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The Impact of Policy Reform on Small-Scale Agribusiness: A Case Study of Maize Processing in Zimbabwe

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Maize is the staple food in Zimbabwe. Most maize is consumed as sadza, a stiff porridge made from maize meal that is Zimbabwe’s national dish. Prior to agricultural policy reforms implemented in 1993, the maize milling industry in Zimbabwe was dualistic, with five large-scale milling firms operating alongside numerous small-scale firms.¹ Large-scale firms produced maize meal using capital-intensive, imported roller mill technology. These firms were well integrated into a single-channel marketing system dominated by a national grain marketing board and accounted for over 90 percent of the maize meal consumed in urban areas. By contrast, small-scale millers used hammer mills, relatively simple machines powered by small electric or diesel engines, to grind maize grain into maize meal. Small-scale millers were heterogenous, with great variation in firm size and product line. Prior to 1993, small-scale mills had 8 percent of the urban market for maize meal.

Given the importance that most governments attach to ensuring adequate food supplies at affordable prices, substantial research has been conducted on choice of technology issues in food processing. Most studies have generally found that simple mechanical technologies that still retain the attributes of small-scale, labor-intensity, and relatively low investment cost are often superior to both large-scale, capital-intensive, imported technologies and traditional, non-mechanized techniques (Timmer 1973; Stewart 1977; and Bagachwa 1991). In recent years, structural adjustment reforms have renewed interest in the potential for small-scale agribusinesses

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to provide both employment and foster a competitive environment more conducive to long-term economic growth.

Using survey evidence from Zimbabwe, this paper explores implications of choice of technology in the maize milling industry and examines the impact of economic reforms on the growth of small-scale milling firms. A central argument is that, prior to 1993, deep-seated policy biases protected large-scale mills from competition from small-scale firms. Recent surveys demonstrate that, under certain conditions, the growth of small-scale mills can simultaneously provide consumers with lower-priced maize meal products, expand employment opportunities, and reduce the need for maize meal subsidies to large-scale millers.

The next section explores policy biases in technology choice in Zimbabwe. Section 3 compares alternative milling technologies with respect to production costs, employment generation, investment costs, foreign exchange utilization, and other criteria. Section 4 investigates the impact of policy reform on the maize milling industry, while Section 5 examines the post-reform marketing constraints facing production millers. The article concludes with a discussion of the implications of policy reform for the development of small-scale agribusinesses.

TECHNOLOGY CHOICE AND POLICY BIAS

In any society, the evolution of technology is the result of a seemingly infinite number of choices made by individuals, firms and institutions. Neo-classical economists treat technology choice as a decision about the combination of capital and labor used to produce a particular good. With information on relative factor prices, the optimum technology is the one where the relative marginal productivity ratios are proportional to wage/capital rental ratios. According to the stylized neo-classical view, technological advances occurs when more efficient, better-suited technologies replace inferior ones. Such views treat the process by which technology change is generated as exogenous to the economic system, with
technological evolution the product of continual autonomous advances in scientific and technical knowledge. Theories of "induced innovation" are an attempt to overcome the inadequacies of the earlier approaches by interpreting technological innovation as endogenous to the economic system. Hayami and Ruttan (1985) have identified two distinct approaches to describing technological evolution and innovation: (1) the Hicksian tradition which focuses on technology changes in the private sector (expressed as changes in factor proportions) as responses to changes in relative factor prices which, in turn, reflect relative resource scarcities; and (2) the Schmookler-Griliches approach focuses on the influence of market demand forces on technology innovation. Hayami and Ruttan (1985) further build on the Hicksian tradition to develop a theory of induced innovation based on the critical role of the public-sector in inducing innovative behavior and technical change.

The mechanics of technology choice in manufacturing becomes somewhat more ambiguous in the case of developing countries that have only embarked on widespread industrialization strategies in the past half century. One school of thought, based upon assumptions of fixed factor proportions, gained ground in the 1970s with arguments that developing countries had little in the way of meaningful choices. According to this view, often a particular product can only be produced with a unique technology for which factor proportions are rigidly specified (Eckaus 1955). Thus, there are no efficient alternatives to the capital-intensive techniques of industrialized nations, and drastic, non-market solutions are the only hope for the employment and growth problems of developing countries (White 1978).

While fixed factor proportions theorists have lost favor in recent years, a variant of their premise still survives. According to this variant, private or public-sector decision-makers in developing countries face difficulties because there are often several technologies available "off-the-shelf" for the production of a particular good. In such instances, neo-classical theory implies that firms and government select the "best" technology for a particular task based on a rational calculus of benefits and costs given local
conditions. Yet because existing technologies have often evolved in radically different environments than those in developing countries, "off-the-shelf" technologies from industrialized countries may not be appropriate for developing nations. In neo-classical terms, the "best" technology may simply be the best of a number of poor options.

Because of this problem, an entire literature has developed on the issue of "appropriate technology" for developing nations. A common theme throughout this literature is the over-reliance on capital-intensive or skill-intensive technologies that are inappropriate to nations with a labor-rich, capital-scarce resource base or the lack a well-developed coterie of skilled technicians (Sen 1957; Morawetz 1974). The dependence upon capital-intensive technologies during the 1950s and 1960s contributed to the widespread realization that development strategies had not produced expected benefits such as rising employment levels (Edwards 1974).

**Maize Processing in Zimbabwe**

In Zimbabwe, large-scale millers use imported roller mills to produce two maize meal products: super-refined meal and roller meal (Table 1). Both of these products are relatively refined and marketed through urban and rural private retailers in sealed plastic bags. In 1991, the largest large-scale milling firm accounted for about 60 percent of the maize meal consumption, and the two largest companies controlled about 78 percent of the market. Prior to June 1, 1993, the large-scale millers sold maize meal to retailers at government-controlled prices.²

Although small-scale millers are widespread in rural areas, historically their market share in urban areas has been small. All small-scale millers use hammer mills that pulverize grain with numerous metal "hammers" as it is poured into the machine. Two types of small-scale millers can be characterized: "custom millers" and "production millers." In 1991, most small-scale millers were "custom millers" who provided milling services to customers who would bring their own maize and container and pay a fee to have it milled. When used without other equipment, hammer mills are capable of producing only one type of maize meal: straight-run meal. Straight-run meal is an unrefined whole meal obtained when the
entire maize kernel is pounded into flour (Table 1). In February 1992, 57 custom millers were operating in the Harare/Chitungwiza megalopolis (Jayne and Rubey 1993). Custom millers provide milling services at unregulated prices.

Production millers began operating in 1991 and 1992. These newer small-scale milling firms use hammer mill technology in conjunction with a dehuller to produce refined maize meal. The addition of the dehuller permits the miller to remove a portion of the grain and germ from the maize kernel. With a dehuller and a hammer mill, production millers are able to produce refined maize meal products (roller meal and super-refined meal) that are similar to the refined products of large-scale mills. With a bagging machine, production millers can sell refined maize meal directly to consumers and retailers.

Production milling firms are a heterogeneous group; firm size varies from the smallest production miller using one hammer mill and one dehuller in a small building behind a rural grocery shop to

Table 1. Types of Maize-Meal Produced in Zimbabwe

<table>
<thead>
<tr>
<th>Type of meal</th>
<th>Type of mill</th>
<th>Description</th>
<th>Extraction rate (percent of maize kernel retained)</th>
<th>Maize meal ave. price per ton, 1993 (ZS/ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super-refined</td>
<td>1. large-scale millers</td>
<td>The bran (hull) and germ are completely removed; meal ground from the endosperm.</td>
<td>65%</td>
<td>ZS 2427</td>
</tr>
<tr>
<td></td>
<td>2. production millers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roller meal</td>
<td>1. large-scale millers</td>
<td>Most of the bran and germ are removed; meal ground mostly from the endosperm.</td>
<td>85% to 92%</td>
<td>ZS1625</td>
</tr>
<tr>
<td></td>
<td>2. production millers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straight-run</td>
<td>1. custom millers</td>
<td>Meal processed from the whole maize kernel; the bran, germ, and endosperm are retained.</td>
<td>98%</td>
<td>ZS1226</td>
</tr>
</tbody>
</table>

the largest production miller using six hammer mills, six dehullers, and operating in a new multi-million dollar factory building. Unlike large-scale millers, many production millers have established their operations in rural areas.

Prior to 1993, a strong policy bias favored large-scale milling firms. First, maize marketing in Zimbabwe was circumscribed by grain movement restrictions that dated back to the 1930s. Legislation embodied in the Grain Marketing Act of 1966 divided Zimbabwe into "Zone A" areas, which included all urban areas and European settler farming areas, and "Zone B," or smallholder areas. The Zone B areas were geographically scattered and were concentrated in the less favorable semi-arid regions. The maize marketing system was characterized by a controlled distribution network as well as centralized storage facilities. Farmers sold maize to the national grain parastatal (the Grain Marketing Board) at government-set prices. The GMB stored the grain in central silos and then sold it to large-scale millers who processed it and sold it as packaged maize meal. Restrictions on private grain movement across zone boundaries impeded private maize trade from surplus to deficit areas and prevented private traders from transporting maize into urban areas.

The combination of movement controls and restrictions on access to maize basically meant that the bulk of the nation’s marketed maize went to large-scale millers. Thus, small-scale millers and consumers utilizing their services found it very difficult to obtain maize grain for milling. Prior to 1993, most of the maize grain processed by custom mills in urban areas was either grown on small urban plots or brought into urban areas illegally. Movement restrictions meant that urban small-scale millers and consumers could not obtain enough maize grain to meet urban demand.

Maize meal pricing policy was the second policy bias favoring large-scale mills. In order to reduce the price of roller meal to urban consumers (the dominant maize meal in urban areas), large-scale millers received subsidies from the government for the production of roller meal. The roller meal subsidy was administered by crediting the GMB accounts of large-scale millers Z$562 (US$112) for every ton of roller meal produced. The effect was to reduce the retail price
of roller meal substantially below what it would have been without the subsidy. As a result, a 50-kg bag of processed roller meal was slightly cheaper than the price of a 50-kg bag of maize grain purchased by an individual from the GMB. The principal political objective of the roller meal subsidy was to ensure that consumers had access to low-cost maize meal. However, the large subsidy on roller meal eliminated any incentive for small-scale millers, traders or consumers to purchase maize from the GMB for processing at custom mills. Thus, although custom millers could have provided consumers with low-cost straight-run meal without requiring a subsidy, the role of custom mills was severely restricted by these policy biases.

THE POLITICAL ECONOMY OF ALTERNATIVE MILLING TECHNOLOGIES

The appropriate choice of maize milling technology is dependent upon many criteria. Milling technologies can be evaluated in terms of production costs, employment generation, investment costs, and foreign exchange utilization. Naturally, the relative importance of these criteria differ among consumers, politicians, and private investors.

Production Costs

Although several choice of technology studies of grain milling enterprises in Africa and Asia have been carried out over the past two decades, few were able to obtain data to compare the production costs of alternative technologies. One notable exception found that unit milling costs for medium-sized firms with hammer mill and dehuller technology in Kenya were roughly half of those of large-scale firms using roller mills (Mukumbu 1992).

In Zimbabwe, data on large-scale millers' investment costs and labor requirements were obtained from representatives of large-scale milling firms and confirmed by industry informants. The estimates of capital and labor costs of production mills and roller mills, derived from survey data and informant interviews, are compared in Table 2.
Table 2: Capital and Labor Cost of Production Mills and Large-scale Mills (1993 Estimates)

<table>
<thead>
<tr>
<th></th>
<th>Production mill</th>
<th>Large-scale mill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output per month (maximum tons)</td>
<td>519</td>
<td>1,610</td>
</tr>
<tr>
<td>Average wage per month (Z$)</td>
<td>340</td>
<td>951</td>
</tr>
<tr>
<td>Capital cost per 100 tons of output (Z$)</td>
<td>238</td>
<td>840</td>
</tr>
<tr>
<td>Labor cost per 100 tons of output (Z$)</td>
<td>2,753</td>
<td>2,957</td>
</tr>
<tr>
<td>Total capital and labor costs per 100 tons of output (Z$)</td>
<td>2,991</td>
<td>3,797</td>
</tr>
</tbody>
</table>

Table 2 shows that at full capacity, production mills have lower capital and labor costs than large-scale firms. Although accurate information on other input costs (electricity, water, maintenance, etc.) is not available for large-scale mills, these figures support the assertion of lower cost-structures for small-scale mills. One reason for this is because wages paid by production millers are almost one-third of those paid by large-scale millers. Lower wage rates paid by production millers may reflect rural-urban wage differentials and less adherence to tax and minimum wage requirements.

**Employment Generation**

A second criterion that can be used to evaluate the suitability of small-scale mills versus large-scale mills is the potential for employment generation. In the short run, structural adjustment reforms in many African nations have typically been accompanied by falling real wages, rising unemployment in the formal sector as loss-making state enterprises are privatized or streamlined, and increased local prices of imported goods due to currency devaluation. The growth of small-scale agribusinesses can counterbalance these adverse effects by providing employment, income, and import-substituting commodities. A recent survey estimated that there are over 800,000 micro and small enterprises in Zimbabwe. However, the urban food processing sector in Zimbabwe accounted for a much smaller percentage of total enterprises than in other African nations (Liedholm and Mead 1992).

The potential for employment generation differs greatly among the three types of milling technologies. In 1993, a custom mill
employed 2.36 persons on average, not including the mill owner. The usual arrangement was to have one operator monitoring the flow of maize grain into the mill, while a second operator took the cash and monitored the flow of maize meal in the customer's container. On weekdays the typical custom mill operated one long shift (of over 10 hours). Additional workers were often employed to fill in and stagger work schedules. During periods of peak capacity, the production mill employed 34 factory workers on average. During slack periods, when the number of shifts per day declines, the average number employed by production mills fell to 18 employees. By contrast a large-scale mill producing 18 tons per hour requires 111 factory workers at peak capacity, with 37 workers for each of 3 shifts. Table 3 displays the employment levels for each of the three technology types.¹⁰

Hammer mills require more labor to operate than the roller mills used by large-scale millers. Table 3 shows it takes over seven times as many workers to produce 100 tons of maize meal with a production mill than with a large-scale roller mill. Custom milling generates considerably less employment per unit of output than production milling because of the absence of dehulling and packaging stages. However, employment generation in custom milling is still double that of large-scale milling. Small-scale millers offer great potential for employment generation. In particular, production milling is more technologically “appropriate” than large-scale milling in a country such as Zimbabwe that has high rates of unemployment and underemployment. For example, if production milling completely replaced large-scale milling, the net employment gain in the milling industry as a whole would be over 9,000 new jobs. One caveat, however, is that job creation in small-scale milling enterprises would likely create lower paying jobs than those in large-scale mills. Although total employment in maize milling would increase seven-fold, there would only be a doubling of the wage bill in the milling industry as a whole.
Table 3: Employment Levels for Alternative Milling Enterprises

<table>
<thead>
<tr>
<th></th>
<th>Custom mill</th>
<th>Production mill</th>
<th>Large-scale mill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak monthly capacity</td>
<td>129.2</td>
<td>518.7</td>
<td>11,610</td>
</tr>
<tr>
<td>(tons of meal)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of factory</td>
<td>2.4</td>
<td>34.1</td>
<td>111</td>
</tr>
<tr>
<td>employees during peak</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average number of mill</td>
<td>297</td>
<td>559</td>
<td>645</td>
</tr>
<tr>
<td>operating hours per</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>month during peak</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum capacity per</td>
<td>209</td>
<td>446</td>
<td>8,640</td>
</tr>
<tr>
<td>480 hours of operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(tons of meal)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee hours per shift</td>
<td>9.9</td>
<td>8.9</td>
<td>8.0</td>
</tr>
<tr>
<td>Number of employee hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>worked per 100 tons of</td>
<td>550</td>
<td>1,780</td>
<td>233</td>
</tr>
<tr>
<td>meal produced</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey data.

**Investment Costs and Foreign Exchange Utilization**

The investment capital required to initiate a milling enterprise differs among the three types of milling technologies. In terms of the average investment cost per 100 tons of output, custom mills have a slight advantage over production mills, while both types of small-scale milling enterprises offer at least seven times the output per dollar invested as large-scale mills (Line 3 of Table 4). Line 5 of Table 4 shows the “cost” of creating one factory milling job in each of the three types of milling enterprises. In this case, production mills are superior, with an investment cost of Z$4,350 per job created. It costs over two and a half times as much to create a job in custom milling. The investment cost per job created for both custom and production milling is minuscule compared with a large-scale mill; it takes almost fifty times as much investment capital to create one job at a large-scale mill compared to a production mill.
Table 4. Investment in Alternative Milling Enterprises (1992 Zimbabwe Dollars)

<table>
<thead>
<tr>
<th>Item</th>
<th>Custom mill (electric)</th>
<th>Production mill</th>
<th>Large-scale mill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 1 Average investment cost for milling system (1992 Z$)</td>
<td>Z$28,632</td>
<td>Z$148,342</td>
<td>Z$23,400,000</td>
</tr>
<tr>
<td>Line 2 Peak monthly output (tons of meal)</td>
<td>129</td>
<td>519</td>
<td>11610</td>
</tr>
<tr>
<td>Line 3 Average investment cost per 100 tons of output (1992 Z$)</td>
<td>Z$22,195</td>
<td>Z$28,600</td>
<td>Z$201,550</td>
</tr>
<tr>
<td>Line 4 Number of employees</td>
<td>2.4</td>
<td>34</td>
<td>111</td>
</tr>
<tr>
<td>Line 5 Cost of creating one milling job</td>
<td>Z$11,930</td>
<td>Z$4356</td>
<td>Z$210,810</td>
</tr>
<tr>
<td>Line 6 Number of employees per Z$100,000 invested in milling equipment</td>
<td>8.2</td>
<td>23.0</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Source: Survey data.

The foreign exchange requirements of the different milling technologies also vary widely. All large-scale roller mills are imported. Some auxiliary components may be obtained locally, but no more than 10 percent. By contrast, the hammer mills used by custom and production millers are manufactured locally. Local hammer mill manufacturers do require some imported parts, namely diesel engines, bearings, and the raw material for sieves. Thus, although new entrants to maize milling can purchase a mill completely with local currency, hammer mill manufacturers do face some need for foreign exchange. Table 5 shows the foreign exchange requirement of investment in alternative milling enterprises.

Clearly, the hammer mill technology used by custom or production millers is far superior to large-scale roller mills in terms of foreign exchange required to produce a given output of maize meal. Yet, for many years large-scale millers were given high priority in the allocation of scarce foreign exchange. Since they were responsible for processing the staple food for the bulk of the urban population,
they were classified by the government as an “essential” food manufacturing enterprise. Prior to financial reforms implemented in 1993, businesses needing foreign exchange allocations for imported machinery were required to make applications to the government in order to obtain foreign exchange. For example, in 1991 and 1992, large-scale millers submitted applications for large allocations of scarce foreign exchange in order to purchase imported roller-milling equipment. With the over-valued exchange rate that prevailed during much of this period, administrative allocation of foreign exchange was a rationing mechanism. For certain industries, regular allocations of foreign exchange essentially meant that foreign exchange could be obtained at below-market rates. With an over-valued exchange rate, the economic cost of foreign exchange allocations to large-scale millers would be even greater than appears in the financial analysis presented here. Hammer mill manufacturers, on the other hand, cited many problems obtaining imported parts during the late 1980s due to foreign exchange rationing.

Table 5. Foreign Exchange Requirements of Alternative Milling Enterprises (1992 Zimbabwe Dollars$)

<table>
<thead>
<tr>
<th>Item</th>
<th>Custom mill (electric)</th>
<th>Production mill</th>
<th>Large-scale mill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 1</td>
<td>Average investment cost for milling system (1992 Z$)</td>
<td>Z$28,632</td>
<td>Z$148,342</td>
</tr>
<tr>
<td>Line 2</td>
<td>Foreign exchange requirement (1992 Z$)</td>
<td>Z$12,243</td>
<td>Z$55,498</td>
</tr>
<tr>
<td>Line 3</td>
<td>Peak monthly output (tons of meal)</td>
<td>129</td>
<td>519</td>
</tr>
<tr>
<td>Line 4</td>
<td>Foreign exchange required per 100 tons of output (1992 Z$)</td>
<td>Z$9491</td>
<td>Z$10,693</td>
</tr>
</tbody>
</table>

$ Based on December 1992 exchange rate: $1 U.S. = Z$5.
Source: Survey data.
The administrative allocation of foreign exchange can lead to implicit biases towards large-scale roller mills over hammer mills, despite hammer mills' advantages in employment generation and capital utilization. Choice of technology in a particular industry is not merely an engineering or technical decision, but one guided by implicit and explicit government policies regarding financial markets as well as wage levels and access to inputs. In Zimbabwe, the political nature of foreign exchange allocation provided support for large-scale roller mill technology and, at the same time, inhibited the local production of hammer mills by domestic manufacturers.

Other Dimensions of Technology Choice
A comparison of different types of milling technologies inevitably raises the broader question as to why capital-intensive roller mills were repeatedly selected by large-scale milling firms despite the apparent advantages of labor-intensive small-scale hammer mill technology in Zimbabwe. After World War II, urbanization and growing urban demand for maize meal contributed to the steady growth of the maize milling industry. A major question is why investors in maize milling failed to choose hammer mill technology around which to build a large-scale milling industry. Several explanations are apparent.

First, distorted factor prices encouraged the adoption of capital-intensive technologies. In Zimbabwe, as in many developing countries, labor costs were inflated by minimum wage legislation, mandated benefits, trade union pressures, and restrictions on laying off workers (White 1978). Likewise, capital and investment costs were kept artificially low with mechanisms such as below-market interest rates, over-valued exchange rates and accelerated depreciation schedules. Although high-wage and cheap-capital policies may have had well-defined political goals, the net result was that manufacturing enterprises tended to favor capital-intensive technologies. Perception of a “principal-agent” problem in maize meal manufacturing may have also induced greater substitution of labor by capital in Zimbabwe. In maize meal manufacturing, the labor-intensity of hammer milling means that quality control and
employee monitoring demands more managerial time per unit of output than would be the case for a capital-intensive roller mill. Current managers of large-scale mills, primarily members of the European settler elite, often possess strongly-held preconceived notions about the difficulties in managing labor-intensive enterprises.

Second, decision-makers within milling firms often possess bounded rationality; information on all available technologies may be difficult to obtain and search is costly. Decision-makers cannot review all of the possible technological alternatives and therefore can make choice errors. Such errors are exacerbated when there are no explicit criteria for selection of technology (Igwe and Ndekwu 1985). Technology choices involve much more than evaluating current factor prices but also reflect managers' expectations of future factor prices. Fears of labor's future intransigence have often been suggested by firm managers as a reason for a capital-intensive method (Winston 1979). When such fears are not borne out, it appears to the observer that an inappropriate technology choice was made. Clearly, in pre-independence Zimbabwe, with the trade unions a focal point for the liberation struggle, there were strong fears on the part of European managers regarding the growing costs of labor dependence.

Third, cost-minimization is only one decision-making criterion in technology choice. Leibenstein (1966) argues that firms often exhibit X-inefficiency: a rather ambiguous type of inefficiency largely, but not wholly, reflecting insufficient motivation. In situations where competitive pressure is light, decision-makers may not work as effectively as they could. Wells (1975) argues that inappropriate technological choices result from preference for more sophisticated and modern technologies over traditional ones, the preferences of the "engineering man" take precedence over "economic man." Maize mill managers in Zimbabwe often view large-scale capital intensive industries as symbols of progress and a source of national pride; they often resent what they perceive as an overall stereotype of industrial underdevelopment in Africa and are eager to display modern technologies to visitors. Occasions when "state-of-the-art"
manufacturing technologies are adopted by Zimbabwean firms are well-publicized in the government-owned media.

Finally, once roller mills were established in Zimbabwe, an entire set of formal and informal market regulations were erected that effectively protected the large-scale milling industry from competition. Maize movement restrictions, maize meal subsidies, zoning laws, and a foreign exchange allocation system were strong barriers to entry and gave a handful of large-scale milling firms a great deal of market power. The dominance of a parastatal marketing agent, urban GMB depots, and pan-territorial prices conferred further advantages on the large-scale millers. Until the policy and regulatory changes initiated in 1993, potential competitors found the market power of large-scale millers insurmountable.

**IMPACT OF POLICY REFORM ON THE MAIZE MILLING INDUSTRY**

In June 1993, as part of an economic structural adjustment program, the Zimbabwean government initiated two major reforms designed to introduce greater competition in agricultural marketing. These reforms ended a persistent policy bias toward large-scale mills. First, the subsidy paid to millers for the production of roller meal was completely eliminated. Second, maize movement restrictions that limited access by small-scale millers to maize grain were gradually lifted. By August 1993, anyone was permitted to buy and sell maize grain anywhere in the country without restrictions, with the exception of the five large-scale milling firms who were still required to purchase from the GMB.\(^\text{12}\)

Policy reform had a widely differing impact on small-scale millers, depending upon whether they were custom millers (who only offer milling services) or production millers (who sell bagged and branded maize meal). As a result of the reforms, the number of small-scale millers grew, consumption shifted towards straight-run meal produced by custom mills, and the market share of custom millers increased rapidly. For example, by October 1993, the number of
custom millers in Harare/Chitungwiza increased by 30 percent. Based on panel data, maize processed by custom mills in Harare/Chitungwiza during 1991 peaked at 1,480 tons per month in June, about 13 percent of total urban demand. By December 1991, total throughput at these custom mills fell to 628 tons. The experience of 1991 contrasts sharply with the post-reform situation in 1993. As shown in Figure 1, maize throughput at custom mills in Harare/Chitungwiza peaked in June 1993 with total throughput of 5,076 tons, about three and a half times the peak amount in June 1991. Similarly, in 1991, 8 percent of urban consumption needs were met by straight-run meal. Following policy reform in mid-1993, 48 percent of urban maize meal requirements were being processed at custom mills (Rubey 1995).

The removal of roller meal subsidies created a large difference in the relative prices of roller meal and hammer milled straight-run meal. With real incomes falling, many consumers sought cheaper ways of procuring maize meal. Many consumers began procuring maize grain from nascent urban grain markets or rural areas and paying a fee for it to be milled into straight-run meal at a local custom mill. Over 93 percent of consumers surveyed in mid-1993 cited the lower cost of straight-run meal as the primary reason for consuming it. The growth of small-scale mills has benefited consumers since the margins of custom millers are only about one-third of those of large-scale milling firms. The gross margins of large-scale mills using roller mill technology are effectively fixed by agreement among the large-scale millers. At custom mills, not only are processing costs lower, but consumers also save money by performing many of the value-adding functions of the marketing chain themselves.

With the growth in custom milling, maize meal sales by large-scale millers have fallen drastically. Unlike small-scale millers, large-scale millers were required to purchase all maize requirement from the GMB until April 1994. As shown in Figure 2, GMB sales of maize grain to large-scale millers, a good proxy for sales of maize meal by large-scale millers, fell drastically in 1993 compared to 1991.
Unlike custom millers, small-scale production millers have not seen sales grow as a result of the 1993 policy reforms. Despite the fact that the wholesale prices of roller meal from production millers are lower than roller meal produced by large-scale millers, production millers have yet to gain a significant share of the purchased maize meal market. The peak monthly output for production millers was in late 1992 and early 1993, at the height of nation-wide drought. By late 1993, average monthly output had fallen to a quarter of previous levels. Large-scale millers continue to dominate the purchased maize meal market because lower wholesale prices of production millers have not been translated into lower retail maize meal prices. Although market reform has encouraged the growth of production milling firms, there are bottlenecks in the retailing stage of the maize marketing system that are preventing consumers from fully realizing the benefits of policy reform. Furthermore, there is evidence that the large-scale firms have developed marketing strategies that have effectively limited market access by production millers.
Under existing law, large-scale milling firms are permitted to collude in price setting. In the aftermath of the 1993 reforms, all four large-scale milling firms set identical wholesale maize meal prices. Wholesale prices charged by production millers for their roller meal products are slightly (7 percent) lower than prices charged by large-scale millers for roller meal. Although many retailers purchase maize meal from production millers at wholesale prices below those of the large-scale millers, retail prices are identical. Many small retailers, especially those in rural areas, are dependent upon the distribution networks provided by large-scale millers. Large-scale milling firms are conglomerates; they have diversified food and non-food product lines and can exercise market power. In addition to manufacturing maize meal and wheat flour, they package and distribute a wide range of other foodstuffs such as salt, sugar, cooking oil, dried fish and beans that are the mainstay of many small retailers. Thus, small
retailers are often reluctant to jeopardize their regular deliveries from large-scale milling conglomerates by stocking a lower-priced roller meal product from a production miller. Retailers have also cited the challenges in receiving allocations of cooking oil and sugar from large-scale millers during periodic shortages as another reason for maintaining good relations with the large-scale milling firms and their sales representatives. Even those retailers who have considered stocking low-priced roller meal from production millers voiced concerns about the reliability of supplies from production millers. In their view, selling maize meal procured from production millers at lower prices may be a way to increase maize meal sales (and profits) in the short run, but there is uncertainty about whether production millers can guarantee reliable supplies.

Second, the structure of the food retailing in urban areas of Zimbabwe suggests that there is scope for monopolistic collusion between retailers and processors, particularly given their strong historical links. Consumer surveys in mid-1993 revealed that 46 percent of consumers of bagged maize meal purchased maize meal at large supermarkets. About 44 percent of consumers purchased maize meal at small grocery stores with 9 percent purchasing at very small neighborhood shops. While most of the large supermarkets stock maize meal from three of the four large-scale millers, only two of the eleven production millers interviewed had been able to regularly market their products through large supermarket chains. With essentially two large supermarket chains in urban areas, the scope for informal agreements between large supermarkets and large-scale millers is substantial. For example, in March 1993, a large supermarket chain briefly introduced a low-priced roller meal produced by a production miller and bagged exclusively for the chain. One informant interviewed asserted that the product was discontinued after the supermarket signed an agreement with a large-scale milling firm.

Due to these difficulties breaking into established maize meal marketing channels dominated by large-scale millers and retailers, the most common constraint cited by production millers was difficulty in marketing their product. In order to overcome this
marketing constraint, production millers have adopted a variety of strategies:

**Vertical integration.** Faced with difficulties convincing small groceries and large supermarkets to stock their items and the inability of production millers to convince retailers to pass on the lower wholesale prices to consumers, production millers have been forced to look for alternative retailing options. One common strategy has been for production millers to focus on selling their maize meal at their own retail shops. Most production millers have a diversified range of businesses, ranging from bus companies to bakeries to nightclubs. The majority of production millers have at least two retail shops, with two millers having as many as six shops. Almost half of all production millers had recently opened a retail store in an urban area, or were planning to do so.

**Expanded product range.** Large-scale millers offer retailers, in addition to maize meal, a wide range of staple foods. In order to compete with large-scale millers, production millers have begun to purchase bulk quantities of these foodstuffs and package them for resale. Offering an expanded product range requires very little new investment: all that is needed is a bag sealing machine and an initial supply of plastic bags. The only limitation is the allocation system whereby limited supplies of certain foodstuffs are administratively allocated to firms (e.g. rice). In the past, there were perceptions by production millers that established firms had advantages in receiving allocations over emergent firms.

**Cultivate relationships with small urban retailers in poorer suburbs.** Small urban retailers are not as dependent upon large-scale millers for deliveries as rural shops since there is a wider array of possible suppliers. All three of the production millers whose manufacturing sites are in urban areas have targeted their marketing strategy at small urban retailers in poorer suburbs. By focussing on a handful of small urban retailers, some urban production millers have begun to penetrate urban markets in these areas.

**Provide custom milling services.** Given the flexibility of hammer milling equipment, most production millers have supplemented their income by providing custom milling services with their hammer milling equipment. With capacity utilization at only 25 percent, most
production millers have designated one or more mills for custom milling.

**Target institutional buyers.** Institutional buyers (schools, hospitals, prisons, refugee camps, military units, etc.) often have year-round demand for maize meal and purchase large quantities. The major problem for production millers hoping to supply government institutions is the government tender process. Tenders are typically put out for large amounts and most production millers do not have the production and distribution network required to bid for a nationwide tender. However, production millers have made headway in supplying private schools and refugee camps run by private voluntary organizations.

With the increased dependence in urban areas on custom mills, production millers and large-scale millers will battle for market share amidst an overall decline in the demand for purchased maize meal. Yet without greater market access for production millers at the retail level, consumers will not realize the full benefits of policy reform. Policy reform, although a necessary condition, may not be a sufficient one for the growth of production millers and other small-scale agribusiness firms. Select institutional investments and policy reforms may be needed to further facilitate the growth of labor-intensive, small-scale agribusinesses. For example, in the case of maize milling, facilitating actions might include government efforts to reform Tender Board procedures in order to permit emergent businessmen to bid on the supply of small lots or directives to the newly formed Monopolies and Mergers Commission to investigate claims of collusive trade practices in maize meal retailing.

**Conclusions**

For decades, the maize milling industry in Zimbabwe was dominated by five large-scale private milling firms with over 90 percent of urban maize meal market. By contrast, urban small-scale millers only had an 8 percent market share in 1992. For decades, legal and policy restrictions protected large-scale milling firms from competition from small-scale milling firms. Policy reforms undertaken in 1993, namely
the removal of movement restrictions and the ending of subsidies for
troller meal, contributed greatly to the growth of small-scale milling
enterprises in urban areas. Large-scale milling firms, sheltered for
decades from competition, lost considerable market share to
emergent small-scale milling enterprises, particularly to custom mills
offering consumers a low-priced maize meal product. By October
1993, the urban market share of custom millers and large-scale
millers was evenly split at about 48 percent each, while production
millers had a market share of 4 percent.

The recent growth of small-scale milling enterprises in Zimbabwe
has reversed the trend toward consolidation in the maize milling
industry and spurred the adoption of more appropriate labor-intensive
technology. Moreover, these outcomes were achieved by private-
sector investors without the government support of cheap credit,
training schemes, and other traditional measures for aiding small-
scale agribusinesses. While among southern African nations
Zimbabwe has relatively high per capita incomes, these findings
suggest that the elimination of deep-seated policy biases can be a
necessary, yet often overlooked, condition for the growth of small-
scale agribusinesses. A conducive policy environment is a necessary
condition to create incentives for investment in small-scale
agribusinesses.

Although small-scale agribusiness firms within a particular
industry may have many similar characteristics, policy reforms can
have a differential impact on different types of small-scale firms. In
this study, two types of small-scale milling enterprises were studied:
"custom mills" that provided milling services and "production mills"
that produced a bagged and branded product in direct competition
with large-scale millers.13 Survey data presented here show that
custom millers benefitted greatly from the 1993 policy reforms by
producing a product that was not manufactured by large-scale millers
and production millers, thereby avoiding direct competition. On the
other hand, production millers continue to face difficulties gaining
market access for their products. Production millers produce bagged
and branded maize meal products that compete directly with maize
meal products offered by the five large-scale milling firms. Despite
reforms that reduced preferential access to raw materials and ended subsidies, large-scale milling firms have a well-organized lobbying association, are permitted under current law to engage in collusive price setting, and have maintained strong links with the largest retail grocery stores. The growth of custom milling also suggests that a common strategy pursued by small-scale agribusiness, namely identifying under-exploited market niches, can also be a strategy that leads to a dominant market share. As consumption patterns changed in Zimbabwe, custom milling, which had formally been a niche market in urban areas, became a dominant mode of maize processing.

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NOTES

1. The number of large-scale milling conglomerates shrunk to four in 1992 with the buy-out of the third largest firm by the second largest firm.

2. Prices set by the government were based on cost-of-production data supplied by the large-scale millers.

3. Harare is Zimbabwe's capital city. Together with nearby Chitungwiza, it has a population of almost 1.5 million.
5. From 1989 to 1991, less than two percent of the GMB’s total maize intake was sold to private traders or small-scale millers (Jayne and Chisvo 1991).
6. Roller meal subsidies existed at varying levels for much of the post-Independence period. In late 1992, immediately prior to the elimination of subsidies, increasing numbers of production millers also became eligible for the subsidy payments. Custom millers, who only provided milling services, never received subsidies.
7. In Zimbabwe, obtaining accurate production cost comparisons is complicated since there are difficulties establishing a standard unit of comparison. Straight-run meal from custom hammer mills is produced on a service basis, is not bagged, and has a higher extraction rate than roller meal. Therefore, straight-run meal from custom mills and roller meal from roller mills are fundamentally different products, making direct or sample production cost comparisons invalid. Comparisons of cost figures of roller meal from production mills and roller mills do not present such problems.
8. Since custom mills produce different products, they are excluded from this comparison.
9. Wage data is from a 1993 production miller survey and estimates derived from 1992 large-scale miller Annual Reports and interviews. Labor include all administrative and sales personnel but does not include the opportunity cost of time of the mill owner. Investment cost is depreciated over the life of the equipment. Depreciation is based on a 10-year expected life for hammer mills and dehullers and 20-year expected life for roller mills. No salvage value is assumed, although there is a market for used hammer mills.
10. Only factory workers involved in milling, packing and direct supervision are included. Administrative, sales and delivery staff are excluded.
11. Only the machinery costs are included. Additional costs for
installing packing facilities, buildings, and delivery vehicles are
excluded.

12. For example, production millers could purchase grain directly
from farmers. This permitted production millers to purchase
grain at prices that averaged 27 percent lower than prices paid by
large-scale millers (Rubey 1995). However, less than a year later,
the restriction requiring large-scale millers to purchase grain
from the GMB was lifted.

13. Although there is scope for a production hammer miller to re-
orient their activities and operate as a custom miller as demand
dictates, certain sunk costs have been incurred.

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