

How Responsive to Prices is the Supply of Milk in Malawi?



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Introduction

Dairy is a key investment sector for the Government of Malawi. Nevertheless, the sector is still underdeveloped. One of the problems that dairy producers face is the low prices that they receive. Although the reasons behind this are not fully clear, one of the causes seems to be the competition from imported powder milk.

In 2009 milk powder imports were available at very low prices, particularly from Europe (e.g., from Ireland). As a reaction, Malawian dairy processors reduced the price paid to farmers by 26.5% (from 68 to 50 Kwachas per litre). This motivated advocacy (domestic and international) institutions to lobby the Government for an increase in the powder milk duty, which in 2010 went from 20% to 30%, which brought a slow adjustment on the price paid to farmers.

Whilst an increase in the price paid to farmers would raise their revenues (assuming the same delivery), it might also bring additional blessings, as if farmers respond to prices, they may improve their revenues beyond the increase in prices.

The purpose of this work is to study the responsiveness of the deliveries of milk at the milk bulking groups to changes in the price paid to farmers by processors (i.e., the elasticity of supply faced by processors).

Specific research questions are:

- Is the supply of milk at the MBG price responsive?
- If so, how much would the expected increase in revenues be if prices increase?
- If supply reacts, what are the dynamics (e.g., short term, long term)?
- What are the chances that the expansion of milk production (if any) due to the change in prices would reduce substantively the idle capacity observed in dairy processing?

Data

The dataset used for the analysis was constructed from the monthly reports by the Shire Highlands Milk Producers Association (SHMPA), which provides information of farmers' deliveries to milk bulking groups (MBGs) associated to the main Malawian dairy processors in the Southern region. They cover the period September 2008 until February 2013. SHMPA represents 89.2% of the total milk collection. The dataset comprised:

- the monthly quantity of milk delivered by farmers to the different milk bulking groups;
- the prices paid by processors to the milk bulking groups; and
- the price received by farmers and the total discounts applied to milk prices.

Empirical work

The methodology comprised:

1. Test the stationarity of the data using panel data tests (e.g., Im, Pesaran and Shin test).
2. Estimate a dynamic supply response equation.

All the tests rejected the hypothesis of non-stationarity. Then the next step was to fit the supply response relationship. This was done using Hendry's general to specific methodology (Hendry, 1995) and the starting point was to consider an autoregressive distributed lag model (ADL). The estimated supply equation was:

$$\log(M_{t,i}) = \alpha_{0i} + \alpha_1 \log(M_{t-1,i}) + \alpha_2 \log\left(\frac{P_{t,i}^M}{P_t}\right) + \alpha_3 \log\left(\frac{P_{t-1,i}^M}{P_{t-1}}\right) + \alpha_4 t + \alpha_5 t^2 + \alpha_6 d_{1t} + \alpha_7 d_{5t}$$

$M_{t,i}$ is the monthly quantity delivered of milk by farms in period t to the i milk bulking group.
 $P_{t,i}^M$ is the average monthly price paid to farmers for milk at each milk bulking group,
 P_t is the consumer price index,
 t is a trend,
 d_{1t} is a seasonal dummy for January,
 d_{5t} is a seasonal dummy for May.
 α 's are parameters.

Econometric results

Table 1 presents the econometric results of the supply response model in error correction form.

Table 1: Econometric estimation in error correction form

Dependent Variable: $\Delta(\text{LOG}(\text{MILK}))$				
Cross-section weights (PCSE) standard errors and covariance				
Cross-section fixed				
Parameters	Coefficient	Std. error	t-Statistic	Prob.
α_2	0.645	0.100	6.470	0.000
α_1	0.703	0.026	26.723	0.000
α_0^*	6.271	0.815	7.696	0.000
α_4^*	0.039	0.006	7.005	0.000
α_5^*	-0.001	0.000	-7.108	0.000
α_6^*	0.205	0.067	3.074	0.002
α_7^*	0.248	0.070	3.568	0.000
$\alpha_2 + \alpha_3^*$	1.446	0.272	5.310	0.000
Weighted Statistics				
R-squared	0.248	Mean dependent variable		-0.005
Adjusted R-squared	0.227	S.D. dependent variable		0.221
S.E. of regression	0.195	Sum squared residuals		28.862
F-statistic	11.429	Durbin-Watson statistic		2.071
Prob(F-statistic)	0.000			
Unweighted Statistics				
R-squared	0.207	Mean dependent variable		-0.003
Sum squared residual	29.146	Durbin-Watson statistic		2.142

Note: * stands for the long term solution parameter in the equation below, i.e., in brackets.

$$\Delta \log(M_{t,i}) = \alpha_2 \Delta \log\left(\frac{P_{t,i}^M}{P_t}\right) + (\alpha_1 - 1) \left[\log(M_{t-1,i}) - \frac{\alpha_{0i}}{\alpha_1 - 1} - \frac{\alpha_4}{\alpha_1 - 1} t - \frac{\alpha_5}{\alpha_1 - 1} t^2 - \frac{\alpha_6}{\alpha_1 - 1} d_{1t} - \frac{\alpha_7}{\alpha_1 - 1} d_{5t} - \frac{\alpha_2 + \alpha_3}{\alpha_1 - 1} \log\left(\frac{P_{t-1,i}^M}{P_{t-1}}\right) \right]$$

Conclusions

- Overall, the results indicate that farmers' supply of milk is price responsive. **The price elasticity of the supply in the short term is equal to 0.6 whilst in the long term is 1.44.**
- This indicates that farmers' revenues not only benefit from an increase in the price of milk but also from the increase in the quantity produced. **An increase of 1% in the real price would increase revenues by 2.45%.**
- Furthermore, this may indicate the possibility that domestic producers could significantly increase their supply of milk and, therefore, reduce the idle capacity present in processor plants. However, that would require significant adjustment in the real price of milk. **In practice, the nominal price of milk is infrequently adjusted by processors.**
- The negative value of the price lag in the equation indicates that the long term effect is not as high as it could be. One could speculate that this could be due to the reaction of the underlying informal sector to an adjustment in the formal sector price. This requires further exploration.
- Finally, note that this work has been based on 16 MBGs that have steadily been providing milk during the entire period. If we were to include other MBGs with more erratic behaviour, one would expect a much lower response. Therefore, **one could conclude that in addition to fair prices for producers, there is still work to be done to increase productivity.**

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