Regional Price Transmission in Southern African Maize Markets

Tracy Davids, Kateryna Schroeder, Ferdinand Meyer, and Brian Chisanga

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Regional Price transmission in Southern African maize markets

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International Agricultural Trade Research Consortium

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A regional perspective on analysing the impact of agricultural policies

- Institute for Social and Economic Research, University of Kinshasa; Democratic Republic of Congo;
- Tegemeo Institute of Agricultural Policy and Development, Egerton University – Kenya
- Centre for Agricultural Research and Development, Bunda College, Malawi;
- CEPPAG, University of Eduardo Mondlane, Mozambique
- Bureau for Food and Agricultural Policy (BFAP)- University of Pretoria & Stellenbosch, South Africa;
- Department of Agriculture Economics and Agribusiness- Sokoine University of Agriculture, United Republic of Tanzania;
- Indaba Agriculture Policy Research Institute (IAPRI), Zambia
- Department of Agriculture Economics Makarere University, Uganda
- Department of Agriculture Economics and Extension, University of Zimbabwe, Zimbabwe
1) Background & Context
   - Overview of maize markets in the region
   - Trade flows and prices
   - Policy Environment

2) Previous work on price transmission in region

3) Methodology and some preliminary empirical results

4) Concluding remarks and way forward
Maize in the region

• Basic food staple to bulk of the population – association with food security

• Dominant crop planted in the region

• Government intervention in markets is common – efforts to insure availability and affordability

• Non-GM white maize less freely available in global market – differentiated product?
Regional Maize Consumption

Maize food consumption per capita

Kg per capita per year

South Africa  Kenya  Zambia  Tanzania  Malawi  Mozambique  DRC  Uganda  Zimbabwe

Source: ReNAPRI Outlook, October 2015
Maize – Regional Overview

Source: ReNAPRI Outlook, October 2015

The diagram shows the production of maize from 2004 to 2024, with projections for future years. The trend indicates a steady increase in production, with a projection of a 30% increase by 2024. The diagram also breaks down the consumption into food, feed, other & losses, and net trade categories, with the production and consumption data clearly illustrated over time.
Maize trade in the region: 2012-2014

Consistent Exports:
- South Africa
- Zambia
- Uganda

Consistent Imports:
- Zimbabwe
- Kenya
- DRC
- Mozambique**

Generally Self Sufficient:
- Tanzania
- Malawi

Source: ITC Trademap, FEWSNET, ReNAPRI, IVIS
Regional trade-flow

Net Exports: Average 2010-2014

Source: ITC Trademap, FEWSNET, ReNAPRI
Regional trade flow

Net Exports: Average 2010-2014

Source: ITC Trademap, FEWSNET, ReNAPRI
Policy: History of intervention

- Government actively partaking in market – not always at market related prices – strategic reserves?
  - Zambia, Kenya, Malawi

- Export controls during periods of perceived shortage
  - Zambia, Malawi, Tanzania

- Input Support Programs
  - Malawi, Zambia, Tanzania, Kenya
Relative prices in the region

- World Price: US Gulf
- South Africa: Ranfontein
- Malawi: Lilongwe
- Mozambique: Maputo
- Zambia: Lusaka
- Zimbabwe: Harare

Source: FEWSNET, FAO GIEWS, ReNAPRI
Relative prices and volatility

Source: FEWSNET, FAO GIEWS, ReNAPRI
Problem

• Government interventions are said to be targeted at stabilisation of domestic prices of a politically sensitive crop
  – Countries experiencing the greatest instability are those most actively intervening in their markets (Chapoto & Jayne, 2009)

• Role of intra-regional trade implies a cross country impact of such policies
  – Quantification of country specific policy impacts on prices in the rest of the region requires an understanding of price formation and the extent to which prices are transmitted between different markets in the region
Price transmission (or price co-integration) refers to the co-movement shown by prices of the same good in different locations.

Such models are used to assess competitive market equilibrium or market efficiency, a price based indicator that holds on the conditions of spatial equilibrium;

Some benefits:
- Use of price data only;
- Allows for short and long run dynamics’ analysis;
- Allows for relaxing assumptions of linearity and symmetric adjustment.
Limitations...

• Frequent reliance on the price data only;

• Transaction and transportation costs are assumed to be equal to zero or set as a fixed proportion of the prices used – transport costs known to be high in Africa;

• Price vs. market integration;

• Price transmission parameters summarize overall effects that might affect prices in different markets. Further research is needed to study separate roles of different factors.
<table>
<thead>
<tr>
<th><strong>Price transmission – what do we know about the region?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conforti (2004)</strong></td>
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<td><strong>Minot (2010)</strong></td>
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<td></td>
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<tr>
<td><strong>Traub, Meyers, Jayne &amp; Meyer (2010)</strong></td>
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<td><strong>Jayne &amp; Meyers (2012)</strong></td>
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<td><strong>Burke and Meyer (2014)</strong></td>
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</tbody>
</table>
Trade-flows have changed

Zimbabwe maize imports

2007-2008

2012-2014

South Africa  Zambia  Tanzania  Mozambique  Malawi  Uganda  Kenya  DRC  Other
Transportation costs

For imported grain crops in Sub-Saharan Africa – cost of transportation (sea & land) may represent more than half of the final price (Minot, 2010)
Moving Rates
Lusaka -> Beira: USD 130
Lusaka -> Harare: USD 68
Lusaka -> Durban: USD 170
Randfontein -> Harare: USD 120
Randfontein -> Maputo: USD 70
Beira -> Harare: USD 75
Beira -> Lilongwe: USD 94
Lilongwe -> Harare: USD 60
Durban -> Harare: USD 145
Contribution of this study

• Wider Regional Coverage in Southern Africa
  – South Africa, Zambia, Zimbabwe, Malawi, Mozambique
  – Updated data considers Zambia’s shift to an exporter

• Trade-flows considered as explanatory / threshold variable
  – Formal and informal trade included

• Multiple markets considered within relevant countries
Methods used (Current progress)

• Unit-root tests (levels and differences):
  – Augmented Dickey-Fuller (ADF)
  – Philips-Perron (PP) tests
  – Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test

• Co-integration tests using Engle and Granger (1987) method
## Results to date

<table>
<thead>
<tr>
<th>Pairs of series</th>
<th>Engel and Granger Procedure</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>ADF</td>
<td>PP</td>
<td>KPSS</td>
<td></td>
</tr>
<tr>
<td>Zambia (Lusaka) – South Africa</td>
<td>-3.15*</td>
<td>-3.22*</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>Malawi (Lilongwe) – Mozambique (Tete)</td>
<td>-5.52**</td>
<td>-5.48**</td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>Zimbabwe (Harare) - Mozambique (Manica)</td>
<td>-2.98</td>
<td>-3.92**</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>Zambia (Lusaka) – Zimbabwe (Harare)</td>
<td>-3.24*</td>
<td>-3.40**</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>Mozambique (Tete) – Zimbabwe (Harare)</td>
<td>-6.81**</td>
<td>-6.77**</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>Mozambique (Maputo) – South Africa</td>
<td>-3.11*</td>
<td>-2.73</td>
<td>0.48**</td>
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</tr>
<tr>
<td>Zimbabwe (Harare) - South Africa</td>
<td>- 2.26</td>
<td>-2.77</td>
<td>0.35*</td>
<td></td>
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</tbody>
</table>

Asterisks denote levels of significance (* for 10 percent, ** for 5 percent). The 5% and 10% critical values for tests with a drift are -3.37 and -3.07 respectively. The 5% and 10% critical values for the KPSS test in levels are 0.463 and 0.347 respectively.
Going forward

• Rate of price adjustment & direction of causality
  – Single equation error correction model to measure speed of adjustment and short run price transmission between relevant series

• Account for non-linearity
  – Identification of different trade regimes (Jayne & Meyers, 2012), with trade-flow as transition variable between regimes
    – Consideration of trade-flows between country pair or from third markets

• Additional markets?
Concluding remarks

• Intra-regional trade-flow, both formal and informal is an important consideration within the region, as trade from outside the region remains limited

• Transportation costs in the region are extremely high leading to significant price differentials and volatile markets

• Few maize markets in the region reflect long run co-integration with world market

• Market integration within the regions has generally non-linear and different regimes should be considered

• Implications for structure of quantitative policy analysis tools

• Price transmission within country important consideration going forward...
Thank you!

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