.3	3.3	12.5
11. Southern Mindanao	-4.4	3.4	12.7
12. Central Mindanao	-20.0	19.0	32.9
13. NCR	-4.0	3.0	12.1
14. CAR	32.9	-33.9	-35.9
15. ARMM	-7.1	6.1	16.1
16. Caraga	-8.0	7.0	17.2
Income Decile			
1	-4.7	3.7	13.1
2	-5.4	4.4	13.9
3	-5.5	4.5	14.1
4	-5.8	4.8	14.5
5	-6.0	5.0	14.7
6	-6.0	5.0	14.7
7	-5.4	4.4	13.9
8	-5.5	4.5	14.1
9	-5.2	4.2	13.6
10	-5.2	4.2	13.7

Source of basic data: 2000 FIES, NSO

adversely affect them. At the same time, results from the simulation reveal that Scenario 2 and Scenario 3 will not have a significant negative impact on a large proportion of consumers.

Looking at the effect by different income groups, the magnitude of impact on poor households, in general, is smaller compared to other households. The same relationships are observed for the three scenarios. Clearly, the benefits of rice trade policy reforms, particularly Scenarios 2 and 3, would accrue mainly to middle-income households. In contrast, the benefits to the poorest and richest households are slightly lower. In addition, if the Philippines would not change its existing rice trade policies, it is clear that all household income groups would generally suffer from welfare losses. It is also very important to highlight that, if no trade reforms are implemented, the middle-income households would continue to have the highest welfare losses compared to other groups of households.

The disaggregation by income decile shows further that the greatest welfare effects will be observed when there is full tariff reduction and removal of QR. This also confirms that households at the middle of the income distribution, particularly those at the fourth to sixth income deciles, are the ones who will be affected the most. In particular, if the Philippines does not implement any trade reforms, it is clear that this group of households will experience the greatest negative effects. On the other hand, if the country decides to implement reforms, most of the benefits will accrue to middle-income households. Despite the uneven distribution of benefits, it is important to highlight that, among the three trade reform scenarios, the most beneficial policy for the Philippines in the long run would be the elimination of rice QR and full tariff reduction.

CONCLUSIONS

This paper analyzed the effects of rice trade policy reforms on household welfare in terms of changes in consumer and producer prices using nonparametric methods. The nonparametric approach relaxes the issue of restrictiveness of the functional form of the relationship between the variables. It should also be noted that one of the challenges in using nonparametric techniques is the selection of the bandwidth and the course of dimensionality. Thus, the technique may not be useful in small samples since smoothing tends to be more useful with large amounts of data. Despite some limitations, this study was able to demonstrate the usefulness of nonparametric techniques in extracting more information from economic survey data with minimum structural/model assumptions.

The benefits of rice trade policy reforms are not the same for all households, making it necessary for the government to consider the distributional effects of any policy change. The aggregate macroeconomic effect may be misleading as it cannot illuminate the welfare effects among the most vulnerable segments. Effects

vary by geographical location, urbanity, and income group. Rice budget share is higher for poor households compared to nonpoor households. Furthermore, rice production is more common among rural households. The presence of very few net sellers in the Philippines, as reflected in the net benefit ratio, supports earlier observations that the country is still not rice self-sufficient. Hence, the government should address this by providing programs that would improve farm productivity and encourage moving out of subsistence rice farming. In designing specific interventions, the differences in the potential impact should always be considered. Insufficiency in rice production can be caused by lower productivity, which can be traced to the inappropriate soil system in many producing areas. Hence, an important provision of the Agriculture and Fisheries Modernization Act (AFMA) that requires the identification of production zones for different crops should be implemented. Lower productivity may also be explained by the inefficiency among farmers in accessing factors of production. This is due to the perennial practice of the government to dole out distribution of production inputs, instead of merely to facilitate farmer's access to them.

When comparing the results of different rice trade policy scenarios, it is evident that the elimination of QR and full tariff reduction would lead to the largest percentage decrease in consumer and producer prices. This scenario also provides the highest gain in welfare among the three scenarios in the long run. In fact, the gain is significantly higher compared to simply reducing tariff across sectors, which reflects the potentially great impact of the removal of QR. Although it is quite clear that poor households are expected to benefit from the removal of QR and full tariff reduction in the long run, the benefit for the income-poor households is slightly less than the middle-income households.

One critical issue that is often argued is that, while opening the domestic rice market is beneficial in the long run, the poor usually bears the burden of adjustment in the short term. About one-third of households in the Philippines are living below the poverty line, a majority of which are net consumers of rice. It is expected that the Philippines can generally experience negative welfare effects due to increases in rice prices at the initial stage of rice tariffication. Although the increase in prices can raise the gross income of farmers who sell rice, the small farmers and poor households who are mostly net buyers of rice may suffer an immediate decline in welfare in the short run. If removal of QR is done without ensuring stability of farmers' income, it would result in welfare losses, especially for poor households who greatly depend on rice farming as the main source of livelihood. Since poor farmers are less likely to be able to cope with shocks in the short run compared to big farmers, policy measures should ensure that they are provided the necessary assistance to compensate for the immediate negative effects.

It is also important to highlight that the potential benefits due to rice trade liberalization cannot be translated into actual gains unless the necessary conditions are in place. The further extension of the special treatment of rice in the Philippines should only provide enough time and opportunity for rice farmers and especially the government to do their part in preparing for full rice trade liberalization by improving farmers' efficiency and competitiveness. The previous failure of the government to fulfill its promise of preparing the rice sector for global competition is due to budgetary constraints, coupled with inaccurate allocation that prevented it from providing sufficient and appropriate support for the sector. This time, the government should have a strong political will and commitment to extend support to the rice sector by providing sufficient funds to finance appropriate programs for the sector. Investing in infrastructures such as good irrigation, farm-to-market roads, and extension services even before reforms are initiated would help prepare the rice sector for trade liberalization. Efficient rural infrastructure is also important so that consumers can realize the full benefits of cheaper rice. Significant gains in a developing country like the Philippines can also be realized if it implements reforms that provide an environment, which allows movements of capital and labor across sectors. Improving the investment climate is important in order to allow the creation of new economic opportunities. The government should also be able to improve its capacity to redistribute the local benefits from the trade reforms. One specific issue that the government should also address is its rigorous requirements for importation. Another issue that always comes out relates to the presence of key players who are able to capitalize on and have the power to corner more profit opportunities within the rice industry. Thus, this potential for collusion should also be addressed by the government.

Finally, despite the potential benefits of trade reforms, particularly the removal of QRs, it is generally recognized that there will always be losers and winners in any policy change. Hence, the potential distributional impact should also be considered. Like all other countries undertaking the process of trade liberalization, the Philippines must necessarily incur some costs. However, we should realize that the costs associated with these reforms are temporary, but the benefits through better resource allocation are permanent and can even exceed the temporary costs. Therefore, these costs should not prevent a country to pursue trade liberalization, but should rather be considered as an essential investment to earn benefits in the long run. The effectiveness of any policy, compensatory policy reforms, greatly depends on the government's capacity to enforce it.

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