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# Staff Paper

**IMPROVING FOOD SUBSIDY TARGETING: AN APPLICATION OF CONTINGENT VALUATION TECHNIQUES**

**by**

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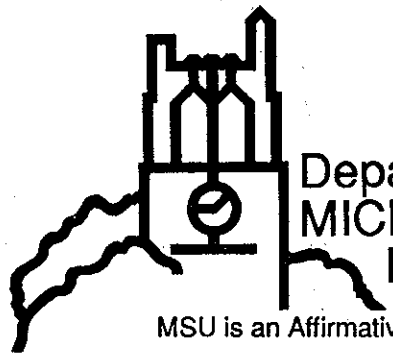

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## I. Structural adjustment and the targeting problem

Over the past ten years, there has been increasing recognition by government and international financial institutions of the social costs associated with structural adjustment (Stewart, 1991). Almost a decade ago, Cornia, Jolly and Stewart (1987) drew attention to the negative effects of stabilization and adjustment measures on the food security status of vulnerable groups.[1] During the adjustment process, most countries face what Timmer, Falcon, and Pearson (1983) termed the "food-price dilemma." That is, governments are caught between the need to induce greater agricultural supply response by offering remunerative producer prices and the desire to keep retail food prices low for both urban and rural consumers.

A possible solution to the "food-price dilemma" lies in reducing the real cost of producing food through technological change in agriculture, marketing, processing, and through increasing non-farm sources of income so that consumers are able to purchase more food from the market (Staatz, D'Agostino, and Sundberg, 1990). However, these are medium to long-term endeavors. In the meantime, ameliorating food insecurity means finding ways to reach the large number of rural and urban consumers that do not have enough resources to assure themselves or their children an adequate diet.

In an attempt to escape the food-price dilemma, many governments have sought to reduce consumer food prices by subsidizing the margin between producer and consumer prices. These general food subsidy schemes are usually designed to provide a staple grain or basic commodity basket at below-market prices. Such schemes provide subsidized staples to households irrespective of income levels and thus are "untargeted." However, general subsidies entail significant fiscal costs. With many African nations experiencing an overall deterioration in budgetary resources, general subsidies have often become unsustainable. Although, as Pinstrup-Andersen (1988) has pointed out, general subsidy programs have been effective in reducing poverty and improving the nutritional status of the poor, they are not the most cost-effective means of doing so.

Thus the dilemma is how to target food subsidies so as to address the nutritional needs of the food insecure in a manner that is financially sustainable and does not undermine the chances for assuring food security enhancements (both on the supply and access fronts) over the long term. Programs need to be designed that target poor households

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[1] Food security is defined as "the ability of a country or region to assure, on a long-term basis, that its food system provides the total population access to a timely, reliable and nutritionally adequate supply of food" (Eicher and Staatz, 1986). The concept of food security involves more than supply at the national level and meeting food production goals. It also includes assuring access of the individuals and households to food supplies through generating effective demand via income growth or transfers (Weber et al., 1988).

without effective demand, yet do not disrupt the ability of the market to supply the rest of the population (Rubey, Staatz and Weber, 1991).

Targeting consumer subsidies entails a number of tradeoffs. By excluding some portion of non-needy households, targeting improves the cost-effectiveness of the scheme since the degree of "leakage" is reduced, ideally without sacrificing coverage to the needy groups. However, the administrative costs of targeting increase as the targeting effort intensifies to further reduce leakages. At some point, the increased administrative costs are greater than the cost savings from reducing benefit leakage to non-needy households (Pinstrup-Andersen and Alderman, 1988). Cumbersome administrative procedures designed to reduce leakage can also have the effect of excluding eligible households.

There are numerous options for administering targeted subsidy schemes that traditionally have been available to governments; eligibility for program participation can be based upon household income, asset ownership, nutritional status of household members, occupation, household composition or geographic area. For example, households with incomes below a certain threshold or households with members determined to be at nutritional risk are identified and given access to subsidized commodities through food stamps, fair-price shops or some other mechanism. Yet identifying vulnerable households involves obtaining significant amounts of data on the economic or nutritional status of individual households and requires a certain level of administrative capacity to carry out the scheme. There is general consensus that many, if not most, African countries lack these prerequisites for the effective information collection and administrative targeting of food subsidies (Rubey, Staatz and Weber, 1991)[2].

Given the limitations of administratively-targeted schemes in Africa, there has been a surge in interest in "self-targeting" mechanisms. Indeed, self-targeting offers the hope of reaching the food insecure with minimal leakage and without complicated administrative requirements. A self-targeted commodity is a good with a negative income elasticity of demand; as incomes rise, consumers choose to consume less of these foods. Thus, self-targeting schemes have the potential to be very cost-effective; if inferior goods are subsidized, richer households will voluntarily exclude themselves from the subsidy program by choosing more preferred, unsubsidized staple foods.

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[2] Despite the difficulties of targeting individual households, there still may be potential for disaggregated, local level or "village level" targeting of subsidized food. Surveillance systems can ascertain when a deterioration in consumption levels or increases in food prices create the need for outside assistance. Potential distribution channels include PVO's, women's groups, or farmer cooperative organizations. In some sense, this is a limited solution, suited more to micro-level drought relief activities. Such options also have to be carefully designed so as not to reduce incentives to storage or production.

Designing a self-targeted subsidy scheme requires detailed information on the consumption patterns of the rural and urban poor, including price and income elasticities and relative contributions of various foods to total dietary intake. For self-targeting to work, there must be significant diversity in dietary patterns between the poor and the rich (Waterfield, 1985). Unfortunately, consumption studies suggest that for some countries an inferior food staple may not be part of observed consumption patterns (Rogers and Lowdermilk, 1988). An obvious solution is introducing a new commodity that has the characteristics of an inferior good. Yet with a range of possible choices, how can analysts identify whether a new commodity (that is not part of consumption patterns) is appropriate for a self-targeted subsidy scheme?

The purpose of this paper is to demonstrate possible applications of contingent valuation techniques to better inform the targeting of consumer food subsidies. Contingent valuation techniques, although widely used in resource and environmental economics, have not been used previously to identify opportunities to better target food subsidies. By ascertaining potential demand for commodities not currently available in the market, these techniques can become an important tool in identifying improved targeting opportunities. This paper uses results of a contingent valuation study of maize meal preferences in urban Zimbabwe to gauge potential demand for alternative maize meal products and evaluate such products as possible vehicles for targeting food assistance. The potential savings from substituting a general subsidy on white maize meal with alternative targeting mechanisms are also calculated.

## II. Maize meal subsidies in Zimbabwe

As in much of southern and eastern Africa, white maize is the dominant cereal crop in Zimbabwe. White maize meal is the staple food of most Zimbabweans, and most consumers express a strong dislike for yellow maize. Yellow maize is produced almost solely by large-scale commercial farmers for use as animal feed; it is only available for human consumption when domestic shortfalls necessitate maize imports from outside the region. For example, during the 1992 drought in Zimbabwe, domestic maize production fell drastically, and with little white maize available on world markets, over two million tons of yellow maize were imported from the Americas.

Historically, three types of white maize meal, differing primarily in degree of processing, have been consumed in Zimbabwe: super-refined meal (the most refined), roller meal and straight-run meal (the least refined). Super-refined and roller meal are primarily produced by large-scale milling firms , while straight-run meal production is usually the preserve of small-scale mills, often milling on a fee-for-service basis. The conventional wisdom is that most urban consumers prefer the two more refined types of maize meal over straight-run meal. Maize meal subsidies have been an integral component of food policy for over a decade. During the early 1990's, maize meal subsidies were limited

exclusively to white roller meal, a somewhat refined maize meal which accounted for at least 80 percent of all maize meal sales.

The principal objective of the white roller meal subsidy was to ensure that consumers had access to low-cost maize meal. For example, during the August 1992 to June 1993 period[3], subsidies reduced the retail price of white roller meal to all consumers by 35 percent. However, since the white roller meal subsidy was untargeted, the budgetary costs were enormous. The cost of the roller meal subsidy was estimated by the Ministry of Industry and Commerce to be over Z$44 (almost US$ 9 million) per month in 1993.

## III. Methods for estimating potential demand

Given budgetary pressures that created the need to reduce maize meal subsidies, at least two options were available. One option was replacing the subsidy on white roller meal with a self-targeted subsidy on a lower-priced product such as yellow roller meal. A second option was be to enact policy reforms that enhance the availability of lower-cost maize meal products such as white straight-run meal. Yet there are several problems with using traditional estimation techniques to determine the implications of each of these options:

1. At the time of the survey, neither yellow roller meal nor white straight-run meal were widely available in urban food markets. Due to low fixed margins, large-scale millers did not produce white straight-run meal and movement controls prevented urban small-scale millers (and consumers) from obtaining significant quantities of maize grain for manufacturing white straight-run meal. Yellow roller meal is only available during times of severe drought (1992, 1984 and 1967) when significant imports are required;

2. Until mid-1993, the retail prices of all types of processed maize meal were fixed by government. With fixed prices, there is little empirical basis for estimating own-price and cross-price elasticities.

Without an empirical basis for predicting consumer responses to changes in subsidy policy, subsidy reform is stymied. If cross-price elasticities are zero and low-income consumers are unwilling to switch from white maize meal to a lower-priced maize meal product, removing the subsidy on white roller meal would be ill-received and may have serious political ramifications. If cross-price elasticities are strongly positive, the

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[3] The roller meal subsidy was completely eliminated in June 1993. Although supplementary feeding programs and drought relief food distribution exist, no explicit government subsidies on maize meal products remain.

targeting potential is lost. The advantage of contingent valuation techniques is that, in the absence of market data, they can indicate whether consumers across differing income groups are willing to substitute yellow roller meal or white straight-run meal for white roller meal and help in ascertaining the potential effectiveness of targeted subsidy schemes.

Contingent valuation techniques elicit value data directly from individuals affected by a policy change (Hoehn and Krieger, 1988). Survey design consists of a series of market simulations in which a representative sample of consumers are asked to make decisions among alternative goods at specified price levels. In the case of estimation of potential demand for a new commodity, the new product can be compared to an existing product that the consumer does purchase. Contingent valuation techniques have been used extensively to value willingness-to-pay for non-market goods such as environmental assets, but have not been widely applied to market goods.

In the limited studies that have been done on market goods, data gathered from contingent valuation techniques and used to estimate potential demand have been shown to provide fairly accurate estimates of actual demand. In a study of the demand for fresh strawberries in Wyoming, Dickie, Fisher, and Gerking (1987) compared the estimation of demand functions based on actual transactions versus the demand estimation from hypothetical contingent valuation bids. They found that there was no statistical difference between the demand function estimated from a sample that was based on actual data and a consumer sample that reflected hypothetical contingent valuation responses.

Data was collected from a random sample of 512 households in three urban centers in Zimbabwe. Face-to-face interviews were conducted with the "primary food purchaser" for each household. The primary food purchaser was defined as the member of the household making the day-to-day decisions about food purchases. Respondents were given a hypothetical scenario and asked if they would purchase a specified commodity at a particular price. In this market simulation, the commodity under investigation (the "new" products, yellow roller meal or white straight-run meal) were referenced against the existing government-set price of white roller meal. The new product was offered to consumers as a binomial choice in an iterative bidding process. If the offer of the new product was refused at a particular price in the binomial choice, the price of the new product relative to white roller meal was systematically lowered until the respondent stated they would purchase the new product. If the respondent agreed to purchase the new product at the initial price, the price was raised until the respondent refused to purchase it. In either case, the maximum willingness-to-pay of the respondent was obtained for yellow roller meal and white straight-run meal.

## IV. Effects of a targeted subsidy on yellow roller meal

The conventional wisdom in Zimbabwe is that there are strong consumer preferences for white maize meal products among all segments of the urban population. Survey results support this view: 89 percent of respondents said that they "strongly prefer" white roller meal to yellow roller meal. Only 1 percent were indifferent, with 8 percent "strongly" preferring yellow roller meal and 2 percent "somewhat" preferring yellow roller meal. Less than 1 percent of households preferred a mix of white and yellow maize, mostly to accommodate differing preferences within the household.[4] Yet the critical question is whether a subset of consumers would purchase yellow maize meal if it were offered at a price discount relative to white maize meal. The results presented here suggest that, with a small price differential, a significant proportion of consumers would switch from white to yellow roller meal.

To investigate the sensitivity of lower income consumers to changes in the price differential between white roller meal and yellow roller meal, a market simulation was conducted. The "primary food purchaser" of each survey household was given the (hypothetical) option of buying a 10 kg bag of white roller meal at Z$17.40 (the then market price) or yellow roller meal at a specified lower price in an iterative bidding procedure. Table 1 shows the proportion of households in each income quintile that said they would shift from white roller meal to yellow roller meal at two sample prices for a 10 kg bag of yellow roller meal: Z$15.10 (a 13 percent discount) and Z$12.85 (a 26 percent discount).

As shown in Table 1, consumers in the lowest income quintile are much more likely to switch from white to yellow roller meal at a specified price differential. When yellow roller meal is 13 percent lower than white roller meal, 32 percent of the poorest fifth would switch, while only 20 percent of the richest fifth would switch. This trend is further explored in Table 2 which summarizes the average prices at which consumers in the five income groups said they would switch from white to yellow roller meal. Lower income consumers are likely to switch with a smaller price differential than higher income consumers.

[4] Interestingly, there is evidence that the small proportion of consumers that do prefer yellow maize meal are relatively recent converts. About 63 percent of those preferring yellow maize admitted that they would not have wanted yellow maize one year ago. This suggests that the drought-induced or "forced" consumption of yellow maize in 1992 resulted in a change in preferences for a small proportion of the population.

**Table 1: Percent of consumers by income quintile switching from white roller meal to yellow roller meal at specified prices**

| Income Quintile | Percentage of households that would switch to yellow roller meal: | |
|---|---|---|
| | Z$15.10 (13% discount) | Z$12.82 (26% discount) |
| Quintile 1 (bottom 20%) | 32 percent | 62 percent |
| Quintile 2 | 19 percent | 44 percent |
| Quintile 3 | 25 percent | 58 percent |
| Quintile 4 | 20 percent | 46 percent |
| Quintile 5 (top 20%) | 20 percent | 39 percent |
| All consumers | 23 percent | 50 percent |

Source: Survey data

**Table 2: Average price at which consumers would switch from white roller meal to yellow roller meal, by income quintile**

| Income Quintile | Average price at which consumer would switch from white roller meal (at $17.40 per 10 kg bag) to yellow roller meal |
|---|---|
| Quintile 1 (bottom 20%) | 13.08 |
| Quintile 2 | 11.48 |
| Quintile 3 | 11.66 |
| Quintile 4 | 10.62 |
| Quintile 5 (top 20%) | 9.47 |

Source: Survey data

Results of this market simulation show that a portion of consumers are willing to switch from white roller meal to yellow roller meal when the price differential is high enough. Furthermore, the required price differential is relatively smaller for lower-income groups. Since determining how quantity demanded changes with price is analogous to deriving a demand curve for a product, the responses to the willingness-to-pay questions can also be treated as consumption decisions under different market prices. To derive a market demand curve for straight-run meal, the sample data were aggregated using 1992 Central Statistical Office population figures resulting in each sample household representing 987 urban households. A regression equation was then estimated with the market simulation data. Total quantity of yellow roller meal demanded was expressed as a function of the price difference between white roller meal and yellow roller meal and a constant. Since the demand equation is a summation of total quantity of yellow roller meal demanded at different bid prices, it is not possible to incorporate other socio-demographic variables into this simple calculation. Thus, since the price of white roller meal was fixed by government, the resulting equation in Table 3 is the demand function for yellow roller meal conditioned on the government-set price of roller meal.

**Table 3: Regression results of demand for yellow roller meal conditioned on the price of white roller meal**

QUANTYEL = 31.543 + 294.290 PDIFF

T-statistics significant at .01 level
Adjusted R-squared = .93

where:

| | | |
|---|---|---|
| QUANTYEL | = | The quantity of yellow roller meal demanded by all urban consumers (in thousands of metric tons per year) |
| PDIFF | = | The price difference expressed in percentage terms white roller meal and yellow roller meal = [(white price-yellow price)/white price]. |

These results indicate that a one percent increase in the price differential between white roller meal and yellow roller meal will result in an increase in quantity demanded of yellow roller meal by urban consumers by 2,943 tons. The equation can be used to calculate the amount of yellow roller meal demanded at any given price differential (within the range of sample prices). For example, if yellow roller meal were introduced at a retail price of Z$15.70, the relationship estimated above means that 60,295 tons of yellow roller meal would be demanded. With total urban demand for maize meal

estimated to be 240,820 tons, 25 percent of urban consumers would switch to yellow roller meal.

Although milling margins and retail maize meal prices are no longer set by government, the potential savings from a targeted subsidy can be examined within the context of the government-determined pricing structure that prevailed until mid-1993. Based upon the prevailing milling margins in 1992/1993, Table 4 presents a comparison of roller meal pricing structures for four different scenarios:

Scenario 1: No subsidy on white or yellow roller meal.

Scenario 2: White roller meal subsidy of Z$562 per ton (the August 1992-June 1993 policy).

Scenario 3: Targeted subsidy on yellow maize grain of Z$180 per ton for production of yellow roller meal.

Scenario 4: Targeted subsidy on yellow maize grain of Z$456 per ton for production of yellow roller meal.

Table 4 assumes that both white and yellow maize have similar producer prices, but because of a subsidy of Z$180 per ton, yellow maize can be purchased by millers for Z$890, while the millers' acquisition price of white maize is Z$1,070 per ton.[5] With the pricing structure depicted in Table 4, with the targeted subsidy depicted in Scenario 3, the retail price of yellow roller meal is Z$15.10 per 10 kg bag (Z$1,510 per ton), while white roller meal sells for Z$17.51 per ton. By contrast, the subsidy of Z$562 on white roller meal translates to a retail white roller meal price of Z$11.40.

National demand for purchased maize meal varies from year to year depending on rural demand which is in turn dependent on harvest levels. However, urban demand for purchased roller meal was relatively constant during the 1989-1993 period. With the contingent valuation data for urban households, it is possible to calculate the cost of the urban portion of a targeted subsidy on yellow roller meal maize versus the costs of the urban portion of a white roller meal subsidy. As shown in the last line of Table 4, assuming that 85 percent of urban consumers consume white roller meal, the treasury costs of the urban portion of the white roller meal subsidy would have been roughly

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[5] Even in the absence of a targeted subsidy, yellow maize producer prices might be lower than that of white maize since historically yellow maize has had higher yields than white maize on commercial farms. If yield differentials have persisted, price differentials between yellow and white roller meal could be achieved with a smaller targeted subsidy, or possibly even no yellow maize subsidy.

Z$115 million per year. By contrast, the urban portion of a targeted yellow roller meal subsidy of Z$180 (Scenario 3) would have amounted to Z$11 million.[6]

**Table 4: Alternative roller meal pricing scenarios: subsidy on white roller meal versus targeted subsidy on yellow roller meal***

| | Scenario 1: White roller unsubsidized | Scenario 2: White roller with subsidy | Scenario 3: Yellow roller with $180 targeted subsidy | Scenario 4: Yellow roller with $456 targeted subsidy |
|---|---|---|---|---|
| Parastatal selling price per ton before subsidy | Z$1070 | Z$1070 | Z$1070 | Z$1070 |
| Minus targeted government subsidy on yellow maize grain | --- | --- | Z$180 | Z$456 |
| Parastatal selling price per ton (a) | 1070 | 1070 | 890 | 614 |
| Maize milling costs (large-scale) | | | | |
| Factory costs (b) | 188 | 188 | 188 | 188 |
| Mark-up (.2270 percent of a+b) | 286 | 286 | 245 | 182 |
| Distribution allowance | 62 | 62 | 62 | 62 |
| Ex-mill price (delivered to retailer) | 1606 | 1606 | 1385 | 1046 |
| Minus government's white roller meal subsidy | --- | 562 | --- | --- |
| Retailer's margin (9 percent) | 145 | 145 | 125 | 94 |
| Final retail selling price (per ton) | 1751 | 1140 | 1510 | 1140 |
| Budgetary costs of the urban portion of the subsidy (in Z$ per year) | 0 | 115 million | 11 million | 61 million |

*Calculations based on consumer purchase of 10 kg. bag

Of course, by replacing a white roller meal subsidy (Scenario 2) with a targeted subsidy on yellow roller meal (Scenario 3), consumers are worse off. Those that switch to yellow roller meal pay Z$15.10 per 10 kg bag versus the price of subsidized white roller meal of Z$11.40. But given pressures to remove subsidies altogether, a targeted yellow maize

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6 Only the urban portion of subsidy costs are compared here since the total cost of each option would depend upon the willingness of rural consumers to buy yellow roller meal at the specified price differential, and rural consumers were not interviewed during this market simulation experiment.

subsidy still provides some measure of protection to vulnerable groups at one-tenth the cost of the white roller meal subsidy. With a larger targeted subsidy that reduces the price of yellow roller meal to Z$11.40 (Scenario 4), consumers would be no worse off in terms of cash expenditures on maize meal. Since the regression in Table 3 can be used to show that 55 percent of the urban population would switch to yellow roller meal in such a scenario, the cost of the targeted subsidy to reduce the selling price to Z$614 per ton would be Z$61 million, still only slightly more than half of the cost of the white roller meal subsidy.

A major implication of these results is that costs of a self-targeted subsidy on yellow roller meal would have been significantly lower than the white roller meal subsidy on roller meal that existed until mid-1993. Since a targeted subsidy would have only applied to yellow roller meal, higher income groups would have chosen to consume white maize meal, thereby voluntarily excluding themselves from the subsidy scheme and reducing the fiscal costs of the subsidy.

However, a major problem with a targeted subsidy on yellow roller meal is designing the mechanism for administering the yellow roller meal subsidy. To prevent diversion of subsidized yellow maize grain into animal feeds, the subsidized yellow maize price would have to be provided only to manufacturers of yellow roller meal. In the case of the white roller meal subsidy, the subsidy was primarily administered through four large-scale milling companies. By excluding small-scale hammer millers from the subsidy scheme, the roller meal subsidy eliminated the margin within which small-scale millers could operate and entrenched the position of higher-cost large-scale millers (Rubey, 1995). Thus, although a targeted yellow roller meal subsidy would result in considerable savings for government, an alternative would be to undertake policy reforms that enhance the availability of white straight-run meal, a lower-cost maize meal product. This option is explored in the next section.

## V. Opportunities for market-oriented targeting

In Zimbabwe, the conventional wisdom has historically been that urban consumers prefer more highly refined maize meals to less refined maize meals. In a 1992 press statement, the Commercial Millers' Association noted that "straight-run meal is an unsophisticated, unrefined product which normally sells at a price lower than that for roller meal ... as this product has never been popular its demise is no great loss." Such views appear to be consistent with survey responses: given a choice between roller meal and straight-run meal at identical prices, the majority of consumers prefer roller meal over straight-run meal. Almost 67 percent of respondents "strongly" or "somewhat" preferred white roller meal to white straight-run meal.

A complex set of regulations governed maize marketing in Zimbabwe for decades. Until very recently, the maize marketing system was characterized by a controlled distribution

network as well as centralized storage and milling facilities. Once sold to the nations's Grain Marketing Board (GMB), maize was normally transported onward to central silos and processed by large-scale millers and stockfeed manufacturers. Jayne and Chisvo (1991) found compelling evidence that restrictions on private grain movement across zone boundaries impeded direct private trade from surplus to deficit areas, and effectively forced the bulk of marketed output in surplus zones into the GMB system. The combination of movement controls and restrictions on access to maize meant that the bulk of the nation's marketed maize moved through the GMB to the large-scale maize millers. From 1989 to 1991, less than two percent of GMB's total maize intake was sold to private traders or small-scale millers (Jayne and Chisvo, 1991). At various times, large-scale millers have also received subsidies designed to lower the cost of the more refined meals to consumers.

Parastatal control of maize purchases and sales, preferential access to maize supplies by large-scale millers, and prohibitions on the transport of maize into urban areas by private traders prevented urban consumers and small-scale millers from obtaining maize for processing into meal (Jayne and Rubey, 1992). Thus, it was plausible that the widespread consumption of refined, white maize meal in urban areas resulted from a set of market restrictions that effectively limited access to alternative maize meal products. Furthermore, evidence suggests that small-scale hammer mills have considerably lower processing costs than the roller mills used by the four large-scale commercial millers. For example, a 1992 study in Kenya found that unit milling costs for medium-sized firms with hammer mill technology were roughly half of those of large-scale firms using roller mills (Mukumbu, 1992).

On June 1, 1993, the white roller meal subsidy was completely eliminated. A week later, the President of Zimbabwe encouraged urban consumers to avoid the effects of subsidy removal by obtaining maize grain and having it milled into straight-run meal at local hammer mills. Although the grain movement restrictions that restricted small-scale millers' and urban households' access to maize grain were not officially lifted until November 5, 1993, the president's statement meant that regulations limiting the movement of maize grain into urban areas were no longer enforced. In June 1993, when the survey described here was undertaken, roller meal was the dominant product in urban markets and alternative marketing channels for straight-run meal were still in their early stages of development. A portion of urban consumers did consume straight-run meal by bringing their own maize to small-scale hammer mills and having it ground for a fee. In June 1993, 27 percent of urban households were consuming straight-run meal. In contrast, in 1991, small-scale hammer mills in Harare processed 8 percent of the city's maize meal requirements (Jayne and Rubey, 1992). Despite this growth in straight-run meal consumption, private, non-GMB marketing channels were still in their infancy. The potential demand for straight-run meal, gradually becoming more easily available as alternative marketing channels grew, was unknown. Since actual market data might significantly underestimate the potential demand for white straight-run meal, contingent

valuation techniques were used to elicit the willingness of consumers to switch from white roller meal to white straight-run at specified price differentials.

The "primary food purchaser" of each household was asked to suppose that they went to the store where they usually bought maize meal and a 10 kg bag of roller meal was available for Z$17.40 (then the current market price). The respondent was asked to make a series of decisions about whether they would purchase the roller meal or straight-run meal at another specified price. The findings show that at relatively small price differentials, as much as half of the urban population would be willing to switch to straight-run meal. Table 5 presents the compete results broken-out by income quintiles.

**Table 5: Percent of consumers by income quintile switching from white roller meal to white straight-run meal at specified prices (June 1993)**

| Income Quintile | Percentage of households that would switch to white straight-run meal: | |
|---|---|---|
| | Z$15.10 (13% discount) | Z$12.82 (26% discount) |
| Quintile 1 (bottom 20%) | 55 percent | 82 percent |
| Quintile 2 | 54 percent | 79 percent |
| Quintile 3 | 59 percent | 75 percent |
| Quintile 4 | 50 percent | 74 percent |
| Quintile 5 (top 20%) | 51 percent | 74 percent |
| All consumers | 54 percent | 77 percent |

Source: June 1993 survey data

When white straight-run meal is available at a 13 percent discount compared to roller meal, Table 5 predicts a large shift to white straight-run meal. Over half of the respondents (54 percent) stated they would switch. The magnitude of the potential shift to straight-run meal is even greater with a 26 percent price difference; 77 percent stated they would switch. As Table 5 shows, the strong willingness to shift to straight-run meal does not vary across income groups. However, these findings suggest that policy reforms that permit the wider availability of straight-run meal do not specifically target low-income households. Higher-income households are also willing to switch from white roller meal to lower-priced straight-run meal when offered at a price discount. While a market-oriented strategy centered on reforms that spark the introduction of "new" products may not be exclusively targeted to the poor, targeting is essentially an attempt to reduce program costs. Thus, policy changes that enhance the availability of a greater

variety of maize meal types can reduce or eliminate the need for budgetary expenditures on maize meal subsidies while still protecting the poor.

Price differences between white straight-run meal and white roller meal largely reflect different combinations of labor and capital requirements in processing. Straight-run meal has lower acquisition costs partly because the gross margins at custom mills are lower than for larger-scale roller mills (Jayne et al., 1991). Rubey (1995) presents evidence that production and custom mills have slight lower labor costs and much lower capital costs than large-scale milling firms. Consumers also save money because custom mills satisfy consumer demand for fewer marketing services; many consumers would rather spend time travelling and queuing for milling services than pay extra cash for the convenience of store bought roller meal.

As in the yellow roller meal example, a regression equation was estimated with the data from the market simulation aggregated using urban population figures. Quantity of white straight-run meal demanded was expressed as a function of the price difference between white straight-run meal and white roller meal and a constant. Thus, with the price of white roller meal fixed by government, Table 6 presents a demand function for white straight-run meal conditioned on the government-set price of white roller meal:

**Table 6: Regression results of demand for white straight-run conditioned on the price of white roller meal**

QUANTSR = 70.517 + 335.721 PDIFF

T-statistics significant at .01 level
Adjusted R-squared = .88

where:

| | | |
|---|---|---|
| QUANTSR | = | The quantity of straight-run meal demanded by all urban consumers (in thousands of metric tons per year) |
| PDIFF | = | The price difference expressed in percentage terms white roller meal and white straight-run meal = [(roller price-straight-run price)/roller price]. |

The estimates obtained above can be used to predict the potential market share of straight-run meal when movement controls and associated policy restrictions are lifted. However, a full accounting of the price differential between white roller meal and white straight-run meal must incorporate the additional value of time in obtaining straight-run meal. Unlike roller meal, straight-run is not usually sold in processed form. To obtain

straight-run meal, the consumer must procure grain, travel to the local hammer mill, and wait for the maize to be milled. To account for the procurement time, a measure of consumers' opportunity cost of time was made. Opportunity cost of time was valued as the average hourly wage of adult employed urban residents as calculated from survey data (Z$3.20).

Table 7 presents the estimated total acquisition cost of white roller meal and white straight-run meal, including the opportunity cost of travel and waiting time. Table 7 demonstrates the price advantages of straight-run meal. In terms of cash outlay, straight-run meal is far cheaper than unsubsidized roller meal and its price is only four percent higher than the price of subsidized roller meal. Even after factoring in the opportunity cost of travel and waiting time, the total acquisition cost of 20 kg of straight-run meal is 24 percent lower than the unsubsidized price of white roller meal. Although, white straight-run meal costs 31 percent more than subsidized white roller meal, the unsubsidized white roller meal (Z$35.96) costs 51 percent more than white straight-run meal (Z$23.84).

**Table 7: Acquisition costs of white roller meal and white straight-run meal incorporating consumer's opportunity cost of time**

| DESCRIPTION OF COST ITEM | White roller meal (with subsidy) | White roller meal (no subsidy) | White straight-run meal |
|---|---|---|---|
| Average acquisition cost for 20 kg (Z$) | 22.53 | 34.65 | 21.11 |
| plus milling costs | --- | --- | 2.27 |
| Cash outlay for 20 kg (Z$) | 22.53 | 34.65 | 23.38 |
| plus opportunity cost of consumers' time travel and waiting time (Z$) | 1.31 | 1.31 | 3.97 |
| Total acquisition cost of 20 kg of meal (Z$) | $23.84 | $35.96 | $27.35 |

Source: Constructed from survey data

Estimates of acquisition costs for white roller meal and straight-run meal presented in Table 7 can be used to predict the market share of straight-run meal vis-a-vis roller meal. These predictions can then be compared to actual, post-reform market shares. To estimate the demand for straight-run meal assuming alternative acquisition costs, the coefficients from the straight-run meal demand equation estimated in Table 6 were used. Since the contingent valuation data collection procedure considered only pair-wise comparisons, super-refined meal is excluded from the forecasts of market share. Market

share is considered in terms of only roller meal and straight-run meal.[7] The results are shown in Table 8.

**Table 8: Predicted and actual market shares of white roller meal and white straight-run meal based on total acquisition cost of maize meal***

| | Roller meal market share (percent) | Straight-run market share (percent) |
|---|---|---|
| Predicted post-reform market share | 37 | 63 |
| Actual post-reform market share* | 43 | 57 |

* Actual market share data (percentages exclude super refined which had 5 percent of market) from UNICEF, 1995

As shown in Table 8, the predicted market share of straight-run meal estimated from consumer responses to market simulations was fairly close to the actual post-reform market share. Assuming an opportunity cost of time figure of Z$3.20, the predicted market share of straight-run meal is 63 percent, while the actual market share in the December 1993 post-reform period was 57 percent. Such findings suggest that contingent valuation techniques can be useful in predicting *ex-ante* the effects of market reform. Data gathered from market simulations of willingness-to-pay provided a good indication of how consumers would respond to a specific set of policy reforms that sparked the introduction of a previously unavailable product.

In Zimbabwe, the removal of subsidies on June 1, 1993 was accompanied by movement decontrol that gave consumers access to maize grain for milling into straight-run meal. As predicted by the consumer responses to market simulations, a majority of consumers switched to the lower-priced straight-run meal. The implication is that policy and regulatory reforms that increase the availability of new, lower-cost products with no direct budgetary costs can be viewed as targeted approaches that contribute to market development. By expanding opportunities for alternative marketing channels to meet latent consumer demand for lower-priced food staples, some of the adverse effects of subsidy removal can be ameliorated.

[7] In December 1993, super-refined meal had a market share of five percent.

## VI. Conclusions and food policy implications

A major dilemma during the process of market reform is determining how to target food subsidies so as to address the nutritional needs of the food insecure in a manner that is financially sustainable and does not undermine the potential for emerging food markets to enhance food security over the long term. The analysis presented here suggests that a targeted subsidy on yellow roller meal could have been a much more cost-effective mechanism than a subsidy on white roller meal for protecting the poor in urban Zimbabwe during the 1980s and early 1990s. However, given the need for a centralized mechanism for administering a yellow roller meal subsidy in order to minimize leakages, a yellow roller meal subsidy would have had an adverse effect on emergent, lower-cost small-scale processing and trading enterprises.

Yet there may be other options for protecting the poor than centralized administration of a targeted subsidy scheme. The experience of maize market reform in Zimbabwe suggests that complementary policy reforms that enhance the availability of new, lower-priced products, such as white straight-run meal, can have beneficial effects on consumers, often providing a similar measure of protection as a targeted subsidy. Since white straight-run meal was widely accepted across all income groups, complementary reforms meant that all consumers willing to switch to straight-run meal, including many lower-income consumers, were protected from the effects of subsidy removal. In other situations where the new lower-priced products that emerge for more competitive food markets are primarily consumed by the poor, the measures could also be self-targeting. The strategies described here are compatible with efforts to develop sustainable food markets in that they do not require centralized administrative capacity or explicit budgetary outlays. Thus, policy reforms that permit the introduction of a lower-cost food staple are market-oriented strategies for protecting the poor when subsidy removal is necessary.

Reforming and reorienting consumer food subsidy schemes in order to minimize budgetary costs but still provide coverage to vulnerable groups requires better knowledge of consumer preferences for alternative food staples. However, when staple food prices are fixed by government or certain products for which there may be latent demand are unavailable in the market, analysis of alternative policy options is constrained. This research suggests that contingent valuation techniques, widely used in resource economics and transportation studies, can be particularly useful in the *ex-ante* valuation of the potential effects of market reform and subsidy removal. When applied in the context of a systems approach to food markets, contingent valuation techniques can provide indications of how consumers might respond to and be affected by new targeting measures or specific policy reforms that spur the introduction of previously unavailable products. By identifying commodities for which demand cannot be articulated and quantifying potential demand, the effects of subsidy removal may be ameliorated through reform that permits marketing channels for new products to develop. Furthermore, this

research suggests that even quick, low-cost contingent valuation surveys of a well-known, yet unavailable, product may offer reliable data on potential demand and market share.

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