DETERMINANTS OF IMPORT DEMAND FOR RICE IN UGANDA

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A RESEARCH DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH AND GRADUATE TRAINING IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF ARTS DEGREE IN ECONOMICS OF KYAMBOGO UNIVERSITY.

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DECLARATION

This thesis is my original work and has never been presented for a degree in any other university.

Signed……. Date…….

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APPROVAL

We as University supervisors confirm the work done by the candidate under our supervision.

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Signed…….. Date…….

SSERUYANGE JOHN (Ph.D.)

DEDICATION

My dear grandfather **Hon. Yonasani Kanyomozi**, who set a solid basis for me to obtain this degree, is the one to whom I dedicate my dissertation. I could not have progressed thus far without his prompt efforts.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criterion
APRO	Apparent domestic consumption of rice
ARDL	Auto-Regressive Distribution Lag
AVEPRIC	Average Price of Imported rice
DF	Dickey-Fuller
FPE	Final Prediction Error
GDP	Gross Domestic Product
HQIC	Hannan Quinn Information
$IMPO_{rice}$	Import demand for rice
JB	Jarque Bella
OLS	Ordinary Least Squares
MAAIF	Ministry of Agriculture, Animal Industry, and Fisheries
MAPRO	Quantity of maize produced domestically
NERICA	New Rice for Africa
NRDS	National Rice Development Strategy
REER	Real Effective Exchange Rate
RIPRO	Domestic rice produced
SBIC	Schwarz Bayesian Information Criterion
UBOS	Uganda Bureau of Statistics
VAR	Vector Auto Regression
VECM	Vector Error Correction Model
VIF	Variance Inflation Factor
WARDA	The West Africa Rice Development Association

ABSTRACT

This study uses a Vector Error Correction Model (VECM) framework to analyze the factors influencing Uganda's import demand for rice. The study focuses on the causal effects of the average price of imported rice, GDP, domestic rice production, real effective exchange rate, domestic consumption of rice, and domestic production of maize on the demand for imported rice in both the short-run and long-run. The findings reveal a significant relationship between GDP and demand for imported rice both in the short and long run and also indicate that the average price of imported rice and domestic rice production have significant long-run effects on import demand for rice. These findings offer valuable insights that can guide policymakers and stakeholders in shaping strategies to reduce reliance on imported rice by promoting domestic rice production. Results shed light on the need to put in place measures to promote domestic rice production by supporting domestic rice producers through providing support to farmers, such as access to improved seeds, subsidies, improved access to credit, fertilizers, and agricultural technologies, as well as training programs to increase productivity and competitiveness of the domestic rice industry.

Keywords; Import Demand for rice, VECM, Uganda

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter includes the study's background, the research problem statement, the study's objectives, its scope, its importance, its hypothesis, the conceptual framework, and definitions of important words.

1.1 Background of the study

In Uganda, a sizable majority of the population eats rice, one of the main dishes. The increase in population, urbanization, and changes in dietary habits have all contributed to an increase in the demand for rice in recent years. However, Uganda's domestic rice production cannot keep up with the demand in the country, thus vast amounts of rice must be imported to fill the gap in supply. Data from the Uganda Bureau of Statistics (UBOS) show that from 209,767 metric tons in 2019 to 227,645 metric tons in 2020, the country's rice imports climbed by 8.6%.

Similarly, from $104.8 million in 2019 to $121.9 million in 2020, the value of rice imports climbed by 16.4%. The majority of the imported rice comes from Asian nations including India, Pakistan, and Thailand. The economic impact of rice imports is substantial, especially for the trade balance and foreign exchange reserves. The government of Uganda has made expanding indigenous production of rice and lowering reliance on imported rice a top priority. This is demonstrated, for instance, by several government programs and policies that have been put in place to increase the nation's rice production.

The production of rice in Uganda is of significant importance to the nation's food and cash-produce industries (Jagwe et al., 2005). It is estimated that rice production covers 95,277 thousand hectares of land with an annual production of 258,193 thousand tons of grain which makes it one of the most important cereal crops in the country, with commercial maize being the only crop produced in larger quantities. (Kijima et al., 2006). The crop is predominantly grown in lowland and upland areas, with only 5% grown in irrigated fields, and is crucial for the country's youth in urban areas and government organizations (Hyuha et al., 2007).

Moreover, a strategic plan was formulated in 2009 to redirect the efforts of farmers toward rice cultivation to cater to the increasing demand for the crop in Uganda, particularly in urban regions due to changing preferences. The plan aimed to benefit both consumers and the country as a whole. (MAAIF 2009, Samuel, 2015). Several studies conducted in the country have shown that rice production in Uganda is profitable and has higher yields compared to those in Asia (Kijima et al., 2006; MAAIF, 2009) and that it is a significant grain commodity in the country (Hyuha et al., 2007).

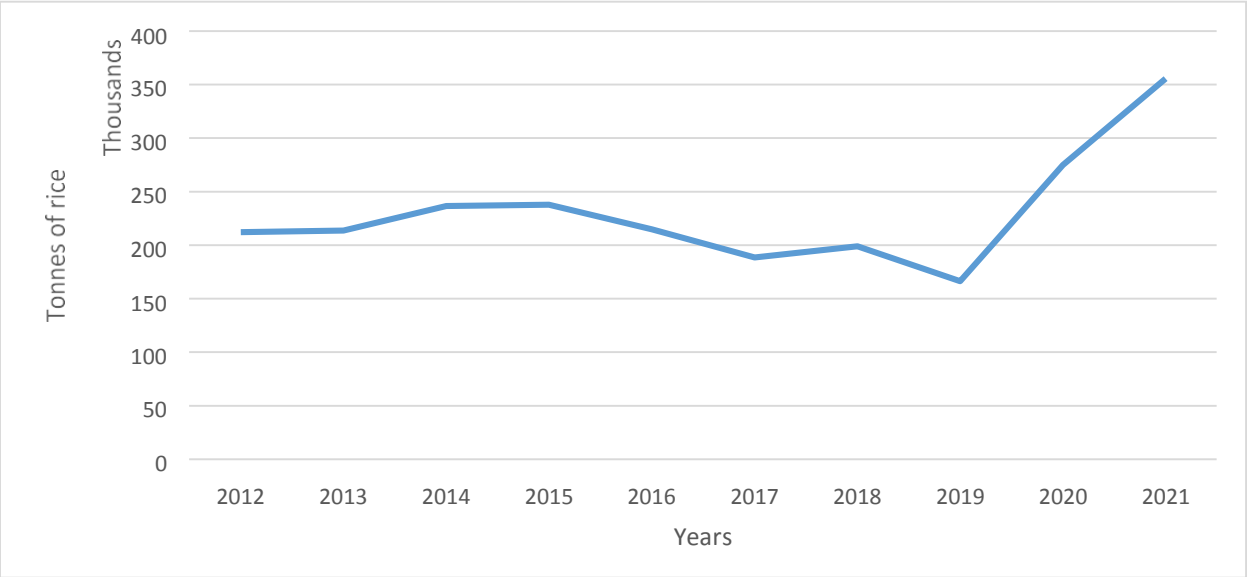
The factors that influence the desire for imports in developing nations are widely documented (Hyuha et al., 2017; Ogundele, 2007; Pudjiastuti et al., 2021; Atera E. A. et al., 2018; Peter Rosner et al., 2008; Pudjiastuti et al., 2021; Yusuf, W. A et al., 2020) and use different econometric techniques and data. However, evidence relating to import demand for Uganda has remained scant. The only existing study is Hyuha et al. (2017). Hyuha et al. (2017) found population, domestic rice production, price of the rice imported, and the consumption of the imported rice were significant and therefore influenced the import demand for rice in Uganda. Thus, this dissertation builds on Hyuha et al., (2017) but investigates the short-run and long-run causal relationship between the demand for rice and its determinants. What sets this study apart is its utilization of up-to-date data, the inclusion of GDP and the average price of imported rice, and the application of a co-integration regression technique employed to examine the causal relationship between the demand for rice and its determinants in Uganda, both in the short run and the long run.

1.1.1 Rice Production in Uganda

Production of rice in Uganda has been increasing throughout the years, but it still falls short of meeting the country's demand. Although rice is grown across the country, it is mostly grown in the eastern and northern regions, with the most common varieties being NERICA (New Rice for Africa), and other improved varieties. Smallholder farmers dominate rice production in Uganda, with an average farm size of less than 2 hectares. The government of Uganda has been implementing various initiatives to promote rice production and reduce imports. These include providing subsidies for inputs such as seeds and fertilizers, promoting the use of improved rice varieties, supporting irrigation projects, and establishing rice milling facilities.

However, there are still challenges facing rice production in Uganda, such as poor infrastructure, inadequate access to credit, high production costs, and the impact of climate change, which affects water availability for irrigation. These challenges limit the competitiveness of local rice farmers and the possibility of raising rice yield in Uganda.

Figure 1: Rice Production in Uganda from 2012 to 2021. ('000 Tonnes)



Source: Author's compilation.

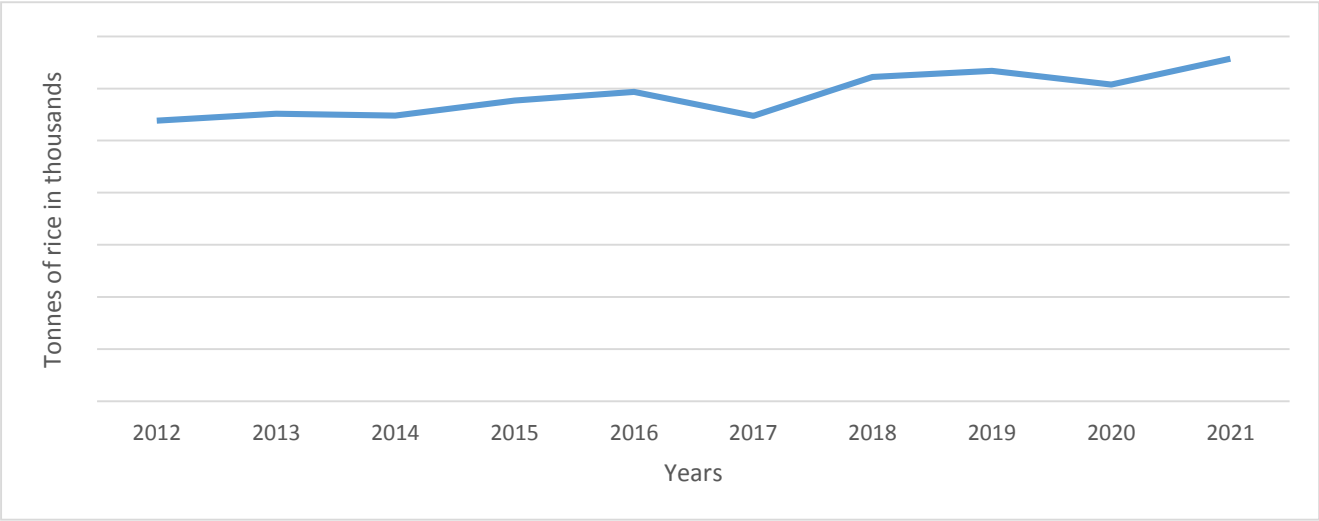
Figure 1 demonstrates that rice production increased steadily from 2012 to 2014, reaching 237,008 tonnes in 2014. Production in 2015 stayed the same at 238,193 tonnes. But from 2016, there was a reduction, and in 2017 and 2019, production fell even more, to 188,674 tonnes and 166,596 tonnes, respectively. A major increase to 275,000 tonnes was seen in 2020, and then a significant increase to 355,800 tonnes was seen in 2021. The overall trend indicates that growth and stability peaked in 2015, then declined from 2016 to 2019, and then recovered and expanded in 2020 and 2021. The demand for rice is still very strong in Uganda despite the rise in production. This can be related to the large domestic demand for rice, which outweighs domestic production. Because of the increasing demand, rice must be imported to satisfy domestic consumption requirements.

1.1.2 Rice Consumption in Uganda

With an average annual per capita intake of around 13 kilograms, rice is currently Uganda's second-most significant staple food after bananas. In particular, Pakistan, India, and Thailand are the

primary Asian countries from which Uganda imports the majority of its rice. The Ugandan government has been carrying out many programs to encourage domestic rice production to lessen reliance on rice imports. These initiatives include giving subsidies for essential inputs like fertilizer and seeds, assisting irrigation projects to guarantee a sufficient supply of water, and encouraging the use of better rice varieties to boost yields. Low yields, limited storage facilities, and high production costs, which limit the competitiveness of local rice producers, are some of the issues that still need to be resolved.

Figure 2: Rice Consumption in Uganda from 2012 to 2021. ('000 tonnes)



Source: Author's compilation.

Over the period from 2012 to 2021, the consumption of rice in Uganda demonstrated a consistent upward trend. Rice consumption increased gradually from 107553 tonnes in 2012 to 131,489 tonnes in 2021.

Several factors could contribute to this rising trend in rice consumption. Firstly, changing dietary preferences and urbanization might have influenced the increase in rice consumption. As people shift towards more convenient and versatile food options, rice has gained popularity due to its ease of preparation and compatibility with various dishes.

Additionally, rising income levels and improved standards of living could contribute to the increased demand for rice. As people have more disposable income, they can afford and incorporate rice into their regular meals.

1.2 Statement of the Research Problem

Uganda has fertile soils, good favorable seasons, and rice growers schemes to support rice production but the country continues to import rice because domestic production has not kept pace with the high demand for rice, leading to a significant reliance on imports of rice to make up for the deficit. Furthermore, importing rice causes a significant trade deficit and depletes foreign currencyreserves which potentially affects the country's earnings from the foreign exchange premium andits Balance of Payments statement. To overcome such disruptions in the country's current accountflows, there is a need to have a better understanding of the drivers of import demand for rice in Uganda by focusing on the causal effects of the independent variables over the long and short terms, the gap this study tries to fill.

1.3 Objectives of the Study

This study investigates factors influencing the import demand for rice in Uganda.

1.3.1 Specific Objectives

To achieve the main objective of the study, the following specific objectives were to:

i) Investigate the short-run and long-run causal effects of the average price of imported rice on the import demand for rice in Uganda.
ii) Investigate the short-run and long-run causal effects of GDP on import demand for rice in Uganda.
iii) Investigate the short-run and long-run causal effects of domestic rice production on import demand for rice in Uganda.

1.4 Hypotheses of the Study

H_{01}: The short-run and long-run causal effects of the average price do not affect the demand for imported rice in Uganda.

H_{02}: The short-run and long-run causal effects of GDP do not affect the demand for imported rice in Uganda.

H_{03}: The short-run and long-run causal effects of domestic rice production do not affect the demand for imported rice in Uganda.

1.5 Scope of the Study

The scope of this study is divided into conceptual scope, time scope, and geographical scope.

1.5.1 Conceptual Scope

The conceptual scope is built on the foundations of demand theory. Additional study variables have been derived from empirical research.

1.5.2 Time Scope

The study focuses on Uganda's Import demand for rice for a period of 41 years i.e. 1980-2021.

1.5.3 Geographical Scope

This study's geographical scope is restricted to Uganda due to the following reasons;

i. Research focus: The study has specific research objectives that are directly related to Uganda. For example, the study aims to analyze the determinants of import demand specifically within the Ugandan context. By focusing on a specific country like Uganda, the study provides targeted and relevant insights for policymakers and stakeholders in that particular context.
ii. Data availability: Conducting a study requires access to reliable and relevant data. There is access to comprehensive and accurate data on import demand, as well as other relevant variables, specifically for Uganda, it thus makes sense to focus the study on Uganda.
iii. Resource constraints: Conducting a study requires time, funding, and resources. Limiting the geographical scope to Uganda allows the researcher to concentrate their efforts and resources effectively. It enables them to dive deeper into the specific challenges and opportunities within Uganda's import demand dynamics without spreading themselves too thin across multiple countries.

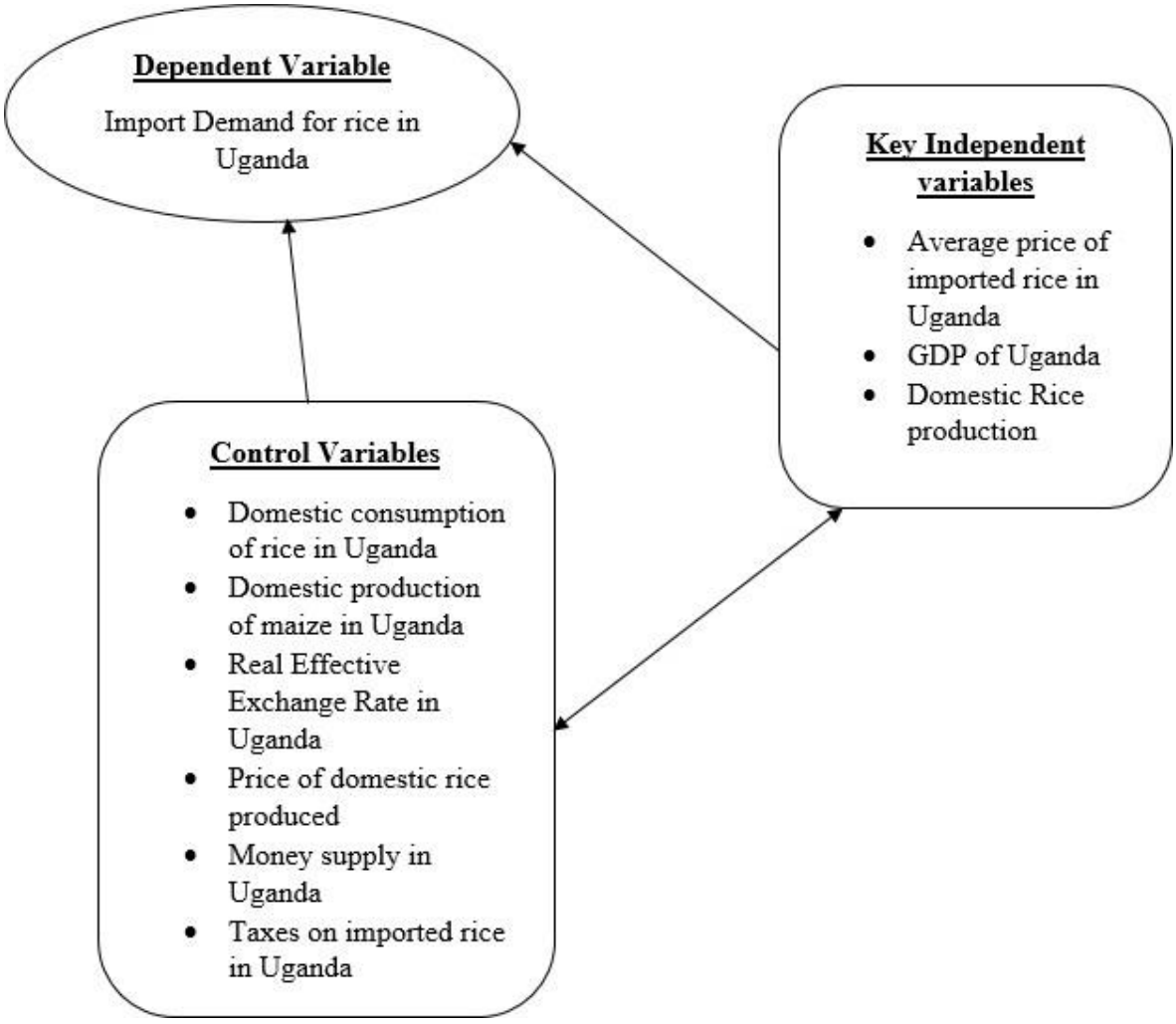
1.6 Significance of the Study

This study contributes to the existing body of literature on the determinants of import demand in developing countries. Specifically, there is a need to have a better understanding of the drivers of import demand for rice in Uganda by focusing on the causal effects of the independent factors in both the short-run and long-run, the gap this study tries to fill. It is believed that the study findings will inform policymakers and stakeholders about the factors that drive import demand for rice in Uganda.

1.7 Conceptual framework

The conceptual framework is a comprehensive description of the key concepts and theories that show the connection between context, and variables that are independent and dependent. This conceptualization is presented in Figure 3.

Figure 3: Factors that influence the import demand of rice in Uganda



Source: Adopted from Boansi David (2015) but, modified by the author.

1.8 Definition of Key Terms

Import Demand: Import demand is defined as the number of goods or services that a country imports from other countries. In this study, the import demand for rice refers to the amount of rice Uganda imports from other economies. In my study import demand for rice is the dependent variable.

The average price of imported rice (AVEPRIC): The average price of rice imported in Uganda is defined as the average cost paid for imported rice per unit (such as per kilogram or metric ton) in Uganda's rice market. It represents the arithmetic mean of the prices at which different batches or shipments of imported rice are purchased from international suppliers and brought into Uganda.

Domestic rice produced (RIPRO): Rice produced in Uganda is defined as rice that is grown and harvested within the borders of Uganda. It includes all varieties of rice grown in Uganda, such as NERICA, Jasmine, Super, Kaiso, and Basmati. Rice production in Uganda is primarily concentrated in the eastern and northern regions of the country, where the climate and soils are favorable for rice cultivation.

Gross Domestic Product (GDP): An essential economic measure, GDP calculates the total worth of all finished products and services generated within the borders of a country during a specified period. It offers a thorough overview of the output and economic activities of a nation. GDP serves as an essential measure of a country's economic performance and is often used to compare the relative size and growth of different economies. It provides insights into the overall level of economic activity, productivity, and standards of living within a country.

Real Effective Exchange Rate (REER): The Real Effective Exchange Rate (REER) is defined as the country's currency relative to a weighted average of the currencies of its trading partners, adjusted for inflation. It reflects the real purchasing power of the country's currency about its trading partners. The REER is calculated by taking the nominal exchange rate, adjusting it for inflation, and then weighting it by the trade shares of each country's trading partners. The weights are typically based on the relative importance of each country in the country's trade flows.

Domestic consumption of rice (APRO): Domestic consumption of rice is defined as the estimated total amount of rice eaten within the nation during a specific period, considering only the rice produced domestically. It excludes any imported rice and takes into account only the rice that is consumed within Uganda's borders. Apparent domestic consumption provides insights into the quantity of rice that is utilized by the domestic market, reflecting the demand for rice among Ugandan consumers.

Quantity of maize produced domestically (MAPRO): The quantity of maize produced in Uganda is defined as the total amount of maize that is grown and harvested within Uganda during a given period, typically a year. It includes all varieties of maize grown in Uganda, such as white maize and yellow maize. Maize is a major regular food in Uganda and an important crop for both the security of food and income generation. It is primarily cultivated by modest farmers using traditional methods, as well as by some larger commercial farms.

Taxes on imported rice in Uganda: Taxes on imported rice in Uganda refer to the various duties, levies, and taxes imposed by the Ugandan government on rice that is imported into the country. These taxes are typically applied at the border or point of entry and are intended to generate revenue for the government, protect domestic rice producers, and regulate the flow of imported rice into the country. These taxes and levies can significantly affect the cost of imported rice in Uganda, making it more expensive compared to domestically produced rice.

Money supply in Uganda: Money supply in Uganda refers to the total amount of money in circulation, which includes demand deposits, cash, and other liquid instruments. The money supply in Uganda is a key determinant of the overall economic conditions, which can influence import demand for rice through its effects on purchasing power, exchange rates, inflation, interest rates, and government policies.

1.9 How these variables affect the Import Demand for rice in Uganda

The average price of imported rice: Uganda's import demand for rice can be greatly influenced by the average price of that grain imported. Price elasticity of demand, or how much the amount demanded changes in reaction to a change in price, is an important factor. A rise in the average price of imported rice leads to a comparatively greater decline in import demand if the market for imported rice is elastic, meaning that consumers will react to price fluctuations. On the other hand, the decline in import demand will be less if demand is inelastic, meaning that buyers are less sensitive to price fluctuations. Furthermore, Consumers may choose to switch to locally grown rice or other grains in place of imported rice due to higher prices. This substitution impact may lessen the need for rice imports.

Domestic rice produced: The demand for imported rice may decline as domestic rice production rises and customers begin to substitute domestically produced rice for imported rice. When domestic rice is thought to be a near substitute for imported rice in terms of both quality and cost, the substitution impact is very significant. Also, the need for imports may decline if domestic rice can be produced at a price that is competitive with that of imports. This is because, given equal circumstances, firms and customers are more likely to choose the less expensive choice.

Gross Domestic Product: The demand for imported rice grows when the GDP rises becausecustomers have more spending power. If local production of rice cannot keep up with the rising demand, there may be a rise in the need for imported rice. Additionally, increases in GDP frequentlyresult in better infrastructure, including facilities for storage and transportation. This may lower the price of domestically produced rice and encourage companies to buy small amounts, thus reducing the demand for imported rice.

Real Effective Exchange Rate (REER): A decline in the REER, which signifies the local currency's depreciation, may result in imported rice being comparatively more costly than rice grown domestically. Because domestically grown rice is now relatively cheaper, consumers and businesses may choose to switch to it, which could result in a drop in the need for imports of rice. Additionally, the purchasing power of customers may be impacted by changes in the REER. A decline in the value

of the home currency (a lower REER) may result in higher import prices, particularly for rice, which may decrease demand for imports, particularly from lower-income groups.

Domestic consumption of rice: Imported rice will need to bridge the gap if rice production in Uganda is less than what is consumed. The need for imported rice is directly impacted by the amount of this deficit. Also, consumption patterns may be impacted by the cost and accessibility of both imported and domestically produced rice. There may be a greater demand for imported rice if it is more readily available or more reasonably priced than domestic rice.

Quantity of maize produced domestically: An increase in the quantity of maize produced domestically can contribute to higher incomes for maize farmers and rural communities. This can lead to increased purchasing power and overall consumption, potentially reducing the demand for imported rice. Furthermore, higher domestic production of maize could improve Uganda's trade balance if maize exports increase. A stronger trade balance can positively impact the country's overall economic stability and reduce the need to import rice.

Taxes on imported rice in Uganda: Taxes can significantly increase the cost of imported rice in Uganda, making it less competitive compared to domestically produced rice. These taxes can impact the import demand for rice by affecting its price relative to domestic rice, as well as its overall competitiveness.

Money supply in Uganda: A rise in the quantity of currency in circulation can lead to higher purchasing power for consumers. This can increase demand for imported rice, as consumers have more disposable income to spend. Additionally, variations in the amount of money in circulation can influence the exchange rate. A rise in the quantity of money in circulation can lead to currency depreciation, making imported rice more expensive. This can reduce import demand for rice as it becomes relatively more costly compared to domestic rice.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The theoretical and empirical aspects of import demand for rice are examined in this chapter. The literature review delves into existing studies to reveal the underlying theories and principles that govern import demand for rice. The chapter concludes by summarizing the main findings derived from the literature review and highlighting any research gaps that require further exploration.

2.1 Theoretical Review

The three primary hypotheses that describe the function of import demand are; the neo-classical theory, the Keynesian theory, and the imperfect substitution theory. These theories emphasize how price, income, and currency rates impact the dynamics that shape business (Hong, 1999). Within the notion of imperfect substitution, the customer is considered to maximize utility vulnerable to financial limitations, which aligns with the conventional demand theory.

Based on the relative costs of goods and services, the neoclassical economic model assumes that enterprises and customers make rational decisions. It implies that the main factors influencing Uganda's import demand for rice are the cost of rice, consumer income, and the cost of replacement items like maize. According to the model, customers will move to cheaper imported rice as the price of domestic rice rises, increasing the demand for imports. The Heckscher Ohlin (H-O) framework is linked to neoclassical theory; it was created using Ricardo's work (1817). As different countries have different production factors, the hypothesis states that countries buy commodities for which they have the least amount of endowment of factors (Englama et al., 2013). Stated differently, the theory suggests that demand for imports is also influenced by the price at which the importing nation produces a certain good from its exchange counterpart. The advantage over others primarily focuses on how relative import prices affect the amount and the path of global trade (Shuaibu & Fatai, 2014). In a similar vein, rising consumer affluence is predicted to drive up demand for imported rice. The

neoclassical model further posits that as higher income levels lead to greater consumption of all goods and services, including imports, they positively affect import demand.

According to the Keynesian model, import demand for rice in Uganda would depend on the level of income and aggregate demand in the economy. If income and aggregate demand are high, the demand for rice, including imports, would be higher. The import demand function is a function of the importing country's revenue, the cost of the goods imported, and the cost of goods produced locally (Goldstein and Khan, 1985). Similarly, the Keynesian theory clarifies how macroeconomic variables affect import demand. It describes how price and income affect import demand. It recognizes and considers the consequences of changing spending on output on the equilibrium of the balance of payments (Johnson, 1976). Conversely, if income and aggregate demand are low, the demand for imported rice would be lower. According to this model, import demand is impacted by variables like income, interest rates, and government spending.

In emerging nations like Uganda, other aspects such as domestic production capacity, trade policies, and institutional factors may also influence import demand. For example, trade policies such as import tariffs and quotas may affect the disparity in cost between domestic and imported rice, thereby influencing import demand. Overall, the theoretical literature implies that the import demand is influenced by a combination of economic variables such as earnings and actual effective trade rates, comparative costs, domestic production of rice, and quantity of maize (as a substitute) domestically produced. However, the relative importance of these factors may vary across countries and over time.

2.2 Empirical Literature

Import demand determinants are widely documented (Boansi and Favour, 2015; Muhammed et al.; 2023; Poerschke et al.; 2014; Yusuf et al., 2020). For instance, while trying to understand the factors influencing Nigeria's demand for imported rice, Yusuf et al., (2020) utilized a short-run and long-run dynamic model to trends, and extent of causality among the explanatory variables. The study identified the production of rice locally, the price of imported rice, the consumption of rice, per capita income, the exchange rate, the price of locally produced rice, variance in domestic stock, the price of local maize, the price of meat, and population growth as the determinants of the import demand of rice in Nigeria.

Relatedly, Muhammed et al., (2023) report, the determinants of rice demand in Sokoto North Local Government Area, Sokoto State of Nigeria. The study revealed that the price of rice, household size, and household income played significant roles in shaping the demand for rice. By examining 120 respondents using the quota sampling technique, the research utilized the powerful Ordinary Least Square (OLS) multiple regression analysis method to extract valuable insights.

Further, Prasetyo et al., (2016) conducted an intriguing study on import demand for rice in Indonesia. The study shed light on the primary determinants impacting rice imports, namely GDP, rice consumption, and the import price of rice in the world market. Employing a comprehensive Multiple Linear Regression analysis model augmented with an Error Correction Model (ECM).

Additionally, Boansi and Favour (2015) investigated the persistent increase in rice imports in Ghana, unearthing compelling findings. The study revealed a significant correlation between the volume and value of rice imports and various factors, including rising real per capita income, increasing millet price (while keeping the imported rice price unchanged), growing demand for meat, urbanization, and trade liberalization. Employing a robust multiple regression model, the study painted a comprehensive picture of the complex forces shaping Ghana's rice import landscape.

Moreover, Poerschke et al., (2014) conducted a study on rice import demand in Brazil, spanning from January 1995 to June 2010. The results showed that the nation's need for rice imports was mostly determined by income and domestic prices. It's interesting to note that in the study, the price of imported rice had a less-than-proportionate impact on import demand. The researchers used linear and non-linear relationships, indicating short and long-term aspects, in their analysis to fully capture the intricacy of the variables.

The import demand function for Long grains (Indica) rice in Saudi Arabia was studied by Bashir et al. in 2022. A long-term association between import demand quantity, import prices, per capita income, population, and crop index is revealed by the study using a Vector Error Correction Model (VECM). Their study showed that positive shocks to the population had a consistent, and long-term negative influence on imports, using time series data from 1983 to 2018. This research

supports Saudi Arabia's dietary trend away from traditional rice dishes and emphasizes the nation's changing food tastes.

Additionally, Englama et al., (2013) conducted a study on Nigeria using quarterly data from 1970 to 2011 and an Autoregressive Distributed Lag (ARDL) methodology to assess the total import demand function. The analysis found that the coefficients about foreign reserves, domestic consumer prices, income levels, and currency rates all had statistical significance. These findings suggest that these variables had a significant role in dictating the amount of goods imported into Nigeria.

Ordinary least squares (OLS) regression was used in Hermawan et al.'s 2017 study to examine the variables affecting the cost of rice within Indonesia. According to the study, local rice output and the exchange rate had opposing impacts on the cost of rice in the country, although the price of rice internationally and per capita income showed a positive correlation.

A 2SLS technique was used in a study by Putra.K. (2019) to examine the factors impacting rice imports into Indonesia. The results showed that while production of domestic rice, foreign rice prices, and foreign currency rates had a negative influence on rice imports, domestic demand for rice and domestic rice prices had a favorable impact on imports.

Setting that aside, Harvey et al. (2011) calculated the overall import demand function for Thailand, analyzing annual data from 2000 to 2010 and findings indicated that both the long-run and short-run demand for imports was primarily driven by income, demonstrating the income-explanatory nature for imports demanded. The study further revealed that demand for imported rice in Thailand was price-inelastic, further underscoring the complex dynamics of import behavior in the country.

Besides, Mah's (2000), study employed the limits test to analyze the factors influencing import demand for various products in the information technology sector of Korea. According to Mah (2000), import demand is a general function of the relative cost of an importer's goods and its revenue. The discoveries of Mah's study in 2000 indicated that relative price is the most critical factor, whereas income has little impact. In Mah's study, import demand was modeled as a function

that incorporates a country's population, real GDP, and trade-weighted exchange rate. The results attained from the analysis of Ordinary Least Squares indicated that each of the mentioned factors has a very substantial effect on the demand for imports.

Nonetheless, research on the variables influencing Iran's import demand was done in 2000 by Abrishamii and Mehrara, who discovered that population was the main influence. They used the ARDL Pesaran and Shin technique to estimate and analyze demand formulas for capital and intermediate consumer goods imports from 1971 to 1999. The study's findings reveal that, notwithstanding importers' availability of foreign currency at set or regulated rates, the parallel market exchange rate more correctly captures the opportunity cost for importers. This rate is better able to describe how imported goods behave in Iran.

Lim and Kim (2002) also looked at how political and economic developments affected North Korea's import demand in 2002. The price index and gross national income were used to model import demand, and it was discovered that both variables had a sizable impact on import demand. However, the variable measuring relative import prices was not thought to be a substantial or relevant component in influencing imports, indicating that other non-market factors including wealth were thought to be the most significant predictors of imports.

Hussain (2007) also looked at Jordan's trade demand's long-term elasticity. To calculate import demand, the study used actual income and equivalent prices for imports. The findings demonstrated that demand for imports is significantly influenced by real income and relative import pricing. Using initial quarter time series data from 1976 to the first quarter of 2004.

Based on import costs and the GDP, Chen (2008) calculated Taiwan's import demand. The study showed how shifts in a nation's revenue and relative import prices affect import demand. Additionally, it was discovered that the short-term effects of money had a greater impact than the long-term benefits.

Uzunoz and Akcay (2009) used a double logarithmic-linear model to analyze the variablesaffecting Turkey's wheat import demand from 1984 to 2006 and found that the demand for imports

was highly affected by the value of the currency, the value of domestic wheat production, and domestic demand.

A study on South Africa's import demand from 1985 to 2015 was done by Vacu et al. (2020). According to the study, import demand was highly influenced by variables like individual use private consumption, investment volume, government spending, as well as the import price index, and exports of goods and services. To capture the dynamic linkages, the study used the Auto Regressive Distributive Lag (ARDL) model and incorporated many independent variables. Overall, the study gave useful information about the factors that affected South Africa's import demand during the period.

Furthermore, to estimate import demand, Batholomew (2012) used the country's revenue, a policy dummy for trade liberalization, and a relative import price. The analysis revealed that private expenditure had the biggest short-term effects on import demand, followed by government spending, exports, and investment spending. The author suggests that strategies for reducing spending might be more advantageous than focusing on exchange rate indicators.

Additionally, Hoque et al., (2010) looked at how trade liberalization affected imports into Bangladesh and discovered that relative prices of imports and income were important factors in both the short and long term. The research found trade liberalization policies had a strong short-term influence but had minimal long-term impact.

In a study published in 2011, by Zhou et al., the import demand estimated functions for Brazil and India. The findings emphasized how a country's imports are significantly influenced by its GDP and comparable import prices. According to the study, demand for imports is very elastic and sensitive to long-term variations in income, suggesting that changes have little effect on relative import costs on demand globally for these countries' products.

Furthermore, Fukumoto (2012) examined the microeconomic import resources necessary for final consumer items, intermediate products, and capital goods. The research revealed that there was no direct connection between import demand and relative import prices and that it fluctuated depending on the type of purchases made and the growth rate of the economy, among other

variables. The study estimated the import demand for various sorts of commodities in developing nations by taking into account several variables, including GDP, discretionary income, total consumption, total investment, and total exports.

Furthermore, by dividing actual domestic income is allocated between exports, investments, and consumption, Khan et al., (2013) modified Pakistan's conventional demand function. The findings discovered a robust connection between import demand and various types of expenditure, with investment spending making up the majority of Pakistan's import demand.

Budha (2014) looked into how spending variables affected Nepal's imports from India. According to the study, the demand for imports was considerably influenced by both private and state investment, export expenditure, relative import prices, and trade liberalization policies. Compared to government spending, individual use has a bigger influence on Nepal's demand for imports. To lessen Nepal's dependency on imports from India, the research recommended encouraging investment spending and bolstering the export sector.

2.3 Literature Summary and the Research Gap

Literature analysis reveals several research done on rice import demand in various nations, offering insights into the variables and factors influencing import demand. According to the studies, several variables, including GDP, rice consumption, import price, income, exchange rate, local rice price, population, and demographic development, are important predictors of rice import demand.

The current body of literature does, however, contain major gaps. First, despite Uganda's heavy reliance on rice imports, few thorough studies particularly address the import need for rice in Uganda. Second, the LR and SR causal relationship between rice import demand and its drivers has not been addressed in the previous studies. Finally, more study is required to determine how policy changes, such as trade liberalization and investments in domestic production, affect the demand for rice imports.

Therefore, by investigating the variables impacting Uganda's import demand for rice, this study seeks to close these gaps. The study will give decision-makers insightful information they can use to create plans that will enhance domestic production, decrease reliance on imports, and guarantee

the nation's food security. By filling in these gaps, the study will add to the body of literature and offer useful recommendations for Ugandan policymakers.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

Research design, methodology, data sources and types, empirical model, variable definitions, diagnostic tests, and data analysis procedures are all covered in this chapter.

3.1 Research Design

A causal relationship research design is used in this study. This design allows the investigation of the cause-and-effect relationships between variables. We can ascertain which variables have a causal effect and comprehend the particular determinants that affect rice import demand by identifying the variables that directly affect import demand for rice.

3.2 Research approach

A quantitative research approach is used in this study.

3.3 Data types and data sources

For this research, time series data from 1980 to 2021 is used. The data was obtained from the Uganda Bureau of Statistics (UBOS), and the World Bank website.

3.4 Empirical Model

In the specification of the empirical demand function of demand for imported rice in Uganda, we base on the theoretical import demand function as well as existing literature to identify potential predictors. In this study, the variables of average price of imported rice, gross domestic product (GDP), and rice production domestically are included as key predictors while variables of domestic consumption of rice, real effective exchange rate (REER), price of domestic rice produced, and domestic maize production (which is viewed as a close substitute for rice) are included as control variables. The functional form of the import demand for rice is thus given as:

$$Import\ Demandrice = f\ (RIPRO, RIRIC, GDP, REER, APRO, MAPRO, u) \ldots\ldots\ldots\ldots\ldots (1)$$

Where;

RIPRO is the domestic rice production in Uganda

AVEPRIC is the average price of rice imported

GDP represents the disposable income

REER is the Real Effective Exchange Rate

APRO is the apparent domestic consumption of rice in Uganda

MAPRO is the quantity of maize produced domestically in Uganda u

represents other factors.

In a VECM framework, the model (1) can be written (and will be estimated in STATA) as:

$$\Delta InImportDemand_t = \beta_0 + \sum_{i=-1}^{k-1} P_i \Delta InImportDemand_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta InGDP_{t-j} +$$

$$\sum_{m=-1}^{k-1} \theta_m \Delta InREER_{t-m} + \sum_{n=-1}^{k-1} \mu_n \Delta InAVEPRIC_{t-n} + \sum_{p=-1}^{k-1} \varphi_p \Delta InRIPRO_{t-p} +$$

$$\sum_{r=1}^{k-1} \emptyset_r \Delta InAPRO_{t-r} + \sum_{s=1}^{k-1} R_s \Delta InMAPRO_{t-s} + \lambda_1 ECT_{t-1} + u_{1t} \quad \ldots\ldots\ldots\ldots (2)$$

Where;

ECT_{t-1} is an equilibrium error, which appears as "_cel L1" in STATA in each of the equations estimated.

$\boldsymbol{\lambda}$ is the adjustment parameter.

t is a time indicator.

Equation (2) demonstrates simultaneous relationships and endogenous relationships among the variables. In equation (2), the dependent variable $\Delta InImportDemand_t$ is influenced by multiple independent variables that are included on the right-hand side of the equation. These independent variables include lagged values of $\Delta InImportDemand_t$, $\Delta InGDP_{t-j}$, $\Delta InREER_{t-m}$, $\Delta InAVEPRIC_{t-n}$, $\Delta InRIPRO_{t-p}$, $\Delta InAPRO_{t-r}$, $\Delta InMAPRO_{t-s}$, and the lagged error correction term ECT. By including these variables in the equation, the model recognizes that import demand can be influenced by multiple factors simultaneously.

Equation (2) also includes endogenous relationships, which refer to the fact that some of the independent variables are impacted by past values of the dependent variable or other independent

variables within the model. For example, the lagged terms $\Delta InImportDemand_{t-i}$, capture the past changes in import demand, which can have a feedback effect on current import demand. Similarly, the lagged terms $\Delta InGDP_{t-j}$, $\Delta InREER_{t-m}$, $\Delta InAVEPRIC_{t-n}$, $\Delta InRIPRO_{t-}$, $\Delta InAPRO_{t-r}$ and $\Delta InMAPRO_{t-s,}$ reflect the influence of past values of GDP, real effective exchange rate, average prices, relative import prices, domestic aggregate production, and monetary aggregate, respectively, on the current import demand. These endogenous relationships acknowledge that the variables in the model are interdependent and can affect each other over time. By considering the lagged values of these variables, the model accounts for their dynamic relationships and allows for the examination of how changes in one variable can impact others in subsequent periods.

3.5 Definitions of the Variables in the Empirical Model.

Table 1: Variable notation, variable description, the unit of measurement, and the a priori signs of thecoefficient variables

Variable Notation	Variable Description	Unit of measurement	A priori signs	Data sources
$IMPO_{rice}$	Import Demand for Rice			World Bank
AVEPRIC	The Average Price of Rice imported	US$	-	UBOS
RIPRO	Domestic Rice Production	Tonnes	-	UBOS
GDP	Gross Domestic Product	US$	+	World Bank
REER	Real Effective Exchange Rate	US$	+	World Bank
APRO	Domestic Consumption of rice	Tonnes	+	UBOS
MAPRO	Quantity of maize produced domestically	Tonnes	-	UBOS

Source: Author's compilation.

3.6 Diagnostic tests

Time series secondary data is particularly valuable in making forecasts, analyzing the impact of specific events, and uncovering ad hoc patterns. Nonetheless, there are certain limitations associated with time series data. These drawbacks include the existence of unit roots, cointegration serial correlation, challenges related to collinearity, and issues concerning normality.

3.6.1 Unit root Test/stationarity Test

A unit root test is a statistical test used in time series analysis to determine whether a series is non-stationary and possesses a unit root, which implies that the variable is non-stationary. Non-stationary variables tend to have a trend or exhibit random fluctuations which make it challenging to recognize meaningful patterns or relationships. The unit root test helps determine whether differencing is required to create a stationary time series. Stationary time series have constant variance and mean over time, and they exhibit predictable patterns. To determine whether each of the series has a unit root, I use the Augmented Dickey-Fuller (ADF) test. The unit root null hypothesis will be rejected if the DF statistic, as estimated by the ADF test, is smaller than the crucial number given for the 5% significance level.

H_o: Variable is non-stationary/has a unit root

H_a: Variable is stationary/has no unit root

3.6.2 Cointegration Test

After conducting the test for a unit root, it is important to determine whether a linear combination of variables with integrated of order 1 i.e. (I (1)) is a stationary process of integrated of order 0 i.e. (I (0)). If this is the case, the variables are considered to be cointegrated. Cointegration represents the statistical expression of the long-term equilibrium connection between variables. It suggests that even if there may be short-term deviations from this relationship among the variables, they will eventually return to it in the long run, and the residuals will be stationary. To ascertain if each of the variables in the model has a long-term relationship with each other, a Johansen cointegration test was used. This test is used to determine the presence of a long-term relationship between multiple time series variables. It determines whether or not these variables are cointegrated by determining whether a linear combination of them is stationary.

Test for hypothesis

H_o: No cointegration

H_a: Cointegration between variables

3.6.3 Normality Test

The test evaluates whether the skewness and kurtosis of the data match what would be expected in a normal distribution using the Jarque-Bera test. The skewness is expected to be zero in a normal distribution, indicating a symmetric distribution and the kurtosis is expected to be equal to 3, indicating a similar peakness as the normal distribution. Departures from these expected values suggest a deviation from normality. The test statistic is given by;

$$JB = N\left[\left(\frac{S^2}{6} + \frac{(K-3^2}{24}\right)\right] \text{..... (i)}$$

S, N, and K denote the sample skewness, the sample size, and the sample kurtosis respectively. According to the central limit theorem, if the data has a large sample size and the disturbances are not normally distributed, the ordinary least squares (OLS) estimators can still be considered approximately normally distributed. This means that even if the assumption of normality is violated, the OLS estimators can be relied upon for inference and hypothesis testing. In the case of testing for normality using the Jarque-Bera (JB) test statistic, normality is rejected when the test statistic exceeds the critical value from the chi-square distribution with two degrees of freedom.
This test is done to check the normal distribution of the variables. This Jarque- Bera test is used to assess whether the variables follow a normal distribution. The data is tested for normality by comparing its null hypothesis with the alternative hypothesis.
Test for hypothesis
H_0: Normality
H_a: No normality

3.6.4 Multicollinearity Test

When the independent variables in a regression model show strong connections or links with one another, this is referred to as multicollinearity. The standard errors and regression coefficients become indeterminate and limitless when perfect multicollinearity is present. Regression coefficients sometimes have significant standard errors compared to the coefficients themselves, even in situations where multicollinearity is imperfect. This suggests that it is impossible to estimate the coefficients with a high degree of reliability. (Gujarati, 2004).

The Variance Inflation Factor (VIF) is used in this study to determine whether multicollinearity is present. The degree of multicollinearity among the independent variables is determined using the VIF as a diagnostic tool. The study can determine if there are strong correlations between predictors, which could make it difficult to interpret the regression coefficients and their associated standard errors, by calculating the VIF for each independent variable.

The purpose of this test is to determine whether the independent variables have a significant relationship or not. It is crucial to handle multicollinearity since it might cause instability and inconsistent regression findings. The VIF is used to assess multicollinearity. VIF is given by; $VIF = \frac{1}{1-R^2}$ where the variable "R" represents the coefficient of determination (R-squared) in a

regression model. The percentage of the dependent variable's change that the independent variables in the model can account for is shown by the coefficient of determination. If the mean VIF is below 10, it is generally considered an indication that multicollinearity is not a significant concern.

Test for hypothesis

H_0: no multicollinearity

H_a: multicollinearity exists

3.6.5 Autocorrelation Test

In time-series studies, serial correlation describes a situation where the errors associated with a particular period extend into subsequent periods. When serial correlation is present, the error term can exhibit either a moving average process or an autoregressive process;

$$\text{MA(P)}; u_t = \rho_1 e_t + \rho_2 u_{t-1} + \ldots + \rho_p u_{t-q} \quad \text{(ii)}$$

$$\text{AR(q)}; u_t = \rho_1 u_{t-1} + \rho_2 u_{t-2} + \ldots + \rho_q u_{t-q} + e_t \quad \text{(iii)}$$

Serial correlation poses challenges in time series studies as it causes standard errors to be underestimated, leading to inaccurate confidence intervals and statistical tests. Moreover, the availability of serial correlation also results in inefficient least squares estimates, impacting the precision and reliability of the estimated coefficients (Greene, 2007).

To determine whether a serial correlation exists, the Breusch-Godfrey serial correlation (LM) test is employed. The Breusch-Godfrey test offers several advantages over Durbin's statistic, as discussed in the literature (Greene, 2007). Firstly, the LM test extends its procedure to test for greater serial correlation orders. Because of its chi-squared limiting distribution, which is independent of both data and parameters, the LM test can be used even in the presence of stochastic regressors, in contrast to the Durbin-Watson test, which needs non-stochastic regressors. (Greene, 2007). Moreover, because the Durbin-Watson test is biased toward identifying no serial correlation, it might not be accurate when the lag-dependent variable is one of the explanatory variables (Greene, 2007). These characteristics make the LM test a preferred choice for detecting serial correlation in regression models.

Test for hypothesis

H_0: no autocorrelation

H_a: autocorrelation exists

3.6.6 Lag Selection Test

The lag selection test is a statistical procedure used to determine the optimal lag order in time series analysis. The lag order represents the number of past observations that should be included in the model to predict future values. The lag selection test helps in choosing the appropriate lag order by evaluating the statistical significance of different lag lengths.

The most commonly used lag selection test is the Akaike Information Criterion (AIC) or the Bayesian Information Criterion (BIC). They aim to balance the goodness of fit of the model with the complexity of including more lags.

This test is done in the VECM model to figure out how many lags are in the model. The autocorrelation test is used to assess the availability of autocorrelation in time series data.

3.7 Data analysis

Data is gathered using MS Excel and exported to STATA for analysis. A multiple linear regression model is fitted ascertaining the cause-and-effect relationship according to the results of the pre-estimation diagnostic test. The model is estimated as an ECM (Error Correction Model) model to identify short-run and long-run causal relationships.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Introduction

A thorough overview of descriptive statistics, diagnostic tests, the implications of the results of the regression diagnostic tests, and the outcomes of the regression is provided in this chapter. This chapter lays the groundwork for the analysis that follows by offering a strong framework for examining the variables affecting Uganda's import demand for rice.

4.1 Descriptive statistics of the variables

The central tendencies, dispersion, and distribution of the variables used in the study can be understood by the descriptive statistics of these variables.

Table 2: Mean, Median, Mode, Standard deviation, minimum, and maximum values of the variablesused in the study.

Variable Notation	Mean	Median	Mode	Std.Deviation	Min	Max
$IMPO_{rice}$	444,479.8	22,7836.5	1,300,000	407,715.9	72,175	1,379,188
GDP	386.606	292.34	_	171.611	221.79	734.49
REER	91.181	91.855	88.98	3.552	81.33	96.58
AVEPRIC	523.476	503	475	70.674	414	703
RIPRO	123,648.6	114,000	19,000	85,923.79	15,000	355,800
APRO	135,500	130,500	61,000	70,158.44	49,000	269,000
MAPRO	481,858.8	439,500	1,100,000	289,089.9	119,600	1,106,068

Source: Author’s computations.

Table 2 summarizes the descriptive statistics that provide a snapshot of the central tendencies, dispersion, and range of values for each variable, offering insights into their characteristics and variability within the dataset.

Table 3: Skewness values of the variables used in the study.

Variable Notation	Skewness	Prob>chi2
$IMPO_{rice}$	-0.753	0.05187
GDP	0.67719	0.08038
REER	0.52457	0.17559
AVEPRIC	0.52311	0.17681
RIPRO	1.4864	0.00012
ALL		**0.00013**

Source: Author's computations.

Table 3 summarizes the skewness for each variable, with the overall skewness of 0.00013 which is less than 0.05 indicating that the distribution of the data is very close to symmetric. Since the skewness value is very close to zero, it suggests that the data is evenly distributed around the mean.

Table 4: Kurtosis values of the variables used in the study.

Variable Notation	Kurtosis	Prob>chi2
$IMPO_{rice}$	4.3729	0.07634
GDP	3.6525	0.39956
REER	5.1739	0.00501
AVEPRIC	5.28	0.00325
RIPRO	6.3844	0.00001
ALL		**0.00000**

Source: Author's computations.

Table 4 summarizes the kurtosis for each variable, with an overall kurtosis of 0.00000 which is less than 0.05 indicating that the distribution of the data is mesokurtic, meaning it has a kurtosis value close to the normal distribution.

4.2 Diagnostic Test results

4.2.1 Unit root Test/stationarity Test

The Augmented Dickey-Fuller (ADF) test was used in the study to ascertain whether each variable has a unit root. The tests done show that all my variables are integrated into order 1 i.e. I (1) as shown in Table 5.

Table 5: Augmented Dickey-Fuller (ADF) Unit root tests for levels and first difference

Variable Name	Variable in levels Z(t) (p-value)	Variable in first difference Z(t) (p-value)	Order of integration
InIMPO	-0.257 (0.931)	-6.669*** (0.000)	I (1)
InGDP	-0.591 (0.873)	-3.262** (0.017)	I (1)
InRE	-2.628 (0.087)	-4.912*** (0.000)	I (1)
lnAVEPRIC	-1.634 (0.466)	-4.935*** (0.000)	I (1)
LnRIPRO	-1.408 (0.694)	-5.701*** (0.000)	I (1)
lnMAPRO	-1386 (0.589)	-6.907*** (0.000)	I (1)

Source: Author's computations. **, *** indicates significance at 5% and 1% levels respectively.

The null hypothesis of a unit root in levels for all variables is not rejected by the estimated Z(t) statistics, and it is not rejected by the null hypothesis of a unit root in the first difference, which suggests that all variables are I (1).

4.2.2 Cointegration Test

To determine whether the variables in the model have a long-term relationship between themselves, a cointegration test was done using the Johansen test, under the null hypothesis of no cointegration.

Table 6: The Johansen's Cointegration test results

Rank	Trace statistic	5%critical value
0	102.460	94.15
1	54.897*****	68.52
2	35.698	47.21
3	20.073	29.68
4	5.719	15.41
5	0.665	3.760

Source: Author's computations.

Table 6 includes an asterisk to denote significance at the 5% level. The trace statistic supports the rejection of the null hypothesis that there is at most one cointegration vector, indicating the presence of at least one cointegration vector.

4.2.3 Normality Test on the dependent variable

To determine whether the dependent variable in the model is normally distributed, a normality test was done using the Jarque-Bera, and the results are summarized in Table 7.

Table 7: Normality test for the dependent variable

Variable	Prob>chi2
InImpo	0.205

Source: Author's computations.

The JB normality test results in Table 7 show a p-value of 0.205 which is greater than 0.05, suggesting that the null hypothesis is not rejected. This means that the dependent variable is normally distributed.

4.2.4 Multicollinearity Test

To determine whether the independent variables used in the model have a high correlation between them, a VIF (Variance Inflation Factor) test was carried out after the OLS regression. Table 8 shows the summary of the VIFs for the independent variables included in the model as well as the mean VIF.

Table 8: VIFs and mean VIF of the independent variables in the model

Variable	VIF	1/VIF
InAPRO	17.58	0.057
InRIPRO	12.91	0.077
InGDP	5.84	0.171
lnAVEPRIC	3.03	0.330
InRE	1.43	0.701
Mean VIF	**8.16**	

Source: Author's computations.

Based on the mean of VIF which is less than 10, then there is no problem of severe multicollinearity between the independent variables.

4.2.5 Autocorrelation Test

The Lagrange-multiplier test was used to detect the availability of autocorrelation in the model under the null hypothesis of no autocorrelation. Table 9 shows a summary of the chi2 with their p-values.

Table 9: Autocorrelation test on the model

Lag	Chi2	Prob>chi2
1	29.018	0.790
2	28.087	0.824

Source: Author's computations.

The estimated chi-square statistic does not reject the null hypothesis of no serial correlation of first and second order respectively suggesting that the residuals are not severally correlated.

4.2.6 Lag Selection Results

The outcome of the lag selection criteria indicated that 1 lag was selected for the VAR. The VECM representation of a VAR will therefore have 1 lag. Therefore, the SBIC criterion is used in the study.

Table 10: Lag selection test results in the VECM

Lag selection criteria						
Lag	**LL**	**LR**	**FPE**	**AIC**	**HQIC**	**SBIC**
0	161.355		7.0e-13	-8.124	-8.017	-5.720
1	493.018	663.33	2.5e-19	-23.001	-22.142	-13.395*
2	554.786	123.541	1.7e-19	-23.673	-22.063	-12.048
3	611.728	113.88	2.6e-19	-24.091	-21.730	-10.011
4	720.553	217.65	1.0e-19	-27.240	-24.127	-11.058

Source: Author's computations. *****Indicates lag order selected by the criterion.

LL-modified Log Ratio; LR-modified Likelihood Ratio; FPE-Final Prediction Error; AIC-Akaike Information Criteria; HQIC- Hannan Quinn Information Criteria; SBIC-Schwarz Bayesian Information Criterion.

4.3 Implication of the regression diagnostic tests results

i) All variables are integrated of order 1 i.e. I (1)
ii) There was cointegration
iii) All variables are potentially endogenous

Use VECM for regression analysis to examine causal relationships between variables in both short and long-run.

4.4 Regression results

Table 11 shows a summary of the regression estimates from the VECM. The estimates of VECM indicate both SR and LR coefficients as indicated in Table 11.

Table 11: VECM Regression Estimates

	Coeff.	Std.Error	z-ratios	p-values
SR Coefficients				
Dependent Variable **D(InImpo)**				
Adjustment Parameter(ECT_{t-1})	**-0.151****	**0.058**	**-2.58**	**0.010**
D_InGDP	-0.690**	0.572	-1.21	0.000
D_InRE	0.111	0.845	0.13	0.109
D_InAVEPRIC	0.801	0.623	1.29	0.620
D_InRIPRO	-0.573*	0.208	-2.75	0.069
D_InAPRO	-2.006**	1.518	-1.32	0.000
D_InMAPRO	0.369**	0.463	0.80	0.000
C	0.018	0.092	0.19	0.850
LR Coefficients				
Dependent Variable: InImpo				
InGDP	-2.927**	0.491	-5.96	0.000
InRE	-7.433**	2.315	-3.21	0.001
InAVEPRIC	2.840**	0.805	3.53	0.000
InRIPRO	-1.962**	0.423	-4.63	0.000
InAPRO	2.352**	0.648	3.63	0.000
InMAPRO	0.333	1.009	0.33	0.741
C	9.751			
Prob>chi2	0.000			
Serial correlation tests				
Ho: NO AR (1)	0.790			
Ho: NO AR (2)	0.824			
Normally distributed residuals for InImpo Equation Ho: Residuals are normally distributed JB p-value	0.444			

Source: Author's computations. *, ** indicates significance at 5 and 10 percent levels respectively.

[1]*R-Squared - 0.959*
Adj R-Squared - 0.955
F (4, 37) - 218.22
DW Statistic- 1.345

[1]*These statistics are got from the OLS regression model before running the VECM Model.*

Estimates in Table 11 present short-run and long-run relationship between import demand for rice, GDP, Real Effective Exchange Rate, Average Price of imported rice, Rice domestically produced, Apparent consumption of rice and Maize domestically produced in Uganda for one cointegrating vector in the period 1980-2021 and can be explicitly displayed in equation (3) as shown below;

$$\text{InImpoRice} = 9.751 - 2.927\text{InGDP} - 7.433\text{InRE} + 2.840\text{InAVERPRIC} - 1.962\text{InRIPRO} + 2.352\text{InAPRO} + 0.333\text{InMAPRO} \quad \text{.....(3)}$$

A Prob>chi2 value of 0.000 indicates that the model fits the data well and is statistically significant overall at the 5% level. The estimated P-values of 0.790 and 0.824 of first and second order respectively are greater than 0.05, suggesting that the residuals are not severally correlated and therefore do not reject the null hypothesis of no serial correlation. The JB P-value of 0.444 is greater than 0.05 indicating that we fail to reject the null hypothesis, suggesting that the residuals are normally distributed.

The Adjusted R^2-value of 0.959 in the model indicates that the variables explain 96% of the changes in import demand for rice in Uganda. The D-W Statistic is 1.345 which is close to 2 which also confirms that there is no problem with autocorrelation. The F (4, 37) value of 218.22 from the variables indicates significance, indicating a strong connection between the variables used in the study.

4.4.1 Error Correction Term

In this model, the error correction term represents how to import demand for rice in Uganda reacts to alterations in the explanatory variables and adjusts over time to reach a long-term equilibrium. The error correction terms calculated coefficient is precisely negative, falling between -1 and 0. The estimated coefficient of the error correction term is accurately negative and lies between -1 and 0. Additionally, it is statistically significant at a 5% level of significance. In particular, the coefficient value of -0.1505 indicates that around 15.1% of the adjustment going towards the long-run equilibrium takes place within a one-year timeframe.

4.4.2 Interpretation of the Regression Coefficients concerning study objectives

H_{01}: The average price of imported rice does not have short-run causal effects but has long-run causal effects on the demand for rice imports in Uganda.

This implies that variations in the average price of imported rice may not have an immediate impact on import demand, but over time, as prices persistently fluctuate, they influence the demand for imported rice in Uganda.

H_{02}: GDP has a short-run and long-run causal effect on demand for imported demand for rice in Uganda.

This suggests that changes in GDP have an immediate as well as a sustained impact on the demand for imported rice. Specifically, a rise in GDP in both the short and long run leads to a decrease in import demand.

H_{03}: Domestic rice production does not have short-run causal effects but has long-run causal effects on the demand for rice imports in Uganda.

This suggests that changes in the production of rice domestically do not immediately affect the demand for imported rice, but over the long term, variations in domestic production levels influence the demand for imported rice in Uganda.

4.4.3 Regression Coefficients

Table 11 presents SR and LR results from the VECM model which satisfy the linear regression assumptions as well as passing several diagnostic tests. This suggests that these findings can be the basis for insightful interpretation and discussion.

GDP and Import Demand for Rice

Consistent with one of the particular objective of this research, which aimed to examine the immediate and long-term causal impacts of GDP on the demand for rice imports, the results offer strong evidence of the association between these variables. Findings indicate a significant negative impact of GDP on the long-term import demand for rice. An increase in GDP in the LR by 1 percent leads to a decrease of 2.93 percent in the import demand for rice, holding all other factors

constant. Furthermore, in the immediate run, findings reveal that GDP exerts a negative influence on the import demand for rice. The statistical significance at the 5 percent level emphasizes the robustness of this relationship. Specifically, a one percent rise in GDP leads to a 0.69 percent reduction in the import demand for rice, keeping in mind all other aspects constant. The negative coefficient of GDP could reflect a substitution effect, as GDP increases, consumers substitute away from imported rice for domestically produced rice. This might be caused by variables like shifts in the relative costs of rice grown locally and the accessibility of alternatives like maize. This finding emphasizes GDP's significance in influencing Uganda's rice import dynamics and advances our understanding of how it influences the country's demand for rice imports over the long and short terms.

Average Price of imported rice and Import demand for Rice

One of the objectives specified in the study was to examine the relationship between the Average Price of imported rice (AVEPRIC) and the import demand for rice in Uganda. The findings reveal a positive significant relationship between these variables. The coefficient of 2.84 in the LR, which is significant statistically at both the 1 percent and 5 percent levels, indicates that an increase in the Average Price of imported rice by 2.84 percent leads to an increase in the import demand for rice holding all factors constant. This finding might be caused by consumers' quality perception about imported rice whereby they perceive imported rice to be of higher quality. Additionally, preference for variety as imported rice may offer a variety of options (for example, different grain sizes, colors, or textures) that are not available domestically.

Rice is produced domestically and Import demand for Rice

The study findings, aligning with one of the specific objectives, reveal a negative significant relationship between domestically produced rice (RIPRO) and the import demand for rice in Uganda. The coefficient of -1.962 in the LR at both the 1 percent and 5 percent levels indicates that a unit decrease in domestic rice production leads to a 1.962 percent rise in the demand for rice imports holding all factors constant. The underlying reason for this phenomenon can be attributed to the substitution effect where as domestic rice production increases, consumers may substitute away from imported rice for domestically produced rice due to lower prices and preference for locally produced rice.

4.4.4 Other Significant Variables in the Study.

Domestic consumption of rice and Import Demand for Rice

These variables show a substantial negative connection. The SR's coefficient of -2.006 is significant statistically at the 1 percent and 5 percent levels when all other variables are held constant. A 2.006 percent drop in domestic rice consumption (APRO) increases the demand for rice imports. This may be due to elements like consumer demand for homegrown rice and adequate domestic production. Additionally, the coefficient of 2.352 in the LR, which is statistically significant at the 1 percent and 5 percent levels, shows that, when all other variables remain constant, a 2.352 percent increase in domestic rice consumption results in an increase in the demand for rice imports. Consumers may choose imported rice due to its superior quality and varieties (like Basmati), which are not produced domestically, and the fact that increasing domestic rice consumption might not keep up with the amount of rice produced domestically.

Quantity of maize produced domestically and Import Demand for Rice

Results show that the amount of maize produced locally (MAPRO) has a considerable positive influence on the demand for rice imports in the short term. Keeping all factors constant, a one percent increase in MAPRO in the SR results in a 0.369 percent rise in the demand for rice imports. This could be the result of things like the complementary nature of rice and maize in consumer dietary habits. The increase in the consumption of both goods could be the result of economic improvements.

Real Effective Exchange Rate and Import Demand for Rice

The study findings reveal a negative significant relationship between the Real Effective Exchange Rate (REER) and the import demand for rice in Uganda. The coefficient of -7.433 in the LR at both the 1 percent and 5 percent levels indicates a unit decrease in REER leads to a 7.433 percent increase in the import demand for rice holding all factors constant. This might be due to higher import costs because local currency depreciates making imported rice more expensive in local currency. This leads consumers to turn to domestically produced rice which will be relatively cheaper.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The conclusion, recommendations, and limitations are covered in this chapter.

5.1 Conclusion

In conclusion, the primary objective of this research is to find out which factors affect Uganda's desire for rice imports. The findings show significant relationships between three significant variables—the average price of imported rice, GDP, and domestic rice production—and the demand for rice imports. The causal consequences of these relationships are examined in both the short and long-run analyses of these relationships. First, this study shows that the import demand for rice is causally affected over the long term by the average price of imported rice. The findings point to an inverse link, indicating that as the average price of rice drops, import demand for rice rises. This result emphasizes how crucial price factors are in determining the dynamics of import demand.

Secondly, the analysis shows that GDP significantly influences the import demand for rice in both the short and long-terms. The strong correlation shows that as GDP grows, the demand for rice imports declines. This could suggest a substitution effect, as GDP increases, consumers substitute away from imported rice for domestically produced rice. Additionally, a growing need for rice imports is a result of economic growth and rising affluence where consumers' incomes increase and they prefer higher quality domestically produced rice.

Thirdly, it is discovered that Uganda's domestic rice output has considerable long-term causal effects on import demand for rice. This result can be attributed to Uganda's high levels of demand, which outpace domestic production. In addition, other factors included in this research, such as the

domestic price of rice and domestic rice consumption, were also discovered to be significant over the long term. These findings show how Uganda's demand for rice imports is influenced by domestic market conditions and consumption trends.

Overall, this study helps us understand the factors that influence Uganda's import demand for rice. The results highlight the significance of the GDP, domestic production of rice, and the average price of imported rice in determining the dynamics of rice imports. These findings can be used by policymakers and stakeholders to create strategies that support domestic rice production that is sustainable and efficiently control import demand in Uganda's rice market.

5.2 Recommendations

Promoting GDP Growth

Implementing import substitution strategies specifically targeted at the rice industry is crucial to lowering Uganda's import demand for rice, increasing production capacity, and increasing GDP. The main goal of these regulations should be to encourage domestic rice production and raise the quality of that rice. To do this, the government can provide targeted subsidies, tax exemptions, and cost-effective loan choices, fostering an environment that is favorable for the production of rice.

Additionally, encouraging value addition and processing of domestically grown rice will meet a variety of consumer tastes and improve the competitiveness of domestic rice. Modern rice milling, processing, and storage facility investments will promote value addition, boost domestic production, and lessen the demand for rice imports.

Supporting agricultural research and innovation is also essential for creating high-yielding rice varieties that are compatible with Uganda's climate and soil conditions. Technology breakthroughs in rice farming, processing, and storage should be driven by the government and private sector. In the end, collaboration on research projects will increase domestic rice output, boost GDP, and lessen the nation's dependency on rice imports.

Promoting Domestic Rice Production

It is important to increase the productivity and competitiveness of the local rice industry since domestic rice output influences import demand significantly. This can be done by offering farmers

assistance such as access to better seeds, subsidies, increased loan access, fertilizers, and agricultural technologies, as well as training programs to boost the domestic rice industry's productivity and competitiveness. Additionally, encouraging the production of improved rice varieties to increase domestic rice production yields and encouraging the cultivation of diverse rice varieties that are well-suited to regional agroecological conditions allows farmers to lower risks related to pests, diseases, and the effects of climate change.

Reducing import demand for rice through price mechanisms

The average price of imported rice has a considerable influence on import demand, according to the study's findings. Uganda should address price-related issues in the rice industry if it wants to improve food security and minimize trade imbalances. It is essential to strengthen the rice supply chain, which calls for improvements to market accessibility, storage capabilities, andtransportation networks to expedite distribution, reduce post-harvest losses, and boost the competitiveness of locally produced rice.

Additionally, encouraging farmer cooperatives and agribusiness development initiatives will strengthen the bargaining power of smallholder rice farmers and give them more authority over the production of their crops. The optimization of production and marketing tactics will result in improved price negotiations if they are given entry to finance, extension services, and market information.

The establishment of a supportive environment for domestic rice farmers is required to encourage price competitiveness. This entails cutting regulatory burdens, offering subsidies, reducing tariffs to lower production costs, and investigating affordable transportation solutions. These actions will strengthen the overall price competitiveness of rice grown domestically, lowering the need for imports and boosting the domestic rice sector.

5.3 Limitations of the study

The primary obstacle in performing this study was the inability to gather data over a much longer period since some variables, particularly the dependent variable, were not available. Due to this restriction, the study was forced to take into account a small number of variables to maintain the degrees of freedom.

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