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Determinants of Sugar Market Performance under Imperfect Market Conditions: Empirical Evidence from Kenya *(Pp 1-16)*

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Abstract
This study investigates market (supply and demand) factors causing high pricing, which influences performance of the locally manufactured sugar from the six (n=6) manufacturing firms in Kenya. The study was based on Industry competitiveness model (Siggel, 1995, Markusen, 1992 and; Kasekende, 1994). Empirical results reveal that consumption of sugar in Kenya varies from an average rate of about 2.2% whereas sales of sugar registered an average of 2.1%. From this analysis the study unveils a market deficit of locally produced sugar that falls below market demand. Correlation analysis between sales and consumption of local sugar for the same period (1996-2006) shows a negligible 0.155 but with significance of 0.67. The study concludes that price related factors significantly contribute to poor performance of local sugar manufacturing firms under the prevailing imperfect market conditions in Kenya. The study recommends that diversifications are crucial for sugar subsector if the sugar firms have to

maximize revenues and become more competitive both at local and regional markets.

Key Words: Performance, Sugar firms, Sugar, imperfect market, demand, and; supply

Introduction

The integration process in global markets have become critical and in particular, the emergence of regional economic blocs portraying different experiences in trade in different regions of the world. Some studies reveals positive impacts in most developed countries like in the case of EU, a total contrast is manifested in the case of developing countries. Like most developing countries participating in trade blocs arrangements, Kenya has experienced an influx of imported goods; amongst them is sugar from COMESA member states, which has significantly skewed the local sugar market in favour of imported sugar. In result, some sugar manufacturing firms have closed business which has not just largely affected the livelihood of communities solely dependant on sugar cane farming in western Kenya but equally caused adverse impact on Kenya's National income. Kenya's sugar industry support the livelihoods of about twenty percent of the 40 million populations and contribute about ten percent of GDP.

Given such significant role of sugar industry to Kenya's economy and the role of sugar product in general, a market factor analysis is necessary to inform sugar industry organization in Kenya and other countries similarly engaged in trade bloc arrangements. Kenya is a net importer of sugar of approximately 200,000 metric tonnes per annum, which implies consumption level (domestic demand) exceeds production (domestic supply) (Fig 1). Hence, the deficit is compensated by sugar imports from low cost sugar producing countries in the COMESA region.

The cheap sugar imports under the COMESA protocol have significantly affected the sales performance of the local sugar. Thus, sales turnover have significantly remained below the production level (Fig 1) in spite of the domestic sugar market being in permanent deficit. Local sugar manufacturing firms in Kenya for example, experienced closing sugar stocks estimated at 28,113.3 Metric tonnes per annum for the period 1996-2005, which according to Kenya sugar Board, a national body mandated to manage sugar issues in the country, largely attributed to high pricing of domestic sugar against cheaper imports. The trend has persisted, thus the need to devise

remedial measures that would sustain the domestic sugar industry in an imperfect market condition.

Focus of the Study

With the progress of the COMESA and liberalization of member countries' economies, Kenya's sugar manufacturing firms have remained uncompetitive in both local and regional market. The performance has slowed done and the future for the sugar firms seems grim. This study is a critical assessment of the liberalized market conditions characterized by imperfect markets. The focus is to present empirical evidence of market determinants in sugar subsector that impacts on the performance of Sugar manufacturing firms and project what the future would be/holds for the sugar sub-sector in Kenya. The research results would add knowledge and contribute to theory development critical for academia and policy makers in the sugar sub-sector in the East African region and Kenya in particular.

Objectives of the Study

This study is guided by the following specific objectives:

1. To identify competitive market factors for the sugar manufacturing firms in Kenya

2. To assess the relationship between domestic sugar retail prices and sugar sales in Kenya

3. To determine whether or not there is a significant relationship between market factors and performance of Sugar manufacturing firms in Kenya.

Hypothesis of the Study

H_o : There is no significant relationship between market factors and performance of sugar manufacturing firms at 0.05 level of significance

H_1: There is significant relationship between market factors and performance of sugar manufacturing firms at 0.05 level of significance

Scope and Limitations of the Study

A census survey of the seven sugar-manufacturing (n=7) firms in Kenya adequately portrayed the performance trend of the industry. These sugar-manufacturing firms are all located in western Kenya, which has favourable

climate and soil for sugar cane farming. The study overly, considered average production and sales of each firm in the period from 1995-2005.

Theoretical Framework

The study was based on Industry competitiveness model (Siggel, 1995, Markusen, 1992, Kasekende, 1994). A regression application of the model identified significant factors that determine performance of the sugar industry under competitive market conditions. According to Siggel (1995) and Markusen (1992), industrial competitiveness at macroeconomic level, means capacity of a production unit to profitably and durably win a large share of its market, hence competitiveness is proxied by sales volume. Thus, it entails concept of productivity as an approximation of competitiveness (Markusen, 1992).

Kasekende and Ssemongerere (1994) classified the indexes of industrial competitiveness into supply and demand indexes, which use aggregated microeconomic models to identify supply and demand factors for specific commodities. Performance of sugar industry was measured by sales turnover based on the demand and supply factors as aggregated market factors.

Sugar industry performance was modeled from the above supply and demand factors.

Sales Performance (S_p) = f (supply factors S_f and demand factors D_f).

Where

S_p – Sales performance ; S_f – Supply factors; D_f – Demand factors

Thus the model

$$S_p = f(S_f, D_f)\qquad\qquad 1.1$$

Model Specification

The exogenous variables were decomposed and model specified as;

$$S_p = \alpha_1 - \beta_1 SC_p - \beta_2 ExFS_p + \beta_3 T_{eff} - \beta_4 DSR_p - \beta_5 ISR_p + \beta6 SC_1 + \varepsilon \quad 1.2$$

Where;

S_p – Performance of the sugar industry based on the sales performance;

SC_p –Sugar cane prices in Kshs/Tonne;

$ExFS_p$ – Ex Factory sugar prices in Kshs/Tonne;

T_{eff}, -Technical efficiency expressed as ratio of tonne cane per tonne sugar (TC/TS);

DSR_p – Domestic sugar retail price in Kshs/Kg;

ISR_p –Imported sugar retail price;

SC_l- Sugar consumption levels in tonnes;

ε -   Random term;

α_1- Autonomous performance;

β_1--β_6 - coefficients of the independent variables

An application of backward regression analysis systematically tested the hypothesis. It reduced the model to only significant determinants of the industry performance .The method computed "t" values that are significant in a two-tailed test at 0.05 significance level and (df =9) .

Research Methodology of the Study
The findings of the study are derived from sugar manufacturing sector in Kenya. The sugar industry consists of seven manufacturing firms (n=7) which are all included in the cross section survey. Structured Questionnaires were administered on key informants for the primary data while desk top reviews provided relevant secondary data for analysis.

Multiple Regressions process established the relationship and magnitude between the market factors (independent variables) and sales turnover (dependent variable).The task of the multiple regressions explained the variance of sales turnover by estimating the contributions to this variance by the market factors. (Kerlinger and Pedhazur, 1973).

Backward multiple regression analysis involved all the predictor variables (market factors), initially entered into the regression model, and then individual predictor variables got deleted whenever they did not make significant contribution to sales performance. Equations were estimated in linear forms to establish the significance and elasticity's of the market factors (Kerlinger & Pedhazur, 1973, Hickle, Wiersman & Jurs 1994).

The study statistically tested for each of problems common to multiple linear regression analysis such as   multicollinearity, autocollinearity and heteroscedasticity. A test statistic for presence of intercorrelations by correlation matrix (table 1), Durbin Watson *d* statistic test (table 4) and

Spearman's rank correlation test (table 3), which according to Koutsoyannis (1998-239) are the revised Frisch's confluence analysis which generally are applicable in market analysis. The results revealed insignificant intercorrelations.

Empirical Results and Discussions
The results of the study have been analysed in a structured manner consistent to the purpose of the study which primarily discusses issues of open market competition and expounds on   empirical evidence from Kenya's sugar manufacturing industry. My presentation is in the following order; First, the performance trend of the sugar manufacturing industry and Two,   analysis of the market factors significant to performance of sugar manufacturing firms.

Performance of the Sugar manufacturing firms in Kenya
The study expounds on the performance trend of the sugar-manufacturing firms under imperfect market conditions in Kenya. Fig 2 shows the domestic sugar sales growth and domestic sugar consumption growth rates during the ten-year period (1996-2005) in Kenya.

Inter temporal Sugar Consumption pattern exhibited dynamic trend on the positive levels for the ten year period while intertemporal sales pattern exhibited both positive and negative variations (Fig 2). The sales dynamics, moving across positive and Negative divergences is attributed to high pricing of domestic sugar. Percentage analyses of rates of change indicate that, consumption changed at an average rate of 2.2% while sales was at 2.1%, the difference being market deficit. The market deficits imply that the amount of sugar produced locally fall below local market demand. However, the local sugar manufacturing firms experience closing stocks at an average of 28,113.3 metric tonnes annually. Unsold stocks in the local market by the local firms indicate that, domestic sugar is highly undesirable due to pricing effects. The manufacturing firms have attributed their pricing to high production costs. A Further consideration of correlation between sales and consumption of sugar for the same period (1996-2006) by application of Pearson's is 0.155 which is significantly below 0.5.

Multicollinearity analysis (table 1) revealed that only two variables (Technical efficiency and domestic sugar retail price) showed some intercorrelations to sugar cane price. Further observation of their significance revealed that they comparatively had the lowest significance at 0.016 and 0.20 respectively.

A correlation analysis between sales and each case of the exogenous variables were investigated to further shed more light on the insignificant intercorrelations.

First, positive relationship (fig 3) exists between technical efficiency and sugar sales with coefficient of determination (R^2) of 0.088. This implies that technical efficiency has potential to improve on local sugar competitiveness by 8.8%. Further, improvement on the technical efficiency would result into increase in sales by 43.86 times and vice versa. This conforms to economic priori conditions where improved technology yields better performance.

However the minimal value of coefficient of determination (R^2) 0.08, which is far much below 0.5 shows a very insignificant effect of the intercorrelations (Mukras, 1993). This imply, technical efficiency could not be singled out as a policy target area to improve on the performance of sugar-manufacturing firms under liberalised market conditions

Second, an intercorrelations analysis between domestic sugar retail prices and sugar sales (Fig 4) show that there is an inverse relationship between the variables with a coefficient of determination of 0.259%. This imply that domestic sugar retail prices could account for 25.9% variability on sale of sugar and any change in domestic sugar retail prices would have an inverse effect of 7.31 times. This conforms to the economic theory which explains the law of demand.

The minimal value of R^2 0.259 compared to 0.5, manifests insignificant effect of the intercorrelations (Mukras, 1993). Hence, domestic sugar retail prices cannot be a policy candidate to improve the performance of sugar-manufacturing firms

Further intercorrelation analysis of the four independent variables revealed the following R^2 values; sugar cane prices (SC_P) 21.1%, Ex factory sugar prices ($ExFS_p$) 33.5%, Imported sugar retail prices (ISR_p) 0.8% and sugar consumption levels (SC_l) 20.8% which are all below(0.5). According to Mukras (1993) when R^2 of a variable is below 0.5 it shows insignificant intercorrelations among the variables thus, there is no serious existence of multicollinearity problem among the explanatory variables of the study model.

This could imply some difficulty to separate the relative influence of the explanatory variables to formulate specific industry competitive policies. According to Mukras (1993), where multicollinearity test fails to identify a

set or subset of the estimates, policy formulation be based on the significant estimates. This is because policy formulation generally needs reliable information on the structural coefficients, particularly under circumstances, which does not involve forecasting.

Statistic test for heteroscedasticity by use of Spearman's rank correlation commonly applicable to small sample surveys suggests that Spearman rank correlation values exceeding 0.5 imply presence of heteroscedasticity and vice versa (Koutsoyannis, 1977).

From the Spearman's rank correlation coefficient table 2, values are; sugar cane (-0.256), Technical efficiency (0.139),Ex factory prices (0.042),domestic sugar retail prices (-0.006), Imported sugar prices (0.128),and sugar consumption(0.042).All the correlation coefficients are below 0.5 ,hence the study confirmed the absence of heteroscedasticity amongst the independent variables.

In further consideration of the intercorrelation problems under market analysis, Durbin Watson *d* statistic test ($2 < d < 4$) for autocorrelation shows value of 2.340 (table 3) which suggests weak negative autocorrelation.

According to Mukras (1993), where multicollinearity, heteroscedasticity and autocorrelation test fails to identify a set or subset of the estimates, policy formulation for industrial organization would suitably be based on the common characteristics of significant estimates, because policy formulation needs reliable information on the structural coefficients, particularly under circumstances, which does not involve forecasting. Hence, the study proceeded to analyse the significant factors to performance of the sugar-manufacturing firms under a competitive market conditions by use of multiple regression analysis and *t* statistic test for the study hypothesis.

Competitive Market Factors for the Sugar Manufacturing Firms in Kenya

This section provides empirical evidence of the significant market factors to the performance of the sugar-manufacturing firms in Kenya. Multiple regression of the industry competitive model and *t* test determined the coefficients and levels of significance of the market factors to the performance indicator.

$$Ps = \alpha_1 - \beta_1 SC_p - \beta_2 ExFS_p + \beta_3 T_{eff} - \beta_4 DSR_p + \beta_5 ISR_p - \beta_6 SC_1 + \varepsilon$$

Backward regression analysis determined the coefficients of the study variables in the model:

The backward regression analysis method reduced the model to show only significant variables. The reduced model to:

$$Ps = \alpha_1 - \beta_1 SC_p - \beta_2 ExFS_p - \beta_4 DSR_p - \beta_5 ISR_p + \varepsilon$$
$$1.3$$

The signs of the coefficients conform to economic priori conditions. Thus the model expressed in real coefficient terms as:

$$Ps = 5.6 - 1.997 SC_p - 1.25 ExFS_p - 0.59 DSRp - 0.613 ISR_p + \varepsilon$$

The equation shows that sugar cane price has a negative coefficient, this confirmed economic prior condition, where the price of factor inputs inversely and linearly affects the sales of the final product (normal law of demand).   Similarly, imported sugar price with a negative coefficient confirmed the economic theory where unit change in substitute product (imported sugar) price has an inverse effect on its alternative product sales turnover, which in this case is domestic sugar (effects of related goods on demand). Hence, the study proceeded to test the hypothesis that there is no significant relationship between the market factors and performance of sugar manufacturing firms in Kenya.

Student *t* statistic test (Table 4), identified the significant independent variables. The method of backward regression, computed only significant (*'t'*) values, in a two tailed 't' test at a level of 0.05 as commonly applicable in industrial organization studies. The critical point of acceptance or rejection of the null hypothesis at $t_{0.05} = \pm 2.262$ at df 9. Only four of the six independent variables are significant in determining sales turnover. These are sugar cane price (SCp) $|t| = -8.401$, Ex-factory sugar prices (ExFS$_p$) $|t| = 6.591$, Imported sugar prices (ISRp) $|t| = -4.176$ and Domestic sugar prices (DSRp) $|t| = 3.269$ all determined to be   outside the $|t| = \pm 2.262$ curve .Therefore the study rejected the null hypothesis that these particular market factors were not significant to the performance of the sugar industry by accepting the alternative hypothesis that they are significant. These four significant variables share a common fact that they are all price related. Hence, effective competitiveness of sugar manufacturing firms under the imperfect market conditions require a closer consideration of price related factors. Orphelie (2005) observed that such situations required techniques, which many sugar-

producing countries have adopted to offer sugar at lower prices in the emerging liberalized sugar market.

A summary of the regression model (Table 4) shows that the significant variables had a coefficient of determination (R^2) of 0.942; this imply that the significant explanatory variables accounted for 94.2% of sales turnover of the industry. This is a high percentage of variability in the dependent variable (sales) considering that only four of the independent variables are significant, since all other factors omitted could only explain 5.8 percent of any change ($\varepsilon = 0.058$).

Conclusions

From the empirical evidence, price related factors are significant to performance of the sugar industry under the imperfect market condition which fashioned by the economic integrations between Kenya and other regional states. Whenever, any sugar industrial organization would target performance based on sales, then sugar pricing factors should be of due concern. The Sales decline observed, is attributed to many reasons such as; high local sugar prices as compared to imported sugar, high sugar cane production costs, sugar manufacturing costs and influx of cheap imported sugar. This study concludes that price related factors significantly contributed to poor performance of local sugar manufacturing firms in Kenya under the imperfect market conditions.

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Fig1.National sugar consumption, production and sales (1995-2005)
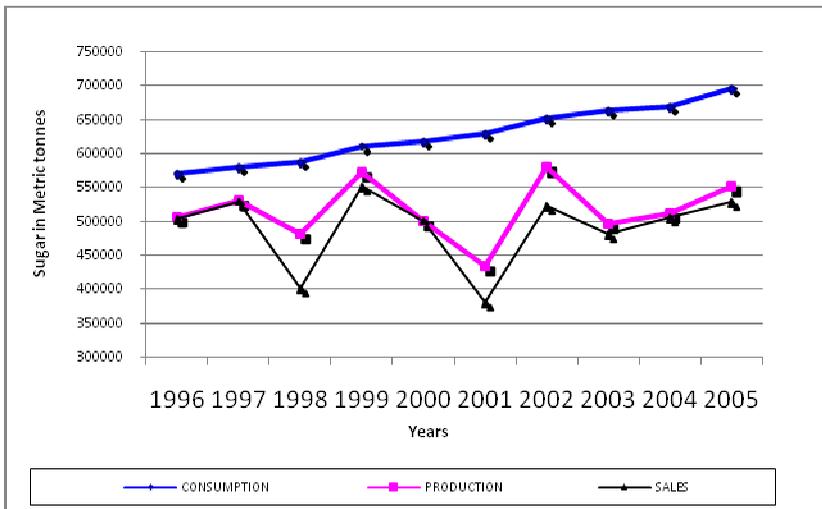
Figure 2: Domestic sugar consumption and sales growth rates
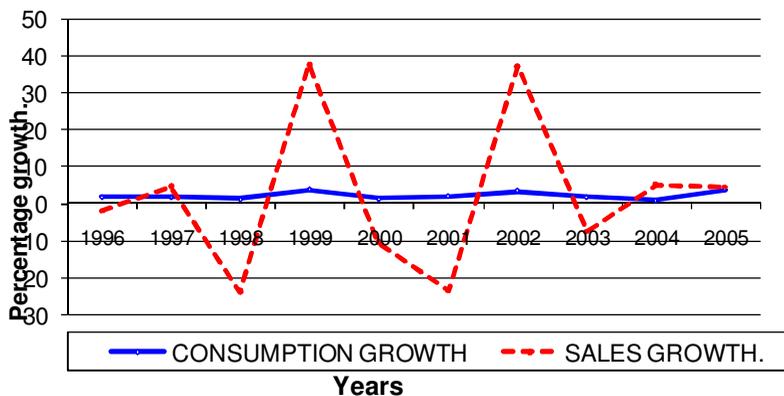
Fig 3: Correlations between technical efficiency and sugar sales (1995-2005)
Source: KSB, 2005
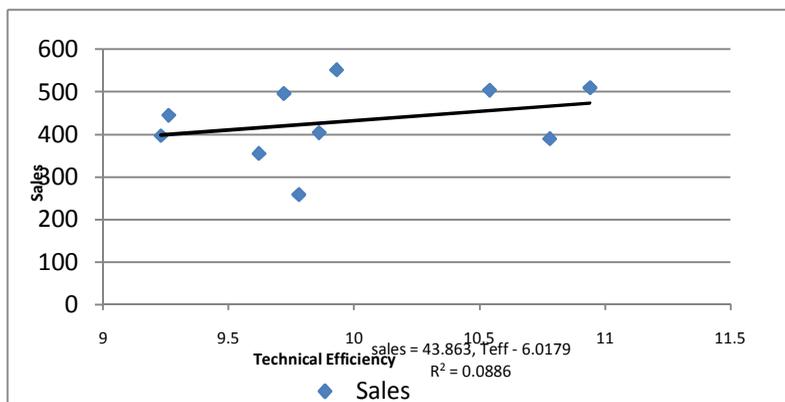
Fig4: Relationship between domestic sugar retail prices and sugar sales (1995-2005)

Sales = -7.310DSRp + 778.9
$R^2 = 0.259$

◆ Sales ── Linear (Sales)
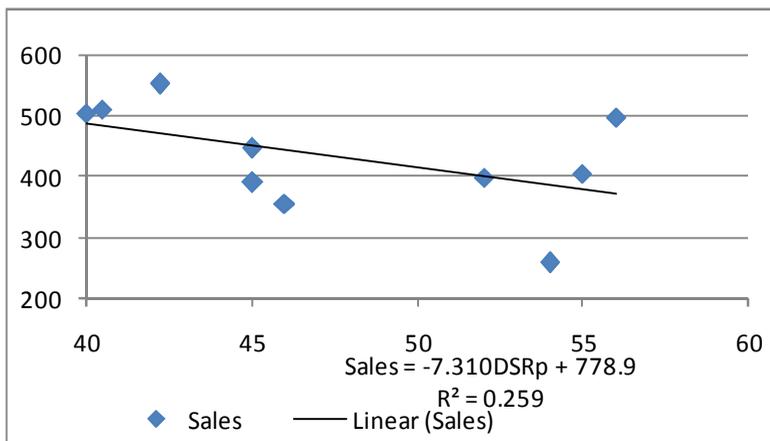
Y-Axis – *Sales*   X-axis – *Domestic Sugar Retail Prices*
Source: K.S.B, 2005

Table1: Correlation matrix for the independent market factors

Correlatio

		SCp	ExFSp	Teff	ISRp	DSRp	SCI
SCp	Pearson Correlation		1				
	Sig. (2-tailed)		.				
	N		1				
ExFS$_p$	Pearson Correlation		-	1			
	Sig. (2-tailed)		.18	.			
	N		1	1			
T$_{eff}$	Pearson Correlation		- *	.29	1		
	Sig. (2-tailed)		.01	.40	.		
	N		1	1	1		
ISR$_p$	Pearson Correlation		-	.09	.58	1	
	Sig. (2-tailed)		.12	.80	.07	.	
	N		1	1	1	1	
DSR$_p$	Pearson Correlation		.71 *	-	-	-	1
	Sig. (2-tailed)		.02	.13	.09	.76	.
	N		1	1	1	1	1
SC$_l$	Pearson Correlation		.58	-	- *	-	.59 1
	Sig. (2-tailed)	.077	.152	.001	.232	.071	.
	N	10	10	10	10	10	10

*. Correlation is significant at the 0.05 level (2-tailed).

Table 2: Correlation matrix between estimates of error term and independent variables

	Sugar cane prices	Technical Efficiency	Ex Factory Sugar price	Domestic Sugar price	Imported sugar price	Sugar consumption
Corr Coeff	-0.256	0.139	0.042	-0.006	0.128	0.042
Sig(2 tail)	0.475	0.701	0.907	0.987	0.725	0.907
N	10	10	10	10	10	10

Source; Survey data 2007

Table 3: The Coefficients and t values of the regression model

Model	Standard Coefficients Beta	T –test values t
Constant α	5.6	7.948
Sugar cane prices(SCp)	-1.997	-8.401
Ex Factory Sugar Prices(Ex-FSp)	-1.250	6.591
Domestic Sugar Retail Prices(DSRp)	-0.589	3.269
Imported Sugar Retail Prices(ISRp)	-0.613	-4.176
Technical efficiency(Teff)	-	-
Sugar Consumption level (SCl)	-	-

Source; Survey, 2006

Table4: Regression model summary

Model	R	R square	Durbin Watson d statistic
$Ps = \alpha_1 - \beta_1 SC_p + \beta_2 ExFS_p + \beta_4 DSR_p - \beta_5 ISR_p + \varepsilon$	0.971	0.942	2.340