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Evaluating the effectiveness of inter-regional trade and storage in Malawi's private sector maize markets

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ABSTRACT

This paper evaluates the effectiveness of the private sector maize marketing system in Malawi using threshold autoregression models. Two dimensions of maize market performance are evaluated: (1) inter-regional trade and spatial price transmission; and (2) storage and seasonal price relationships. In both cases, threshold autoregression models which account for nonlinearities predicted by economic theory are applied. Results indicate that spatial price transmission and seasonal price patterns in private sector maize markets in Malawi are generally consistent with long-run competitive inter-regional trade and storage behavior, and that in most cases shocks to long-run equilibrium are arbitraged away quickly. This suggests the private sector in Malawi is generally doing a good job of transporting maize from surplus to deficit regions and smoothing maize consumption between harvests.

Introduction

For many years after Malawi's independence in 1964, maize marketing was dominated by the Agricultural Development and Marketing Corporation (ADMARC), a government parastatal which had exclusive rights to buy and sell maize at administratively determined prices. However, the food and financial crises of the mid 1980s led to policy reform which eventually eliminated ADMARC's monopoly/monopsony power in maize, forced it to operate on a more commercial basis, and created a role for private sector maize trade (Harrigan, 2003). A new government parastatal, the National Food Reserve Agency (NFRA), was then created to manage a strategic grain reserve (SGR) and provide a social safety net during severe maize shortages.[1]

The private sector maize trade has grown in importance in Malawi over the past 30 years in response to these policy reforms. A private sector channel has evolved in which small and medium-scale traders source maize from smallholder farms throughout the country, assemble the maize into larger lots, and ship it to larger traders, processors, animal feeders, and retailers. There is also an estate sector which sells primarily to larger traders, and a private sector import channel which imports maize from northern Mozambique, southern Tanzania, and sometimes eastern Zambia.[2] This cross-border trade links into the Malawi private sector maize channel through small-scale traders and assemblers in the border areas (Jayne et al., 2008).

ADMARC continues to play an important role and has its own marketing channel operating in parallel with the private sector channel. In 2002, ADMARC had approximately 350 depots spread throughout the country (Kutengule et al., 2006). ADMARC buys maize from farmers and traders, stores it for later resale, transports it to deficit locations, and resells it to traders, millers, schools, hospitals, and households. ADMARC prices are set in consultation with the Malawi Government and its operations continue to be subsidized via transfers from treasury.

With the rise in private sector maize trade in Malawi over the past 30 years the effectiveness of this marketing channel has become an important food policy issue. The private sector has been criticized for excluding poor households in remote areas subject to small volumes, high transport costs, and transport interruptions (especially during the rainy season). The private sector channel has also been criticized for "unscrupulous" trading which exploits the weak bargaining and information position of smallholder households. In contrast, a recent rapid appraisal study found there are many participants, small, medium, and large, operating throughout most levels of the private sector maize channel in Malawi (Jayne et al., 2008). Buyers and sellers have a range of marketing alternatives and there is competition among participants with few barriers to entry. The study also found that smallholder households were not being excluded from the private sector channel, even in the more remote areas surveyed. This suggests a competitive channel that should be operating quite efficiently.

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[1] ADMARC still plays an important role in this social safety net due to its own operations and to the fact that maize released from the SGR is generally distributed through ADMARC depots.

[2] On rare occasions when Malawi has a surplus some maize may flow out of Malawi across these borders as well.

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The objective of this paper is to further evaluate the effectiveness of the private sector maize marketing system in Malawi through empirical price analysis using historical time-series data. The advantage of the time-series approach is that it facilitates testing how well private sector markets are performing, and can potentially identify trends in performance over time. Malawi maize is an especially interesting case because of the controversy surrounding the joint role of ADMARC and the private sector maize marketing channel, and because a number of existing studies have already investigated spatial price relationships in Malawi maize markets (e.g., Golletti and Babu, 1994; Chirwa, 2000). The results presented here can therefore add to the ongoing debate about the effectiveness of the private sector maize marketing channel in Malawi.

Two dimensions of private sector maize market performance are studied in this paper. The first is spatial price transmission and the effectiveness of inter-regional trade. Without effective spatial trade and price transmission there may be regional deficits and surpluses, even when total available supply can meet the needs of all households at prevailing average prices. So inter-regional trade is an important part of an effective food security strategy. The second performance dimension studied is seasonal price movements and the efficiency of maize storage. Maize storage plays two critical roles in Malawi's food economy. First, intra-year (seasonal) storage takes the seasonal maize harvest and spreads consumption out over the lean season when little or no maize is being harvested. Second, stocks may be carried over from 1 year to the next so a good harvest in 1 year can be held over as a reserve against a poor harvest in the future. This inter-year storage smooths consumption across years to help manage annual production variability. Both dimensions of storage play an important role in Malawi's maize market performance.

There are two major existing studies on spatial maize price transmission and inter-regional trade in Malawi. Golletti and Babu (1994) used linear cointegration methods and concluded that price shocks do get transmitted across regional markets in Malawi, but that transmission is incomplete and it takes a long time (up to 6 months) for adjustment to occur. Chirwa (2000) also used linear cointegration methods to investigate maize and rice price transmission across regional markets. He found that a long-run equilibrium exists among maize prices from several regional markets, but does not directly address the issue of how long it takes for price transmission across markets to occur.

It is now well known that linear cointegration methods are restrictive for investigating spatial price transmission.[3] Furthermore, neither existing study uses more recent data after 2000, and we know spatial price relationships may change over time in response to learning, policy changes, and investments in information systems and transportation infrastructure (Negassa and Myers, 2007). The current paper allows for a nonlinear adjustment process and uses more recent data to provide new evidence on the effectiveness of spatial maize price transmission and inter-regional trade in private sector Malawi maize markets.

Considerable research has focused on storage efficiency, especially inter-year storage (e.g., Newbery and Stiglitz, 1981; Williams and Wright, 1991). However, little of this research has focused directly on Malawi maize. Exceptions include Pinckney (1993) and Dana et al. (2006) who evaluate maize storage strategies for Malawi. However, these studies focus primarily on overcoming production shortfalls with public stocks held across years without evaluating the effectiveness of private sector storage incentives. The current paper focuses on intra-year (seasonal) storage and evaluates the efficiency of private sector incentives for intra-year storage.

The remainder of the paper first discusses the data used in both the spatial and storage analyses. Then the approach and results for the spatial model are discussed followed by the approach and results for the storage model. Both approaches use a variant of the threshold autoregression model (TAR) to account for nonlinearities in the adjustment process (see Tong and Lim, 1980; Tong, 1990; Balke and Fomby, 1997 for derivations and details on TAR models). The paper concludes with a discussion of the implications of the results for the effectiveness of private sector incentives for inter-regional trade and storage in Malawi maize markets.

Data and background

Malawi can be separated into three main geographic regions—the Southern Region, featuring Blantyre as the main urban center; the Central Region surrounding the capital of Lilongwe; and the Northern Region which has scattered smaller urban areas. The Southern Region has high population density with limited cultivated land, and so is almost always in maize deficit. The Central Region has more cultivated land, higher productivity, and often produces a surplus. The Northern Region produces a surplus in some years and is deficit in others. Major inter-regional maize flows are therefore from the center to the south, with intermittent flows in both directions between the center and the north, depending on weather patterns and the season.

The Malawi Ministry of Agriculture and Food Security implements a weekly survey of retail food prices in approximately 70 "council markets" spread throughout the country. These reports were collated into a data set of weekly regional private sector retail maize prices. The data run from the first week of July 2001 through the first week of October 2008. The use of weekly price data helps alleviate the aggregation bias that is often present in spatial price studies using monthly data (Taylor, 2001). Not all 70 markets could be included in the analysis. Apart from the complexity of looking at all potential trade routes among 70 markets, data from many markets were not available over the entire sample period, because they were only added to the survey more recently. Other markets had so many missing observations that it would have been misleading to include them.

Fig. 1 shows a map of Malawi showing 10 maize market locations chosen for analysis. For Lilongwe and Blantyre the data are actually from Mitundu and Lunzu markets, respectively, which are located on the outskirts of these cities (see Phiri, 2008). However, because of their close proximity to these major urban areas we continue to describe these data as from Lilongwe and Blantyre. Mzuzu, Lilongwe, and Blantyre are three major urban areas in the Northern, Central, and Southern Regions respectively, and were included to represent larger central markets. Karonga is on a major road to the north and is expected to be well-connected with Mzuzu. Dowa and Mchinji are relatively close to Lilongwe, Dowa just to the east and Mchinji close to the Zambian border to the west. Luchenza is on a major road from Blantyre to Mulanji and the Mozambique border. Chitipa in the far north and Nchalo and Bangula in the south were included to represent more remote and potentially less well-connected markets. Most of the markets had some missing observations which were imputed using best subset regressions on all other available prices.[4]

[3] The problem is that linear models fail to allow for a zone of trade inactivity when price spreads fall below a threshold that reflects transfer cost between regions. They therefore tend to under-estimate the speed of adjustment to long-run equilibrium.

[4] The proportion of missing observations per location ranged from 0% to 23% with an average of 15% across all markets. The effect of imputing these missing observations with best subset regressions cannot be known. However, since the best subset regressions have no dynamics (lags) the procedure should not introduce spurious dynamics into the price relationships. Hence, the best subset regressions appear to be the best available way of imputing the missing observations in this application.