Measuring Price Transmission in Maize Grain Markets: The case of South Africa and Mozambique

Lulama Ndibongo Traub – University of Stellenbosch
Robert J. Myers – Michigan State University
T.S. Jayne – Michigan State University
Ferdinand Meyer – University of Pretoria

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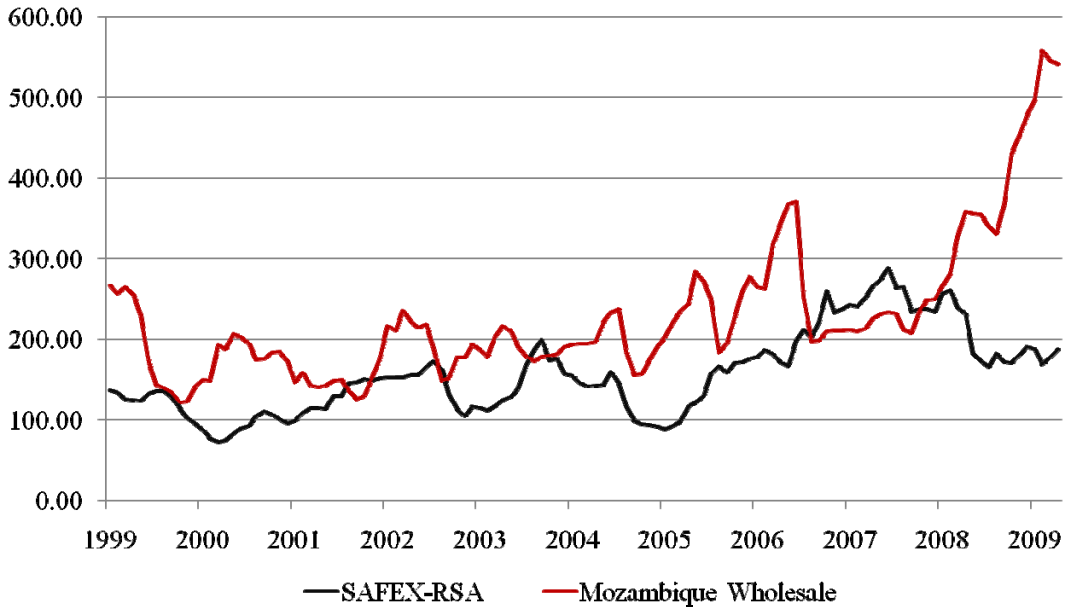
Motivation

- 2007/2008 Global food & financial Crises
  - Disjoint between global regional commodity prices
- South Africa grain markets
  - Clear price transmission between global and domestic grain prices
  - Surplus grain producer
  - Price shocks → regional grain markets

White Maize Grain Price Movements, 1999 – 2009 (Nominal USD/MT)

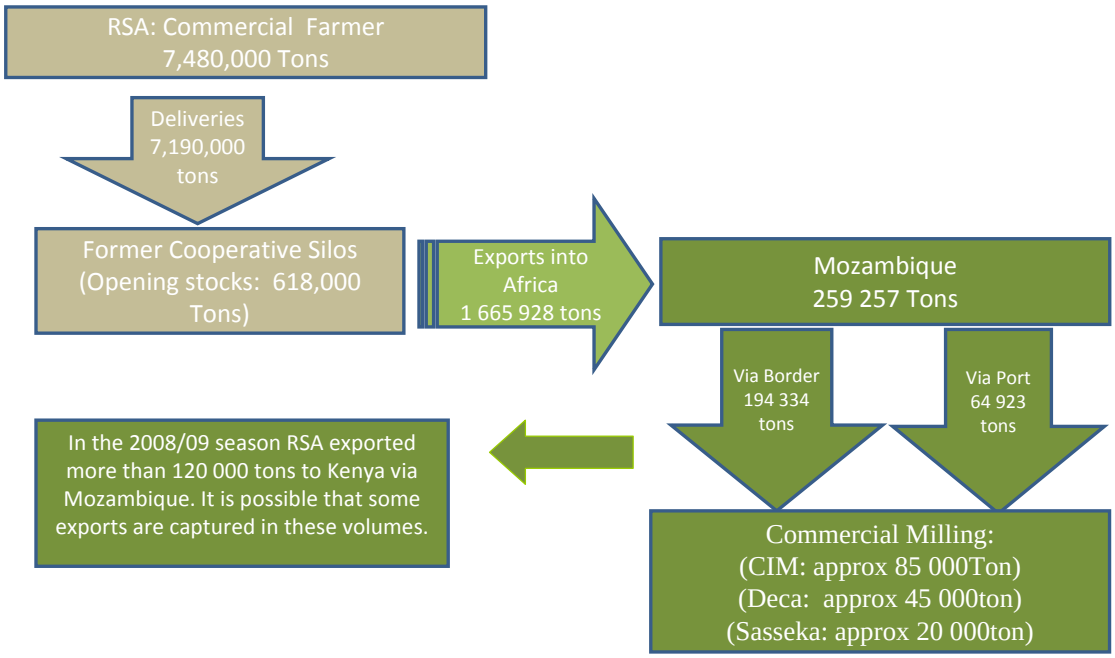


Study Objectives

To Determine:

- Degree of price transmission and speed of adjustment to spatial price differentials between RSA and Mozambique maize grain markets

RSA to Mozambique White Maize Trade Flow: 2008/2009



Modeling Framework

- Switching Error Correction Model (SECM):

$$\Delta P_t^{out} = \left(\sum_{j=1}^{L} (\alpha_{1j}^{trade} \Delta P_{t-j+1}^{in}) + \phi^{trade} ECT_{t-1}^{trade} \right) I_t^{trade}$$
$$+ \left(\sum_{j=1}^{H} (\alpha_j^{non-trade} \Delta P_{t-j+1}^{in}) + \phi^{non-trade} ECT_{t-1}^{non-trade} \right) I_t^{non-trade} + v_t \quad (1)$$

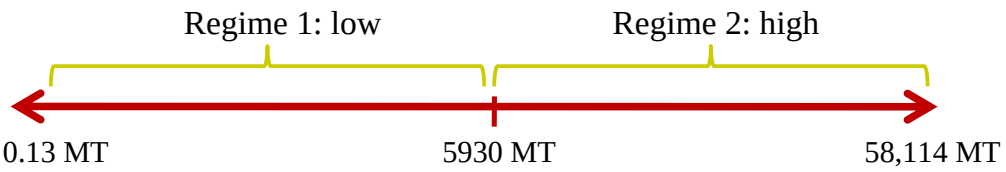
  - Attractiveness:
    - variation in cointegrating relationship & speed of adjustment

Modeling Framework

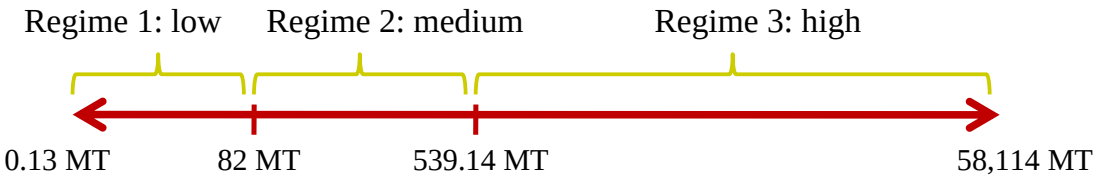
- RSA-Mozambique case
  - Continuous, unidirectional trade
  - Multiple trade regimes
    - Estimated the threshold values rather than imposing them a priori

Modeling Framework

- Thresholds: Monthly import volumes
  - Wholesale Model



  - Retail Model



Model Framework

- Single-equation error correction model (SEECM)

$$\Delta M_t = \alpha_0 + \beta_1 \Delta S_t + \beta_2 \Delta T_t + \lambda(M_{t-1} - \beta_1 S_{t-1} - \beta_2 T_{t-1}) + \phi_1 S_{t-1} + \phi_2 T_{t-1}$$

$$+ \sum_{i=1}^{n} a_i(\Delta M_{t-i} - \beta_1 \Delta S_{t-i} - \beta_2 T_{t-i}) + \sum_{i=1}^{n} b_i \Delta S_{t-i} + \sum_{i=1}^{n} c_i \Delta T_{t-i} + \eta_t \qquad (2)$$

Model Framework: Unit Root & Cointegration Tests

Test	Retail Maize Meal Model			
	Full Sample	**Regime 1:** ($q \leq 82$)	**Regime 2:** ($82 < q \leq 539.1$)	**Regime 3:** (q>539.1)
T	**153**	**24**	**18**	**111**
Mozambican Retail Prices				
-ADF *p-values*	0.8190	0.9969	0.9828	0.3838
-PP *p-values*	0.7943	0.9964	0.9928	0.3857
SAFEX				
-ADF *p-values*	0.3190	0.6061	0.8334	0.6695
-PP *p-values*	0.3523	0.7363	0.8297	0.6700
Diesel Prices				
-ADF *p-values*	0.6043	0.6290	0.9989	0.1220
-PP *p-values*	0.5538	0.4051	0.9815	0.2131
Engle-Granger				
EG *p*-values	0.005	0.009	0.012	0.005

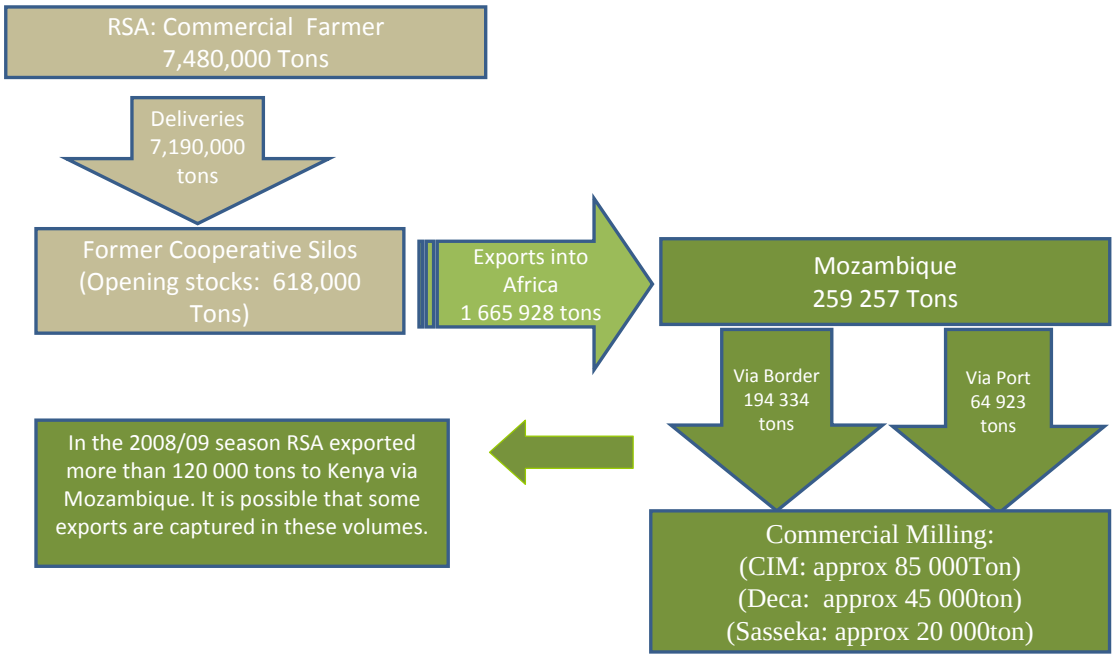
Model Framework: Unit Root & Cointegration Tests

Test	Wholesale Maize Grain Model		
	Full Sample	**Regime 1:** (*q≤5930)*	**Regime 2:** (*q*>5930)
T	**124**	**97**	**27**
Mozambican Wholesale Prices			
-ADF *p-values*	0.7723	0.2636	0.9951
-PP *p-values*	0.9590	0.5501	0.9973
SAFEX + VAT(17%)			
-ADF *p-values*	0.0017	0.0053	0.3657
-PP *p-values*	0.0000	0.0000	0.3760
Diesel Prices			
-ADF *p-values*	0.4893	0.9721	0.3404
-PP *p-values*	0.4325	0.9442	0.0786
Engle-Granger			
EG *p*-values	0.549	0.729	**0.0000**

Regression Results: Wholesale Maize Grain

Model	β_1	β_2	λ	Half-life	No. Obs.	R^2	F-statistic
Full Sample							
Cointegration	0.05	80.95	-0.128	5.06	122	0.2430	0.0001
	(0.27)	(20.09)*	(0.04)*				
Partial Cointegration	-0.004	-7.08	-0.128	5.06	122	0.2430	0.0001
	(0.03)	(77.18)	(0.04)*				
Stationary	-0.004	-4.86	-0.128	5.06	122	0.2430	0.0001
	(0.03)	(7.23)	(0.04)*				
Regime 1: *q* <=5930							
Cointegration	-0.023	55.09	-0.258	2.32	95	0.3623	0.0000
	(0.141)	(9.99)*	(0.052)*				
Partial Cointegration	0.001	2.25	-0.258	2.32	95	0.3623	0.0000
	(0.028)	(62.23)	(0.052)*				
Stationary	0.001	1.19	-0.258	2.32	95	0.3623	0.0000
	(0.028)	(7.86)	(0.052)*				
Regime 2: q >5930							
Cointegration	**-2.50**	1260.76	**-0.012**	57.4	27	0.4463	0.1401
	(19.70)	(6851.9)	**(0.066)**				
Partial Cointegration	**-0.032**	-699.07	**-0.012**	57.4	27	0.4463	0.1401
	(0.23)	(4972.5)	**(0.066)**				
Stationary	**-0.032**	-56.24	**-0.012**	57.4	27	0.4463	0.1401
	(0.23)	(23.12)*	**(0.066)**				

RSA to Mozambique White Maize Trade Flow: 2008/2009



Regression Results: Retail Maize Meal

Model	β_1	β_2	λ	Half-life	No. Obs.	R^2	F-statistic
Full Sample							
Cointegration	3.75	68.69	-0.07	10.31	149	0.2159	0.0000
	(1.73)*	(66.80)	(0.03)*				
Partial Cointegration	0.26	4.66	-0.07	10.31	149	0.2169	0.0000
	(0.22)	(7.12)	(0.03)*				
Stationary	0.26	36.48	-0.07	10.31	149	0.2169	0.0000
	(0.22)	(10.42)*	(0.03)*				
Regime 1: $q \leq 82$							
Cointegration	3.02	50.23	-0.322	1.78	21	0.5935	0.1068
	(1.48)	(69.38)	(0.191)				
Partial Cointegration	1.86	30.82	-0.322	1.78	21	0.5935	0.1068
	(0.77)*	(59.94)	(0.191)				
Stationary	1.86	-91.9	-0.322	1.78	21	0.5935	0.1068
	(0.77)*	(44.9)*	(0.191)				
Regime 2: $(82 < q \leq 539.1)$							
Cointegration	1.48	104.0	-0.294	1.99	17	0.9364	0.0005
	(1.05)	(34.8)*	(0.147)				
Partial Cointegration	-0.638	-41.83	-0.294	1.99	17	0.9364	0.0005
	(0.351)	(57.6)	(0.147)				
Stationary	-0.638	-102.1	-0.294	1.99	17	0.9364	0.0005
	(0.351)	(26.14)*	(0.147)				
Regime 3: $q > 539.1$							
Cointegration	**3.74**	53.63	**-0.07**	10.31	111	0.1636	0.0163
	(1.71)*	(72.7)	**(0.025)***				
Partial Cointegration	**0.297**	4.25	**-0.07**	10.31	111	0.1636	0.0163
	(0.242)	(7.76)	**(0.025)***				
Stationary	**0.297**	19.91	**-0.07**	10.31	111	0.1636	0.0163
	(0.242)	(14.0)	**(0.025)***				

What's the Point?

- Point 1:
  - No price transmission between RSA and Mozambican grain markets
  - Price transmission between RSA and Mozambican retail maize meal markets
- Implications
  - Market structure matters

What's the Point?

- Point 2:
  - In high frequency data the stochastic properties are likely to change over time
- Implication
  - Thresholds matter

What's the Point?

- Point 3:
  - Price transmission between RSA grain and Retail maize meal markets
    - $1 → $3.70
- Implications
  - Possible non-competitive behavior of the milling sector

Conclusion

- What are the questions remaining?
  - Why is RSA grain so thinly traded?
  - What about central and northern Mozambique?
  - What about yellow maize?

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