Rice Price Stabilization in Madagascar: Price and Welfare Implications of Variable Tariffs

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1. Introduction

International trade, especially private sector international trade, has long been recognized by economists as an efficient means of stabilizing domestic food prices. Trade flows add to domestic supplies in times of shortage (or provide an additional market in times of surplus), with adjustments in trade taxes providing a mechanism to influence both traded quantities and domestic prices.[2] The main alternative intervention, publicly held stocks, has generally proved to be highly inefficient, both because of high costs involved in government procurement, storage and disposal (distribution) of food, as well as disincentives for development of more efficient private markets. Nonetheless, governments in developing countries continue to intervene in food markets, in large part because of the political sensitivity of food prices in urban markets, notwithstanding pressures for liberalization of markets and reductions in fiscal subsidies on the part of donors (Islam and Thomas, 1996).

To a large extent, Madagascar has opted for a policy of market stabilization through private sector trade for its major food staple, rice, since a period of structural adjustment in the late 1980s.[3] Private sector imports, averaging about 5 percent of total supply, have occurred almost every year, stabilizing rice prices in the months prior to the major rice harvest (Figure 1). Although structural adjustment policies in sub-Saharan

[2] See Timmer (1989) for a discussion of the analytics of trade policy to stabilize food markets. For an example of how private trade with India has stabilized rice prices in Bangladesh, see Dorosh (2001).
[3] The rice subsidy reached 25% of the government budget in the mid-1980s prior to market reforms (Dorosh and Bernier, 1994).

Africa have often led to increased price variability, the private sector rice import trade generally has kept rice prices in Madagascar more stable than prices of major staples in other African countries, such as Ethiopia and Zambia (Table 1).

However, in 2004, following a surge in rice prices brought about by a domestic production shortfall that coincided with a large depreciation of the Malagasy franc (FMG) and a rise in world rice prices, government interventions actually discouraged private sector imports through uncertainties regarding possible reductions in import tariffs. Instead of reducing rice import tariffs, a policy of subsidized sales of rice at an official price below import parity (including tariffs) was adopted.

In the Madagascar context, adjustments in the import tariff for rice are problematic for several reasons. First, adjustments in rice tariffs can entail a significant loss of fiscal revenues. Second, unless tariff adjustments are done in a transparent manner, the uncertainty surrounding possible impending tariff adjustments could reduce private sector incentives for imports. Third, although most Malagasy are net rice consumers, reductions in tariffs can reduce incomes of domestic producers.[4]

This paper explores these issues and analyzes the relative merits of adjustments in the import tariffs to the main alternative for rice price stabilization: subsidized sales of government rice to target groups. To do so, we use data from the national household survey and a partial equilibrium model of Madagascar's rice economy to simulate the effects of these policy options on the population as a whole and on the poor in particular.

[4] A fourth issue is that tariff reductions for rice could result in major political pressures to reduce tariffs for other consumer items, resulting not only in a distorted and complex trade regime, but further reducing tariff revenues, and perhaps leading to a surge in imports and a balance of payments crisis. This aspect, is, however, beyond the scope of this paper.

2. Analytical framework

The effects of tariff changes on domestic rice prices, rice demand, domestic production and import levels can be estimated using a simple analytical framework as described below. Domestic rice prices in Madagascar have generally tracked the import parity price of rice, indicating that these two broad types of rice are very close substitutes in demand for Malagasy consumers (refer to Figure 1). Thus, the analysis assumes that, as long as Madagascar is a net rice importer, domestic prices are equal to the import parity price of rice, i.e. the US$ cost and freight price of rice times the FMG/$ exchange rate, and adjusted for import tariffs (including the TVA) and marketing costs (transport, handling, storage, etc.) to domestic rice markets.

Under these assumptions, any change in world prices, exchange rates or tariffs will result in a corresponding change in the import parity and domestic prices of rice. Given these exogenous price changes, new levels of domestic demand and production can be calculated using assumed price elasticities of demand and supply. Effects of these price changes on various household groups are estimated using data from the national household survey on household rice consumption and production. Sensitivity analysis is done using alternative estimates for these key parameters.

The model implicitly assumes an integrated market across regions of Madagascar, i.e. prices throughout the country are assumed to be driven by the import parity price. Even though imported rice is found in many rural markets in Madagascar, there remain large areas in which rice markets are effectively isolated from the national rice market throughout the year due to high transactions costs (Moser et al., 2005). In the absence of effective price transmission from import parity to local rice prices, household demand

and supply will not respond to changes in the import parity price. Because of this, the model will tend to overstate the overall price responsiveness of domestic demand and supply. For this reason, the elasticities of supply and demand used in this analysis are deliberately chosen to be low.

This annual model further does not take into account the often significant seasonality of rice prices in Madagascar (Barrett, 1996). The implicit assumption in the model is that seasonal price fluctuations remain unchanged (in percentage terms) when average annual prices change. Thus, in each simulation, producer prices in the immediate post-harvest season rise by the same percentage (relative to the base) as consumer prices.

Net supply of rice in Madagascar is calculated as the sum of net production and imports in the base year of 2001, the year of the national household survey. We use a production estimate of 1.787 mn tons of rice (equivalent to 2.978 mn tons of paddy multiplied by 0.61 to adjust for milling, seed, feed and wastage). Assuming a level of imports of 200 thousand tons (and no change in stocks), net availability (consumption) is equal to 1.987 mn tons.

3. Implications of changes in rice import tariffs

Effects on rice imports and tariff revenues

Table 2 presents simulation results of the effects of the elimination of the 10% tariff on rice imports. Since some of the marketing costs are assumed to be fixed in FMG terms, the percentage change in the domestic rice price is only 6.9%. Four scenarios illustrate the effect of the elimination under different assumptions of price responsiveness of consumers and producers in Madagascar. Under the assumption of no change in quantities demanded or supplied (Simulation 1 with elasticities of supply and demand both equal to zero), the change in tariff rates results in a proportional decline in tariff revenues, which fall from $20.7 mn to only $13.8 mn (a 33 percent decline).

If consumer demand falls with rising rice prices, the elimination of a tariff increases rice demand by 1.4 percent (with an elasticity of demand of -0.2, simulation 2) or 2.9 percent (with an elasticity of demand of -0.4, simulation 3). To supply this demand (assuming production is fixed), imports also rise from 200 thousand tons in the base scenario to 229 and 258 thousand tons in simulations 2 and 3, respectively. With greater import volume, tariff revenues decline less than in simulation 1 – by only $4.9 mn (24 percent) in simulation 2 and only $2.9 mn (14 percent) in simulation 3.

If producers are also price-responsive, the 6.9 percent decrease in prices results in a 30 thousand ton decline in rice production (1.4 percent, assuming an elasticity of supply of 0.2, simulation 4). Combined with the effects of lower prices on consumer demand, this leads to an increase in imports to 283 thousand tons (13.8% of supply, compared to only 10.1% of supply in the base). Tariff revenues are $19.6 mn, only $1.1 mn (6 percent) below the base levels.

Thus, these simulations indicate that, taking into account price-responsiveness of supply and demand for rice in Madagascar, elimination of the 10% tariff on rice has little effect on overall tariff (plus TVA) revenues for rice imports, because the volume of rice imports increases as the tariff rate is reduced.

Impacts on households

Net buyers of rice make up a large part of the population in Madagascar, also in rural areas (Barrett and Dorosh, 1996; Minten and Zeller, 2000). Estimates based on annual production and consumption data from the 2001 national household survey (the enquete permanent aupres des ménages, EPM 2001) indicate that 19% of the households in Madagascar are net sellers of rice, 11% are self-sufficient and 46% are net buyers (Table 3). 23% of the households are urban households and most of them can be considered net buyers. Almost 60% of the purchased rice in Madagascar is estimated to be consumed by the net buyers in rural areas.

The effects of changes in rice tariffs and rice prices on household rice consumption and welfare depend to a large extent on whether the household is a net producer or consumer of rice. Most households in Madagascar grow some rice (even urban households), so the beneficial effects of a decrease in rice prices for consumers is not as large as it would be if most households purchased all their rice. For the poorest 60 percent of households in Madagascar, the ratio of production to total consumption is 98%; for the urban poor, this ratio is 74% (Table 3). Even for rural rice deficit households, own production is equal to 50% of rice consumption. Moreover, there are significant numbers of almost self-sufficient poor households (1.36 million people in 269 thousand households, EPM 2001 data) that suffer net welfare losses when rice prices rise.

Eliminating the 10% rice tariff and thus reducing the domestic rice price by 6.9% results in net benefits to the rural poor net buyers and the urban poor by a total of $8.5-8.8 mn (Table 4), with the estimated benefit increasing as the price responsiveness of supply and demand increase. However, rural poor surplus producers suffer a welfare loss of $6.9 to 7.2 mn because of the lower rice price. Thus, the net benefits to all poor (including also the rural self-sufficient households) are only $0.6 to $1.3 mn.

In a year of high import parity prices of rice that raises domestic prices, producers of rice gain relative to normal price years, even with a decline in the rice tariff. Reducing the rice tariff simply mitigates the welfare loss of high rice prices to net consumers (and reduces the windfall gains to net rice producers). In these simulations, the government forgoes $1.1 mn (Simulation 4 with high price responsiveness) to $6.9 mn (Simulation 1 with no price responsiveness) in revenues in order to transfer benefits of $8.5 to $8.8 mn to poor net consumers. The ratio of benefits to poor net rice consumers to lost tariff revenues is 1.2 to 7.7, with the most plausible estimates ranging from 1.8 to 7.7 (simulations 2 through 4).

In theory, a targeted direct cash transfer of $8.5 to $8.8 mn (or targeted subsidized sales of rice of the same value) could avoid the welfare losses for net producers, while providing the same benefits to net consumers as a rice price reduction. Administrative costs of targeting and distribution, as well as the likelihood of leakages, would raise the costs of such a program beyond the $8.5 to $8.8 million in benefits calculated here.

It is also important to note that reductions in rice tariffs have substantial benefits for non-poor net rice consumers, as well as costs for non-poor net rice producers. Most of these non-poor households are net rice consumers; including these households into the estimated benefits to net rice consumers raises total estimated benefits substantially, i.e. ranging between $27.1 mn and $28.0 mn (compared with $8.5 mn to $8.8 mn considering only poor net consumers). Thus, the most plausible estimates of the ratio of benefits to net consumers relative to lost tariff revenues rises overall to a range of 5.6 to 24.5. Net gains to all households also rise to a range of $7.2 mn to $8.7 mn (compared to only $0.6 mn to $1.3 mn considering only poor households). These net benefits to the non-poor come at no additional cost to the government (in terms of additional lost tariff revenues), but are not necessarily the major objective of the price stabilization through tariff reduction policy.

4. Medium-term rice price stabilization options

One option to stabilize prices in Madagascar would be to rely on international trade and periodic tariff adjustments to set the ceiling price of rice. This policy would involve no government or publicly managed stocks, no restrictions on private market imports (apart from tariffs), and import tariff adjustments to be set each year at time of major harvest (March/April) and fixed for one year. These import tariffs could be set at a price to maintain private sector incentives for imports at expected world prices. The key to this price stabilization through private imports policy, however, would be transparency and a level playing field, i.e. a common set of tariffs, rules and information for all market participants.

The above analysis suggests that reductions in rice import tariffs in years with high import parity prices can effectively mitigate the adverse effects of sharp increases in prices on poor consumers in Madagascar. In years when world prices and exchange rates have not risen substantially relative to the previous year, no tariff adjustments would be needed to maintain a substantial degree of price stability.

In case of local production shortfalls coinciding with very high import parity prices, the government might want to intervene. It would, however, have to tender for commercial imports in a transparent and equitable manner and sell at loss if it wanted to reduce market prices. Donor food aid stocks could also provide a small emergency stock for targeted safety net distribution.

A second broad policy option would involve a rice security stock, not necessarily managed by the government, but under government control. To avoid disincentives to local producers, the sales/release price should be announced prior to the main planting season and held fixed for one year. And to avoid disincentives for private sector imports, the sales/release price should be higher than the expected import parity price. Stocks could be rotated through government sales at import parity (including tax) and government tenders for commercial imports.

Such a policy of government stocks and domestic market interventions risks substantial fiscal losses, corruption, and private market disincentives if government expands stocks, the policy is not transparent, or the government intervenes heavily in local markets. Unfortunately, this has been the usual experience in Sub-Saharan Africa and elsewhere (Pinstrup-Andersen, 1988). Given the small size of typical rice market shortfalls, very rough initial calculations suggest that costs of even relatively small stocks in Madagascar may not outweigh advantages. Assuming a stock of 60,000 tons with $30/ton annual storage costs, the total annual costs would be $1.8 mn. Major production shortfalls in Madagascar occur about one in four years. Average costs (including costs of stock rotation, etc.) per major production shortfall may thus amount to almost $8 million.

Under either of these options, flexibility in adjusting the import tariff, once per year, in line with expectations of the world price of rice would be needed. This differs from a variable tariff policy in that it is more transparent and less complicated –

important considerations in Madagascar's current atmosphere of mistrust between government and many private sector traders.

5. Summary and conclusions

Since Madagascar is a net rice importing country, and since domestic and local rice are very good substitutes, changes in the cost of imported rice in domestic markets (the import parity price) to a large extent determine the price of local rice. In this situation, as long as incentives for competitive private sector trade are maintained, this import parity price provides a price ceiling for domestic prices in the country, and transparent and pre-announced tariff reductions can be used to mitigate the effects of increases in the price of imported rice on poor consumers.

Estimates presented in this paper suggest that these tariff adjustments result in small losses of tariff revenues (since reductions in tariff rates also increase the quantity of imports) with benefits to poor net rice consumers estimated to be between 2.0 to 8.7 times the value of lost tariff revenues. Moreover, these benefits are achieved without the high administrative costs of a direct food transfer program or maintenance of government stocks.

Finally, the experience of Madagascar as described in this paper illustrates the importance of maintaining private sector incentives if trade flows are to act as an effective price stabilization mechanism. Transparency of government policy is thus crucial for an effective adjustable tariff policy.

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Table 1: Monthly staple price variability in some selected developing countries ($/ton)

	Bangladesh National Ave. Wholesale Coarse Rice $/ton	India Delhi Wholesale Coarse Rice $/ton	Zambia Lusaka Retail White Maize $/ton	Ethiopia Addis Retail Maize $/ton	Madagascar Antananarivo Retail Rice $/ton	Madagascar Antananarivo Retail Rice $/ton
Period	1996-2002	1996-2002	1996-2002	1996-2002	1996-2002	2003-2004
Average Price	240.9	218.7	191.8	127.7	397.2	421.3
Standard Deviation	32.0	23.0	59.4	39.6	49.4	59.7
Coef. of Variation	0.133	0.105	0.310	0.310	0.015	0.02
Maximum	307.1	266.0	352.1	225.7	538.8	572.8
Minimum	193.5	184.0	100.9	55.7	313.3	279.3
Max/Min	1.59	1.45	3.49	4.05	1.71	2.05
Max/Mean	1.27	1.22	1.84	1.77	1.36	1.36

Source: Authors' calculations.

Table 2: Effects of Tariff Changes on Imports and Tariff Revenues

	Base	Simulation 1	Simulation 2	Simulation 3	Simulation 4
Elasticities (demand,supply)		(0,0)	(-0.2,0)	(-0.4,0)	(-0.4,0.2)
Production (paddy, mn tons)	2.978	2.978	2.978	2.978	2.936
Rice Production (mn tons)	1.787	1.787	1.787	1.787	1.762
Imports (mn tons)	0.200	0.200	0.229	0.258	0.283
Total Supply (mn tons)	1.987	1.987	2.016	2.045	2.045
Elasticity of demand	--	0.0	-0.2	-0.4	-0.4
Elasticity of supply	--	0.0	0.0	0.0	0.2
Import Tariff (percent)	10	0	0	0	0
Price (= import parity) (FMG/kg)	5200	4841	4841	4841	4841
% change demand	--	0.0%	1.4%	2.9%	2.9%
% change price	--	-6.9%	-6.9%	-6.9%	-6.9%
Change in imports (mn tons)	--	-	0.03	0.06	0.08
% change in imports	--	0%	14%	29%	42%
Implicit import elasticity	--	0.0	-2.1	-4.2	-6.0
Tariff revenues (bn FMG)	207	138	158	178	196
Tariff revenues (mn $)	20.7	13.8	15.8	17.8	19.6
Change in tariff revs (mn $)	--	-6.9	-4.9	-2.9	-1.1
% reduction in tariff revs	--	-33%	-24%	-14%	-6%
Imports/Supply	10.1%	10.1%	11.3%	12.6%	13.8%
Value of Imports (mn $)	57.0	57.0	65.2	73.4	80.7

Source: Model simulations. (Note that total tariffs on rice in the base case consist of a rice import tariff of 10% and a value added tax of 20 percent. The total tariff is equal to 36% of the cost and freight price of rice).

Table 3: Rice consumption and production according to household net rice sales groups, 2001

	Rural						
	Net buyers	Self-sufficient	Net sellers	Urban	Total	Rural	Net buyers
Total Population							
Total population	7.321	1.682	3.082	3.583	15.668	12.085	10.903
Total # households	1.519	0.366	0.626	0.805	3.315	2.510	2.324
Pop/HH	4.82	4.60	4.92	4.45	4.73	4.81	4.69
% of total population	46.7%	10.7%	19.7%	22.9%	100.0%	77.1%	69.6%
Rice production (kgs/HH)	231	433	1,692	265	539	625	243
Rice use (kgs/HH)	550	436	812	603	600	599	568
Rice consumption (kgs/person)	114.1	94.8	165.0	135.5	126.9	124.4	121.5
Rice consumption ('000 tons)	835	160	509	485	1,989	1,503	1,321
% production / use	42%	99%	208%	44%	90%	104%	43%
Poorest 60% of Population							
Total poor population	4.666	1.361	2.179	1.196	9.402	8.205	5.862
Total # poor households	0.851	0.269	0.377	0.219	1.715	1.497	1.070
Pop/HH	5.48	5.07	5.78	5.47	5.48	5.48	5.48
% of Total Poor	49.6%	14.5%	23.2%	12.7%	100.0%	87.3%	62.4%
% of Total Population	29.8%	8.7%	13.9%	7.6%	60.0%	52.4%	37.4%
Rice production (kgs/HH)	242	424	1,470	387	559	584	272
Rice use (kgs/HH)	485	356	935	522	568	575	492
Rice consumption (kgs/person)	88.4	70.3	161.8	95.5	103.7	104.9	89.9
Rice consumption ('000 tons)	413	96	352	114	975	861	527
% production / use	50%	119%	157%	74%	98%	102%	55%

Source: Calculated from EPM 2001 data

Table 4: Effects of Tariff Changes on Household Welfare

	Base (kgs/cap.)	Simulation 1 (mn $)	Simulation 2 (mn $)	Simulation 3 (mn $)	Simulation 4 (mn $)
Import tariff (percent)	10	0	0	0	0
Elasticities (demand,supply)	--	(0,0)	(-0.2,0)	(-0.4,0)	(-0.4,0.2)
Poorest 60% of Households					
Rural Net Buyers	88	7.4	7.5	7.6	7.7
Rural Self-Sufficient	70	-0.7	-0.6	-0.6	-0.6
Rural Surplus	162	-7.2	-7.2	-7.1	-6.9
Urban	95	1.1	1.1	1.1	1.1
Total	104	0.6	0.8	1.1	1.3
Net Buyers*	90	8.5	8.6	8.8	8.8
Change in tariff revs (mn $)	--	-6.9	-4.9	-2.9	-1.1
Net Benefit/Lost Tariff Revenue	--	1.2	1.8	3.0	7.7
All Households					
Rural Net Buyers	114	17.4	17.6	17.8	17.9
Rural Self-Sufficient	95	0.0	0.1	0.1	0.2
Rural Surplus	165	-19.8	-19.7	-19.5	-19.3
Urban	135	9.8	9.9	10.0	10.1
Total	127	7.2	7.8	8.3	8.7
Net Buyers*	121	27.1	27.5	27.8	28.0
Change in tariff revs (mn $)	--	-6.9	-4.9	-2.9	-1.1
Net Benefit/Lost Tariff Revenue	--	3.9	5.6	9.6	24.5

*Rural net buyers and all urban households.

Source: Model simulations

Figure 1: Retail price evolutions and import levels of rice in Antananarivo, Madagascar