Policy Interventions of the Food Reserve Agency to Maize Grain and Maize Meal Markets in Zambia

Yoshihiro YAMADA

1

I. Summary

English Summary

This is a fieldwork report conducted in Zambia from October to December 2017 under the Global Leadership Training Programme (GLTP) provided by the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS). This study will consist one chapter of my master’s thesis. This opportunity was great to develop my master’s research but also to understand the life and culture in Zambia. Through the fieldwork, I encountered many challenges but now I am remembering them even as great memories in my heart.

Below is the summary of this research.

The Sustainable Development Goals (SDGs) was set as part of a new sustainable development agenda in 2015 and this study contributes to the achievement of Goal 2: ZERO HUNGER. Increasing price of staple foods is a very serious issue especially for people who belong to the poor group. Providing market information of those grains will benefit making food and agricultural policies better and result in mitigating the hunger of poor people.

Government’s strong interference to markets may interrupt the competition and decreases the efficiency of the markets. During 2010 to 2013, the Zambian government’s Food Reserve Agency (FRA) purchased over 80% maize grain from small-holder maize market and sold it to the selected maize millers with the strongly subsidized price. Maize millers who had no access to the FRA’s subsidized maize incurred price disadvantage. This study examines the difference of price transmission between maize grain and meal prices before and after the FRA’s subsidy program. Threshold cointegration tests, symmetric and asymmetric error correction models were employed in this study. The results indicate that the speed of adjustments towards positive deviation from the long-run equilibrium is different between before and after the FRA’s subsidy program. In another word, maize meal prices adjustment to the price decrease in maize grain price became slower after the subsidy program of the FRA, which could imply that market power of maize milling sector became relatively stronger against maize grain wholesaling and farm gate level due to the subsidy selection. I concluded that one possible reason for the recent high maize meal prices is the strong market power of maize millers in the market.

1 2nd Year Master Course Student, Laboratory of Food and Agricultural Policies, Graduate School of Bioresource and Bioenvironmental Sciences, Kyushu University, Fukuoka, Japan/Research Period; 10th Oct. to 12th Dec./Host University; University of Zambia
ザンビア国における政府の政策的介入がメイズとメイズミール市場へ及ぼす影響

本稿は、国連大学サスティナビリティ研究所が提供するグローバルリーダーシップトレーニングプログラム(GLTP)の支援のもと、ザンビア国において行ったフィールドワークの報告書である。また、本研究は修士学位論文の一つの章を構成する。

このフィールドワークを通じ、修士研究を発展させるのみならず、ザンビア現地で生活し、文化に触れることができた。多くの困難があったことは確かであるが、今思い返せばそれもよい思い出の一部として振り返ることができる。

以下は本研究の概要である。

2015年に持続可能な開発目標(SDGs)が立てられた。本研究はそのSDGsのうち目標2に掲げられている、「飢餓をゼロ」に貢献できると考える。主食となる穀物価格の高騰は特に貧困層にとっては深刻な問題となる。それらの穀物市場の情報を提供することは、よりよい食料・農業政策の策定に有益であり、貧困層の飢餓削減の一助となるだろう。

政府の市場への強い介入はその市場参加者の競争を妨げ、市場の効率性を損なわせる。2010年から2013年の間、FRAは小規模農家が生産するメイズの80%以上を購入し、その購入したメイズを一部のメイズ製粉業者へ補助金付き価格で販売した。FRAの補助金付きメイズを手に入れることができないメイズ製粉業者は価格競争の点で不利を被った。本研究はFRAの市場への介入の前後でのメイズとメイズミール価格間の価格伝達の相違を検証するものである。関値共和分検定、対称と非対称誤差修正モデルを分析に用いた。分析結果は、FRAの市場介入以前ではメイズとメイズミール価格間に正の不均衡が生じた場合の調整速度に相違が観察された。言い換えると、FRAの市場介入以前ではメイズの価格下落に対するメイズミールの調整速度は速く、FRAの市場介入後では調整速度が穏やかになっており、より下方硬直的である。それは、FRAが特定のメイズ製粉業者にのみ補助金付きのメイズを販売するという行為により、メイズ製粉業者の市場支配力がメイズ農家、メイズ卸売業者に対して相対的に強くなったことを示唆している。最後に、近年のメイズミールの高価格の原因の一つはメイズ製粉業者の市場支配力が強まったことによると結論づけた。
II. Research Activity

1. Introduction

Since the initiation of market liberalization in 1991, the Government of Zambia has been playing important roles in domestic maize markets. Kuteya and Sitko (2015) note that there are two periods of weak and strong state intervention. The first period began with the inception of the FRA in 1996 and continued to 2009, in which periods, the FRA was taking on a minority role in the domestic maize market. During the first period, the FRA purchased less than half of the available marketed maize, thus the period was characterized as active participation of private sector in the market. The second period began at the record harvest of 2009/10 marketing year. The second period is characterized as a high level of involvement in the maize market by the FRA, with on average 80% of the available maize were purchased by the FRA. Under the second period, little maize was available for private sector.

Since 2009/10 production season, maize harvests have been above 2.5 million metric tons each year in Zambia. Despite maize surpluses, there were nationwide maize meal shortages and skyrocketing maize meal prices. In response to this price spike, the Government of Zambia started heavily subsidizing the price of maize held by the Food Reserve Agency (FRA) to maize millers. Before August 2011, maize millers purchased maize from the market or from the FRA at $265 per metric tonne. However, from September 2011 to March 2012, the FRA started the subsidy program to selected maize millers, which selling maize at $140 per tonne. The FRA even provided transport for this maize to the millers’ factories, such that the maize millers’ effective acquisition price was approximately $80 per metric tonne (Kuteya and Jayne, 2012). The FRA maize subsidies were only conferred to some selected millers, not all of the maize millers in Zambia.

As a result of the thinly traded private market channels, urban and rural consumers became increasingly dependent on an access to the maize meal produced by the commercial millers. With the highly limited number of private market actors and the volume of maize held by them, the supply market of maize in Zambia has faced significant risks of shrinking supply chains between consumers and commercial processors or the FRA and processors (Kuteya and Sitko, 2015). It suggests that FRA’s strong market intervention adversely changed the structure of maize grain to meal marketing channel. So far, no research has used threshold cointegration test and analyzed the effect of FRA’s behavior on the interrelations between maize grain and maize meal markets using threshold autoregressive model.

This study, therefore, shows the empirical results that FRA’s strong market intervention seriously affected the efficiency of maize meal market based on the comparison of two different regimes. Two regimes are separated referencing Kuteya and Jayne (2012) which mentioned FRA’s subsidy was the strongest from September 2011 to March 2012. The first phase covered the period between January 2006 to August 2011 before FRA’s intervention was recognized as strong and the period of the second phase is between September 2011 to January 2017 after the strong intervention by FRA.

2. Data

The data collected and used in this study are monthly maize grain price and maize meal prices (Breakfast and White roller) provided by the Central Statistical Office of Zambia and consumer price index in Zambia from January 2006 to January 2017. The maize grain and maize meal prices are represented in Zambian kwacha (ZMW) per kg. The total number of observations is 133. All the price
data were taken logarithm and deflated using CPI, after that, they have removed its seasonality on the Web Decomp (http://ssnt.ism.ac.jp/inets/inets.html) which is provided by the Institute of Statistical Mathematics, Japan.

Figure 1. Pattern change of maize and maize meal prices.

3. Methodology

a) Unit root tests

Augmented Dickey-Fuller (ADF), Phillips and Perron (PP) and Zivot and Andrews (ZA) tests were employed to test the stationarity property and to confirm the order of integration. The appropriate lag length was determined by using Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC).

b) Threshold cointegration tests

In the Engle-Granger (1987) cointegration analysis, long-run equilibrium relationship is specified as:

\[ P_t^m = \alpha + \beta P_t^g + \mu_t \]  

Where \( P_t^m \) and \( P_t^g \) are the price of maize meals and maize grain, respectively; \( \alpha \) is intercepted; \( \beta \) shows elasticity of price transmission; \( \mu_t \) is disturbance term.

Following the Engle-Granger procedure, the residuals of the equation above are used to estimate:

\[ \Delta \mu_t = \rho_1 \mu_{t-1} + \gamma_1 \Delta \mu_{t-1} + \epsilon_t \]  

Enders and Granger (1998), Enders and Siklos (2001) provided Threshold Auto Regressive (TAR) and Momentum Threshold autoregressive (M-TAR) model to capture the asymmetric cointegration against symmetric Engle and Granger (1998) cointegration hypothesis. These tests are alternatively employed to reassure the proper adjustment process towards positive and negative deviation from the equilibrium. The threshold autoregressive model is specified as the equation below:

\[ \Delta \mu_t = \alpha + l_t \rho_1 \mu_{t-1} + (1 - l_t) \rho_2 \mu_{t-1} + \sum_{i=1}^{T} y_i \Delta \mu_{t-i} + \epsilon_t \]
\[
I_t = \begin{cases} 
1 & \text{if } \mu_{t-1} \geq \tau \\
0 & \text{if } \mu_{t-1} < \tau 
\end{cases}
(4)
\]

While the momentum threshold autoregressive model is specified as the equation below;

\[
\Delta \mu_t = \alpha + M_t \rho_1 \mu_{t-1} + (1 - M_t) \rho_2 \mu_{t-1} + \sum_{i=1}^{T} \gamma_i \Delta \mu_{t-i} + \epsilon_t 
(5)
\]

\[
M_t = \begin{cases} 
1 & \text{if } \Delta \mu_{t-1} \geq \tau \\
0 & \text{if } \Delta \mu_{t-1} < \tau 
\end{cases}
(6)
\]

Where \(I_t\) and \(M_t\) are Heaviside indicator functions; \(\rho_1\) and \(\rho_2\) are long-run adjustment coefficients towards positive and negative deviation from the equilibrium, respectively; \(T\) is the lag length; \(\gamma_i\) is short-run adjustment coefficient; \(\epsilon_t\) is white noise disturbance, and \(\tau\) is the threshold value. Chan (1993)’s method was employed for estimating the threshold value \(\tau\). First, arrange the \(\mu_t\) which is estimated by OLS in equation (1) from small to large. Second, remove the 15% from minimum and maximum and obtain remaining 70% middle of the series. Finally, apply the 70% of the series to the equation (3) and (5) and estimate the threshold value \(\tau\) which minimize the RSS (Residual Sum of Squares). The \(\tau\) obtained by this method is called super-consistent estimate value. The model selection of either TAR or M-TAR is determined by AIC and BIC.

c) Symmetric and Asymmetric error correction model

The dynamics of price transmission between maize grain and maize meals are estimated with Error Correction Model (ECM). Depending on cointegration tests, I employed both symmetric and asymmetric ECM. The symmetric ECM is expressed below;

\[
\Delta P_t^m = \mu_0 + \rho_1 (P_t^m - \beta P_t^g) \mu_{t-1} + \sum_{j=1}^{k} \delta_j \Delta P_{t-j}^m + \sum_{j=1}^{k} \theta_j \Delta P_{t-j}^g + v_t 
(7)
\]

Where \(\Delta P_t^m\) is the first difference of logarithms of maize meal prices, \(\mu_0\) is the constant term, \(\rho_1\) is error correction term representing the speed of adjustment, \(\beta\) is the elasticity of price transmission, \(\delta_j\) and \(\theta_j\) short-run adjustment coefficient, \(v_t\) is error term.

While the asymmetric ECM is estimated as follows;

\[
\Delta P_t^m = \rho_1 I_t \mu_{t-1} + \rho_2 (1 - I_t) \mu_{t-1} + \sum_{j=1}^{k} \delta_j \Delta P_{t-j}^m + \sum_{j=1}^{k} \theta_j \Delta P_{t-j}^g + v_t 
(8)
\]

Where \(\Delta P_t^m\) is the first difference of logarithm of maize meal prices, \(\rho_1\) and \(\rho_2\) are the error correction term from threshold cointegration regression representing adjustments to positive and negative shocks to the marketing margins, \(\delta_j\) and \(\theta_j\) short-run adjustment coefficient, \(v_t\) is error term.

4. Research Findings

Following the method of Abdulai (2000, 2002), I visualized the adjustment to positive and negative deviations in Figure 2 and 3. As shown in the figures, both breakfast and white roller maize meals adjust quickly to a unit reduction in maize grain price, while adjusted slowly to a unit increase in maize grain price during the regime1. Comparing the regime 1 (above) and regime 2 (below), the response to a unit reduction in maize grain price became slower in the regime 2.
Source: Author’s calculations

Figure 2: Breakfast maize meal asymmetric response (above) and symmetric response (below) to unit shock in maize grain. Notes: The figure above shows the response of Breakfast maize meal in regime 1, while below shows the response in regime 2.
5. Discussion and Conclusion

Despite the bumper production of maize grain, maize meal prices kept increasing. To account for the situation, the FRA heavily subsidized the maize grain price to selected commercial maize millers. It is obvious that the maize millers who did not receive the heavily subsidized maize grain from the FRA incurred the price disadvantage, and the market power of the selected millers maybe became stronger. Figure 1 and 2 show maize meal price response to a unit reduction in maize grain became slower in regime 2 compared to regime 1 which respectively correspond with before and after the FRA’s market intervention. The high price of maize meal is a serious problem in the country in which it is the staple food, especially for the poor population. Government’s strong participation in the market resulted in the inefficient market situation.

This study revealed that maize meal prices adjusted quickly to the reduction in maize grain price in regime 1 before the FRA’s strong presence in the market, while adjusted slowly in regime 2 after the FRA’s intervention to the market. The FRA’s maize grain purchasing activity had an effect of increasing its mean price in the market (Nkonde et al., 2011; Manson and Myers, 2012). Even though maize meal prices might have increased along with the maize grain price, this could be one reason for
high maize meal prices. Another possible explanation is the strong market power of maize millers, keeping their marketing margin. To reduce the negative effect on the market, the FRA should allow access to their maize grain for all maize millers who needs then act on measurement to mitigate the price change of maize grain with the policies which encourage market competition in maize milling sector.

Acknowledgement

This research was supported by Global Leadership Training Program (GLTP) which is provided by the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS). I express my gratitude and thankfulness to Dr. Natsuko IMAI, Ms. Aiko HORI and Ms. Rieko SATO of the UNU-IAS for their full support.

I am genuinely thankful to Dr. Jewette MASINJA and Ms. Kabwe MUSONDA of GLTP coordinator at the University of Zambia. They helped me to complete field survey and also took care of my accommodation and visa issues so that I could concentrate on my study.

Lastly, I am extremely grateful to my supervisor Professor Gelson TEMBO of School of Agricultural Science, University of Zambia. Throughout the discussions with him and his reviews and comments, I could gain new inspects every time.

References


III. Reflection to the GLTP in Africa

1. My motivation to participate in the GLTP
I applied for the GLTP for three reasons. First, I wanted to collect data on commodity prices in Zambia since I was writing my master’s thesis on the topic of food and agricultural policies of the country. Second, GLTP’s grant seemed to be a great financial support to conduct my fieldwork. With this financial support, I could experience many things in the field. At last, I thought I need the support of a Zambian supervisor to complete my master’s research because my supervisor in Japan had no strong expertise in Zambian agriculture. Actually, it was the best thing that I was supervised by Prof. Tembo at the University of Zambia. He gave me many guidance and interesting insights on my analysis. He also connected me to the people in the Ministry of Agriculture, Food Reserve Agency (FRA) and Indaba Agricultural Research Policy Institute (IAPRI) for data collection.

2. Field experiences
The data I needed for this study was maize grain and maize meal prices. I visited the Central Statistical Office (CSO) and the Ministry of Agriculture for the data. I was also conducting other two more studies at the same time so I visited some rice farmers in Luapla and Northern provinces as well.

Table 1: The locations where I visited during the field survey.

With maize farmer

At a rice field

University of Zambia

With my supervisor

Nshima with fish

With my friend’s family
During the time being in Lusaka, I stayed at a youth hostel inside the campus of the University of Zambia. It was very hot to sleep for the first two weeks after I arrived at Zambia. After the summer time, the temperature was low in the morning and evening. There were two disadvantages on the hostel. At first, many mosquitoes came inside the room from somewhere. To bring mosquito repellent is recommended. Second, wifi is not available in the room but available at a common space, sometimes not available though. It’s expensive to use the internet in Zambia. If you still buy internet bundle, you can buy the cheapest and big bundle from Zamtel. However, the hostel was great for the price, 200K per day. I never experienced water stop or hot water stop which I experienced many times in Luapla and Northern province. It’s one of the great choices in Lusaka.

The transportation from Lusaka to Luapla and Northern province was the bus. It is cheap but seats are very small for the people with the big body. My shoulder touched the person next to me all the time of almost 10 hours trip. It was a hard trip but also left in my memories.

I ate the nshima shown in the picture above on the daily basis. However, at the beginning of arrival in Zambia, I did not fit the local food and had diarrhea. So I often went to the East Park shopping mall next to the university campus. I could buy most stuff including medicine, internet bundle, food and cloth. As long as staying in Lusaka, I could access to the food around the world. For the information, one of my friends moved to another accommodation with kitchen inside the campus and cheaper price. I don’t know if it’s available for short staying people but if I cooked by myself I could control my health more.

For the transportation, I mostly used taxi and bus. The bus is cheap but they don’t start until all seats are full then it takes time. It is better to use the taxi driver introduced by your friend for your safety.

I had an opportunity to visit a friend’s house and enjoyed their handmade local food. It was a great experience and appreciated my friend. I strongly hope to keep the friendship with him forever.

Fortunately, I did not have a big health problem and enjoyed the life in Zambia. As long as you keep rules such as not go to the dangerous places or not to walk at night, Zambia is the great country to visit.
3. Challenges

Writing a proposal, requesting budget, contacting new people and conducting fieldwork were all challenges for me. Thanks to many people’s support, I’ve completed the programme.

I repeated the process of submission and modification of my proposal seven times. I learned how a research proposal should be and the way of writing a proposal in English.

When I arrived at the airport in Zambia, an immigration officer gave me a business visa which expires in a month instead of regular entry visa. I needed to extend my visa but the business visa was not able to be extended. I visited an immigration office many times and prepared for few photos, health check certificate, and many other documents. I spent much time and money to deal with the issue. If I did get a normal entry visa, I could save much time and money to concentrate on my study.

About data collection, it was difficult for me to reach the officer who was taking care of the data which I needed. I thought if I go to the reception of the ministry, they would introduce me the relevant department or officers but actually, they did not. I prepared a letter addressed to the title of Director General but a specific name of the person or the department was required which I could not know at the time. I had to visit several departments without collecting any data. I asked my supervisor for the help and he kindly called the director general and asked him to share the data with us. I finally obtained the data and learned the importance of personal network and connection to be trusted. As I was a foreigner in Zambia, they maybe hesitated to provide the data to a stranger.

4. How to make use of this experience to your future career development

I learned the skill of project management through this programme. From writing a research proposal to reporting, I experienced each step required in any project. I am going to work for a private company from this year and my job in the company might not have direct geographical or sectoral connection to Africa either agriculture. What I learned from the GLTP, however, is the management skill that can be applied to any kind of research or work.

5. Encouragement to other students

I’d like to say that any students who participate in the GLTP can experience every step of a project management under supervisions of many professional people. Writing a proposal, requesting budget, reporting and coordinating fieldwork schedule are very important practices. For the students who want to be a researcher or to work as a consultant in developing countries, the programme provides a very effective training opportunity. You can learn the process step by step with the supports of many professional people. Even for the people who intend not to work in academia either development, the GLTP is still very useful training programme because what you can strengthen is your own competence that is required in any kind of job.

After participating in this programme, I strongly agree with the idea that we can experience and achieve many things by ourselves in the field overcoming difficulties and enjoying happiness that we can only feel on the ground of Africa.