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Analysis of Determinants of Coffee Farm Gate Prices in Uganda

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Abstract

Coffee plays an important role in the economy and livelihoods of Uganda's rural population. As is the case of many agricultural commodities, price volatility is a major concern for stakeholders in the coffee market. Most of Ugandan coffee is exported directly by coffee processors and therefore there is no active domestic wholesale market. In such cases, the point of competition is the border. The processors/exporters receive the full export price equivalent of the world prices depending on the point of delivery. A number of studies indicate that if high demand appears in world markets, such effects could transmit to local markets. This study aims to complement the available literature by examining the relationship between coffee farm gate prices and two major determinants that is the export prices and local production. The study used an ordinary least squares regression model. While the model has two explanatory variables, only the export price significantly determines the farm gate price which accounts for about 57% of the variation in the farm gates. A unit increase in export price would increase farm gate price by 42.5%. Local production has no significant effect on the level of farm gate prices. Further research is required to examine the trend of coffee export prices so as to derive forecasts for future export prices which can be used to predict farm gate prices for better planning and decision making.

Keywords: Coffee; Farm Gate; Prices; Determinants.

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1. Introduction

This chapter contains the background of to the study, statement of the problem, objectives of the study, hypotheses as well as the scope and significance of the study.

1.1 Background

From 2006 to mid-2008 the international prices of agricultural commodities increased considerably, by a factor larger than two. This upward trend in agricultural prices captured the world's attention as a new food crisis was emerging. Several explanations for these movements in prices, ranging from demand-driven forces to supply shocks, have been provided by analysts, researchers, and development institutions [1]. The prices of China's agricultural products have been unstable for about ten years. The abnormal volatilities are frequent, which have a bad effect on farmers' production decision making and people's consumption. For the fluctuation of agricultural products prices, some researchers analyzed fluctuation causes and effects, the other researchers focused on agricultural prices prediction. Some researchers developed various methods to predict agricultural prices besides the traditional regression analysis method, including the neural networks, the grey method, the combinational model and Gray's theory, etc. [2].

As is the case of many agricultural commodities, price volatility is a major concern for stakeholders in the world coffee market. In exporting countries, volatility is a source of uncertainty in relation to export earnings and tax revenues, as well as instability in producer incomes. In importing countries, price volatility makes it difficult for roasters to control processing costs and affects profit margins for traders and stockholders, making their activities less attractive [3].

Africa is the region with the largest number of coffee producing countries: 25 as opposed to 11 in Asia & Oceania, 12 in Mexico & Central America and 8 in South America. Production in Africa has exhibited negative growth over the last 49 years. Average production was 19.4 million bags per crop year in the period between 1965/66 and 1988/89 when the coffee market was regulated under the export quota system. During the period between 1989/90 and 2014/15 under the free market, average production per crop year was 16 million bags. During those two periods, Africa's share of world production has hence decreased from 24.9% to an average of 14%. Production in crop year 2014/15 is around 16.9 million bags, or 12% of the estimated world production of 141.7 million bags. Of this, an estimated 10.4 million bags were expected to be produced by just two countries Ethiopia and Uganda. Reference [4] Coffee is a major contributor to the economies of East African Community (EAC) members. However, recently, export of the crop has declined due to internal and external forces of supply and demand [5].

The export sector of most eastern and central African countries is dominated by coffee, which accounts for over 70 percent of foreign exchange earnings from total exports (USAID 2010).However, coffee output and quality in the sub region have declined. More recently, it was noted that coffee production decreased by 45 percent in 2011 compared to that in 2010 in Burundi alone. This was due to the decline in coffee prices that triggered poor coffee husbandry practices and crop over maturity [5]. Agricultural prices in Uganda develop within a complex

system, and can be analyzed in several different ways, potentially yielding different results. Spatial price transmission between different local equally-sized markets in Uganda, generally, is not that variable, but differs due to transportation costs [6]. However, prices differ greatly along the supply chain, where the price of common agricultural goods can double from farm to city. Additionally, prices at local markets (no matter the size) can differ due to local shocks or due to availability, i.e. the local harvest and how often traders operate in a local market. Due to the complexity of the value chain, smallholders, who are at the bottom of the chain for agricultural goods, might not experience rising prices following increased demand [7].

Coffee plays an important role in the economy and livelihoods of Uganda's rural population. Based on the available value chain analysis studies, coffee market in Uganda does not include a wholesale market. However, the market includes other agents such as millers and rural traders. Most of Ugandan coffee is exported directly by coffee processors and therefore there is no active domestic wholesale market. In such cases, the point of competition is the border. The processors/exporters receive the full export price equivalent of the world prices depending on the point of delivery. Therefore, the observed price gap is zero (no difference between the prices received by exporters and reference prices). The observed nominal rate of protection can be interpreted as the tax rate on coffee for the different market participants since quantitative restrictions are not imposed in this case. In other words, coffee exporters appear to receive prices very close to what they would have received in world market given all the currently observed market access costs.

However, the situation for coffee farmers is slightly different. Given the current profit margins which are generally low for processors and exporters, coffee growers began to receive some slight price incentives in recent years in the form of positive price gap. However, when reference prices are adjusted for excessive profit margins, the adjusted price gaps in recent years are often small and variable over time [8].

This study aims to complement the available literature by examining the relationship between coffee farm gate prices and two major determinants that is the export prices and local production using an ordinary least squares regression model.

1.2 Problem Statement

Accurately measuring prices and their rate of change is central to almost every economic issue [9]. Some researchers have used a dynamic vector autoregressive (VAR) model to investigate price transmission for agricultural commodities between world markets and the Ugandan market in an attempt to determine the impact of world market prices on the Ugandan market based on the realization that price formation is not a static concept. In the 1990's with high coffee prices on the world market, prices in Uganda were strongly connected to world prices, and did not depend on the oil price. This indicates that if high demand appears in world markets, such effects could transmit to local markets [7].

Additionally based on the available value chain analysis studies, the coffee market in Uganda does not include a wholesale market. However, the market includes other agents such as millers and rural traders. Most of Ugandan coffee is exported directly by coffee processors and therefore there is no active domestic wholesale market. In

such cases, the point of competition is the border. The processors/exporters receive the full export price equivalent of the world prices depending on the point of delivery [8]. This means export prices could have a direct effect on the farm gate prices since buyers of agricultural products in Uganda determine the price at which they buy the products rather than the famers.

Also, spatial price transmission between different local equally-sized markets in Uganda, generally, is not that variable, but differs due to transportation costs [6].Additionally, prices at local markets (no matter the size) can differ due to local shocks or due to availability, i.e. the local harvest and how often traders operate in a local market [7]. This implies that local harvest is also a determinant of farm gate price.

These studies however do not give adequate information on the factors influencing the level of farm gate prices. This study therefore aims to complement the available literature by examining the relationship between coffee farm gate prices and two major determinants that is the export prices and local production using an ordinary least squares regression model.

1.3 Objectives

1.3.1 Main objective

To examine the determinants of coffee farm gate prices in Uganda.

1.3.2 Specific objectives

- To establish whether local coffee production significantly determines farm gate prices.
- To establish whether export prices significantly determine farm gate prices.
- To establish whether both factors jointly determine farm gate prices.

1.4 Hypotheses

- The value of local coffee production does not significantly determine farm gate price.
- The export prices do not significantly determine farm gate price.
- All the factors do not jointly determine coffee export prices.

1.5 Significance

The findings of this study will be helpful to management, policy makers and stake holders in establishing appropriate measures to stabilize and increase coffee farm gate prices

The findings of the study will also be helpful to farmers, buyers and all dealers in the coffee production chain to plan their production levels, forecast future price levels and predict future fluctuations so as to minimize losses and increase profits.

1.6 Scope and Coverage

The study was conducted using national level data compiled from the Uganda Coffee Development Authority because it is both complete and reliable. In terms of coverage the study covered a period of 4 years from 2012 to 2015 as it is the most recent period which will increase the usability and relevance of the study findings. Additionally the study focused on Robusta coffee since it is the major type produced in Uganda (about 80%).

2. Methodology

2.1 Introduction

This chapter looks at the frame work of methodology which was used to achieve the stated objectives. This includes collection and presentation of data, analysis, hypothesis testing and presentation of the results.

2.2 Data Collection

Data on monthly farm gate prices was compiled from monthly reports from the Uganda coffee development authority.

Data on monthly exports of coffee was used to estimate total production since majority of Uganda's coffee production is exported. Export prices were derived from the value of exports indicated in the monthly reports and were converted from US dollars to local currency using the average nominal interest rates for each month. The interest rates were obtained from the Bank of Uganda Website.

2.3 Data Analysis

Data was analyzed using Microsoft excel and STATA and was conducted as follows; Descriptive statistics were generated and used to describe each of the variables.

Bivariate analysis was done using spearman's rank correlation coefficient and tested for significance at a 5% level of significance using STATA.

The data was tested for presence of heteroskedasticity, autocorrelation and multicollinearity using the relevant tests using Microsoft excel.

Model

Export price= α+ β1local production +β2 export prices+ ε_i *(2.1)*

Test for overall significance of the model.

Ho: $\beta1=\beta2=\beta3=0$

Ha: Not all the βi's are simultaneously equal to zero

The F statistic was used where

$F = (\frac{ESS}{k-1})/(\frac{SSR}{n-k})$*(2.2)*

Where ESS, SSR, k, n are the explained sum of squares, sum of squared residuals, number of parameters and number of observations respectively.

If F> Fα, (k-1, n-k), the null hypothesis is rejected otherwise it is not rejected. Where Fα, (k-1, n-k) is the critical F value at the α level of significance and (k-1) numerator degrees of freedom and (n-k) denominator degrees of freedom.

Test for significance of individual coefficients.

Ho: β =0

Ha: β is not equal to zero

A t-statistic was used where

$t = \beta\hat{}/\mathrm{SE}(\beta\hat{})$*(2.3)*

Where $\beta\hat{}$ is the OLS estimate of the true coefficient and SE ($\beta\hat{}$) is its standard error.

If t > t α, k-1, the null hypothesis will be rejected otherwise it will not be rejected.

Assumptions about the error term

- Normality of the error term. This means that the error terms are symmetrically distributed around their mean and their distribution is determined by the mean and the variance.
- Zero mean. This means that the error term has a value of zero on average.
- Homoscedasticity. This means that the variance of the error terms is constant in each period
- Non autocorrelation. This means that the error terms of different observations are independent
- The error term and the explanatory variables are independent.

3. Results

3.1 Descriptive Analysis

Monthly farm gate prices for Robusta coffee in Uganda for the years 2012 to 2015 averaged about sh. 2000 per kilo of dry cherries with a standard deviation of 264. The highest price was sh. 2350while the lowest was sh.1250 per kilo.

Monthly export prices in local currency for Robusta coffee averaged about sh.4987.3 per kilo with a standard deviation of 468.615. The highest export price was sh.6028. Per kilo while the lowest was sh.3942.2 per kilo.

Local production as estimated by the volume of exports averaged at 127876.9 tons with a standard deviation of 35870.9. The highest and lowest levels of production in the period under study were 209499.6 tons and 42454.8 tons respectively.

3.2 Bivariate Analysis

. Spearman FARMGATEPRICEKGUSH EXPORTPRICEKGUSH, stats(rho obs p) star(0.05)

Number of obs = 48

Spearman's rho = **0.6934**

Test of Ho: FARMGATEPRICEKGUSH and EXPORTPRICEKGUSH are independent

Prob> |t| = **0.0000**

There is a strong positive relationship between coffee export prices and farm gate prices. Which implies farm gate prices will increase with an increase in export prices.

Number of obs = 48

Spearman's rho = **-0.0576**

Test of Ho: FARMGATEPRICEKGUSH and PRODUCTION60KGBAGS are independent

Prob> t = **0.6973**

There is no significant relationship between coffee farm gate prices and local production.

spearman EXPORTPRICEKGUSH PRODUCTION60KGBAGS, stats(rho obs p) print(0.05)

Number of obs = 48

Spearman's rho = **-0.0525**

Test of Ho: EXPORTPRICEKGUSH and PRODUCTION60KGBAGS are independent

Prob> t = **0.7228**

There is no significant relationship between production and coffee export prices.

3.3 Model

3.3.1 Test for heteroskedasticity

Using the Park test

Hypotheses

Ho: There is no heteroskedasticity in the residuals.

Ha: There is heteroskedasticity in the residuals.

Intercept = 5.903341577 p value= 0.892556 n= 48

We accept the null hypothesis and conclude that there is no heteroskedasticity in the series (p>0.05).

3.3.2 Test for autocorrelation

Using the Breusch pagan test for serial correlation

Hypothesis

Ho: There is no serial correlation in the residuals.

Ha: There is serial correlation in the residuals.

Intercept= 17.56196021 p value= 0.953131 n=48

We accept the null hypothesis and conclude that there is no serial correlation in the residuals (P> 0.05).

3.3.3 Test for multicollinearity

Hypothesis

Ho: Export price is not correlated to local production.

Ha: Export price is correlated to local production.

F= 0.131451 p value = 0.7185933 n=48

We accept the null hypothesis and conclude that the explanatory variables are not correlated (P> 0.05).

3.3.4 Model derivation

Farm gate price = -134.05-6.41194E-08 PRODUCTION + 0.424675951EXPORT PRICE *(3.1)*

(296.3786) (0.000433) (0.055257)

N =48, SER=177.2708042, R^2 = 0.753842946

The variables jointly explain about 75.4% of the variation in monthly farm gate prices in the 4 years under consideration.

Export price significantly predicts the farm gate prices (P< 0.05). A unit increase in export price would increase farm gate price by 42.5%.

4. Conclusions and Recommendations

4.1 conclusions

While the model has two explanatory variables, only the export price significantly determines the farm gate price which accounts for about 57% of the variation in the farm gates. The relationship between export prices and farm gate prices is brought about by the fact that most of Uganda's coffee is exported and the nature of the supply chain which does not include a whole sale market which leads to direct interaction between exporters and producers of the coffee. The relationship between farm gate prices and export prices is positive which implies that high export prices will translate into high farm gate prices and the converse is true. The level of production has no significant effect on the level of farm gate prices. This is because most of Uganda's coffee is exported. The local market is too small to be affected by variations in production since quantities supplied will always be able to meet the demand hence unlike other agricultural products, there will not be a scarcity arising from low production or surplus resulting from over production to drive prices high or low respectively. Furthermore, domestic production has no significant effect on export prices because demand in the world's largest consumer and largest importer of Uganda's coffee (76.09% as of February 2016), European Union, has stagnated slightly at an estimated 42 million bags, averaging growth of 0.8% per year since 2012.

4.2 Recommendations

Further research is required to examine the trend of coffee export prices so as to derive forecasts for future export prices which can be used to predict farm gate prices for better planning and decision making.

4.3 Limitations of the study

The researcher met one challenge which was unavailability of data especially data on monthly coffee production which is not collected by the any institution in the National statistical system. As a result, the researcher used data on monthly exports of coffee as estimates for total production since majority of the coffee produced in the country is exported.

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