FACTORS AFFECTING LIBERIA'S IMPORTED RICE VOLUMES ACROSS THREE DIFFERENT PERIODS

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Abstract
Purpose - The purpose of this paper is to determine the factors that affect Liberia's rice importation during the pre-war, war and postwar period.
Design/methodology/approach – The study employs two stage least squares (2SLS) multiple regression analysis by modelling secondary annual time series data on Liberia's agriculture subsector from 1979 to 2011.
Findings – The study finds income, interest rate and inflation rate as factors affecting the volumes of imported rice; whereas, the exchange rate, population and imported rice price are found to have insignificant effects on rice imports. Additionally, Cassava is seen to have a strong negative significant relationship with imported rice.
Practical implications – The short-term government food security strategies of tariff waiver on imported rice and import subsidies that encourage rice imports should be revised to prioritizing and upgrading cassava production as a substitute commodity to imported rice.
Originality/value – cassava production and consumption could serve as important substitute to imported rice.
Keywords: Key words: Rice import volumes, 2SLS, Liberia, civil war.
Paper type: Research paper

1. Introduction

Rice is a staple food in Liberia, consumed by over 99% of the population; and yet the total volume of locally produced rice is far less than the country's rice demand (MOA, 2009). Tiepoh (2012) showed that Liberian farmers are unable to produce enough rice to meet their household demand. With this figure going up to 66% of the farm households not being able to produce what they need for consumption. Annual rice production is estimated at 170,000 MT, which is below demand of 400,000 MT, with over 50% gap filled by imported rice (Mwah, 2012; MOA, 2009). The low

domestic production of rice can be attributed to low attention given to the agricultural food crop subsector by both the private and public players. FAO (2000) reported that nonfood agricultural "tree crops, such as rubber, coffee and cocoa" production constitutes the highest income generating activities in Liberia. The same report (FAO, 2000) estimated that about 90 % of the country export earnings come from nonfood agricultural productions. The nonfood agricultural subsector whose practices is done on large scale (plantations) across the country, employs the greatest number of the rural population and contributes significantly to the country's GDP, mainly in the area of export earnings.

In Liberia, cash cropping is prioritized over food cropping, with the belief that income from the cash-crops can be used to purchase food and other necessities of farmers. However, the proceeds from the cash-crops have always fallen short of the cost of production, leaving farmers seriously food insecure and income poor (temporary lack of income). This is because, as (Tiepoh, 2012) correctly noted that there has never been the case of any net importing country or developing country using cash cropping as an effective food security strategy. Tiepoh (2012) notes that the decision by the Liberian government to convert large portion of fertile lands to nonfood agriculture production, such as oil palm, cocoa, coffee and rubber plantations and attracting the vast majority of the population to plantation works, against food cropping is not a good strategy for a nation to achieve food security. The traditional method of food agriculture production in Liberia only supports subsistence farming; often intercropping of food and nonfood agriculture productions constraint the achievement of food self-sufficiency (MOA and FAO, 2009).

The no improvement in the agriculture production, to be specific rice, could be the lack of capacity, high inputs costs and limited government support. For example, Liberia had since fell short of the 10% budgetary allocation to the agricultural sector agreed upon by African governments (Reynolds *et al.*, 2009; Mattinen, Broudic and Deret, 2009). The low level of rice production could also be attributed to the lack of credit and micro-finance institutions, improper transmission of information by input suppliers, high cost of inputs, the lack of feeder roads that hinder access to produce rice and other commercial goods. Additionally, inadequate trained manpower, the 14 years of civil unrest that destroyed the infrastructure and the negligible involvement of the private sector in the rice subsector.

The impact of these constraints has been a surge in rice prices which could, in part, be addressed by targeting local rice production. However, instead of targeting local rice production as a solution to the high rice price burden on the consumers, the government of Liberia suspended tariff on imported rice in 2008 (Tiepoh, 2012). Tariff reduction encourages importation with the immediate effect being the reduction in prices, which serves as a disincentive to local producers (Cadoni and Angelucci, 2013; Valdés and Foster, 2012; Niemi and Niemi, 2008; Christian, 2009; Ahmed, 2012; Benson, Mugarura and Wanda, 2008). However, not long after the suspension of tariff on imported rice, rice prices started to rise again further exacerbating the already precarious situation of high rice prices indicating perhaps that the policy action was inappropriate (Tiepoh, 2012).

The high importation of rice has led to negative balance of payment (BOP), poverty, malnutrition, riot, high levels of political instability and food insecurity among others (Mattinen, Broudic and Deret, 2009; Tiepoh, 2012; Shor, 2013; Flomo, 2007; Wodon *et al.*, 2008). Considering the enormous effects of rising imported rice price on the Liberian market and its effects on the

economy, this study analyzed the effect of factors such as imported rice price, domestic production (rice and cassava), inflation rate, interest rate, exchange rate, income, purchasing power parity (PPP) and population on rice imports and established their contributions to the high import bill arising out of rice importation into Liberia.

2. Data and sources

A number of websites and databases were used to collect secondary data. Data on the volumes of imported rice, volumes of locally produced rice and volumes of cassava produced are taken from FAOSTAT. The official exchange rate and interest rate data came from the IMF - International Financial Statistics. Inflation rates and income (GDP) are taken from the World Development Indicators (WDI) online database by World Bank. Purchasing power parity (PPP-GDP) was sourced from World Bank, International Comparison Program online database. Population data was taken from the world population prospects online database by UNPD. These data were entered in Statistical Package for Social Sciences (SPSS) version 20 and analyzed with STATA software version 11 and MS Excel 2007.

The annual data was divided into three periods reflecting the before the civil war - 1979 to 1988, during the civil war - 1989 to 2003 and after the civil war - 2004 to 2014. This is because these periods witnessed different economic and agricultural atmospheres in Liberia. All variables were expressed in natural logarithm form to correct outliers and achieve normal distribution. The periods before and during the civil war are used as the base categories while the period after the civil war is used as the reference category.

2.1 Statistical Analyses

2.1.1 Time Series Tests

This study modelled the series with correlation analysis and two stage least squares (2SLS) multiple regression equations.

To select the appropriate model (2SLS) that was used to analyze the time series data, a number of post estimation tests were carried out. The Augmented Dickey Fully (ADF) test for detecting stationarity of the variables showed that all the variables were nonstationary. However, all the variables were found to be stationary after differencing at lag order 1. The error normality test result ($p<0.05$) showed that the variables are normally distributed. The test for serial correlation in the residuals indicated that there was no serial correlation in the residuals ($p>0.05$). To assess the validity of the vector autoregressive (VAR) model, the stability and autocorrelation of the residuals were tested to examine the dynamic stability of the system. None of the eigenvalues was close to 1, so the system is stable. The Breusch-Godfrey LM test results ($p>0.05$) indicate no autocorrelation/serial correlation. The Regression Specification Error Test (RESET) for omitted variables results showed no presence of omitted variables in the equation. Except the results of the Ramsey test for heteroskedasticity to examine whether the series have constant variance that showed significant ($p<0.05$) p-value implying that there are some omitted variables. The Breusch-Pagan/Cook-Weisberg test also detected heteroskedasticity, which show constant variance ($p<0.03$). Multicollinearity was detected using the Variance Inflationary Factor (VIF) test indicating that most of the variables were collinear or correlated. The endogeneity tests results were positive, implying the existence of correlation between some of the explanatory variables

and the error term. Thus, the 2SLS is chosen as the most appropriate model to determine the factors that affect Liberia's imported rice volumes.

2.1.3 Empirical model

$$Y_t = B_0 + B_{1t}X_{1t} + B_{2t}X_{2t} + B_{3t}X_{3t} + \ldots + B_{9t}X_{9t} + D_1X_{10t} + D_2X_{11t} + e_t \quad ---------- \quad 1$$

The implicit form of the model is presented as:

$Y_t =$ $f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, e_t)$
$Y_t =$ Volume of imported rice (MT)
$X_{1t} =$ Income/GDP ($)
$X_{2t} =$ Volume of Local Produced Rice (MT)
$X_{3t} =$ Volume of Cassava Produced (MT)
$X_{4t} =$ Purchasing Power Parity ($)
$X_{5t} =$ Imported Rice Prices ($)
$X_{6t} =$ Official Interest Rates ($)
$X_{7t} =$ Inflation Rates ($)
$X_{8t} =$ Population (#)
$X_{9t} =$ Exchange Rates ($)
$X_{10t} =$ Dummy (period before)
$X_{11t} =$ Dummy (period during)
B_o = Constant
e_t = Error Term

2.1.4 Model specification

$$y_i = \mu + \mathcal{S}_i\beta^{\mathcal{L}} + \mathcal{S}_i^1\gamma^{\mathcal{L}} + \mathcal{V}_i \quad ---------- \quad -2$$

Since the true relationship between y_i and $\mathcal{S}_i$ is unlikely to be linear, if the endogenous regressor $\mathcal{S}_i$ takes on (0, 1, 2, 3,……., $\mathcal{S}$), the true model will take the form:

$$y_i = \sum_{j=1}^{\mathcal{S}} D_{ij}\,\beta_j + \mathcal{X}_i^1\gamma + \varepsilon_i \quad ---------- \quad -3$$

Where:
y_i is the outcome of the individual observation;
$X^1{}_i$ K x 1 vector of exogenous covariates (including an intercept);
$\mathcal{S}_i$ is the potential endogenous regressor;
β_i is the model estimates;
D_{ij} = 1($\mathcal{S}_i \geq j$) reflects a dummy variable equal to one if $\mathcal{S}_i \geq j$ and zero otherwise;
ε_i is the error term;
γ the gamma is the generalized model estimates.

3. RESULTS AND DISCUSSION

3.1 Pair Wise Correlation Analysis

Table 1: Correlation coefficients of specific periods and combined matrices

Imported rice	Imported rice volume before civil war	Imported rice volume during civil war	Imported rice volume after civil war	Combined (Imports)
Local produced rice	-0.15	0.27	0.42**	0.43***
Inflation rate	-0.40	-0.03	0.10	0.00
Income	-0.32	0.33	-0.05	0. 31*
Imported rice price	-0.32	-0.32	0.36	0.30*
Exchange rate	-0.00	-0.06	0.48	-0.35***
Interest rate	0.21	0.13	- 0.10	-0.42**
Cassava	-0.17	0.18	- 0.72**	0.53***
PPP	-0.18	0.24	0.39	0.52***
Population	0.29	-0.14	0.43	0.46***

Definition of significant level:
10 % level *
5 % level **
1 % level ***

In the period before the civil war, almost all the factors had negative non-significant relationship with imported rice volume, except for interest rate and population that showed positive relationship with rice imports. The non-significant correlation could possibly be attributed to the low volume of imported rice to the country at that time. During this period, although it had a negative moderate insignificant (r = -0.40) relationship with imported rice volume. This negative relationship implies that increase in inflation rate led to a decrease in rice importation.

The result for the period during the civil war also shows that all the observed factors had insignificant relationship with Liberia's rice imports. In this period however, difference is seen in the sign or direction of the relationship between the factors and imported rice volume. Unlike the period before the civil war, most of the factors are observed to have had positive insignificant relationship with rice imports during the civil war. The inflation rate, imported rice price and population variables show negative insignificant relationship with rice imports during that period. By that time, income showed the highest correlation (0.33) of relationship (positive) with imported rice volume.

For the period after the civil war, only two variables (locally produced rice volumes and cassava produced volumes) are found to be significantly related to rice imports. Most of the variables show positive relationship with the rice imports, except for the variables of interest rate, income and cassava produced volumes. The negative relationship between income and imported rice volumes is negligible since the coefficient is reported as 0.05 with an insignificant p-value (0.35).

The significant positive relationship between the domestically produced rice and imported rice volumes in post-war Liberia can be attributed to the low volume of domestic rice produced. That is to say, despite the continued increase in the local rice production, the country still depends on imported rice to meet the growing demand for rice. This could mean that enough resources are not being put in place to enable local production to meet the local demand such that there is still a gap to be filled by importation. This underutilization of the available resources has resulted to continual increase in imported rice volume and its consequences on the Liberian economy. Shor (2013) showed that the continuous increase in Liberia's rice imports volume is not at the result of its quality, but lack of availability of local grains. In Liberia, the domestic rice production is heavily undermined by the high quality of the foreign produced rice. Even though, majority of the rural population lives and depends on rice production as the main source of livelihood, local rice production is yet to improve to commercial level or marketable status. The low quality or taste of domestic rice could be largely responsible for the imported rice flooding the Liberian rice market.

The cassava produced volume is observed to have a strong negative significant (-0.72) relationship with imported rice volume in post-war Liberia. An increase in the volume of cassava produced leads to a significant fall in imported rice volume in the current period. Thus, cassava can be considered as a substitute commodity for imported rice in Liberia. For cassava to play this substitution role effectively there is need to improve cassava production and encourage consumption. Promotion of cassava will require holistic efforts by all sectors in the country if it is have any effect on reduction the current volume of imported rice and address challenges associated with Liberia's rice importation. Import substitution strategy increases output of local sectors to meet the local demand that is been met by imports (Cooke and Watson, 2011). It increases the domestic production of goods and services. Zhu (2006) studied Taiwan and China imports substitutions strategies and showed a negative significant relationship between import substitution and imports. Hence, cassava production and consumption must be encouraged throughout the country if the volume of imported rice must drop significantly. Additionally, Liberians must adjust their food intake by turning more towards domestic agricultural products, especially cassava products and local produced rice. This will reduce the current rice import bill along with the associated effects.

Turning to the combined analysis, most of the factors show positive significant relationship with imported rice volumes, except the interest rate and exchange rate variables that show negative significant relationship with imported rice volume. The result shows the domestic rice produced, imported rice price, exchange rate, interest rate, cassava produced, purchasing power parity (PPP) and population as factors that are significantly related to imported rice volumes. Only inflation rate is not-significantly related to imported rice volumes as indicated by its p-value (0.99). However, these results are misleading in that the analyses on the disaggregated periods (before the civil war, during the civil war and after the civil war) indicate significant difference in the volumes of imported rice in post-war Liberia.

3.2 Determinants of Liberia rice imports

Table 2: Multiple regression analyses of factors affecting Liberia's imported rice volume

Imported rice	Coefficient	Standard error	Z	P-value	95 % Confidence Interval	
		0.26	2.57	0.01	0.16	1.18
Income	0.67***					
Imported rice price	-0.13	0.40	-0.32	0.75	-0.92	0.66
Interest rate	-0.38**	0.18	-2.10	0.04	-0.74	-0.03
Inflation rate	-0.15*	0.09	-1.71	0.09	-0.32	0.02
Exchange rate	-0.12	0.47	-0.26	0.80	-1.04	0.80
Population	-0.95	1.35	-0.70	0.48	-3.59	1.69
Before the civil war	-1.47**	0.62	-2.35	0.02	-2.69	-0.25
During the civil war	-0.85**	0.42	-2.00	0.05	-1.68	-0.02
_cons	24.57	19.49	1.26	0.21	-13.62	62.76
Number of observations =	31					
Wald chi-square =	39.32					
P-value =	0.00***					
R-squared =	0.55					
Root MSE =	0.42					

The results show significant ($p<0.001$) linear relationships between volume of rice imported and the studied factors. Fifty five percent of the variation in rice import volumes can be explained by the selected factors. Most of the explanatory variables took the expected (negative) signs. Except for the variable of income that seen to have positive effect on rice imports, all the other variables seen to have negative effects on Liberia's rice imports. The variable of income, interest rate and inflation rate along with the periods are established as significant factors affecting Liberia's rice importation. On the other hand, exchange rate, imported rice price and population are found to have negative effect on rice imports, but these effects are insignificant.

The exponential coefficients for the two dummies (periods) are all negative and significant in explaining Liberia's rice imports. The dummy coefficient (-1.47) for the period before the civil war suggests that holding other variables constant, the expected increase in the geometric mean of rice imports is 147 MT less compared to the period in the reference category (period after the civil war). Similarly, a coefficient of -0.85 implies that other things remaining constant, the expected increase in the geometric mean of imports for the period during the civil war is 85 MT less compared to the period after the civil war. The implications of the results for the two dummy coefficients are that, the geometric mean of rice imports in period before the civil war and period during the civil war are lower by 147 MT and 85 MT points respectively in relation to the period in the reference category (after the civil war). In other words, the period after the civil war experiences a tremendous increase in rice imports in comparison with the previous two periods.

Income as a determinant of Liberia's rice imports: the empirical findings show income as the leading factor influencing rice importation into Liberia. As indicated by the coefficient (0.67), income has a positive significant effect on rice importation. This confirms the cointegration analyses results and quantifies the level of effect income has on rice import. For every unit increase in income, rice importation increases by 0.67MT, which implies that higher income leads to higher

imports. Income can therefore be referred to as the most significant factor affecting Liberia's imported rice volumes. The continuous rise in income that is generated from nonfarm activities will eventually increase the demand for imported rice.

This study confirms most of the previous similar studies' results on the same variable in other countries. Income has a statistical significant effect on agricultural imports demand in China (Niemi and Niemi, 2008), and is an important factor in determining agricultural products importation (Humpage, 2000; Honma, 1991; Lord, 1991; Yusoff and Salleh, 1987). According to Dordonu and Sackey (1998) and Humpage (2000), least developed countries imports demand relies on income and relative prices. The study finding disagrees with Mushtaq *et al.* (2014) study that reported income as having a negative significant effect on agricultural products importation.

Interest rate as a determinant of Liberia's rice imports: interest rate is seen to have a negative significant effect on the volumes of imported rice by Liberia. The interest rate coefficient (-0.38) infers that a unit increase in interest rate results to a 0.38MT reduction in imported rice volume. This finding is inconsistent with our hypothesis that an increase in interest rate would lead to higher cost of borrowing domestically that leads to low productivity in the country and in turn, increases rice importation. But the study finding indicates that increase in interest rate implies high cost of borrowing capital that discourages rice importation. A possible explanation for the inverse relationship could be that borrowing shrinks importers capital base, especially when interest rate increases.

Reduction in the volume of imported rice as a result of the increase in interest rate, could promote domestic rice production. This would lead to increased households' consumption of locally produced rice and in addition, increase the capacity of local rice producers to supply local market with domestically produced rice. An increase in interest rate reduces rice imports and its burden on the economic. This is because, large portion of the rice sold on the Liberian market is foreign produced with barely less than US$2000 spent on local produced rice monthly (Shor, 2013).

Elsewhere, a change in interest rate was found to have positive effect on imported goods (CBN, 2006), implying that higher interest rate encourages importation and discourages exports of goods and services due to the high cost for purchasing local currency by foreigners, thereby making imported commodities cheaper than locally produced commodities. This study result supports George *et al* (1999) assertion that interest rate affects importation negatively, because it favors saving over spending. Additionally, an increase in interest rate leads to instantaneous appreciation of the domestic currency and this reduces Liberia's rice importation since higher exchange rate leads to reduction in rice imports. This study establishes interest rate as a factor that discourages Liberia's rice importation. Thus, to reduce the high volume of rice imports and its associated effects, interest rate must be properly manipulated by policy makers.

Inflation rate as a determinant of Liberia's rice imports: turning to the inflation rate (general rise in prices) coefficient, the empirical evidences derived in Table 2 show that inflation rate is negative and statistically significant in determining Liberia's imported rice volume. This means, a unit increase in the rate of inflation results to 15 % reduction in the volume of rice imports. It should be noted that the effect of inflation rate on the volumes of rice imports is only significant at the 10 % level. A plausible explanation could be that, an increase in general prices signals to Liberia's

rice importers to cut down on rice imports that could fetch higher prices. Additionally, higher imported rice price overtime could slow the sale of the commodity. These results are supported by Subervie (2008) and Corrigan (2005) studies that showed inflation rate as having negative significant effect on import demand. The volumes of Liberia's rice imports could be reduced if the Central Bank of Liberia (CBL) institute relevant monetary policy. It implies that inflation rate is a necessary evil in reducing the volumes of Liberia's rice imports.

WARDA (2007) asserted that persistent rise in international rice price (inflation) serves as an opportunity for expanding rice production in countries where it serves as the staple food. Net importing countries' economics can do better if they can take advantage of the continuous increase in rice price. According to Binswanger-Mkhize *et al*. (2011), agriculture growth leads to economic growth and poverty reduction. Africa has the potential to produce these cereals that are currently imported; the climate is favorable with vast and fertile land available (WARDA, 2007).

4. Conclusion

The study assessed the relationship between the imported rice volume and each of the explanatory variables using pair-wise correlation analyses for the three periods. Most of the variables have significant relationship with rice imports, except for inflation rate that is non-significantly related to rice imports in the combined period. For the period specific, most of the factors have insignificant relationship with rice imports (in the three periods), except for the variables of volume of locally produced rice and cassava produced that are seen to have significant relationship with imported rice volumes in the post-war era. Local rice and cassava production are the two significant variables that are related to Liberia's rice importation. Local rice is observed to have positive significant relationship with imported rice volumes in post-war Liberia, while cassava is observed to have a strong negative significant relationship with imported rice volumes in post-war Liberia. The correlation analysis identified imported rice price, income, exchange rate, interest rate, inflation rate, PPP and population as having insignificant relationship with rice import in the three periods.

Given that there is a significant difference in the volumes of Liberia's rice imports across three periods (before the civil war – 1979-1988, during the civil war – 1989-2003 and after the civil war – 2004-2011), combining these periods of rice importation for a single analysis will result into misleading information. The combined statistical analyses on rice importation that do not take into consideration the effect of the war on the volumes of imported rice will certainly have wrong conclusion. This enables researchers and policy makers to identify the effect of macroeconomic factors on imported rice in specific period.

The 2SLS multiple regression analysis in this study used the disaggregated periods to determine factors affecting (cause-effect) Liberia's imported rice volumes and establishes income as having a positive significant effect on imported rice volumes. The positive effect of income on rice imports suggests that increase volume of imported rice may lead to increase shrinking in socioeconomic conditions, since the country spent large portion of its income on foreign produced rice. If this money is spends on domestic agricultural products, local farmers will recover domestic markets that are lost to unfair competition from industrialized and subsidized foreign agriculture. Again, the significant effect of income on rice imports in both short-run and long-run periods, implies that income is largely determined by nonfood agricultural products or cash crops such as rubber, coffee

and cocoa and minerals (Iron ore, Gold, Diamond, etc.). In order to meet food self-sufficiency, favorable measures of imports substitutes must be addressed.

Given that a number of macroeconomic variables such as income, interest rate and inflation rate impact on imported rice volumes, they can help improve the country rice situation; unlike trying to manipulate imported rice price and exchange rate that are found to have insignificant effect on imported rice volumes. This study's results therefore show that the persistent increase in rice imports cannot be addressed by manipulating the imported rice price, exchange rate or population growth; as these are seen to have minimum or insignificant effect on rice import. Increased food agricultural production, specifically cassava must be prioritized if the current rice import bill and the negative balance of trade should improve.

References

Ahmed, M. (2012), "Analysis of incentives and disincentives for rice in Uganda", Technical notes series, MAFAP, FAO, Rome. Accessed 8/11/2014.

Binswanger-Mkhize, H. P., Byerlee, D., McCalla, A., Morris, M. and Staatz, J. (2011), "The growing opportunities for African Agricultural Development", vol. 16.

Bollen, K. A. (2001), "Two-Stage Least Squares and Latent Variable Models: Simultaneous Estimation and Robustness to Misspecifications", vol. 7, pp. 199138 in R. Cudeck, S. du Toit and D. Sorbom (eds) Structural Equation Modeling: Present and Future: A Festschrift in honor of Karl Joreskog, Scientific Software International: Lincolnwood.

Broudic, C. (2008), "Surge in Basic Commodity Prices Liberia – Case Study: Action against hunger", ACF International Networks. Accessed 15/8/2014.

Cadoni, P. and Angelucci, F. (2013), "Analysis of incentives and disincentives for Rice in Nigeria", Technical notes series, MAFAP, FAO, Rome. Accessed 12/8/2014.

CBN, (2006), "How do the monetary policy decisions of the central bank of Nigeria affect you? ", Part 2. Central Bank of Nigeria, Monetary Policy Department. Monetary Policy Series CBN/MPD/Series/03/2006. Accessed 2/5/2014.

Chang, T. T. (1983), "The origins and early cultures of the cereal grains and food legumes", In D. Keightley, ed. The origins of Chinese civilization, Berkeley, CA, USA, University of California Press. pp. 65-94.

CIA World Factbook, (2004), "Facts and Figures, Map, travel, News, Museum Guide about Liberia", Accessed 10/8/2015.

Cooke, S. and Watson, P. (2011), "A Comparison of Regional Export Enhancement and Import Substitution Economic Development Strategies", University of Idaho – US. vol. 41, no. 1, pp. 1-15.

Corrigan, D. T. (2005), "The Relationship Between Import Prices and Inflation in the United States. Journal of Applied Business and Economics", WCOB Faculty Publications. http://digitalcommons.sacredheart.edu/wcob_fac/18, vol. 18.

Daramola, B. (2005), "Government policies and competitiveness of Nigerian rice economy", A Paper presented at the Workshop on Rice Policy and Food Security in Sub-Saharan Africa' organized by WARDA, Cotonou, Republic of Benin. Accessed 10/5/2015.

Daybor, E. J. N. (2013), "Liberia: spends U.S.$200 Million on Rice Importation", http://allafrica.com/stories/201305151248.html. Accessed 5/8/2014.

Dickey, D. A. and W. A. Fuller, (1979), "Distribution of the estimators for autoregressive time series with a unit root", Journal of the American Statistical Association, vol. 74, pp. 427–431.

Dollar, D. and Kraay, A. (2004), "Trade, Growth, and Poverty", The Economic Journal, vol. 114, no. 493, pp. F22-49.

Dordonu, C.K. and Sackey, H. A. (1998), "The East Asia Crisis and its impact on the Ghanaian economy: Policy lessons and recommendations", Ghana Economic Outlook, vol. 3, no. 2, 13-42.

FAO, (2000), "FAO/WFP crop and food supply assessment mission to Liberia", FAO Global information and early warning system on food and agriculture/ world food program. Special report. Accessed 14/6/2014.

Flomo, P. J. (2007), "The Importation of Rice to Liberia", The Perspective, Atlanta, Georgia. Accessed 10/8/2015.

George, E., King, M., Clementi D., Budd A., Buiter W., Goodhart C., Julius D., Plenderleith I. and Vickers J. (1999), "The transmission mechanism of monetary policy", The Monetary Policy Committee Bank of England :www.bankofengland.co.uk. Accessed 12/8/2015.

Honma, M. (1991), "Growth in Japan's Horticultural Trade with Developing Countries: An Economic Analysis of the Market", International Food Policy Research Institute (IFPRI). Accessed 14/7/2015.

Humpage, O. F. (2000), "Do Imports Hinder or Help Economic Growth?", Economic Commentary, Federal Reserve Bank of Cleveland. Accessed 11/8/2015.

Kang, H., Kennedy, L. P. and Hilbun, B. (2009), "An Empirical estimation of the Import Demand Model and Welfare Effects: The Case of Rice Importing Countries", Paper presented at the Southern Agricultural Economics Association Annual Meeting, Atlanta, Georgia, January. Accessed 10/7/2014.

Kasahara, H. and Lapham, B. (2012), "Productivity and the Decision to Import and Export: Theory and Evidence", Department of Economics, University of British Columbia, Vancouver, British Columbia, Canada, vol. 6, no. 1Z1; hkasahar@mail.ubc.ca.

Kohls, R. L. and Uhl, J. N. (1985), "Marketing of agricultural Products", Macmilliam Publishing Company New York. Accessed 14/8/2015.

Lançon, F. and Benz H.D. (2007), "Rice imports in West Africa: trade regimes and food policy formulation", Poster prepared for the 106th seminar of the European Association of Agricultural Economists, Montpellier, France, 25–27 October. Accessed 1/8/2015.

Lord, M. (1991), "Imperfect Competition and International Commodity Trade: Theory, Dynamics and Policy Modelling", Oxford University Press, New York. pp. 403.

Mattinen, H., Broudic C. and Deret H. (2009), "Increased food prices in Liberia: new crisis, old relief-development dilemmas", Humanitarian Exchange Magazine. Accessed 1/8/2015.

Melitz, M. J. (2003), "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", Econometrica, vol. 71, pp. 1695-1725.

MOA, (2009), "Ministry of Agriculture annual report: Production Estimates of major Crops and Animals – 2008", Monrovia, Liberia. Accessed 10/6/2015.

MOA, and FAO (2009), Food and Agriculture policy and strategy "from subsistence to sufficiency". Ministry of Agriculture Republic of Liberia Monrovia, Liberia. Accessed 10/6/2015.

Mushtaq, M., Nazir, R., Bashir, I., Ahmed, S. and Nadeem, M. (2014), "Panel Cointegration Analysis of Government Spending, Exports, Imports and Economic Growth", International

Review of Research in Emerging Markets and the Global Economy (IRREM). An Online International Research Journal, vol. 1, no. 2, pp. 81. www.globalbizresearch.org.

Mwah W. F. (2012), "Action Plan on Rice Seed Production in Liberia", Division of Sectoral Coordination and Department of Planning and Development, Ministry of Agriculture. Accessed 7/6/2015.

Niemi, H. E. and Niemi, J. (2008), "Empirical analysis of agricultural trade between EU and China: Explanation behind China's growing agricultural food imports", MTT Agrifood Research Finland, Economic Research Unit, Helsinki, Finland.12th Congress of the European Association of Agricultural Economists – EAAE. Accessed 10/9/2015.

Norman, J. C. and Otoo, E. (2002), "Rice Development Strategies for Food Security in Africa", In Proceedings of the 20th Session of the International Rice Commission, Bangkok, Thailand. Accessed 10/9/2014.

Nwanze, K. F., Mohapatra, S., Kormawa, P., Keya, S. and Bruce-Oliver, S (2006), "Rice development in sub-Saharan Africa", Journal of the Science of Food and Agriculture J Science Food Agric vol. 86, pp. 675–677.

Oczkowski, E. (2003), "Two-Stage Least Squares (2SLS) and Structural Equation Models (SEM)", http://csusap.csu.edu.au/~eoczkows/home.htm

Pesaran, M. H. and Taylor L. W. (1999), "Diagnostics for IV Regressions", Oxford Bulletin of Economics and Statistics, vol. 61, pp. 255-281.

Reynolds, C., Field M., Subah S. and Tubman F. M. (2009), "Global Food Security Response Liberia Rice Study", The United States Agency for International Development. Accelerated Microenterprise Advancement Project. P.157

Rogers, A. (2000), "An Analysis of the Determinants of Fiji's Imports", Working Paper 2000/03, Economics Department, Reserve Bank of Fiji Suva Fiji. Accessed 10/9/2014.

Shor, J. (2013), "Liberia's Rough Road to Rice Production", An analysis of Liberia rice crisis. Accessed 10/2/2015.

Subervie, J. (2008), "The variable response of agricultural supply to world price instability in developing countries", Journal of Agricultural Economics, vol. 59, no. 1, pp. 72-92.

Tiepoh, G. N. (2012), "Limits of Cash Crop Production in Liberia's Food Security Strategy", The Perspective, Atlanta Georgia. Accessed 6/9/2014.

UNSD, (2010), World Statistics Pocketbook, United Nations Statistics Division, http://data.un.org/. Accessed 1/9/2015.

Valdés, A. and Foster W. (2012), "Net Food-Importing Developing Countries", ICTSD Programme on Agricultural Trade and Sustainable Development. Who They Are, and Policy Options for Global Price Volatility. International Centre for Trade and Sustainable Development (ICTSD) International Environment House vol. 2. no. 43.

WARDA, (2007), "Africa Rice Trends: 2007 Brief – Overview of recent developments in the sub-Saharan African rice sector", Africa Rice Center, Cotonou, Benin. Accessed 10/8/2015.

Wodon, Q., Tsimpo, C., Backiny-Yetna, P., Joseph, G., Adoho, F. and Coulombe, H. (2008), " Potential impact of higher food prices on poverty: Summary estimates for a dozen West and Central African Countries", World Bank Policy Research Working Paper no. 4745. Accessed 10/9/2015.

Yusoff, M. Salleh, M. B. (1987), "The Elasticities of Supply and Demand for Malaysian Primary Commodity Exports", Malaysian Journal of Agricultural Economics, vol. 4, pp. 59-72.

Zhu, T. (2006), "Rethinking Import-substituting Industrialization", Development Strategies and Institutions in Taiwan and China. Research Paper no. 76, pp. 15, 20, 45, and 53.