

**RICE MARKET LIBERALIZATION
IN IRAN: WELFARE AND
POVERTY**

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Abstract

In an effort to achieve and maintain national self-sufficiency in basic agriculture products a variety of programs were adopted by the post-revolution government in Iran in the 1990s. A single rate system of foreign exchange was substituted for the multi rate one for several years. With the aim of providing a certain environment for the private sector to be actively involved in staple food markets. As far as rice marketing is concerned, the government supplies only part of the domestic consumption of rice, namely the subsidized rice, and encourages the private sector to supply the rest of rice with a desired price almost close to the world level. In this study the welfare effects of directing the current intervened rice market towards a free market with no controlled policy is evaluated applying a partial equilibrium analysis to the 1978-1999 data. Then, the link between rice price change or accordingly real income and poverty is calculated by determining the proportion of households whose income is below the poverty line. The results show that while the loss in producers' surplus is relatively high, rice consumers can gain from rice market liberalization. However, because of the decrease in the real income of households, the poverty rate is expected to increase by almost 27 to 76 percent in rural areas but remain unchanged in urban areas.

1. Introduction

Like in many Asian countries, rice is a main staple food in Iran particularly in the northern areas where the majority of this product is produced. As a matter of fact, farmers who traditionally produce rice cannot easily adapt to a new crop pattern in which rice is excluded. Moreover, some type of domestic rice, for example Taromi, can compete with imported rice and is highly acceptable by the consumers. However, producing rice is believed to be uneconomical due to the shortage of water from successive droughts in recent years and because of the lack of comparative advantage (for example Haj-Rahimi, 1997).

The Iranian government intervenes in the rice market by controlling its import to support consumers and to prevent the price of rice rising in the country. Among the factors affecting the increasing gap between production and consumption of rice, direct and indirect policies of the government can be highlighted. These policies include input subsidies, credit programs, guaranteed price, distribution of coupons, and the importing of rice using foreign exchange valued at a special cheap rate allocated for food. Najafi (1999) discussed the fact that most of these programs have been inefficient and have widened the gap.

According to Bakhshoodeh and Akbari (2002), the consumer price of rice is higher than the producer's price and higher than the world price evaluated with the exchange rate in the gray market.¹ They also discussed the fact that the multi rate system of foreign exchange not only causes misallocation of foreign stocks but can also lead to some ambiguous policies and mistaken evaluation of basic economic figures such as prices. In this regard, importers can only earn foreign exchange in a rate between the official and that in the gray market, if they agree to import rice at a predetermined price close to that of domestic rice. This policy seems to be unsatisfactory to traders who are seeking maximum profit. As a result, a shortage of the product exists each year and thus, the government imports rice, spending at the official exchange rate. and by doing this the imported rice is comparatively cheaper than the domestic rice. However, the imported rice is more expensive than

the domestic rice when the prices are evaluated with the real exchange rate in the black market.

In an effort to achieve and maintain national self-sufficiency in basic agriculture products, a variety of programs, such as price support, input subsidies and so on were adopted by the post-revolution government in the 1990s. With the aim of privatization, the Iranian government is relaxing the multi rate system of foreign exchange.

It is said that the governmental policy regarding the rice market has not been successful in achieving a stable price (Najafi and Bakhshoodeh, 2002). The negative nominal protective rate (NPR) for the majority of the studied years indicates that rice producers have not really been supported by the government. Therefore, the increased level of production is due to other factors such as its relative profitability. Despite that rice production has been increased, the consumption has gone up such that the shortages have been made up by imports using a subsidized foreign exchange rate. In general, the implemented policies for supporting rice producers in order to achieve a stable price and income, has resulted in unsatisfactory outcomes that are mainly counter to the general objective of self-sufficiency in agricultural products.

It may be said that of course the government is interested in importing cheap rice. However, imports can be more profitable within a free market from the traders' view. In other words, if the traders do their job under the intervention of the government they they pay a type of tax or an unnamed tariff. In order to achieve economic liberalization and a market-oriented agriculture sector and in order to optimize the use of the scarce inputs, one might think of relaxing such a policy. Or more specifically, removing the tariff and substituting imports with greater domestic production to capture the increasing demand for rice due to the rapid growth of population especially in the urban areas of the country.

This paper investigates the welfare effects of the forthcoming policy that is expected to raise the price of rice. It then goes on to discuss the links between an increase in price and poverty.

2. Rice Economic Features in Iran

According to the FAO database, the per capita consumption of rice was 18.6 kg in 1961 and reached around 34 kg in 1999 indicating an average growth of 1.6 percent per annum. As shown in Figure (1), while the gap between domestic production and consumption of rice fluctuates between 1961 and 1999, and although the production of rice has increased during the last years, a sustainable share of consumption (for example a little over 20 percent in 1995) is imported into Iran each year.

As shown in Figure 2, the consumer price of rice is higher than the world price evaluated with the exchange rate in the black market. However, the price

¹ Various rates of foreign exchange have been experienced at the same time throughout almost all the post revolution years in Iran. The most common rates are the official rates (for example \$1 = 3000 Rials, the Iranian local currency, in 1998) that is used for trading the necessary goods such as major foods; the rate in black market (for example 1\$ = 234.25 Rials in 1980 and 1\$ = 8657 Rials in 1999); and an inbetween rate, which is available for trades under the government control..

received by the farmers is less than the imported price, which is explicitly related to the fact that farmers are taxed.

The rest of the paper is structured as follows: the methods and theoretical basis are given below followed by a short description of data and variables. Then, the findings are presented and some policy implications are discussed.

3. Methodology

Although some trade liberalization studies (for example Taniguchi, 2001) are based on general equilibrium analysis, the usual demand-supply partial equilibrium analysis is also widely used for analyzing food policies (for example Schneider, 1988 and Monteiro da Silva and Grennes, 1999). In this study, the welfare effects of directing rice towards a market-oriented system in Iran is evaluated by applying a partial equilibrium analysis to the 1978-1999 data. This is done using the market supply and demand curves for rice illustrated in Figure 3, where D is the market demand, S_1 is the domestic market supply, S_2 adds the current imports to the domestic supply and S_3 shows the potential aggregate supply after removing tariff.

The current consumers' price of rice is denoted by P_d which is supposed to reach the world price P_w through the market liberalization. Although the farm-gate price of rice P_s is even lower than the world price, final suppliers are assumed to receive P_d . Since all prices are calculated at the basis of domestic market, the analysis is restricted hereafter to P_d for consumers and suppliers (retailers) and P_w .

Assuming constant elasticity supply function $Q_s = \alpha P_s^\varepsilon$ and demand function $Q_d = \beta P_d^\eta$, where Q_s and Q_d are quantities of supply and demand and α , β , ε and η are parameters to be estimated, the possible changes may be summarized as follows:

Production policy :

$$1. \text{ change in quantity produced} = CQP = q_{s2} - q_{s1}$$

$$2. \text{ change in producers welfare (area a)} = CPW = \int_{P_w}^{\alpha P_s^\varepsilon dP} = \frac{q_{s1}}{1+\varepsilon} [P_d - (\frac{P_w}{P_d})^\varepsilon P_w]$$

$$3. \text{ protective effect of tariff (area b)} = PET = q_{s1} (P_d - P_w) - CPW$$

$$4. \text{ foreign exchange effect on production (area f)} = FEP = P_w (q_{s2} - q_{s1}) =$$

$$P_w q_{s1} [1 - (\frac{P_w}{P_d})^\varepsilon]$$

Consumption policy :

$$1. \text{ change in quantity consumed} = CQC = q_{d2} - q_{d1}$$

$$2. \text{ change in consumers welfare (areas a + b + c + d + e)} = CCW =$$

$$\int_{P_w}^{\alpha P_d^{-\eta} dP} = \frac{q_{d2}}{1-\eta} [(\frac{P_d}{P_w})^\eta P_w - P_d] \quad A$$

$$3. \text{ consumption effect of tariff (area e)} = CET = CCW - q_{d2} (P_d - P_w)$$

$$4. \text{ foreign exchange effect on consumption (area g)} = FEC = P_w (q_{d2} - q_{d1})$$

As stated above, the traders are in fact confronted with a tariff, the usual terminology of which is used in describing the possible outcomes of freeing the market. The amount of tariff per unit of product (TPU) equals $P_d - P_w$ and net trade (NTT) is given by $q_{d1} - q_{s1}$ in current market and by $q_{d2} - q_{s2}$ after market liberalization. Revenue effect of the tariff (RET) is shown by the area $c + d$ and can be measured as $(q_{d1} - q_{s1})(P_d - P_w)$.

Following Minot and Goletti (2000), two expressions are first used for calculating the real income effect of rice price change, one for what they call the "before-response" effect (BRE) and another for the "after-response" effect (ARE). Then, the percentage change of poverty is calculated by comparing some poverty indices before and after rice market liberalization.

$$\frac{\Delta W_i}{X_{0i}} = \frac{1}{P_{0p}} \frac{\Delta P_p}{P_i} PR_i - \frac{1}{P_{0c}} \frac{\Delta P_c}{P_i} CR_i \quad (1)$$

The BRE implies very short term, before households respond to the price change, and may be calculated as (1) for household i as:

where the LHS measures BRE and is the first-order approximation of the change in welfare resulting from a change in rice price divided by original income

(consumption expenditure). X_{0i} , P_{0p} and P_{0c} are the original production and consumption price of rice and PR_i and CR_i denote the proportion of the value of rice production and consumption to X_{0i} , respectively.

$$\frac{\Delta W_i}{X_{0i}} = \frac{\Delta P_p}{P_{0p}} PR_i + \frac{1}{2} E_d \left(\frac{\Delta P_p}{P_{0p}} \right)^2$$

$$PR_i - \frac{\Delta P_c}{P_{0c}} CR_i - \frac{1}{2} \xi_d \left(\frac{\Delta P_c}{P_{0c}} \right)^2 CR_i \quad (2)$$

The ARE refers to the effect after producers and consumers respond to the new prices. This effect is calculated as where the numerator of the LHS is the second-order approximation of the change in welfare due to a change in rice price and E_d and ξ_d are the own-price elasticity of rice supply and the own-price Hicksian elasticity of rice demand, respectively.

Minot and Goletti (2000), argue that “these expressions are extensions of the net benefit ratio (NBR) used to study the distribution impact of food price changes in several studies. Equation (1) is similar to the NBR calculation except that it allows the percentage change in producer prices to differ from that of consumer prices. Equation (2) is like equation (1), except that it includes terms to represent the response of consumers and producers to the price changes. If the elasticities in equation (2) are set at zero and the percentage changes in producer and consumer prices are equal to each other, this expression collapses to the NBR used in previous studies.”

The class of poverty indexes of FGT (Foster-Greer-Thorbecke, 1984) is used to measure the poverty effect of rice market liberalization. As mentioned by Dart (1998), the FGT measures are defined as:

$$P_\alpha = \int_0^z \left[\frac{z-x}{z} \right]^\alpha f(x) dx \quad \alpha \geq 0 \quad (3)$$

In which x is the household consumption expenditure, $f(x)$ is its density, z is the poverty line and α denote a parameter of higher value which shows greater sensitivity of the poverty measure to inequality among the poor.

Expression (3) can also be stated as $P_\alpha = (1/N) \sum [(z-x_i)/z]^\alpha$, where N is total population, x_i is the income of poor household i , and the summation is limited to poor households (for example Minot and Gollety, 2000).

The usual values for α are 0, 1 and 2. Then, P_0 denotes the head-count or incidence of poverty and indicates the proportion of households below the poverty line. P_1 is the poverty gap index, which is the product of P_0 and the gap between the poverty line and the average income among the poor. Finally, P_2 is the squared poverty gap index referring to an index of the severity of poverty, in which the proportion and the average income of the poor as well as the variance of income among them is considered. As stated by Mahmoudi (2001), indices are not sensitive to the difference in the depth of poverty that is to the distribution among the poor.

Based on the current and adjusted real income, two sets of poverty indexes are calculated in this study followed by the estimated percentage changes in poverty.

4. Data and Variables

The majority of the data used in this study were gathered from FAO database (<http://apps.fao.org>). These include: production, import, consumption, domestic supply and the farm-level price of rice. The data for cultivated land area of rice and population were also obtained from FAO.

The world prices of rice are calculated based on the dollar rate in black market. The time-series exchange rates of dollar against Rials, the Iranian local currency and in the gray market were obtained from the Plan and Budget Organization (PBO) of Iran. The consumer price of rice and the per capita GDP were also collected from the PBO. The poverty line in rural and urban areas were calculated by adjusting the figures in the previous studies (for example Mahmoudi, 2001 and Assadzadeh and Paul, 2001). The distribution of population by income and real income are taken from Statistic Center of Iran (SCI).

Auto-correlation Function (ACF) plot that is a useful identification and diagnostic aid was used to test the stationarity of the time series data and regarding LB-test results, the prices as well as the GNP were lagged by one case of their values.

5. Results

Since the relationships between quantities demanded and supplied and the respective prices are bi-directional, 2-stage least-squares regression was used to estimate constant elasticity demand and supply functions of rice as:

$$\text{Supply} \Rightarrow Q_t^s = 0.257 P_{t+1}^{0.136} L_t^{1.073}$$

(0.109) (0.459) (0.425)

$$\text{Demand} \Rightarrow Q_t^d = 1.728 P_{t+1}^{-0.035} G_{t+1}^{0.266}$$

(0.022) (0.017) (0.062)

Where Q_t^s and Q_t^d are the quantities of supply and demand in period t , P_{t+1} is the lagged price of rice, L_t is cultivated land area of rice and G_{t+1} is GNP at period $t+1$. The figures in parentheses are standard errors of the corresponding coefficients.

Welfare effects of rice market liberalization:

As estimated, coefficients of elasticities imply that rice is considered as an inelastic product from both supply and demand points of view. Based on the estimated coefficients, various issues of rice liberalization are discussed. The estimated quantities of supply and demand at current prices (Q_{s1} and Q_{d1}) and those after abolishing the government intervention (Q_{s2} and Q_{d2}) are shown in Figure 4.

As shown, removing tariff causes a very slight increase in quantity demanded but does not significantly affect the domestic supply of rice.

In the rest of this paper, the usual effects of rice liberalization in Iran are discussed. The welfare effects of rice liberalization during the post revolution years, that is, between 1979 and 1998, are summarized in Table 1. As indicated, the rice liberalization causes the foreign exchange effect on production to decrease on average by nearly 5500 million Rials each year. The figure on consumption is much higher, that is almost 1600 million Rials. These are related to the possible changes in supply and demand quantities arising from rice market liberalization.

Although the consumers will gain from liberalization, the local supplier, including the government, lose almost 3.3 times what the consumers gain. The value of rice imports increases on average by more than 10 milliard Rials each year. The consumption effect that shows inefficiency low consumption (for example Samuelson and Nordhaus, 1989), is calculated on average to be nearly 8 milliard Rials. Similarly, the protective effect of tariff, which represents efficiency losses from inefficiency high domestic production, is found to be a little less than 100 million Rials each year in 1979 to 1998. Hence, the policy

studied here is removing tariff and so the recent figures may be regarded in a reverse order to represent efficiency gains.

Furthermore, net trade may change from an average of 1.074 million tones in the current market to 1.636 million tones within the liberalized rice market. Finally, revenue effect of tariff is found to be 46.9 million Rials on average. This effect figures out the amount of revenue that the government loses in the new free market. In other words, the revenue effect refers to the loss to the consumers that goes to the government in the form of tax (for example Cramer and Jensen, 1994). Thus, in light of the direction of this study, the figure may be added to the consumers gain.

The net effects of imposing the new policy can be regarded as the difference between the positive effects such as welfare improvement and the negatives effect. In this study, we focus on the social welfare including the reduction in the sum of tariff effects on production and consumption as well as the revenue effect of removing the tariff. Applying a double exponential smoothing forecasting model, the net welfare effect of the rice market liberalization were predicted for the period of 1999-2005 and is depicted in Figure 5.

As indicated, the forecast for net welfare effect of rice market liberalization in Iran for 2001 to 2005 is always increasing. However, taking the growing inflation into account and deflating the forecasts may lead decision makers to be indifferent in the appropriate period for freeing the market in the future.

Poverty effects of rice market liberalization:

According to Tale (1998), there is a wide income gap between the urban and rural households whose average annual income was respectively around 7.4 and 4.6 thousand Rials in 1955.

The proportion of income for the top 10 percent earners in the country is 21.2 times greater than that for the bottom 10 percent. The percentage of households falling below the poverty line in urban areas was 18.7 percent and 21.8 percent in rural areas in 1999 (see Hamshahri, 2000). According to Assadzadeh and Paul (2001), almost 47 percent of the rural population and 24 percent of the urban population lived in poverty in 1993. Based on the 1989 prices, the poverty line was found to be respectively 156962 and 246592 Rials in rural and urban areas. With regard to this study, the head-count poverty measure was estimated to be 0.464 and 0.338 in rural and urban areas, respectively. The measure was found to be 0.371 in 1994. Due to other records, mainly unofficial, the poverty line is around 100 to 350 thousand Rials and almost 10 to 30 percent of the Iranian households fall below the line.

The poverty effect of the rice market liberalization is based on the distribution of households by their income a typical of which is indicated in Table 2 for

households in 1999. As can be seen, a wide gap exists between the lowest and the highest 25th quartiles as well as between households in rural and urban areas.

The fact that a significant income share of the poor, who mostly live in the rural areas, comes from their work in the agriculture sector, any type of price policy that raises the rice price would influence the poverty rate among these households. The real income and poverty effects of rice market liberalization are illustrated in Table 3. As shown in the first two columns, the mean real income in rural Iran falls by nearly 9 percent and in the urban areas by about 5.5 percent as a result of market liberalization.

Taking to account the wholesale price indices to adjusting the poverty line figures reported by Assadzadeh and Paul (2001), the poverty line for rural and urban areas is calculated to be respectively 441756 Rials and 1008218 Rials per month. Based on these figures, mean income of 36.1 percent of households in urban areas and 24.6 percent of households in rural areas falls below the poverty line. The other two measures of poverty, that is P_1 and P_2 , are estimated to be 8.04 and 2.62 in rural areas and 7.12 and 3.28 in urban areas.

Adjusting the households' real income and holding the original poverty lines, the effect of the rice price change on the poverty rate is estimated by calculating the percentage change in the three indices of poverty. This effect is shown in the last three columns of Table 3. With regard to P_0 , the poverty rate is estimated to reach to 43.4 percent, which implies a 76 percent increase, in rural Iran a significant change on the proportion of rural households below the poverty line but it does not change in the urban areas. The percentage changes in P_1 and P_2 is calculated to be 10.29 and 3.69 in rural areas but despite the change in the real income these measures remain unchanged in urban areas. Therefore, rice market liberalization is expected to widen the gap between the poverty line and the average income among the rural poor and poverty is expected to be more severe when the average income of these households as well as the variance of their income is taken into account. This is because of the fact that most of the rice producers live in the rural areas where a higher reduction in real income is expected to occur.

6. Summary and Conclusions

With regard to the recent general policy of converting the economy towards a single exchange rate and considering the public interest in Iran toward establishing a market oriented agricultural sector, this study was conducted to evaluate the possible welfare effects of rice liberalization in the country. Using the time-series of 1961-99 and applying the estimated elasticities of market demand and supply of rice, various effects including changes in social welfare and foreign exchange as well as protective and consumption effects of a defined tariff were calculated and discussed. The results indicated that rice market liberalization would result in decreasing the governmental revenue as well as domestic suppliers' welfare, but increases in the consumers' gain. The rice

imports and its value increase because of the simultaneous decrease in domestic supply and increase in demand.

In summary, the major welfare effects of rice market liberalization in Iran is to appear in decreasing the governmental revenue as well as domestic suppliers' welfare, but it increases the consumers' gain. As to be expected, rice imports go up because of the simultaneous decrease in domestic supply and increase in demand. It may be said that the rice producer may find trading more economical than rice producing. Moreover, as far as the poverty effect of rice price change is concerned, the rice market liberalization may strengthen the poverty severity particularly among the rice producers. Considering the net social welfare effect of the policy, the establishment of a free rice market seems to have enough economic justification and society can gain from the policy. However, taking into account the other aspects of the policy such as its effect on poverty can lead us to a different justification.

In order to improve the rice market situation in Iran, the following may be recommended (also introduced by Najafi and Bakhshoodeh, 2002):

Considering the shortage of water due to recent droughts, the consumption of rice should be redirected through abolishing distribution of coupons by which the consumption can be controlled.

The devoted subsidized foreign exchange to rice imports is considered as a policy against the domestic producers and therefore, the subsidized foreign exchange for importing rice should be abolished.

Despite the fact that domestic rice is not considered an export commodity, some varieties may be potentially considered for the purpose of exports. In this regard, removing exporting barriers is highly recommended.

Considering the low efficiency level of government activities, the role of the government in the rice market should be reduced. For the meanwhile, the government should buy 10 to 20 percent of produced rice at harvesting season with an agreed price in order to supply them in out-seasons to capture the shortages.

A possibility is to promote the private sector and to liberalize the rice market. In the light of achieving long run targets of a market-oriented economy in Iran, privatization and liberalization seem to be the only available alternatives. However, as the results of this study indicate, implementing such a policy may have some distribution effects against the rice producers.

It is believed that implementing above recommendations could increase the market efficiency of rice in Iran and this may cause the scarce resources, especially water, to be allocated optimally. Considering the constant prices, the future net welfare effect of rice market liberalization seems to be high enough

such that the policy should not be postponed. This can be recommended when other things such as drought are considered. However, there are still a couple of issues to be considered. The policy is expected to widen the poverty rate, for instance, and therefore it should be implemented after assuring that its possible side effects do not exceed the net welfare effects. Conducting a general equilibrium analysis is useful to confirm the effects in a more general view.

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Figure 1: Production and Domestic Supply of Rice, Iran, 1961-99

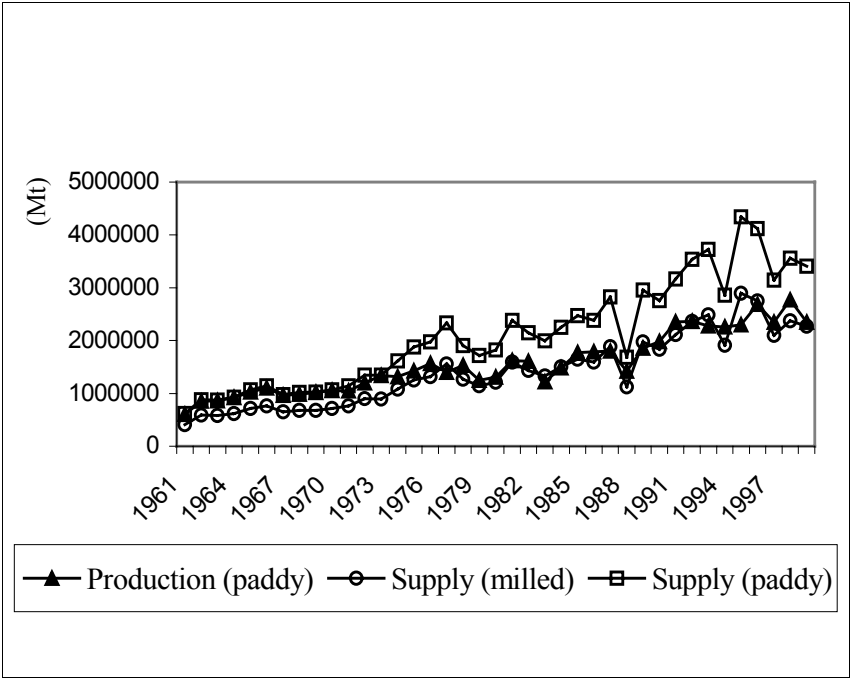


Figure 2: Prices of Rice, Iran, 1975-99

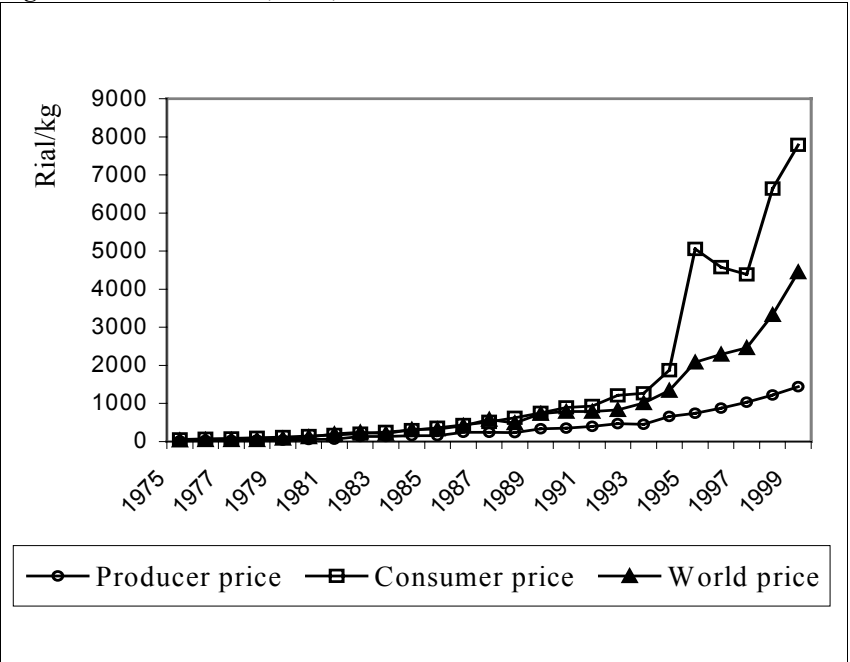


Figure 3: The Welfare Effects of Rice Liberalization in Iran

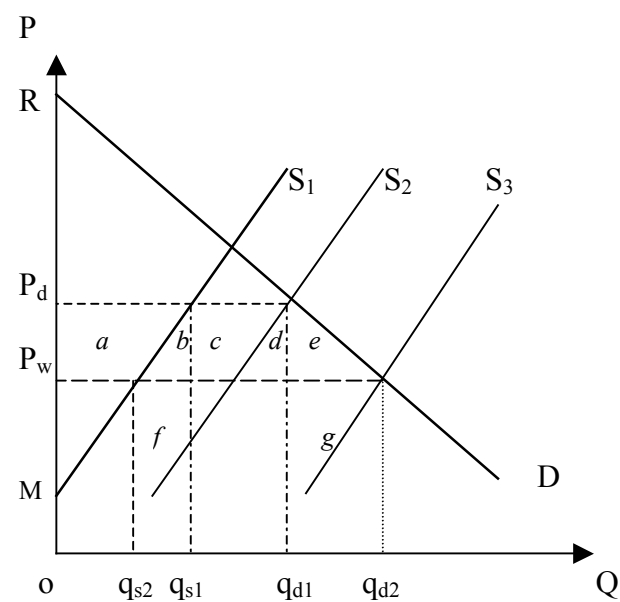


Figure 4: Estimated Quantities of Demand and Supply of Rice, Iran, 1962-99

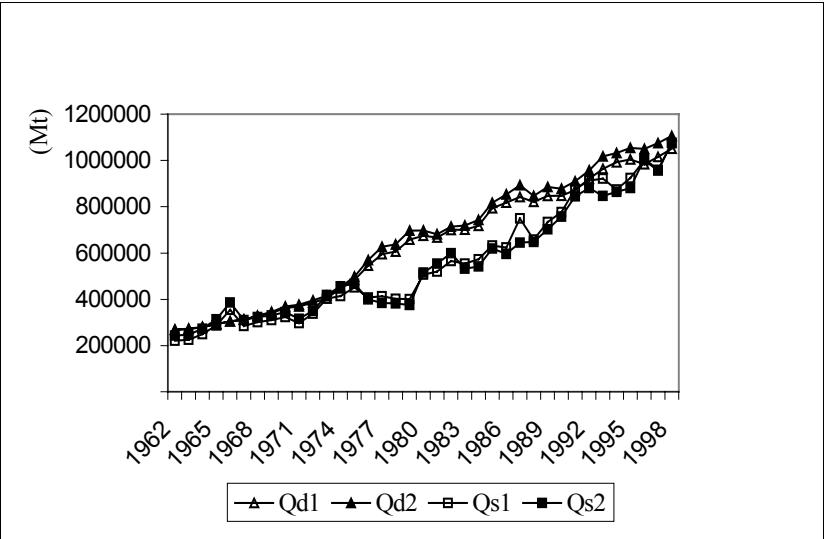


Figure 5: Net Social Welfare of the Rice Market Liberalization, Iran

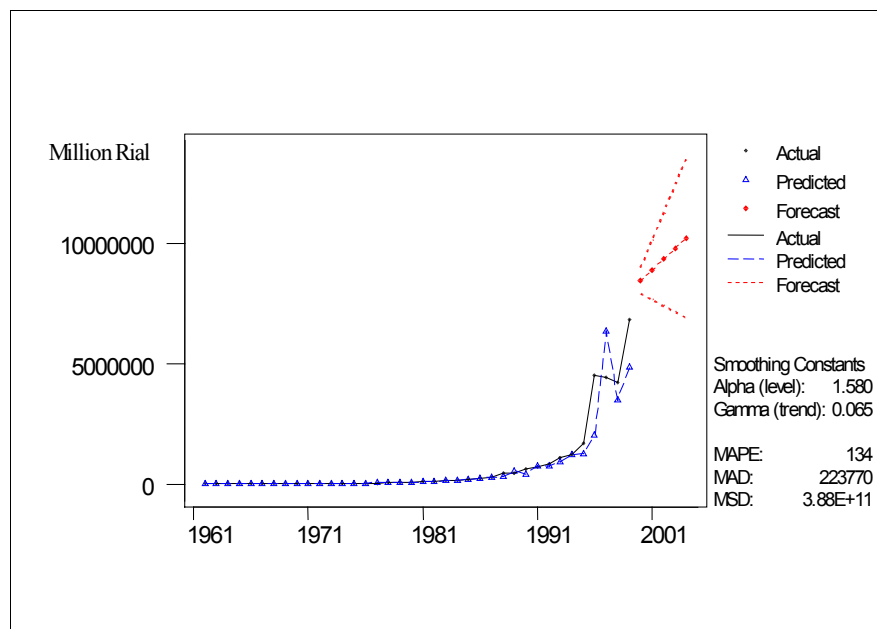


Table 1: The Average Effects of Rice Liberalization in Iran, 1979-98

	unit	Supply side		Demand side	
		Mean	Std. Dev.	Mean	Std. Dev.
Change in quantity	10 ³ tones	-18.2	30.7	36.6	14.8
Welfare effect	10 ⁶ Rials	-121.4	183.9	364.6	426.6
Change in foreign exchange	10 ⁶ Rials	-5479.8	1068.7	15785	21418
Protective (consumption) effect of tariff	10 ⁶ Rials	99.6	159.9	198.1	133.9

Table 2: Distribution of Rural Households by Income, Iran, 1999

Income groups	Mean annually income per household in 1000 Rials		Cumulative proportion of households		Cumulative proportion of income	
	Rural areas	Urban areas	Rural areas	Urban areas	Rural areas	Urban areas
0-7200	5185	4128	24.6	9.1	2.6	2
7200-9000	8069	8058	43.4	21.1	6.5	6
9000-12000	10380	10384	61.7	36.1	11.6	11.1
12000-16500	13926	13849	72.9	51.9	18.4	17.9
16500-19500	17972	17459	80.8	64	27.3	26.4
19500-24000	21190	21071	86.8	74	37.7	36.8
24000-30000	26522	25977	92.9	82.8	50.7	49.5
30000-45000	35412	35184	98.5	91	68.1	66.8
45000 and more	64878	67776	100	100	100	100

Table 3: The Mean Poverty Effect of Rice Liberalization in Iran (%)

	Change in real income		Change in poverty index		
	Short term	Long term	P ₀	P ₁	P ₂
Rural areas	-8.743	-8.747	76	26.8	40.8
Urban areas	-5.5	-5.501	0	0	0