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THE BENEFITS OF A RULES-BASED MAIZE MARKETING POLICY: RESULTS OF AN EXPERIMENTAL STUDY OF ZAMBIA

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Key Policy Points:

- *Strategic interaction between market players affects the performance of grain markets and the risk of food crises. Strategic dilemmas can arise if traders don't trust government announcements on future maize purchases or if the government does not trust stock estimates provided by the private sector.*
- *Government "pre-commitment" (announcing in advance how and when it will operate in the market and then behaving in a consistent manner) is found to produce superior welfare outcomes to "discretionary intervention" whereby the government operates in an unpredictable and ad hoc manner in markets. Situations of food shortage and over-supply were much more frequent under a discretionary policy environment because of the risk of poor coordination between the government and the private sector.*
- *Exploring mechanisms that can support more predictable and rules-based policy responses may therefore be beneficial to the Government of Zambia and the country as a whole.*

INTRODUCTION: The performance of grain markets, often analyzed as the impact of shifting supply and demand forces, is greatly affected by strategic interaction between the private and public actors in the market. The analysis summarized in this policy note examines the premise that greater predictability, coordination and consultation between private and public market actors will enable governments to better achieve national food security, price stability, and rural income growth.

OBJECTIVE: For several years the Government of Zambia (GRZ) has been examining appropriate roles for the state and the private sector in the maize market. Greater predictability and transparency in policy making and a more active involvement of the private sector are frequently raised as important policy recommendations. On March 10, 2007, the Zambia Maize Market Policy Dialogue held in Fringila provided a new way of looking at this issue. The workshop brought together 20 high-level government officials and private maize traders to engage in a novel interactive policy 'game', based on experimental economics techniques applied to a model of the Zambian maize marketing system.

In much of eastern and southern Africa, grain marketing systems are mixed, with both the public and private sectors playing important roles. This note discusses the importance of strategic interaction between the two types of market actors and provides several concrete illustrations of how such strategic interaction can affect market outcomes and the attainment of national policy objectives. Next, the note describes the fundamental aspects of the specific experimental game that was played by government officials and traders. The outcomes of the experiment are then presented, along with the lessons learned.

BACKGROUND: Despite the widespread perception that food markets have been liberalized, governments in much of eastern and southern Africa feel a strong need

to continue intervening. It is widely viewed in the region that governments are responsible for ensuring people's access to food (Bratton and Mattes, 2003). Food prices and availability are highly politicized issues in the region. The transition to multi-party electoral processes over the past decade has intensified the politicized nature of food prices as political parties compete to show how they will deliver benefits to the public in times of need. This kind of political economy creates major dilemmas for the private sector. On the one hand, private traders may need to limit their exposure to unpredictable government operations that would impose added costs and risks on their business operations. This may mean not making the investments in storage and grain buying in rural areas, especially where government is also buying at above market prices, or not importing when it is anticipated that government may release stocks at below market prices. On the other hand, now that markets have been "liberalized," the private sector is expected to effectively serve the needs of the millions of small-scale farmers and consumers in the region and is often blamed when prices rise above import parity or fall below export parity.

Despite the ostensible transition to "liberalized markets," governments still pursue price stabilization and food security objectives through two main routes. The first is marketing board operations, including crop purchasing, importation, and stock releases, often at subsidized prices. Using data provided by the national marketing boards between 1995 and 2005, domestic maize purchases by marketing boards have fluctuated from an estimated 11-55 percent of the domestic marketed maize output in Zambia, 3-32 percent in Malawi, and 15-57 percent in Kenya (Jayne et al., 2006). These figures understate the boards' full impact on markets because they do not count government imports (which can be sizeable) and subsequent release of maize onto domestic markets. Because the marketing boards are typically the largest single player in the market and often behave unpredictably, their operations can create major risks for private actors in the market who are forced to compete against them.

Governments in the region also influence markets through discretionary trade policy instruments such as export bans or quotas, changes in import tariffs, and government import programs. In Zambia and Malawi, problems frequently arise due to uncertainty about when and whether governments will alter import duties or import intentions in response to a short crop (e.g., Zambia in 2000/01, 2001/02; 2005/06; Malawi in 2001/02). Traders that mobilize imports early are likely to incur financial losses if the government later waives the duty and allows competing firms (or the government parastatal) to import more cheaply. When governments create uncertainty over import intentions or tariff rates during a poor crop season, the result is commonly a temporary under-provision of imports, which can produce a situation of acute food shortages and price spikes far above import parity (Nijhoff et al., 2003; Mwanaumo et al., 2005; Tschirley et al., 2004). Analysts not familiar with the details of these situations often erroneously interpret them as evidence that markets fail and that the private sector is weak, leading to a rationale for continued direct government involvement in marketing.

These illustrations highlight the importance of strategic interaction, in determining food security and improving market performance. Many analysts have concluded that predictable and transparent rules governing state involvement in the markets would reduce market risks, allow for greater coordination between private and public decisions in the market, and enable governments to more effectively achieve food security policy objectives. However, these conclusions have generally not been tested in a rigorous manner. Perhaps more importantly, these conclusions may seem unconvincing or abstract to policy makers. From their vantage point, they have not been in a position to see how the performance of markets may be influenced by their own actions. The primary purpose of the Zambia maize policy experiment was therefore to provide first-hand experience, through participating in a

simulated market game, of how government and trader behavior influences market outcomes.

THE MODEL AND DESIGN OF THE EXPERMENT: The basic structure of the maize market experiment is as follows: participants are cast in the roles of either 'Maize Traders' or 'The Government of Zambia' in a drought year. At the beginning of the exercise, the government gives non-binding public signals about import intentions, and then makes import decisions that may or may not be consistent with its earlier stated intentions. Traders make commercial import decisions based on announced government intentions and perceptions about its accuracy. The aggregate consequences of players' decisions then determine price levels and market outcomes, which in turn determine traders' profits and the extent to which government food security objectives were achieved. In a variation of this set-up, the public signal sent by government becomes binding ("pre-commitment"), hence the government must act according to its original announcement.

Government policy in this version of the game then becomes *rules-based* and in this framework, the government acts as the leader and the traders as followers. We then compared the outcomes of the two scenarios: the 'discretionary policy' model in which government could announce its intentions with regard to state imports (but potentially behave differently later) versus the 'pre-commitment' model in which government is bound to follow through on its announced import decisions. (For details of the experiment see Abbink, Jayne and Moller (forthcoming)).

In reality, a number of different actors, including farmers, assemblers, wholesalers, millers, and the government, interact strategically in the Zambian maize market. The Zambia maize policy experiment focuses on the two which have the greatest effect on market outcomes and for whom strategic interactions are endemic: the large traders and the government. A handful of large trading companies (e.g., AFGRI, Amanita, Zdenakie, CHC Traders) handle around 40-50 percent of the marketed maize supply in Zambia. Their trading volume is sufficiently high to exert some degree of market power, so they can be assumed to make decisions strategically, taking the actions of the other players into account.

The behavior of the government, through the Food Reserve Agency (FRA), strongly affects market outcomes. In shortage years the FRA sometimes imports maize in competition with the private sector. In this sense it can be seen as an additional big trader on the market. In contrast to private traders, the government is not a profit-maximizer, but pursues a number of social and political objectives. To gain popular support from consumers the government tries to keep consumer prices low. At the same time, since many households in Zambia are small maize farmers, the government also has an interest in high producer prices. The government goals conflict with the interests of traders who profit from high consumer prices and low producer prices.

Design of the experimental model involved facing a number of challenges. First, the model had to capture the most essential features of the Zambian maize market as accurately as possible. To set up a relatively realistic model, the demand function was estimated using annual data for national production, rainfall, wholesale price levels, urban population, and non-commercial imports between 1993/94 and 2005/06. Second, the model had to be simple enough to be playable in a short experimental session.

EXPERIMENT RESULTS: The experiment was first conducted under rigorous experimental design conditions with 96 volunteer participants at the University of Amsterdam. The theoretical prediction of player behavior is briefly summarized as follows. Under a discretionary policy regime, the government has a strong incentive to import high quantities of maize and thereby keep consumer prices low. Realizing this, traders would choose to import low quantities of maize at the same time to avoid flooding

the market and pushing down prices further. However, since traders are assumed to be more efficient importers than government, the model was set up such that both actors would actually be better-off if traders imported the majority of the maize shortfall (this would also save public budget outlays as well). Even if the government were to realize this and announce that it intends to import a low quantity of maize, the players representing traders in the experiment would still not necessarily respond by making sufficiently high imports, because they knew they could not trust a non-binding announcement. One way of overcoming this strategic dilemma is by implementing a rules-based policy. If the government were to pre-commit itself to import a fixed quantity of maize in the future then the government would have an incentive to announce and implement low imports. This is because the private sector would now find the binding government announcement credible and respond by importing large quantities of maize driven by the motivation to make a profit. The government would also gain by having sufficient imports being made by the private sector, hence achieving its desired maize price levels without incurring major public expenditure to achieve this outcome.

Did the subjects in the Amsterdam experiment behave according to theory? Under a discretionary policy, the game quickly evolved towards the predicted situation where government imports a high quantity and traders a low quantity. Government players also frequently sent misleading signals to traders in an attempt to lure them into importing a higher quantity, but traders were not easily 'tricked'. A policy of pre-commitment did, to some extent, help market participants to overcome the strategic dilemma especially as the game evolved over time. For this policy to work, however, it is necessary that the government players trust that the traders will act in their own best self-interest of importing sufficient maize to make a profit. In the experiment, the government players did not always trust their counterparts in the private sector, so they continued to import high quantities of maize. However, the data also showed that the fear that private sector would not respond favorably was unwarranted. Low government imports were almost always rewarded by high private sector ones.

What are the policy lessons from the economic experiment? Should the Government continue its discretionary mode of intervention or is a policy of precommitment more attractive? The results show that total maize quantities and market prices are quite similar under the two different policy modes. Importantly, however, situations of food shortage (and over-supply) were much more frequent under a discretionary policy because of the risk of poor coordination between the government and the private sector.

Another important difference lies in the incentives for traders to participate in the market: Government pre-commitment resulted in substantially higher trader profits because of the larger volume traded by them. Conversely, a discretionary policy resulted in a complete crowding-out of the private sector. Assuming that the private sector can import maize in a more efficient and timely manner, the discretionary policy therefore causes a welfare loss. A government interested in minimizing the risk of food insecurity and in fostering private sector development could therefore consider practical ways to make its maize market policy more rule-based and predictable.

The same experiment was also conducted with the real maize market players in Zambia who interact in the maize market on a regular basis. Twenty high-level government officials and private sector maize market players participated in the experiment, including the Minister and a Permanent Secretary of the Ministry of Agriculture and Cooperatives, representatives of the Food Reserve Agency, the Chief Executives of the Grain Trader's Association, other traders and millers, and a representative of the Zambia National Farmers Union. Each participant was randomly assigned to a team. Consequently, participants sometimes played a different role than they do in reality. The Minister of Agriculture, for instance, played in a trader

group and a number of traders played the role of the Government. This feature turned out to be very instructive, as it enabled participants to experience the game from different perspectives.

Due to the limited number of observations (only two markets and five rounds, or years) it was not possible to conduct a rigorous experiment as was done in Amsterdam. The Zambia game was primarily intended to be educational and hence the results reported below should therefore be regarded as anecdotal. Nevertheless, each experience reveals important lessons and underscores the points previously made. The Zambia experiment featured two concurrent markets, with substantially different outcomes.

The government in Market 1 was committed to cooperate with traders who quickly identified the optimal outcome (low government imports and high private sector imports), and cooperation quickly evolved. This market behaved even more efficiently than a typical market in the control experiments conducted in Amsterdam.

Market 2, in contrast, exhibited characteristics which were much less cooperative than in the control experiments. According to statements made by the participants after the experiment, the government players deliberately tried to trick traders by announcing that they would largely refrain from importation, but then in fact imported high volumes. In turn, the traders were relatively slow in responding to the government's strategy. This resulted in a total negative payoff for both traders (effectively they went bankrupt). The consequence of the Market 2 outcome was that government now had to arrange for virtually all of the country's grain import requirements itself, having destroyed the private sector's willingness and ability to do so. Notice how this outcome could occur in a policy environment in which grain markets are "liberalized", indicating that liberalization in the absence of public-private sector trust and cooperation can depress the market's ability to play its anticipated role. Essentially, there was a much lower degree of trust and cooperation in Market 2, highlighting the importance of engendering these features between the public and private sectors in a well-functioning grain marketing system.

SUMMARY/CONCLUSIONS:

Discretionary and unpredictable government intervention is one of the greatest policy problems plaguing the food marketing systems and food security in the Southern Africa region because actual and potential government interventions generate private sector uncertainties and inaction leading to additional need for government intervention. This problem has accounted for virtually all of the recent food crises in Zambia and Malawi since 2000, where food supplies have dwindled and prices surged above the cost of importing it (Tschirley and Jayne, 2007).

Effective coordination between the private and public sector would require greater consultation and transparency with regard to changes in parastatal purchase and sale prices, import and export decisions, and triggers for release of stocks. This approach does not imply that government need be passive. Instead, it implies that Government responses, including humanitarian responses and donor interventions, need to be transparent, reliable, and predictable in order to create the space for the private sector to play its role, which includes there reliable and predictable management of commercial imports, when necessary.

The results of the maize market experiment highlight the importance of predictable and transparent rules for governing the state's involvement in markets, and how such operations in the market could reduce the risks of a food crisis and more effectively meet most of the government's policy objectives. Specifically, government pre-commitment to a future course of action was found to be theoretically and, to some extent, empirically superior to a discretionary policy in this particular model and experiment. The Government of Zambia should therefore consider mechanisms which can help make maize market policy more predictable or rules-based in the future, while at the same time providing increased comfort that food

security responses will be efficient and effective.

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