Online ISSN : 2249-460X
Print ISSN : 0975-587X
DOI : 10.17406/GJHSS

GLOBAL JOURNAL

OF HUMAN SOCIAL SCIENCES: E

Economics



Study of Green Brand Image

Households' Response Strategies

Highlights

The Growth of Indian Economy

Customer Satisfaction Variables

Discovering Thoughts, Inventing Future

VOLUME 21 ISSUE 2 VERSION 1.0

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Volume 21 Issue 20 was originally issued as E2

Global Journal of Human-Social Science: E
Economics

Global Journal of Human-Social Science: E
Economics

Volume 21 Issue 2 (Ver. 1.0)

Open Association of Research Society

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Contents of the Issue

i. Copyright Notice
ii. Editorial Board Members
iii. Chief Author and Dean
iv. Contents of the Issue

1. Impact of Inflation on the Growth of Indian Economy. *1-4*
2. Analyse des Déterminants de L'inefficacité Technique des Exploitations Familiales Rizicole dans la Région de l'Extrême Nord-Cameroun. *5-18*
3. Drivers of Real Exchange Rate in the Small Open Island of Mauritius. *19-31*
4. Households' Response Strategies to Rubber Land Deal Shocks in the Ahanta West District, Ghana. *33-44*
5. Study of Green Brand Image, Company Reputation, and Product Quality against Customer Loyalty through Moderating Customer Satisfaction Variables. *45-50*

v. Fellows
vi. Auxiliary Memberships
vii. Preferred Author Guidelines
viii. Index

Volume 21 Issue 20
Originally issued as E2



Global Journal of HUMAN-SOCIAL SCIENCE: E
Economics
Volume 21 Issue 2 Version 1.0 Year 2021
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

Impact of Inflation on the Growth of Indian Economy

By Steven Smith
King Abdullah University of Science and Technology

Abstract- Inflation and economic growth have one of the most mysterious relationship in economic theory. The appropriate level of inflation required for economic growth is hard to define. This paper uses annual data from 1961-2019 to investigate the causal relationship between inflation and economic growth in India. Time series data has been collected from International Monetary Fund database. The study uses Vector Error Correction Model and Vector Auto-regression Model identifies the short-run and long-run relationship between inflation and economic development. The study concludes that inflation negatively affects the GDP in the short run but maybe a positive association in the long run. Granger Causality test was also performed to calculate the bidirectional relationship. The examination revealed that that inflation does not granger cause GDP growth. However, it also shows that GDP growth does not cause granger to cause inflation as well.

Keywords: *covid-19, inflation, economic growth, india.*

GJHSS-E Classification: *FOR Code: 149999*



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Keywords: covid-19, inflation, economic growth, india.

I. Introduction

The central bank in the country is responsible for formulating and implementing the monetary policy to achieve sustainable economic growth and ensure price stability. An efficient way to maintain the price stability is to keep the inflation in a certain level by ensuring that it will hurt economic growth. Higher inflation can reduce the purchasing power and create instability in the economic system. Researchers has been trying to figure out the appropriate relationship between inflation and economic growth for many years. Some researchers concluded that there is negative relationship between inflation and gross domestic product (GDP) growth whereas several studies concluded that inflation is essential for economic growth. Determining a proper relationship is crucial for the policy makers to adjust both monetary and fiscal policy. High inflation discourages savings but saving is important for the economy as it converts to investment capital which fuel the economic growth. But it is not possible to achieve economic growth without having inflation as very low inflation discourages producers. Phillips first hypothesizes that higher inflation positively affects economic growth by lowering unemployment rates.

II. Inflation in India

Since independence, India's economy has faced several shocks from internal and external sources. These shocks affected almost all three manufacturing, service, and agriculture sectors to affect the economic growth. India has faced budget deficits, the deficit in the trade balance, higher inflation, and decreased industrial capacity for several years. But the long-term balance of payment, domestic savings, agricultural production, and government expenditure was growing. India has faced two digits inflations very few times, over the last decade, inflation was comparatively lower than the last decade which was a leading concern for the India's economic policymakers.

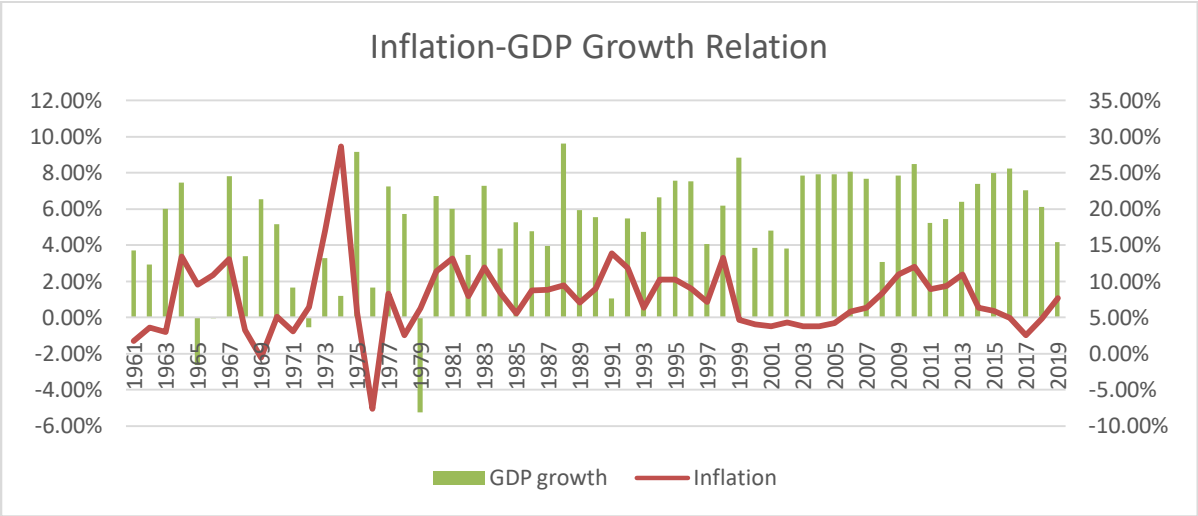

Figure 1

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III. Literature Review

Several studies have been conducted to identify the relationship between the inflation rate and economic growth. Although there is no concrete consensus among all the studies and studies are ongoing to solve the paradox.

In their growth model, Solow and Swan (1956) defined that technological innovation is the primary motivator in long-term growth, and it is determined exogenously, including inflation. In contrast, Mundel (1965) and Tobin (1965) predicted a positive relationship between inflation rate and capital growth required for economic growth. On the other hand, Sidrauski (1967) found an increase in inflation has no relation with capital stock neither output nor economic growth is affected.

Shitundu and Luvanda (2000) studied the effect of inflation on Tanzania's economic growth and found that inflation is detrimental to economic growth. Similarly, Mubarik (2005) found that low and stable inflation promotes economic growth in Tanzania. Attari & Javed (2013) carried out a study for Pakistan covering a period from 1980 to 2010. They concluded that there is a long-run relationship between the inflation rate and economic growth. However, there is no short-run relationship between the inflation rate and economic growth.

Hasanov (2010) investigated the relationship between the real GDP growth rate, Consumer Price Index Inflation, and the growth rate of real Gross Fixed Capital Formation from 2001-2009 in Azerbaijan and found a non-linear relationship between inflation and economic growth. It is similar to the findings of Eggoh & Khan (2014).

Umaru and Zubairu (2012) run the causality test and identified that GDP caused inflation and not inflation causing GDP in the Nigerian economy. The studies also conclude that there is a significant positive impact of inflation on economic growth and output. Similar results were found by Mallik and Chowdhury (2001) while studying Bangladesh, Pakistan, India, and Sri Lanka. They revealed that although moderate inflation promotes economic growth, faster economic growth absorbs inflation by overheating the economy.

Hussain & Zafar (2018) examined the association between money supply, inflation, government expenditure, and Pakistan's economic growth from 1972 to 2015. Using the Granger Causality tests, the researcher reveals that causality runs from Inflation to Economic Growth. Barro (2013) investigated inflation and economic growth for 100 countries used the data from 1960 to 1990. He identified that causation runs negatively from high persistent inflation to lower real GDP Growth.

Vinayagathasan (2013) discussed the impact of inflation on economic growth for 32 Asian economies from 1980 to 2009. The study concluded that maintaining 5.43% inflation does not hurt the economy, but above that rate, there is an inverse relationship between inflation rate and economic growth. Jha & Dang (2012) conducted similar studies in 31 developed and 182 developing countries using data from 1961 to 2009 and concluded that the threshold is 10% for developing countries. Ahamed (2021) studied the relationship between macroeconomic variables such as inflation, domestic credit, and banking sector liquidity for the period of 2005-2018. The study concludes that inflation has an inverse relation with liquidity, ultimately affecting the investment and output.

Manamperi (2014) studied the short term and long-term relationship between inflation and economic growth for BRICS (Brazil, Russia, India, China, South Africa) countries from 1980 to 2012 and observed that for India, there is a long-run positive association between inflation and economic growth and the negative short-run association was observed for Brazil, Russia, China, and South Africa.

IV. Data

The time-series data for the analysis has been collected from secondary sources for 59 years from the period 1961-2019. The data has been obtained from World Development Indicators (WDI), International Monetary Fund Database and Reserve Bank of India. The study period includes major reform, economic shift, regime changes, etc., to reflect the price volatility on economic growth.

V. Methodology

The preliminary statistical step is finding each data series stationarity through unit root tests in the time-series data. Non-stationary data contains unit roots, which can provide spurious correlation among the variables. The study used Augmented Dickey-Fuller Test (1979) and Phillips-Perron Unit Root Test (1988) to identify unit-roots existence. Phillips and Perron (1988) have generalized the Augmented Dickey-Fuller tests to the situations where the disturbance process in error term is serially correlated. The Phillips-Perron test is intended to add a 'Correction Factor' to the Augmented Dickey-Fuller test statistic.

The Vector Error Correction Model (VEC) was used to identify the short-run relationship between two cointegrated variables. The VEC Model analysis's focus is the one period lagged error terms from the previously estimated cointegrating equations. These lagged terms explain the short-run deviations from the long-run equilibrium. On the other hand, Vector Auto-regression (VAR) Model is used to identify the long-run dynamic relationship between model variables. In the end, the Granger causality test has been performed to identify the causal effects.

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VI. Results and Discussion

The Augmented Dickey-Fuller Test and Phillips-Perron Unit Root Test find that the variables are stationary and automatically cointegrated. So there exists a relationship between the independent and dependent variables. The p values for both variables in ADF and PP tests are less than the significance level of 5%. As a result, we reject the null hypothesis of non-stationarity.

Table 1: Augmented Dickey-Fuller Test

Variable	Dickey-Fuller	p-value
gdp	-6.9311	0.01
inf	-5.8938	0.01

Table 2: Phillips-Perron Unit Root Test

Variable	Dickey-Fuller Z(alpha)	p-value
gdp	-56.671	0.01
inf	-35.652	0.01

The Vector Error Correction Model and Vector Auto-regression Model identifies the short-run and long-run relationship between inflation and economic growth. In both models, lag 2 has been selected for better efficiency. The VECM identifies that the inflation rate is negatively associated with economic growth. But the error correction term is not significant, which concludes that the relationship between inflation with economic growth is volatile. However, lag 1 of GDP and lag 2 of GDP is exhibiting short term causality with inflation.

Table 3: Vector Error Correction Model

	ECT	Intercept	gdp -1	gdp -2	inf -1	inf -2
Equation gdp	-0.731(0.184)	4.8617(1.334)	-0.531(0.1731	-0.426(0.1777)	-0.184(0.1521)	-0.032(0.1336)
Equation inf	0.4318(0.12)	-2.755(0.877)	-0.631(0.1138)	-0.380(0.1169)	-0.208(0.1000)	-0.284(0.0879)

The VAR output confirms that the last year's inflation hurts GDP growth while economic growth positively affects. In the INF equation the GDP lag and inflation lag both very much significant. Considering the GDP equation both the inflation and GDP lag are insignificant. The model also concludes that last year's GDP growth negatively affect inflation whereas last year's inflation has positive impact. Last year's inflation and GDP both has positive impact on GDP growth, but both proved to be insignificant As growth positively affects current inflation in the long-run, there exists the possibility of long-run causality from growth to inflation. The covariance and correlation matrix also confirms the possible relationship between inflation and economic growth.

Table 4: Vector Auto-regression Model

Estimation results for equation gdp:

```
==========================
Estimate Std. Error t value Pr(>|t|)
inf.l1  0.03068    0.07910   0.388    0.700
gdp.l1  0.06073    0.13437   0.452    0.653
const   4.70182    1.02284   4.597 2.55e-05 ***
```

Estimation results for equation inf:

```
==========================
Estimate Std. Error t value Pr(>|t|)
inf.l1   0.3008     0.1178   2.554  0.01345 *
gdp.l1  -0.5749     0.2001  -2.873  0.00576 **
const    8.4406     1.5231   5.542 8.74e-07 ***
```

The granger causality test shows that inflation does not granger cause GDP growth. However, it also shows that GDP growth does granger cause inflation as well. Movements explain the economic growth's own shock in its own variance and the other variable.

Table 5: Granger Causality Test

```
Model 1: gdp ~ Lags(gdp, 1:2) + Lags(inf, 1:2)
Model 2: gdp ~ Lags(gdp, 1:2)
Res.Df Df      F Pr(>F)
1     52
2     54 -2 0.1046 0.9009
```

```
Model 1: inf ~ Lags(inf, 1:2) + Lags(gdp, 1:2)
Model 2: inf ~ Lags(inf, 1:2)
Res.Df Df    F  Pr(>F)
1     52
2     54 -2 4.29 0.01886
```


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VII. Impact of Covid-19

Covid-19 has an adverse impact in almost all the economies of the world. The government took steps to lockdown the country for about almost two months. Except for the emergency services, the government halted all the services and restricted social gathering. This shutdown of business has significant impact on the economic growth and daily lives. Huge number of people lost their jobs and migration from urban areas to rural areas became a common phenomenon.

VIII. Conclusion

The study focused on the relationship between inflation and the economic growth of Indian's economy from 1961-2019 period. The study concludes that inflation negatively affects the GDP in the short run but maybe a positive association in the long run. Although it is believed that some inflation is always good for the economy as it motivates the investors to invest and produce more output. However, inflation reduces the purchasing power and make the products more expensive for the consumers. So, an appropriate threshold level of inflation needs to be identified to support the policymaking. Keeping inflation levels below the threshold can achieve maximum growth for the economy.

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Global Journal of HUMAN-SOCIAL SCIENCE: E
Economics
Volume 21 Issue 2 Version 1.0 Year 2021
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

Analyse des Déterminants de L'inefficacité Technique des Exploitations Familiales Rizicole dans la Région de l'Extrême Nord-Cameroun

By Alex Kamgang Ndada, Sabine Nadine Ekamena Ntsama & Nyore
Université de Maroua-Cameroun

Abstract- This article looks at the origin of the productive technical inefficiency of Rice family farms in the Far North region of Cameroon, particularly the Maga production basin, which is one of the largest rice production basins in the country. This product is characterized by low domestic production, so the direct consequence is the import of rice to satisfy local demand; Finally, to evaluate the productive capacity of rice-farming family farms in this production basin, we determine the technical productive efficiency of these rice-farming family farms using CRS and VRS technology to determine the productive inefficiency index; finally, to explain these different indices we use a simple Tobit model. The model shows that certain parameters are at the origin of the technical productive inefficiency in the basin. Among these parameters the services provided by SEMRY is one of the most significant variables of the model.

Keywords: *DEA, technical inefficiency, rice.*

GJHSS-E Classification: *FOR Code: 349999*



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Analyse des Déterminants de L'inefficacité Technique des Exploitations Familiales Rizicole dans la Région de l'Extrême Nord-Cameroun

Alex Kamgang Ndada [α], Sabine Nadine Ekamena Ntsama [σ] & Nyore [ρ]

Résumé- Le présent article s'intéresse à l'origine de l'inefficacité technique productive des exploitations familiales rizicoles dans la région de l'Extrême-Nord Cameroun et particulièrement celles du bassin de production de Maga, qui est l'un des plus grands bassins de production rizicole dans ce pays. Ce produit se caractérise par une faible production domestique donc la conséquence direct est l'importation de riz pour satisfaire la demande locale ; Enfin d'évaluer la capacité productive des exploitations familiales rizicole de ce bassin de production, nous déterminons l'efficacité technique productive de ces exploitations familiale rizicole en faisant appel à la technologie CRS et VRS pour la détermination de l'indice d'inefficacité productive ; enfin d'expliquer ces différents indice nous utilisons un modèle Tobit simple. Il ressort du modèle que certains paramètres se trouve être à l'origine de l'inefficacité technique productive dans le bassin. Parmi ces paramètres les services fournis par la SEMRY est l'une des variables les plus significatives du modèle.

Mots clés: DEA, efficacité technique, riziculture.

Abstract- This article looks at the origin of the productive technical inefficiency of Rice family farms in the Far North region of Cameroon, particularly the Maga production basin, which is one of the largest rice production basins in the country. This product is characterized by low domestic production, so the direct consequence is the import of rice to satisfy local demand; Finally, to evaluate the productive capacity of rice-farming family farms in this production basin, we determine the technical productive efficiency of these rice-farming family farms using CRS and VRS technology to determine the productive inefficiency index; finally, to explain these different indices we use a simple Tobit model. The model shows that certain parameters are at the origin of the technical productive inefficiency in the basin. Among these parameters the services provided by SEMRY is one of the most significant variables of the model.

Keywords: DEA, technical inefficiency, rice.

I. Introduction

Le secteur agricole est l'un des secteurs indispensable à la réalisation des objectifs mondiaux de réduction de la pauvreté dans les pays en voie de développement car demeurant le secteur le plus productif; ces derniers à l'instart des pays de l'Afrique subsaharienne, sont généralement dotés de ressources naturelles et humaines nécessaires à un développement agricole soutenu. C'est pourquoi, les gouvernements africains placent l'agriculture en tête des priorités pour le développement de leurs pays au point où l'agriculture représente en moyenne 50% du produit intérieur brut (PIB) (FAO, 2012). Elle participe à plus de 80% à la valeur des échanges commerciaux et apporte à l'industrie plus de 50% des matières premières (Banque Mondiale, 2007). Dans ces pays elle assure une grosse part du revenu globale, une augmentation généralisée des revenus agricoles s'avère indispensable pour stimuler la croissance de l'ensemble de l'économie, y compris des secteurs non agricoles qui vendent des services aux populations rurales. Ainsi, ce secteur occupe une place stratégique dans l'économie nationale en termes de création de richesses, d'échanges extérieurs, d'emplois, de stabilité sociale, de sécurité, d'autosuffisance alimentaire et d'amélioration du cadre de vie en milieu rural. Face aux défis économiques de l'heure, il constitue incontestablement la clé des solutions à apporter au développement de ces pays.

Cependant, la situation de l'agriculture en Afrique, au sud du Sahara et particulièrement celle du Cameroun est souvent considérée comme peu performante. Par ailleurs, l'évolution de la productivité agricole dans cette région est stagnante et très faible par rapport à celle des autres (Inde, Chine et Brésil) (Banque Mondiale, 2007). La revitalisation des économies de l'Afrique subsaharienne devrait passer par une relance soutenue de la croissance agricole. Le taux de croissance de la production agricole est influencé par trois principaux facteurs: le volume et le type des ressources mobilisées dans la production, l'état de la technologie et enfin l'efficience avec laquelle ces ressources sont utilisées. Cette efficience des ressources permet d'identifier les possibilités d'accroissement de la production sans ressources financières supplémentaires, elle est également source d'accroissement de la productivité (Nyemeck, 2004). Ainsi donc le concept d'efficience est fondamental dans la croissance agricole en Afrique (Schultz, 1964).

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Vue son importance dans le tissu économique camerounais, le gouvernement s'était fixé comme objectifs: d'accroître les revenus des producteurs d'environ 4,5% par an en vue de réduire de moitié, à l'horizon 2015, la pauvreté en milieu rural ; d'assurer la sécurité alimentaire des ménages et de la nation ; de maitriser les importations des produits de grande consommation (le riz et le blé dont le volume des importations a doublé dans la dernière décennie). Pour atteindre ces objectifs, le gouvernement avait centré son action sur le développement des exploitations familiales agricoles qui représentaient plus de 80% de l'appareil de production. Cependant celles-ci se caractérisent par de faible niveau de production et de productivité (MINADER/MINEPIA, 2007).

Les résultats de l'ECAM 4 montrent un impact très mitigé de cette action du Gouvernement dans le développement des activités du monde rural. Les outils encore utilisés sont essentiellement rudimentaires et l'essentiel des activités de production est financé sur les fonds propres ou par l'aide des parents ou amis. Plus d'un quart de la population se consacre à l'élevage et moins de la majorité au sein de la population utilise les services vétérinaires. Ce constat montre l'urgence de la nécessité des interventions ciblées des pouvoirs publics dans le financement de l'agriculture et de l'élevage sous diverses formes pour soutenir la production agricole, sortir une frange importante de la population de la pauvreté. Ces actions permettraient de limiter la dépendance des populations vis-à-vis de l'extérieur.

En délimitant notre étude à la filière rizicole camerounaise, des constats peuvent être misent en exergue, en effet le riz est l'une des principales céréales consommé par les camerounais (INS 2018). Selon une évaluation globale, le Cameroun jouit de l'autosuffisance alimentaire. Toutefois cette autosuffisance demeure très précaire. Les évènements de Février 2008 sont encore de fraîche mémoire pour témoigner de cette précarité. Ces « émeutes de la faim », ne sont jamais très loin et risquent de continuer à embraser nos villes tant que des solutions concertées et efficaces, ne sont pas trouvées pour assurer une sécurité alimentaire durable aux populations. Mais l'horizon d'une abondance alimentaire pour tous semble encore lointain puisque des données récentes de la Banque Mondiale et de l'Institut National de la Statistique révèlent qu'environ 28% des Camerounais vivent en situation d'insécurité alimentaire et que trois des dix régions que compte le pays, à savoir l'Extrême Nord (25% de taux d'autosuffisance alimentaire), le Littoral (56%), et le Nord (83%), sont déficitaires sur le plan alimentaire. De plus le riz apparait comme l'une des spéculations les plus consommés par les Camerounais (INS 2018). Malgré son importance, la filière rizicole fait partie des filières donc la productivité est la plus faible sur le plan nationale. En effet, la production locale de riz, ne permet pas de satisfaire la demande exprimée par la population qui est estimée à 600.000t/an (MINADER, 2007); expliquant ainsi le recours aux importations pour satisfaire la demande. Les importations de riz enregistrent une hausse de 18,6% en quantité et 27,9% en valeur par rapport à 2016. Selon l'INS (2018), le Cameroun a importé 728 443 tonnes de riz pour une valeur de 183,7 milliards FCFA en 2017. Et ce, en dépit des droits de douane appliqués depuis janvier 2016 sur ce produit de grande consommation. Ces chiffres permettent de ressortir la faiblesse de la filière rizicole camerounaise et surtout son incapacité à pouvoir satisfaire la demande domestique, donc l'essentiel de la production rizicole domestique est réalisé par de petite exploitation familiale. Ces exploitations agricole occupent la grande majorité de la population, se caractérisent cependant par une faible capitalisation en utilisant très peu de facteurs de productions modernes (outillages agricoles). Ainsi, les exploitations familiales agricoles semblent être le leitmotiv de la politique agricole camerounaise. Il s'avère donc nécessaire de s'interroger sur le fonctionnement et la logique socio-économique de celles-ci. Pour que la production des EFA[1] leur permette de répondre à la demande des marchés urbains et des produits d'exportations, elles doivent évoluer pour s'insérer dans une économie de marché (approvisionnements en produits alimentaires, en matières premières et énergie, en facteur de productions et en débouchés) (Komon et Jagoret, 2004).

Le potentiel de production rizicole actuel du Cameroun se situe principalement dans les régions de l'Extrême-Nord, du Nord, de l'Ouest et du Nord-ouest qui représentent 94% de la production et 95% des superficies. La production nationale est estimée à près de 84 000 tonnes /an répartie sur environ 40 000 ha, dont une bonne partie estimée à 15 000 tonnes est assurée en dehors des grands périmètres rizicoles par des petits producteurs villageois dans les bas-fonds, le long des berges de rivières et en culture pluviale(MINADER, 2007). Les riziculteurs connaissent actuellement des difficultés liées notamment à une mauvaise gestion de l'eau, aux prestations de labour déficientes et aux approvisionnements insuffisants en intrants. Sur le plan local, la production du riz paddy a augmenté de 12% pour atteindre 311 674 tonnes en 2016 (INS, 2018). Cette embellie est le fruit de la vulgarisation de la culture du riz pluvial et de la distribution d'engrais chimiques. Paradoxalement, une bonne partie de cette production est exportée vers les pays limitrophes, car le riz produit localement est actuellement peu compétitif au Cameroun par rapport au riz importé. Le coût d'acquissions du riz importé est significativement plus faible pour pousser les ménages à consommer localement, des problèmes de transport

[1] Exploitations Familiales Agricoles

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et de la qualité des produits (taux élevés d'impuretés et de brisures, etc.). Alors que la demande annuelle est estimée, selon le ministère de l'Agriculture, à plus de 600 000 tonnes ; Ce qui n'est pas en elle-même une mauvaise nouvelle, elle reflète juste l'existence d'un marché qui apprécie la qualité du produit ; Pour d'avantager augmenter sa capacité d'autosuffisance et satisfaire la demande extérieur, le Cameroun ce doit d'augmenter ces capacités productives.

Le Cameroun envisage de produire annuellement d'ici les dix prochaines années, 1, 2 million de tonnes de riz conformément aux objectifs de production de riz du programme de développement de la filière rizicole. Il n'existe cependant aucun problème de débouchés pour le riz national, la demande nationale et régionale excédant largement l'offre. La plupart des riziculteurs villageois tant dans les zones de bas-fonds que pluviales sont regroupés en Groupements d'intérêt commun (GIC) et parfois en unions. Il existe également quelques fédérations, mais la plupart d'entre elles ne sont pas véritablement opérationnelles. En dehors des producteurs, il existe un grand nombre d'opérateurs privés liés à la fourniture d'intrants, la transformation (décorticage), la commercialisation et le transport. Chacun travaille individuellement en suivant sa propre stratégie pour maximiser son profit. Cela entraîne des conflits d'intérêts au sein de la filière et une mauvaise répartition des bénéfices au détriment des acteurs les plus faibles que sont les petits producteurs.

Il s'avère donc nécessaire de s'intéresser aux capacités productrices de ces petites exploitations agricoles et de connaître leur niveau d'efficacité technique afin de stimuler leur productivité. Cela conduit à nous questionner sur l'utilisation efficace des facteurs de production permettant ainsi à ces exploitations agricoles familiales d'optimiser leurs coûts de production et d'accroître leurs revenus. Par conséquent, les producteurs vont être en mesure de garantir un prix qui couvre les coûts de production, qui rémunère le capital et qui rémunère les exploitants locale tout en étant compétitif sur le marché.

II. Revue de la Littérature

Les sciences économiques aux travers des études micro-économiques ce sont penchées sur l'étude de l'efficacité qui recouvre des éléments larges et parfois différents. C'est à Leibenstein (1966) que nous devons la conception de la théorie de l'efficacité\de l'inefficacité-X pour dire essentiellement que, pour une raison ou pour une autre, le travail dans une firme n'est pas aussi efficace. Pour ce dernier l'inefficacité-X est le type d'inefficience résultant de la mauvaise utilisation des ressources au sein des firmes. Dans un cadre plus général, Leibenstein oppose l'efficience économique globale au processus général d'allocation des ressources au sein de l'entreprise. Dès lors, si l'on suppose l'allocation des facteurs constante, la firme est à même de générer des surplus via l'accroissement de son efficience productive (X- efficiency). Ainsi l'X-efficiency résulte du fait que les organisations n'exploitent pas de façon optimale leurs ressources. La théorie de l'X-efficience prend appuie sur l'existence d'une « frontière » de production à partir duquel une firme est dite efficience ou non. Cette frontière reflète la quantité maximale d'output pouvant être atteinte pour un niveau donné d'inputs (frontière de production); le coût minimal de production de l'output pour un niveau donné de prix des inputs (frontière de coût); ou le profit maximal pouvant être atteint pour un niveau donné des prix d'output et d'inputs (Aminou, 2018). Ainsi, à technologie et dotation en facteurs de production identiques, les firmes peuvent parvenir à des résultats différents en termes de productivité. Dès lors, toutes les entreprises ne se situent pas sur la « frontière efficiente » de l'ensemble de production à partir de l'instant où toutes ne valorisent pas de la même façon l'existence d'un input X, distinct des facteurs classiques (capital et travail), et qui reflète la qualité globale de la gestion des ressources au sein de l'organisation. Il faut signaler que la littérature économique s'agissant de l'efficacité fait la distinction entre l'efficacité technique et l'efficacité allocative. La première se réfère à l'organisation matérielle de la production et la seconde au système de prix auquel fait face l'exploitante et suivant un comportement d'optimisation économique (minimisation du coût, maximisation du profit). (Gervais, Raymond, 2002).

Au cour de ces dernières décennie, les études d'efficacité technique ont pris un bon en avant principalement par l'augmentation significative de la puissance de calcul des ordinateurs et aussi de par l'attention considérable pour les sciences économiques ; principalement pour l'établissement de frontière de production et étudier d'avantage l'échec des firmes dans la réalisation du même niveau d'efficacité (Battese, 1992). Ces approches peuvent être classées selon la forme présumée de la frontière, selon la technique d'estimation utilisée pour l'obtenir et selon la nature et les propriétés supposées de l'écart entre l'activité productive observée et l'activité productive optimale estimée. (Nkamleu, 2004). La littérature micro-économique distingue en matière de frontière de production deux approches qui sont généralement utilisées pour mesurer l'efficacité d'une unité de production: la méthode de l'efficacité productive basée sur la relation entre le principal et l'agent, et la méthode de l'efficacité productive basée sur les frontières de production (Kobou et al. 2009). En ce qui concerne la deuxième approche, deux grandes méthodes, à savoir la méthode paramétrique (Aigner & Chu 1968; Aigner et al.1977) et la méthode non paramétrique (Charnes et al. 1978 ; Banker et al. 1984), peuvent être utilisées pour estimer l'efficacité

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technique d'une firme. Ces deux approches se démarquent dans la littérature grâce à deux méthodes couramment retrouvées dans la littérature économique à savoir la méthode par enveloppement des données encore appelle méthode DEA[2] qui est une approche basée sur la programmation mathématique et la seconde méthode plus connue sous le nom de frontière stochastiques encore appelé méthode SFA qui elle est une approche paramétrique. Les deux méthodes diffèrent l'une de l'autre à cause des hypothèses concernant, d'une part, la prise en compte des résidus (facteurs aléatoires) et d'autre part la spécification fonctionnelle ou non de la fonction de production. Ainsi, chacune de ces deux méthodes repose sur une conception différente de la construction de cette frontière efficace. Néanmoins, toutes ces techniques comportent des avantages ainsi que des faiblesses qui limitent la portée de leurs applications comme outil d'évaluation de l'efficacité (Djimasra 2010). La littérature économique parlant de la mesure de l'efficacité technique, la mesure par l'écart existant entre le niveau de production observé et le niveau d'output optimal déterminé par la frontière de production. En d'autres termes, une firme sera jugée inefficace en inputs si d'autres firmes ou combinaisons de firmes peuvent produire le même output en utilisant moins de quantités d'un facteur ou de plusieurs facteurs. Cette même firme ne sera pas efficace en outputs s'il existe d'autres firmes ou combinaisons de firmes qui produisent plus, à dotation factorielle égale.

III. Méthodologie

Notre population est constitué des individus ayant comme activité principale la riziculture dans la commune de Maga ; A cet effet, étant donnée la dispersion dans toute la commune des riziculteurs, nous optons pour un plan d'échantillonnage aléatoire simple. De par l'utilisation d'un plan d'échantillonnage aléatoire simple, nous optons pour l'utilisation d'une approche probabiliste pour réduire les biais de sélection pouvant exister. En effet notre objectif est de pouvoir avoir une équiprobabilité entre les individus d'être tiré comme faisant partir de notre échantillon dans la population d'étude.

a) Analyse par enveloppement des données

Dans cette étude, l'efficacité technique des exploitations familiales rizicole est mesurée par la méthode d'analyse par enveloppement de données (Data envelopment analysis-DEA). Cette méthode tire ces origines de la thèse de Rhodes (1978) qui donnera naissance plus tard aux modèles Charnes, Cooper and Rhodes[3] (CCR) en 1981 ainsi que celui de Banker, Charnes et Cooper[4] (1984). Le modèle CCR représente une extension des travaux de Farrel (1957) qui mesurait l'efficience technique d'un modèle à input unique et output unique ; le modèle est une approche non paramétrique basée sur l'utilisation des techniques de programmation linéaire pour mesurer l'efficacité et/ou l'inefficacité technique. Il construit une frontière par morceaux linéaire à partir des données observées, donc il ne nécessite aucune hypothèse sur la forme fonctionnelle et la répartition des termes d'erreur. Les ensembles de sortie et d'entrée définissent les frontières de possibilité de production contre lesquelles les performances techniques des activités de production peuvent être mesurées.

Cette méthode calcule les scores d'efficacité technique des différentes exploitations familiales rizicole à partir d'une frontière d'efficacité. Les exploitations familiales rizicoles localisées sur la frontière sont considérées comme techniquement efficace avec un score de 1 (100%) et celles localisées sous la frontière sont inefficaces avec un score inférieur à 1 (Coelli et al., 2002). Ces exploitations familiales rizicoles inefficaces disposent donc d'une marge d'amélioration de leur performance (Cooper, 2006). Elles pourront se référer aux exploitations familiales rizicoles techniquement efficaces pour appliquer leurs meilleures pratiques.

Pour calculer l'efficience technique des exploitations familiales rizicoles, nous modélisons le problème sous forme de programmation mathématique.

$$TE_k = \frac{\sum_{r=1}^{s} U_r Y_{rk}}{\sum_{i=1}^{m} V_i X_{ik}} \qquad (1)$$

Deux contraintes conditionne la maximisation de l'efficacité technique de l'exploitation familiale rizicole k, la première porte sur les poids attribué aux différents inputs et output s'appliquant au exploitation rizicole qui ne permet pas à une exploitation familiale rizicole k d'avoir une efficacité technique supérieur à 1, de plus ces différents inputs et output sont des valeurs strictement positive. Ainsi donc, le problème de programmation linéaire suivant doit être résolu pour chaque exploitation familiale rizicole.

[2] Cette méthode fait appelle à une programmation mathématique enfin de déterminer l'efficacité des firmes

[3] C'est un modèle faisant l'hypothèse de rendements d'échelle constants (modèle CRS). Il est approprié lorsque toutes les organisations opèrent à leur taille optimale.

[4] C'est un modèle faisant l'hypothèse de rendements d'échelle variables. Il est approprié lorsque toutes les organisations n'opèrent pas à leur taille optimale

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$$\frac{\sum_{r=1}^{s} U_r Y_{rk}}{\sum_{i=1}^{m} V_i X_{ik}} \tag{2}$$

Maximiser

$$\frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \prec 1 \qquad j = 1,\ldots,n \tag{3}$$

Sous contraintes

$$u_r, v_i \succ 0, \quad \forall r = 1,\ldots,s; \qquad i = 1,\ldots,m \tag{4}$$

Où :

- TE_k : est l'efficience technique de l'exploitation familiale rizicole k utilisant m inputs pour produire s outputs ;
- Y_{rk} : est la quantité de l'output r produit par l'organisation k ;
- X_{ik} : est la quantité de l'input i consommé par l'organisation k ;
- U_r : est le poids de l'output r ;
- V_i : est le poids de l'input i ;
- s : est le nombre d'outputs ;
- m : est le nombre d'inputs.

La résolution de cette programmation linéaire pour chaque exploitation familiale rizicole ce base dans le cadre de cet article sur l'utilisation des modèles BCC-O et CCR-O, qui consiste à maximiser la somme pondérée des outputs tout en maintenant constants les inputs. L'utilisation simultanée des deux modèles[5] a pour avantage de déterminer le score d'efficacité technique totale, le score d'efficacité technique pur et enfin d'en déduire le score d'efficacité d'échelle, qui est le rapport de l'efficacité totale sur l'efficacité pur. L'objectif principal de l'application de ces différentes technologies est de pouvoir capter l'inefficacité[6] rencontré au sein des différentes exploitations familiales rizicoles.

→ Variable de l'étude

Pour évaluer l'inefficacité technique des exploitations familiales rizicole dans la localité d'étude, On dénombre une variable principale et plusieurs Inputs (la terre, des engrais, la quantité de semence, la main d'œuvre agricole).

Nous pouvons émettre après avoir faire le tour des inputs susceptibles d'évaluer le score d'efficacité le tableau ci-dessous.

[5] Il est annoté qu'une exploitation familiale rizicole peut être considéré comme efficace dans un modèle BCC et ne pas l'être sur un modèle CCR ; l'inverse n'est pas forcement vrai.

[6] Elle est obtenus sous les différentes technologies en réalisant l'opération 1- score vrs ; 1-score crs

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Tableau 1: Paramètre de la mesure de l'efficacité technique dans les EFR

Variables	Etiquettes	Type de Variable
Output		
Production de riz		Variable continue
Inputs		
La superficie agricole	La superficie de la terre dont dispose le riziculteur. Elle est exprimée en hectares. Pour les agriculteurs, la terre est le principal capital physique.	Variable continue
Equipement	La riziculture comme toute autre activité agricole nécessite l'utilisation d'outils pour l'augmentation des performances productives	Variable continue
Main d'œuvre	La quantité de travail utilisée par l'exploitant. Elle est exprimée en hommes-nombre total des jours de travail par campagne et représente la somme de la main-d'œuvre utilisée pour exécuter toutes les opérations culturales. Elle prend en compte la main-d'œuvre salariée permanente, occasionnelle et familiale.	Variable continue
Engrais	Elle est exprimée en kilogrammes. Cette variable correspond à l'utilisation des engrais et fertilisants minéraux et organiques dans la production rizicole.	Variable continue
Semence	Elle est exprimée en kilogrammes, cette variable correspond à l'utilisation des semences dans la production	Variable continue

Source: Kamgang (2019)

En tenant compte des inputs retenu dans le cadre de ce travail et en modélisant le problème dans le logiciel STATA version 15.1 grâce au package « *dea* » conçu par Yong-bae Ji et Choonjoo Lee (2013) nous calculons l'efficacité technique des 253 exploitations familiales rizicoles considérés comme nos DMUS dans le langage du calcul de l'efficacité. Des scores d'efficacité calculés, Ray, S. C. (1988) propose de chercher les sources des inefficiences productives à travers une régression économétrique des scores d'efficacité des exploitations familiales. La méthode utilisée pour l'estimation des déterminants de l'inefficacité est celle du modèle Tobit simple.

b) Le modèle TOBIT simple

Le modèle Tobit, a été introduit par Tobin(1958) pour faire l'analyse du problème de l'achat d'un bien durable. Ce modèle se réfère aux modèles à variable dépendante limitée pour lesquels la variable dépendante est continue mais observable seulement sur un intervalle spécifique. En d'autres termes, le domaine de la variable dépendante est contraint à un espace limité par les observations possibles. Les modèles à variable dépendante découlent des modèles à variables qualitatives, qu'on utilise lorsqu'on désire évaluer la probabilité que la variable dépendante appartienne à l'intervalle pour lequel elle est observable. Pour ce faire, les scores d'inefficacités déterminés pour chaque type d'exploitation sont régressés sur les déterminants potentiels.

Afin de mieux comprendre l'inefficacité dans le cadre de cette recherche, plusieurs variables ont été sélectionné sur la base de la littérature économique mais aussi grâce à notre intuition obéissant à une approche hypothético-déductive. Ceci dans le but d'atteindre les objectifs que nous nous sommes fixés dans le cadre de cette étude. Il est important de savoir quelles variables inclure pour expliquer les sources d'inefficacité technique (Vitaliano et Toren, 1994). Ainsi, nous essayerons d'aborder les variables les plus fréquemment utilisées dans la littérature consultée et qui, semblent les plus importantes. Comme l'indiquaient Romain et Lambert (1995), l'objectif de l'étude d'efficacité n'est pas le calcul du niveau de l'efficacité comme telle, mais plutôt l'identification des facteurs qui sont à l'origine de l'inefficacité. Dans notre travail de recherche, sept variables ont été retenues comme étant des facteurs susceptibles d'expliquer l'inefficacité technique des exploitations familiales rizicoles.

Tableau 2: Variable retenu pour la conception du modèle

Nom de la variable	Etiquette	Modalité	Signe attendus+/-
Ineff	Inefficacité technique		
Nivetude	Niveau d'étude	1. Primaire 2. Secondaire 3. Université	+/-
Age	Age du chef d'exploitation		+/-
Foncier	Le statut foncier	1. Locataire 2. Propriétaire	+/-
Credit	L'accès aux crédits agricoles	1. Non	+/-

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		2. Oui	
Association	Appartenance à une association agricole	1. Non 2. Oui	+/-
Subven	Subvention de la part d'un organisme	1. Non 2. Oui	+/-
Service_Semry	Service SEMRY	1. Non 2. Oui	+/-

Une variable appelée Ineff* est présumée dépendre d'un certain nombre de variables indépendantes regroupées dans le vecteur X, dont les effets sont regroupés dans le vecteur β. On présume que les valeurs observées de la variable Ineff* sont la combinaison de la valeur prédite par la composante déterministe du modèle Xi' β et d'un résidu i , dont la valeur varie de manière aléatoire pour chaque individu. Le modèle Tobit simple utilisé pour expliquer l'inefficacité est spécifié de la manière suivante Si Ineffi représente le niveau d'efficacité d'une exploitation familiale rizicole quelconque i, le modèle peut s'écrire :

$$Ineff_i* = \alpha + X_i\beta + \varepsilon_i \qquad \forall i = 1,...,n \tag{5}$$

Où $Ineff*$ est la variable latente des scores d'efficacité et Xi est le vecteur des variables explicatives.

$$Ineff_i* = \begin{cases} 0 & si\ Ineff_i* \le 0 \\ Ineff* & si\ 0 \le Ineff_i* \le 1 \\ 1 & si\ Ineff_i* \ge 1 \end{cases} \tag{6}$$

Où :

- $X_i = \left(x_i^1 ... x_i^k\right), \quad \forall i = 1,...,n$ est un vecteur de caractéristiques observables
- $\beta = \left(\beta_1 ... \beta_k\right)' \in \mathbb{R}^k$ est un vecteur de paramètres inconnus
- ε_i est la perturbation qui suit une loi $N\left(0, \sigma_\varepsilon^2\right)$

Dans cette relation, $Ineff_i*$ est présumé dépendre d'un certain nombre de variables explicatives regroupées dans le vecteur X_i, non incorporées dans le DEA et dont les effets sont regroupés dans le vecteur β. $Ineff_i$ est la combinaison de la valeur prédite par la composante déterministe du modèle βX_i et d'un résidu dont la valeur varie de manière aléatoire pour chaque exploitation familiale rizicole. Cependant, on suppose que la variable $Ineff_i*$ n'est pas observable directement, mais que l'on observe plutôt la variable $Ineff_i$ continue et limitée à zéro.

IV. Résultats

L'objectif général de cette recherche est d'analyser les niveaux d'inefficacité des exploitations familiale rizicole et d'identifier quels sont les déterminants susceptibles d'influencer l'inefficacité de ces exploitations rizicoles. Ainsi donc, dans cette section nous présentons les résultats des différentes analyses réalisées sur la population d'étude.

a) Mesure de l'efficacité

Dans cette sous-section, nous déterminons l'efficacité technique des exploitations rizicoles sous les technologies CRS, VRS, SE.

→ Rendements d'Echelle Constants (CRS)

Il ressort des analyses, que l'indice moyen d'efficacité technique totale pour l'ensemble des exploitations familiales s'établit à 52.31% dans la population d'étude. Ce résultat signifie qu'en moyenne, sous la technologie de rendement d'échelle constants, les exploitations familiales rizicoles de notre échantillon auraient pût réduire leurs inputs de 47,686% en maintenant constant le niveau de production s'ils avaient adopté la technologie la plus efficace, signifiant aussi que de grands écarts existent dans la gestion des ressources d'un point de vue global et par rapport à la technologie existante. On constate également que, dans la population, il existe des exploitations qui sous la technologie CRS arrivent à utiliser de manière optimale leur ressources dans le processus de production ; néanmoins on observe dans la population des exploitations utilisant leur ressources de manière sous optimale. De pareil résultat démontre l'existence d'inefficience chez les EFR[7] sous la technologie CRS.

[7] Exploitations familiales rizicole

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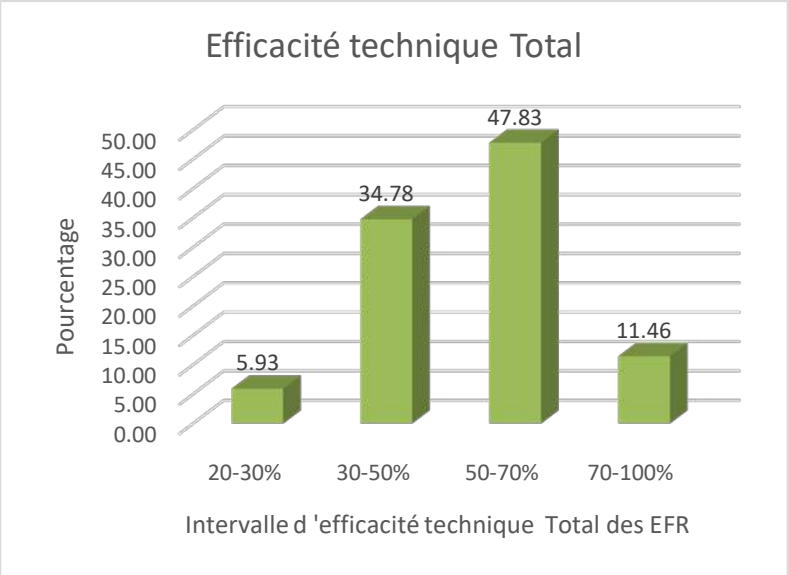

Figure 1

L'analyse de la distribution des scores individuels d'efficacité technique montre que très peu de producteur se situe sur la frontière de production. En d'autres termes, les producteurs produisent en dessous de la frontière, corroborant ainsi l'hypothèse de l'existence d'une inefficacité. Le calcul des efficacités techniques indique qu'en général la performance productive des exploitations familiales rizicole est d'un niveau relativement faible. Des résultats similaires ont été obtenu par Sharma et al (1997), Lebel et al(1999) qui en s'intéressant à l'efficacité des porciculteurs en Hawaï et celles des entrepreneurs forestiers dans le sud des Etats-Unis ont démontré l'existence sous la technologie CRS d'inefficience au sein de ces différentes exploitations agricoles

→ Rendements d'Echelle Variables (VRS)

Ce modèle est une extension du modèle CRS qui ne tient pas compte des rendements d'échelle constants. Selon Coelli et al. (1998), « l'hypothèse de rendements d'échelle constants n'est appropriée que si toutes les unités de production opèrent à un niveau d'échelle optimal, les contraintes financières diverses, etc., pourraient faire en sorte qu'une exploitation familiale rizicole n'opère pas à un niveau d'échelle optimal ». Les statistiques des scores moyens d'efficacité technique pure pour l'ensemble de l'échantillon sont présentées dans le tableau 9. Sous la technologie rendements d'échelle variables (VRS), l'indice moyen d'efficacité technique s'est établi à 57.85% pour l'ensemble de l'échantillon. Ce qui veut dire qu'on aurait pu réduire les ressources utilisées de 42.15% pour le même niveau de production. La distribution de cette efficacité est donnée par la figure ci-dessous.

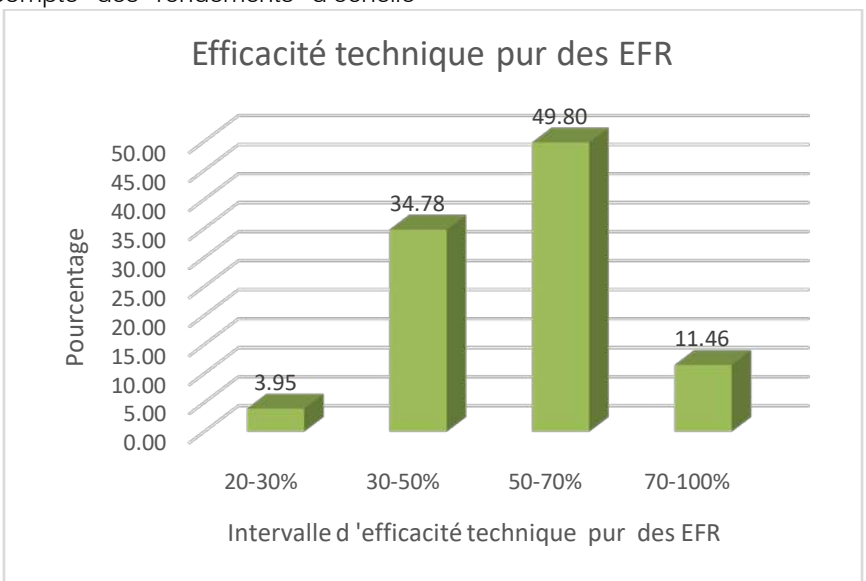

Figure 2

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On constate que sous la technologie rendements d'échelle variables, le nombre d'EFR déclarés efficients est plus élevé qu'en rendements d'échelle constants. Néanmoins on dénote l'existence au sein des exploitations familiales rizicoles d'inefficience d'échelle. Des résultats similaires ont été obtenus par Djimasra(2010), Shafiq M. & Reheman T. (2000), dans leur étude sur la filière coton donc le premier en Afrique subsaharienne et le second sur les exploitations de production cotonnière au Pakistan, Les auteurs ont calculé l'efficacité technique sous la technologie VRS dans leurs différentes études et ont décelé la présence d'inefficacité.

→ Efficience d'échelle (SE)

Après avoir mesuré la frontière d'efficacité technique sous la technologie CRS (efficacité technique totale) et la frontière d'efficacité sous la technologie VRS (efficacité technique pure) des différentes exploitations familiale rizicoles constituant notre échantillon, nous déduisons une troisième mesure qui est celle de l'efficacité d'échelle. Elle est mesurée par le rapport entre l'efficacité technique totale (CRS) et l'efficacité technique pure (VRS). Ces critères nous permettent de comparer chaque exploitation familiale rizicole par rapport aux autres. Ainsi donc, les analyses font ressortir information selon laquelle, l'efficacité d'échelle dans la population est de 0.67. Si les structures productives s'adaptaient à leur taille optimale (efficacité d'échelle), on aurait pu gagner dans l'ordre de 0.23. Pour une bonne visibilité, la distribution des différents scores d'efficacité sont représenté dans la figure ci-dessous.

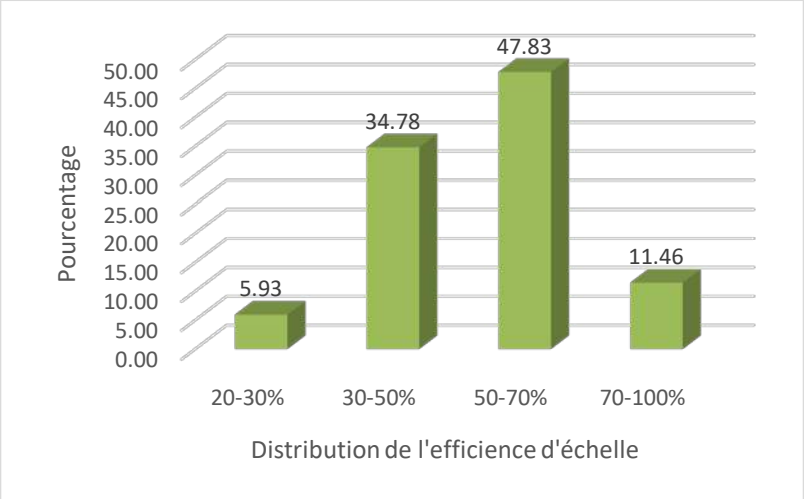

Figure 3

À la suite des résultats obtenus à partir de la méthode DEA, il est possible de corroborer le premier objectif de recherche, à savoir la détermination des scores d'efficacité technique des exploitations familiales agricoles. Par conséquent, il devient pertinent de répondre au deuxième objectif de recherche qui est d'identifier les principaux facteurs explicatifs de l'inefficacité technique des exploitations familiales rizicoles. En effet, leur identification sera certainement d'un grand intérêt, notamment en termes de pistes d'action pour améliorer la gestion de la performance de ces exploitations familiales rizicoles.

b) Identification des facteurs explicatifs du niveau d'inefficacité technique

Les scores d'efficacité calculés dans les différentes technologies (CRS, VRS), ne sont pas seulement expliqués par les erreurs des structures productives non adaptées, mais ils peuvent aussi être influencés par l'environnement structurel propre à chaque exploitation rizicole. C'est pourquoi, Ray (1988) propose de chercher les sources de cette efficacité à travers une régression économétrique des scores d'efficacité (deuxième étape). Cette démarche est d'usage courant, car la plupart des études qui se sont penchées sur la mesure de l'efficacité se font en deux étapes pour l'approche non paramétrique. Dans une première étape, on calcule les scores d'efficacité par la méthode DEA, dans un deuxième temps on tente d'expliquer ces scores par une régression économétrique permettant de tenir compte de la spécificité de la variable dépendante.

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Ainsi donc après application de la méthode économétrique développée par Tobin (1958), nous obtenons le résultat suivant après implémentation sur stata version 13.

Table 3

Variables	CRS		VRS		SE	
	Coef.	St.Err.	Coef.	St.Err.	Coef.	St.Err.
Nivetude	-0.013***	0.005	-0.015*	0.012	0.051*	0.030
Service_Semry	0.099***	0.024	0.070**	0.057	0.333**	0.143
association	-0.121***	0.023	0.081	0.055	-0.414***	0.137
Foncier	0.029	0.007	-0.004*	0.017	0.083**	0.042
subvention	-0.041	0.021	0.050	0.017	0.061	0.003
Credit_agricole	-0.009	0.007	0.005	0.018	-0.037	0.045
Age	-0.001*	0.001	-0.001***	0.001	0.001	0.003
Constant	0.472***	0.043	0.452***	0.106	1.086***	0.264
Number of obs	253.000		253.000		253.000	
left-censored observations	8		4		1	
uncensored observations	245		249		252	
right-censored observations	0		0		0	
Log likelihood	248.20537		28.239549		-196.74415	
Mean dependent var	0.362		0.443		1.026	
Chi-square	49.450		23.968		14.671	
Prob > chi2	0.000		0.004		0.000	

*Note: *** p<0.01, ** p<0.05, * p<0.1*

L'analyse du tableau révèle des informations sur les différentes technologies (CRS, VRS et SE) ainsi que leurs capacités à expliquer l'inefficacité dans la population d'étude ; Le tableau ci-dessus fait état des résultats relatifs à l'explication du niveau d'inefficacité technique dans notre population d'étude. En terme de robustesse, les différents modèles sont globalement significatif, (Prob > chi2= 0.000 pour CRS, Prob > chi2= 0.004 pour VRS et Prob > chi2= 0.000 pour SE) ce qui renvoie les informations selon lesquelles les différents modèle sont aptes à expliquer le niveau d'inefficacité. Plus spécifiquement, l'interprétation du modèle se base principalement sur la significativité des paramètres. Pour comprendre ainsi les sources de l'inefficacité, nous procédons à l'interprétation des paramètres ; L'interprétation des résultats se réalise grâce à la lecture de la significativité des paramètres ainsi que leurs signes, dans le sens où les coefficients obtenus augmentent l'inefficacité technique s'ils ont un signe positif et vice versa.

Les résultats de notre estimation économétrique renvoient les informations selon lesquelles, la variable niveau d'instruction, a un impact négatif et significatif sur le niveau d'inefficacité technique des exploitations rizicole s'agissant du modèle CRS et VRS. Cela implique que les chefs de ménages ayant un niveau d'instruction élevé sont susceptibles d'être plus efficaces que leurs homologues moins instruits. L'explication qui pourrait être avancée est le fait que le niveau d'instruction influence la prise de décision du producteur, notamment dans l'utilisation des intrants convenables dans l'exploitation agricole. Cette variable joue en faveur de la maîtrise des techniques de production. Ces dernières portent plus particulièrement sur une utilisation plus efficace des intrants, sur le développement des bonnes pratiques agronomiques. Des résultats similaires ont été obtenus par Nuama (2010), en étudiant l'efficacité technique des agricultrices de culture vivrière en Côte d'Ivoire ainsi que Sarra (2018).

L'interprétation du signe et de la significativité de la variable « Service_Semry » dans les différents modèles, renvoie l'information selon laquelle l'inefficacité productive des exploitations familiales rizicole serait due en partie aux services rendus par la SEMRY. Ceci peut être expliqué par le fait que, la SEMRY est la société qui est en charge de rendre des services aux riziculteurs dans la localité d'étude. Ceci dit, elle est responsable de l'ameublissement du sol, de l'irrigation des parcelles, des services d'accompagnement mais aussi de la commercialisation du riz. Ainsi cette structure se doit d'enclencher des

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travaux pour tous les riziculteurs avec les moyens souvent limité. D'après les interviews des riziculteurs dans la localité, le non-respect du calendrier agricole par la SEMRY paralyse significativement les producteurs de riz ; c'est le cas des campagnes précédente et celle encours, qui de par le retard enregistré dans l'exécution des tâches par la SEMRY (irrigation, ameublissement du sol, etc), les riziculteurs se retrouvent entrain de récolter leur production en plein mois d'août.[8] La conséquence majeure des services fournis par la SEMRY est la perte significative de la production, mais aussi l'augmentation des coûts de production, principalement dans le transport mais aussi dans la surveillance de la production qui se trouve être encore dans les parcelles éloignés des maisons.

L'analyse de la variable institutionnelle qu'est l'appartenance à une association est un facteur majeur dans l'analyse de l'efficacité technique, en effet cette variable capte l'aspect social du chef de ménage, c'est-à-dire sa capacité à vivre au sein d'une communauté. Ceci dit, dans le cadre de cette recherche, cette variable semble être une source de l'efficacité des exploitations familiales rizicoles étant donné qu'elle possède un coefficient positif et significatif pour les modèles CRS et SE L'explication de ce résultat peut être due au fait que, l'appartenance à une association permet aux riziculteurs de pouvoir profiter de l'expérience des membres de l'association et de réduire ainsi les risques liés à la pratique de cette spéculation ; de plus, en réalisant des achats groupés, les membres d'une association peuvent bénéficier d'une réduction de leur coût d'achat. De pareil résultats ont été obtenu par Choukou et al (2017) en s'intéressant à l'efficacité économique d'allocation des ressources dans la production du maïs au Kanem-Tchad constatent que, l'appartenance à une association permet d'améliorer les capacités productives dans les oasis de Kanem.

Le résultat le plus frappant de notre régression concerne l'effet de l'accès à la terre « Foncier » sur l'efficacité technique des producteurs. Nous nous attendons, à ce que le mode de propriété soit un facteur améliorant l'efficacité technique. Toutefois, la situation semble être différente dans le cadre de notre analyse, dans le sens où la variable accès aux fonciers est positivement corrélé à l'efficacité technique. Les riziculteurs exploitant des parcelles louées sont plus productifs que ceux en faire-valoir direct, Ainsi, les résultats de l'estimation montrent que la variable accès aux fonciers agricoles exerce un effet négatif et significatif.

Ceci peut être expliqué par le fait que, le riziculteur locataire cherche à tirer un maximum de profit lui permettant de couvrir les charges en particulier le prix de location de terre. Par conséquent, il devient plus enclin à intensifier leur culture, optimiser le rendement et produire davantage et de ce fait à utiliser plus d'intrants. Autrement dit, l'exploitant déploie tous ses efforts pour accroître le volume de production et procéder aux améliorations qui contribueront à améliorer la productivité du système de culture rizicole afin de tirer un maximum de profit leur permettant de couvrir la charge locative de la terre. Ainsi, le revenu tiré de sa production sert à honorer son engagement financier envers les propriétaires. Nos résultats vont ainsi dans le même sens que ceux de Nuama (2010), pour qui l'accès à la terre permet d'améliorer de manière significative l'efficacité productive des exploitations rizicoles

La subvention est l'une des variables constituant le modèle économétrique devant servir à l'analyse des déterminants de l'inefficacité des exploitations familiales rizicole. Son interprétation suggère qu'elle est une source d'inefficacité technique; en effet dans la population d'étude, d'après les entretiens réalisés, très peu de riziculteurs ont pu bénéficier d'une subvention extérieur en dehors de celle déjà fourni par la SEMRY. Ceci pourra expliquer le signe de cette variable dans le modèle malgré qu'elle soit non significative dans le modèle. La subvention a pour principale rôle de booster un secteur d'activité en réduisant des coûts pouvant être supporté par des exploitations. Minviel et Latruffe (2017) contredit en partie ces résultats ; en réalisant une méta-analyse sur le sujet de l'efficacité depuis le premier article publié en 1986 jusqu'à la date de leur revue de littérature. Ils ont recensé 68 études empiriques sur le lien entre subventions et efficacité technique des exploitations agricoles, réalisées entre 1986 et 2014 ; soit au total 195 modèles estimés (une étude pouvant inclure l'estimation de plusieurs modèles selon, par exemple, la production principale sur l'exploitation ou le type de subvention). Sur ces 195 modèles, 60% montrent que l'impact des subventions sur l'efficacité technique des exploitations agricoles est négatif, 24% que l'impact est positif, et pour 16% d'entre eux que l'impact n'est pas statistiquement significatif (c'est-à-dire qu'il peut être considéré comme nul).

Les résultats de l'estimation du modèle mettent également en évidence l'effet positif et statistiquement non significatif de l'accès aux crédits sur l'inefficacité technique des exploitations familiales rizicoles. Ce résultat traduit le fait que, si un riziculteur bénéficie d'un crédit pour financer ses activités agricoles, il sera plus efficient, ce qui confirme l'effet bénéfique attendu d'un recours au crédit. En effet, l'accès au crédit est considéré comme un appui en liquidités pour les riziculteurs puisqu'il les aide à acheter des intrants en début de campagne, rémunérer la main-d'œuvre salariale, etc. Plusieurs autres auteurs (kouakou, 2001; Nyemeck et al., 2004) ont conclu la même chose. Cela concorde avec les résultats obtenus par Nuama (2006) concernant l'efficacité technique des agricultrices de

[8] Saison de pluie dans la région de l'Extrême-Nord

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cultures vivrières en Côte-d'Ivoire. Il a conclu ainsi que l'exploitant qui a bénéficié d'un crédit agricole doit avoir assez d'incitations à être techniquement performant.

S'agissant de la dernière variable du modèle qui est l'âge, elle est statistique significative et négative dans le modèle VRS et CRS. En effet, ce résultat rejoint celui de Nuama (2006) qui conclue que les exploitants instruits ont la possibilité de s'informer sur les prix des intrants agricoles. Cela contribuera à remédier à l'asymétrie d'information entre les producteurs et les commerçants, augmenter le pouvoir de négociation et donc acquérir ces intrants à moindre coût. Par conséquent, un niveau d'instruction minimal est souvent prérequis pour accéder à l'information, à la technologie et aux programmes de formation et de vulgarisation et donc, joue en faveur de la réduction du niveau d'inefficacité du riziculteur.En s'appuyant sur les différents éléments présentés ci-dessus, nous avons pu conclure qu'il y a une présence d'inefficacité technique au niveau des exploitations familiales rizicoles dans le bassin de production de Maga, qui peut être expliquée par plusieurs facteurs. Donc, il existe encore des potentialités d'accroissement de la productivité à valoriser pour augmenter la production rizicoles et accroître les revenus des producteurs.

V. Conclusion

Au terme de cette analyse, l'objectif principal de ce papier était d'une part, de mesurer l'efficacité technique des riziculteurs dans le bassin de production de Maga sous les technologies BCC, CCR et d'autre part, de déceler les sources d'inefficacité existantes au sein de ces derniers. La connaissance de ces facteurs permet d'améliorer la productivité globale de ces exploitations. Pour atteindre cet objectif, les données utilisées ont été collectées dans le cadre d'une enquête menée auprès d'un échantillon de 253 exploitants rizicoles dans le bassin de production de Maga, ayant réalisé la campagne agricole 2018 et celle en cours. Dans une première étape, les scores d'efficacité ont été estimés par la méthode non paramétrique grâce au modèle DEA suivant les approches BCC et CCR. Dans une deuxième étape, les principaux déterminants de ces scores ont été identifiés, discutés et interprétés. Le logiciel Stata version 13 a été utilisé pour estimer un modèle Tobit censuré. Il ressort des résultats empiriques que les exploitations familiales rizicoles se caractérisent par une inefficacité technique. Les scores d'efficacité technique des exploitations varient entre 21.42 % et 100 % avec une moyenne de 52.31 %. Cette moyenne traduit le fait que, la production pourrait être nettement améliorée avec les mêmes quantités de ressources productives que celles utilisées actuellement. En d'autres termes, le gaspillage global des facteurs de production est de l'ordre de 47.69 %.

S'agissant du second objectif de ce travail : plusieurs facteurs sont à l'origine de cet écart d'inefficacité technique. Les résultats empiriques obtenus à partir de l'estimation du modèle Tobit censuré et de l'étude des déterminants de l'inefficacité technique pour l'échantillon total permettent de conclure que 5 variables explicatives sont statistiquement significatives au seuil de 5 %. Celles-ci sont notamment l'âge, le niveau d'instruction, le statut foncier des exploitations agricoles, l'appartenance à une association, les services fournis par la SEMRY. Les analyses corroborent les hypothèses de recherche émises dès le départ. Dès lors, sur la base de ces résultats, nous esquissons en conclusion un ensemble de préconisations en termes d'actions publiques dans le bassin de production de Maga, en matière d'amélioration de l'efficacité, visant notamment les exploitations familiales rizicoles.

En effet, des efforts particuliers seraient fournis dans diverses orientations. Les interventions peuvent être concentrées en grande partie sur les formulations de stratégies et politiques, à savoir la fourniture des assistances techniques agricoles, la sensibilisation et la vulgarisation des exploitants à travers les formations agricoles, l'amélioration de l'accès aux facteurs de production, l'octroi de crédits aux agriculteurs, l'amélioration du cadre institutionnel. Ces plans d'actions doivent être appuyés financièrement et techniquement par les institutions responsables (MINADER, MINRESI, etc) afin qu'ils puissent améliorer le degré actuel de la performance des exploitations rizicoles dans le but de les rendrent plus compétitives. Par conséquent, ce travail ne vise pas réellement à fournir des solutions toutes faites aux décideurs et aux institutions responsables, mais leur offre plutôt des outils de réflexion afin d'apporter des solutions efficaces et pérennes ancrées dans les problématiques techniques, institutionnelles et socioéconomique de l'ensemble des exploitations rizicole de la région et donc chercher à promouvoir le secteur rizicole et améliorer les conditions des producteurs de riz au Cameroun donc la conséquence immédiate serait l'amélioration du panier du consommateur et sur le plan macroéconomique, la réduction du déficit de la balance commerciale.

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Global Journal of HUMAN-SOCIAL SCIENCE: E
Economics
Volume 21 Issue 2 Version 1.0 Year 2021
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

Drivers of Real Exchange Rate in the Small Open Island of Mauritius

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Abstract- This paper investigates the factors of real exchange rate (RER) in Mauritius by implementing a dynamic regression approach on quarterly data from 1999:Q1 to 2016: Q4. Productivity differential, interest rate differential, openness, gross domestic fixed capital formation and share price index are the main triggers of RER in the long-run. In the short-run, productivity differential and interest rate differential drive real exchange rate. Thus, RER will converge to its long-run equilibrium level if these factors are allowed to adjust freely.

GJHSS-E Classification: *FOR Code: 149999*



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Drivers of Real Exchange Rate in the Small Open Island of Mauritius

Ashok Babubudjnauth

Abstract- **This paper investigates the factors of real exchange rate (RER) in Mauritius by implementing a dynamic regression approach on quarterly data from 1999:Q1 to 2016: Q4. Productivity differential, interest rate differential, openness, gross domestic fixed capital formation and share price index are the main triggers of RER in the long-run. In the short-run, productivity differential and interest rate differential drive real exchange rate. Thus, RER will converge to its long-run equilibrium level if these factors are allowed to adjust freely.**

I. Introduction

The real exchange rate is a key financial variable that measures the relative competitiveness of the traded sector of a country. Specifically, equilibrium real exchange rate (ERER) is the ratio of prices of tradable goods to prices of non-tradable goods that is compatible with the simultaneous attainment of internal[1] and external[2] equilibriums (Edwards, 1988). There is a general consensus that the prices of tradable goods are determined in the world markets and therefore are given whereas the prices of non-tradable goods are flexible as they are determined in the domestic economy. Thus, any shock to the prices of non-tradable goods leads to misalignment of real exchange rate (RER) from its long-run level and adversely affect competitiveness and economic growth (Kumar, 2010).

The pioneering theory of the exchange rate behavior is the doctrine of purchasing power parity (PPP). It posits that if the price level in domestic country rises relative to its foreign counterpart, the home currency will depreciates in nominal terms, leaving the real exchange rate constant. But, in practice, the equilibrium real exchange rate (ERER) is rather a path of RER equilibrium values (Edwards, 1988) that influences international trade, foreign direct investment (FDI) and capital flows (Villavicencio and Bara, 2008). Fluctuations in real exchange rate are also held responsible for poor growth rate, high current account deficit and financial crisis (Carrera and Restout, 2008).

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The objective of this paper is to investigate the determinants of real exchange rate in a small open island economy. In the exchange rate literature, there are only a few studies that attempt to explain the RER behavior in Small Island Developing States (SIDS) as compared to the huge number of studies carried out in developed countries. One of the most important characteristics of SIDS is their dependence on international trade. The high degree of dependency on imports and exports of SIDS validates the importance of exchange rate in these economies. Based on its remarkable performance in the African continent and its openness, Mauritius represents a good case study to examine the determinants of real exchange rate in SIDS. Undoubtedly, this study will add to the literature on factors determining equilibrium exchange rate by taking into account elements of dynamism and endogeneity in the modeling of RER which has been largely ignored in the exchange rate literature.

The remaining of this chapter is structured as follows. The determinants of real exchange rate and past empirical studies are discussed in section 2 followed by exchange rate regimes in Mauritius in section 3. Sections 4 deals with empirical analysis and finally section 5 concludes and provide some recommendations.

II. The Main Drivers of Real Exchange Rate: Theoretical Underpinnings

Unfortunately, the economic theory does not provide a comprehensive and conclusive view of the determinants of real exchange rate. Reasonably, different studies choose different fundamental factors as potential explanatory variables to explain real exchange rate movements. In this section, the factors that are believed to drive the bilateral real exchange rate between Mauritian rupee (MUR) and US dollar (USD) are highlighted.

a) Productivity differential

The Balassa (1964) and Samuelson (1964) hypothesis suggests that productivity improvement in rapidly growing economies concentrating primarily in the tradable sector causes an appreciation of RER through the increase of income and price of non-tradable goods (Chowdhury, 1999). Technological advancement generally increases the efficiency and productivity of tradable sector. Thus, when productivity goes up, wages

[1] Internal equilibrium means that the non-tradable goods market is in equilibrium in the current period and expected to be cleared in the future periods.

[2] External equilibrium means that the present and future current account balances are consistent with long-run capital flows

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reflecting the marginal productivity of labor also moves up. Since wages are equal across industries, workers in the non-trade sector also benefit from an equal proportional rise in their wages, although productivity gain remains low. The wage increase in traded commodities sector is matched by productivity gain and hence their prices do not rise whereas in the non-traded goods sector, hike in wage rates exceed productivity gain which exert an upward pressure in the prices of non-tradable goods. Consequently, the real exchange rate strengthens.

b) Interest rates

The flexible price monetary approach predicts a positive relationship between interest rate differential and exchange rate and considers a change in nominal interest rate as reflecting a change in the expected inflation. Contrarily, the sticky-price and portfolio balance approaches suggest a negative association between interest differential and nominal exchange rate. In portfolio balance models, which are based on the premise that the financial assets are not perfect substitutes, higher domestic interest rate generates more profit from an investment in domestic asset (Bouraoui and Phisuthtiwatcharavong, 2015). Foreign investors attracted by higher domestic returns invest more in the domestic assets. Thus, more foreign capital flows into the domestic economy and these capital inflows boost up the demand of local currency. In the absence of the central Bank intervention in the foreign exchange market this excess demand for domestic currency leads to an appreciation of the domestic currency.

Interest rate can also affect exchange rate indirectly through its effect on productivity differential. An increase in the interest rate reduces consumptions relative to the future as it boosts up incentive to save. Similarly, investment in physical assets is reduced as returns from bonds are higher (Aguiar and Gopinath, 2007). The induced impacts of consumption and investments lead to a fall in productivity differential. An inverse relationship between higher interest rate and lower productivity differential was reported by Monacelli et al. (2018) in emerging market economies.

c) Openness

The recognition that the tariffs level and the ERER are related in the long-run stimulates many countries to undertake reforms to liberalize trade among them. The trade liberalization reforms, among others, have dealt with the impact of long-term tariff reductions on the real exchange rate. The traditionally accepted view is based on a partial equilibrium interpretation of the elasticities approach which suggests that a lower tariff will reduce the domestic price of imports and consequently will increase its demand. This will generate a current account deficit which, in turn, will require depreciation in the RER to restore external balance, assuming that the Marshall- Lerner condition holds[3].

More openness to international trade can step up productivity of a country through increased competition pressure, changes in market shares, increased access to technological improvements and spillover. Choudhri and Hakura (2000) showed that increased import competition in medium growth manufacturing sectors enhanced overall productivity growth. Alcala and Ciccone (2004) also found economically significant and statistically robust positive effect of openness on productivity.

d) Stock prices

Stock price and exchange rate is theoretically related through the portfolio balance model (Mariano et al. 2016). Surging stock prices lure foreign capital. On the other hand, plummeting stock prices tend to diminish corporate wealth which in turn reduces a nation's wealth. The drops in the wealth of households may cause a slowdown in the demand for money and a cut in the interest rate. A lower interest rate will brisk up capital outflows to another part of the world and thereby causing the domestic currency to lose value. According to this model, plunging stock prices drops the price of the local money in the exchange rate market.

Stock prices can also have indirect influences on the real exchange rate through their impacts on investment and productivity. The mechanism was explicitly explained by Tobin (1969). The effect of share prices on the cost of capital is given by Tobin Q coefficient, which is merely the ratio of the market value of current capital to the cost of replacement capital. Higher share prices imply high Tobin's Q, and thus investment becomes more natural as it requires lower share offering. As a result, firms invest in capital goods. Consequently, higher investment leads to higher productivity growth.

e) Share of investment

Theoretically, gross fixed capital formation affects productivity either through increasing the physical capital stock or through promoting the technology indirectly (Dritsakis et al. 2006). The effects of investment on real exchange rate depend on its composition in tradable and non- tradable goods. If the investment spending occurs in the tradable sector then the RER will depreciate (Edwards, 1989; Baffles et al. 1999). On the other hand, channeling investment into non-tradable sector will cause the RER to appreciate (Rao and Tolcha, 2016).

The factors of real exchange rate discussed in this section are incorporated in the exchange rate modelling below which explains the behaviour of MUR

[3] The absolute sum of long-term export and import elasticities is greater than one.

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against USD. These triggers are selected by taking into account the economic structure of the domestic economy and the smallness of the sample size used in this study.

f) Empirical evidences

In a pioneering study, Meese and Rogoff (1983) compared the traditional exchange rate models with a driftless random walk model. None of the economic fundamentals beat a naïve no-change prediction in the short-run. But, in the long-run, evidence of the association between fundamental values and exchange rate was found. This latter finding was further consolidated by Mark (1995) and Chin and Meese (1995).

In South Africa, Aron et al. (1998) found that RER was overvalued and suggested that devaluation could be an effective instrument to accelerate convergence towards the equilibrium real exchange rate. Chowdhury (1999) examined the determinants of the real exchange rate in Papua New Guinea from 1970 to 1994. The results showed that the terms of trade had a marginal effect on trade-weighted real exchange rate in the long-run. The government expenditure had the expected negative sign but was insignificant both in the short-run and long-run. The coefficient of the net long-term capital inflow was significantly negative as per expectation. The trade restriction appreciated the RER in the long-run. The macroeconomic policy significantly and positively influenced RER. Finally, the predicting power of the nominal exchange rate was as per theory.

Locally, Heerah-Pampusa and Huree-Gobin (2006) used the Capital Enhanced Equilibrium Exchange Rates (CHEER) approach to determine an equilibrium exchange rate for MUR, utilizing monthly data from July 1994 to June 2005. The study found that the US interest rate had a greater influence on the MUR/USD rate than the local interest rate. Imam and Minoiu (2008) estimated the equilibrium real exchange rate (ERER) using the single equation equilibrium exchange rate approach (FEER-SE), and the capital enhanced equilibrium exchange rate approach (CHEER) to assess the exchange rate misalignment in Mauritius over the period 1960- 2007. They applied the autoregressive distributed lag (ARDL) approach to time series data and identified a long-run co-integration relationship among the real effective exchange rate (REER), terms of trade, openness and government consumption. The reported results indicated that both openness and government consumption had a depreciating effect on REER while terms of trade had an appreciating impact on REER.

The single equation equilibrium exchange rate analysis revealed that the MUR was in line with its equilibrium value since 2003 which implied that the exchange rate policy in Mauritius was appropriate since 2003. They then applied vector autoregressive (VAR) approach to estimate a CHEER model, using monthly series of nominal exchange rate, the inflation differential, and the interest rate differential between July 1995 and December 2007. The findings affirmed that the MUR/USD spot rate was consistent with conditional equilibrium since July 1995.

Ranadive and Burange (2013) analyzed the determinants of the real exchange rate in India from 1993 Q1 to 2011 Q4. The result reported that productivity gain weakened the RER in the long- run. Increases in Government final consumption expenditure depreciated the RER. The effect of foreign institutional investment and openness on the RER was mixed. The short-run interest rate rightly strengthened the RER whereas the long-run impact was mixed. The Inflation differential had the correct negative sign and was significant at 5% level of significance. The terms of trade had the positive and significant effect on the RER. Finally, the net foreign assets appreciated the real exchange rate after one year.

The behavior of the Swiss franc was examined by Griffoli et al. (2014). The findings were as expected. Increases in the explanatory variables tended to make the RER stronger in the long- run. Moreover, except for the Balassa-Samuelson effect, all other variables were statistically significant. Bouraoui and Phisuthtiwatcharavong (2015), based on a multiple regression approach, showed that the terms of trade and international reserves had a statistically significant positive influence on the nominal exchange rate, THB/USD. On the other hand, the interest rates differential, manufacturing production index, monetary base and government debt did not display any significant relationship with the exchange rate in Thailand.

A case study examining the sources of the real exchange rate fluctuations in the Philippines was undertaken by Mariano et al. (2016) over the period 1973-2014. The variance decomposition analysis indicated that the gross domestic product was responsible for a higher proportions of the movement in the real exchange rate, it accounted for 29.22% of the variation in the real exchange rate followed by the volume of money flow which accounted for 22.98%. The net foreign assets, the import restrictions, the oil prices, and the budget deficit had each contributed 6.64%, 3.92%, 2.87%, and 2.11%, respectively to the movements of RER.

The researchers investigating the determinants of real exchange rate were not uniform in their choice of variables, methodologies and sample frequencies. These inconsistencies have contributed to some extent to the different prediction of these studies. As regards to Mauritius, in so far, only two studies have been conducted- Heerah-Pampusa and Huree-Gobin (2006) and Imam and Minoiu (2008). These two studies were restricted to use specific variables as determined by

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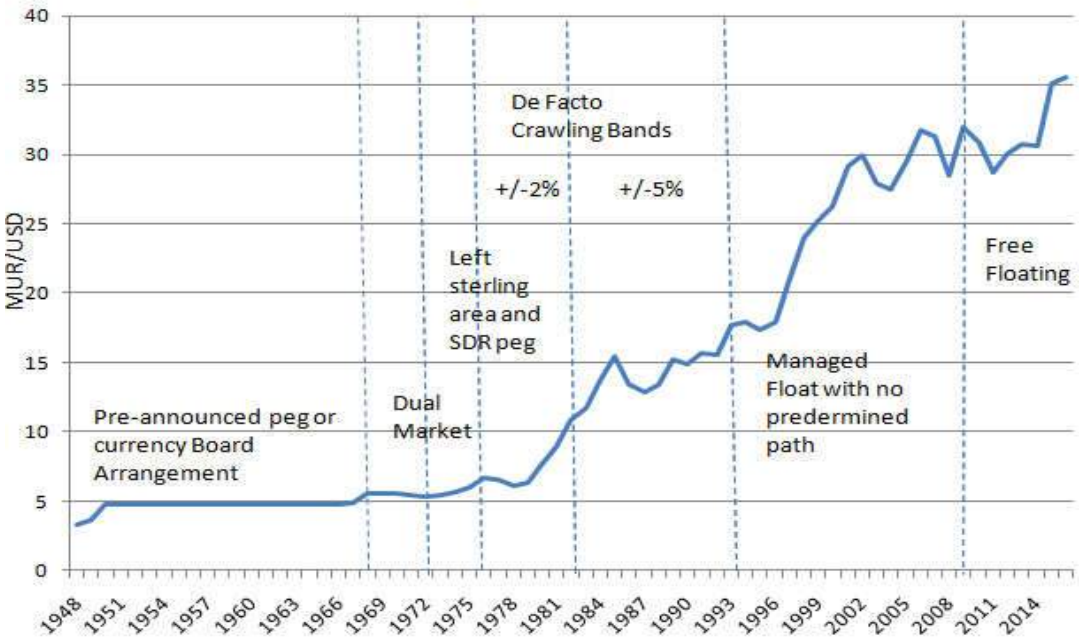
their respective models and thereby excluded significant determinants of MUR. The contribution of this study is therefore to extend the list of factors that may affect the MUR/USD by including more macroeconomic fundamentals. Moreover, the sample period is more recent and latest time series techniques are applied.

III. Exchange Rate Regimes in Mauritius

Initially, Mauritius, being a British colony, shifted between pound sterling and Indian rupee. MUR was first introduced in 1934 and linked to the pound sterling through a currency board until November 1967. Afterwards, it was directly pegged to the pound sterling. Mauritius left the sterling area in 1972 because pound sterling was weakening. An arrangement for a central exchange rate with special drawing rights (SDRs) was made and a parallel second exchange rate for capital transfers was adopted. In January 1976 the country officially fixed the MUR to the SDR within a 2% band. Officially, the rupee was devalued in 1979 and 1981 after a period of overvaluation. Figure 1 below shows exchange rate regimes shifts over the period 1948-2016. The diagram was initially used by Reinhard and Rogoff (2004) and is extended to 2016 in this study.



Source: Reinhard and Rogoff (2004) and Authors

Figure 1: Exchange rate regimes and the nominal exchange rate, 1948_2016

The MUR was officially de-linked from the SDR in mid-1982 and pegged to a trade-weighted basket of major trading partners' currencies, without disclosing the composition of the basket in virtue of an IMF program of liberalization. The exchange rate remained pegged de facto to the USD within a 5 percent band. Exchange rate for overseas travelling was controlled, and a multiple currency practice in the form of 15% tax on capital remittances was maintained up to the early 1990s.

Abolitions of exchange rate restrictions began in 1992 and by the mid-1994 all restrictions were removed. From 1994 to 2008, the country had a managed floating exchange regime. Acknowledging that the Central Bank of Mauritius did not intervene in the foreign exchange market between December 2008 and June 2009, the IMF re-classified the exchange rate to a free- floating exchange rate system in its 2009 Annual Report of Exchange Arrangements and Exchange Restrictions.

IV. Econometric Model

The empirical model is based on Kildegaard (2006); Carrera and Restout (2008); Villaviacencio et al. (2008); Biekpe (2012); Rao et al. (2016) and has been modified by incorporating country specific variables. It is given as:

$$RER_t = \beta_0 + \beta_1 LOP_t + \beta_2 LPD_t + \beta_3 INTDIFF_t + \beta_4 LGDFCF_t + \beta_5 LSPI_t + \varepsilon_t \quad (1)$$

All the variables except interest rate differential are transformed in logs such that their coefficients represent elasticities. In expression (1) RER_t is the log of bilateral real exchange rate between MUR and USD. It is CPI-based *RER* and an increase in RER_t means a depreciation whereas a decrease implies an appreciation. LOP_t is the log of external openness. LPD_t denotes the log of productivity differential between Mauritius and US. The productivity differential is proxied by the ratio of domestic consumer price index to

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domestic manufacturing price index divided by the ratio of US consumer price index to US producer price index. $INTDIFF_t$ is the interest differential between Mauritius and US. The interest rate of Mauritius is the bank rate and of US it is the US Lombard rate. $LGDFCF_t$ is the log of share of investment and $LSPI_t$ is the log of share price index.

The parsimonious specification of equation (1) incorporates the structural determinants of RER as proposed in the theoretical literature. The export oriented and import dependent characteristics of the domestic economy justify the inclusion of openness as an explanatory variable. The spectacular economic performance and the scale of private as well as public investments registered in past recent years rationalize the presence of productivity differential and gross domestic fixed capital formation in the real exchange rate model. The Central Bank of Mauritius regularly smoothes the fluctuations of MUR/USD exchange rate by interest rate policy. Finally, more global financial integration is expected to influence the MUR/USD exchange through Mauritius stock exchange. These variables are largely used in the empirical literature (MacDonald and Clark (1997); Dufrenot and Egert (2005); Kildegaard (2006); Carrera and Restout (2008); Biekpe (2012); Ghalayin (2014); Rao and Tolcha (2016)). The table 1 below depicts the signs of the independent variables found by other researchers using these variables in their analysis.

Table 1: Independent variables and expected sign of their coefficients

Variable	Estimation	References	Source of data	Expected Results
Openness	$\frac{Exports + Imports}{GDP}$	Carrera and Restout (2008) -Depreciation Oriavwote and Oyovwi (2012) -Depreciation	Statistic Mauritius	Depreciation
Productivity Differential	$\left(\frac{MCPI}{MMPI}\right) \Big/ \left(\frac{UCPI}{UPPI}\right)$	Dufrenot and Egert (2005) -Appreciation Kildegaard(2006) -Appreciation	International Financial Statistic	Appreciation
Interest Rate Differential	$Mauritius\ Bank\ Rate - US\ Lambard\ Rate$	MacDonald and Clark (1997) -Appreciation Clostermann and Schatz (2000) -Depreciation Villavicencio et al. (2008) -Appreciation	US Federal Reserve Central Bank of Mauritius	Appreciation

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Gross Domestic Fixed Capital Formation	$\frac{Private\ Inv + Public\ Inv}{GDP}$	Korsu and Braima (2007) -Appreciation Rao and Tolcha (2016) -Appreciation	Statistic Mauritius	Depreciation/ Appreciation
Share Price Index	Share Price Index	Biekpe (2012) -Apppreciation Ghalayini (2014) -Appreciation	Central Bank of Mauritius	Depreciation/ Appreciation

Source: Author's Computation

In order to have a more dynamic interaction among dependent and independent variables in the empirical model, a vector autoregressive model (VAR) is employed. The VAR enables to identify, at least exactly, a system of simultaneous equations (Tarawalie et al. 2012). Moreover, a set of co-integrating equations within a VAR approach does not suffer from simultaneity bias even if the equations comprise a simultaneous equation model (Mukherjee at al. 2003). The empirical method used in this study follows Dufrenot and Egert, (2005), Kildegaard (2006) and Asmah (2013). The data was sourced from Statistics Mauritius, Central Bank of Mauritius, International Financial Statistic (IFS) and Federal Reserve of US.

a) Stationarity and Johansen co-integration tests

The Augmented Dickey-Fuller and the Phillip-Perron (PP) tests employed to carry out the stationarity tests indicate that the series are integrated of order one as shown in table 2 below.

Table 2: Unit root test results

Variable	Level		First Difference		Status	
	ADF	PP	ADF	PP	ADF	PP
Real Exchange Rate (RER)	-1.542668	-2.551847	-7.40679***	-7.408650***	I(1)	I(1)
Productivity Differential (LPD)	-2.423261	-2.544298	-8.7622***	-8.764480***	I(1)	I(1)
Interest Rate Differential (INTDIFF)	-2.544296	-1.303626	-7.60588***	-7.574690***	I(1)	I(1)
Openness (LOP)	-1.493418	-1.795352	-10.6563***	- 10.607560***	I(1)	I(1)
Domestic Fixed Capital Formation (LGDFCF)	-1.686345	-0.949834	-12.9765***	- 14.618020***	I(1)	I(1)
Share Price Index (LSPI)	-1.139654	-2.551847	-5.56669***	-4.498864***	I(1)	I(1)

*Notes: ***and ** indicate significant at 1% and 5% level of significant respectively.*
Source: Author's Computation

The Johansen co-integration test is carried out by including three lags[4] in the VAR model and assuming a linear deterministic trend with intercept but no trend in co-integration equation. Trace and Max-eigenvalue tests indicate one and two co-integrating vectors, respectively. Given the robustness of trace statistic over the Maximum eigenvalue test (Luintel and Khan, 1999), further investigations assume only one long-run relationship among the variables.

[4] The information criteria approach was used to select the lag order of the VAR

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b) Long-run real exchange model

The long-run equilibrium real exchange rate is simply the co-integration vector. The long-run coefficients are depicted in table 3 below.

Table 3: Estimates of long-run coefficients of the variables

Productivity Differential (LPD)	Interest Rate Differential (INTDIFF)	Openness (LOP)	Domestic Fixed Capital Formation (LGDFCF)	Share Price Index (LSPI)	Intercept
-2.114232***	−0. 006964***	0. 479462***	−0. 151053**	−0. 137015***	1. 781789

*Notes: ***and ** indicate significant at 1% and 5% level of significant respectively.*
Source: Author's Computation

The signs of the long-run coefficients are statistically significant and consistent with theoretical predictions. The openness of Mauritian economy to international trade is statistically significant in explaining the depreciation of real exchange rate, with 0.48% depreciation in response to a one percent rise in trade openness. This result is in line with the findings of Imam and Minoiu (2011) and Carrera and Restout (2008). Jongwanich (2009) and Ranadive and Burange, (2013), on the other hand, reported mixed results in eight Asian developing economies and India, respectively.

Productivity differential plays a crucial role in determining long-run real exchange rate in Mauritius. The real exchange rate appreciates by 2.11% in response to a productivity improvement of 1%. This proves that in the long-run the Samuelson-Balassa effect hold in Mauritius and productivity growth primarily takes place in the trade sector. Among the structural variables, the model indicates that the largest estimated coefficient is for productivity differential. The finding is in line with Kumar (2010). Conversely, Griffoli at al. (2014) found all variables except the Balassa-Samuelson measure highly significant.

The semi-elasticity of interest rate differential is negative and significant. In the long-run, an increase by 1 percentage point in the interest rate appreciates the real exchange rate by 0.007%. The finding supports the results of Villavicencio et al. (2008) in Mexico and MacDonald and Clark (1997) between mark and dollar while it is in sharp contrast with the latter's result in Japan.

The coefficient of share of investment is negative and statistically significant. One percent increase in share of investment appreciates the real exchange rate by 0.15 percent. The negative and significant coefficient of share of investment suggests that the gross domestic fixed capital has more influence on the relative price of non-tradable sector than the tradable sector. This implies that the demand side effect of investment outweigh its supply side effect. The result concurs with the findings of Rao and Tolcha (2016); Carrera and Rostout (2008) and Koru and Braima (2007), each showed that high domestic investments appreciated real home currency.

The parameter of share price index is negative and highly significant. In the long-run, 1% increases in share price index causes the real exchange rate to appreciate by 0.14%. The data generating process in Mauritius seems to suit the portfolio balance approach quite well. An increase in stock prices results in an increase in cooperate wealth which ultimately raises the wealth in the economy. The demand for money surges and the monetary authorities increase the interest rate to avoid inflation in the country. Higher interest rate attracts inflows of capital which eventually appreciate the home currency. This result is in accord with the findings of Biekpe (2012) and Ghalayini (2014) in South Africa and European Union, respectively.

c) Short run dynamics of the real exchange rate

In addition to the long-run effects, temporary changes in the fundamentals have also been estimated by a Vector Error Correction Model (VECM) and the estimated short-run coefficients are depicted in table 4.

In the short-run, lag values of the real exchange rate do not appear to have any impact on the actual real exchange rate. These findings can be interpreted as an indication that in Mauritius real exchange rate is driven solely by fundamental factors, and it is not affected by the market behavior of chartist. The coefficients of the short-run productivity differential at lags one and two are positive and significant. These results agree with the prediction of Mundel-Fleming model. Second lag value of interest rate and real exchange rate move together in the short-run. This prediction concurs with the forecast of the flexible price monetary model. The impact of openness on RER is negative at the first lag whereas it is positive at the third lag. These findings indicates that tariff cut and other trade liberalization measures have their expected effects only in the long-run as evidenced by statistically significance and a positive parameter of the third lag of openness variable.

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Table 4: Vector error correction model

Lag	Real Exchange Rate RER	Productivity Differential (LPD)	Interest Rate Differential (INTDIFF)	Openness (LOP)	Domestic Fixed Capital Formation (LGDFCF)	Share Price Index (LSPI)
1	0.338435	0.994230***	0.004124	-0.154267	-0.010253	-0.010055
2	0.282600	0.685110**	0.007115**	0.150306	-0.068341	0.052092
3	0.227927	-0.060798	0.002304	0.216048*	-0.090669	0.087789
C	0.0000946 [0.03707]					
ECM(-1)	-0.509812** [-2.72858]					
R-squared	0.392423					
Adj R-squared	0.151923					

*Notes: ***and ** indicate significant at 1% and 5% level of significant respectively.*
Source: Author's Computation

The speed of adjustment term is negative and significant as expected. It indicates that about 51 percent of the adjustment towards long-run real exchange rate equilibrium takes place within three quarters.

The R-squared coefficient indicates that approximately 39 percent of the variation in the dependent variable is jointly explained by the explanatory variables in the model. The adjusted R-squared takes into account the degree of freedom and shows that only up to 15 percent of the changes in the real exchange rate are being accounted by its fundamental values in the short-run.

d) Diagnostic tests of the VECM model of the real exchange rate

A battery of diagnostic tests has been conducted to check the robustness of the VECM model of the real exchange rate. The error terms of the VECM model are tested for serial correlation, heteroscedasticity and for normality assumption.

Table 5: Diagnostic tests results

Test	Null Hypothesis	Statistics	Probability
Serial Correlation LM test	No serial correlation in residuals	1.362272	0.7144
Heteroskedasticity test	No heteroscedasticity in residuals	32.25976	0.1207
Jarque-Bera (JB) test	Residuals are normally distributed	1.325476	0.515438

Source: Author's Computations

The results of the tests in table 5 depict that the null hypothesis of no serial correlation in residuals, no heteroscedasticity in residuals and that the residuals are normally distributed cannot be rejected at 5% significance level.

e) Variance decomposition analysis

Variance decomposition gauges the proportion of variation in the independent variables brought about by its innovations and shocks emanating from any other variables in the model. More specifically, variance decomposition of the VECM provides "information on the relative importance of shocks to the determinants of the real exchange rate in explaining variations in the real exchange rate" (Rao and Tolcha, 2016). The methodology adopted in this analysis is Choleski decomposition with the following ordering: LRER, LPD, INTDIFF, LOP, LGDFCF, and LSPI.

Table 6: Variance decomposition of the real exchange rate

Period	S.E.	LRER	LPD	INTDIFF	LOP	LGDFCF	LSPI
1	0.016789	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.022372	96.66665	0.030068	0.000455	0.099417	2.722908	0.480501
3	0.027320	83.41411	0.120092	1.852994	3.283607	10.44081	0.888385

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4	0.032851	68.67562	0.112175	2.705742	8.023450	19.76837	0.714636
5	0.036122	61.69320	0.717602	2.356963	10.03142	24.49092	0.709898
6	0.039499	54.24223	3.076491	2.009041	10.97458	28.97115	0.726508
7	0.042750	48.59998	6.002033	1.821295	10.87298	32.00407	0.699648
8	0.045475	45.21774	9.093600	1.746301	10.30496	32.88529	0.752109
9	0.048515	42.37171	12.15577	1.572671	9.590511	33.47111	0.838228
10	0.051504	39.95459	14.42113	1.395416	8.938579	34.32739	0.962904
11	0.054325	37.95186	16.09551	1.276327	8.356266	35.17056	1.149474
12	0.057241	36.05073	17.46872	1.210247	7.824643	36.14807	1.297589
13	0.059984	34.36857	18.51712	1.187525	7.388948	37.12687	1.410969
14	0.062567	32.92635	19.42788	1.181021	7.023143	37.93838	1.503236
15	0.065074	31.69032	20.26127	1.170445	6.700782	38.61078	1.566409
16	0.067429	30.67354	20.97219	1.157265	6.419211	39.15580	1.621996
17	0.069689	29.83061	21.58816	1.146378	6.167047	39.59617	1.671638
18	0.071882	29.12309	22.10639	1.139708	5.945416	39.97346	1.711934
19	0.073988	28.52195	22.52577	1.138153	5.755454	40.30939	1.749287
20	0.076036	27.98995	22.88099	1.138869	5.590234	40.61774	1.782222
21	0.078029	27.50978	23.18698	1.139125	5.446275	40.90736	1.810476
22	0.079963	27.07552	23.45647	1.138205	5.319480	41.17464	1.835693
23	0.081849	26.68095	23.70472	1.135521	5.205600	41.41606	1.857152

Notes: S.E indicates standard error. Period refer to one quarter.
Source: Author's Computations

Table 6 reports only the variance decomposition in real exchange rate because the interest of this study is to track the movements of the real exchange rate emanating from its shocks and innovations from its sources.

In the first year, innovation in real exchange rate accounts for 69% of its forecast error variance, while the remaining 31% of its variance is explained by its determinants. Out of this 31%, the share of investment explains about 20% and openness about 8%. The rest of the variables contribute trivially to the variation in the real exchange rate.

The real exchange rate accounted for approximately 45% of its variation in the second year. 55% of the movements in the real exchange rate are caused by its fundamental variables. The contribution of the share of investment augments from 20% to 33%, that of productivity differential from 0.1 % to 9% and the importance of openness in explaining the variation in the real exchange rate increases by approximately 2%.

It can be observed from table 6 that as we move further in the future, the shock in real exchange rate becomes a less important source of its forecast variance error, while disturbances in its determinants become the most important sources of its forecast error variance. For instance, in year six share of investment is the highest contributor to the variations in the real exchange rate followed by its innovation and shock emanating from productivity differential. As we move further in the future, fundamental macroeconomic variables become the most critical drivers of the real exchange rate and thereby confirming the long-run co-integration results obtained in table 3 above.

f) Impulse response analysis

In addition to the variance decomposition, to have a precise idea of how the effect of a shock to each factor is transmitted to the real exchange rate, the impulse response analysis is performed in the VECM. It demonstrates the dynamic reactions of an endogenous variable following a one- standard deviation shock to its innovation and innovations of other factors in the VAR model. It indicates the direction to which the independent variable moves in response to shocks to the innovation of each dependent variable in the system for an extended future period. Figure 2 below shows the

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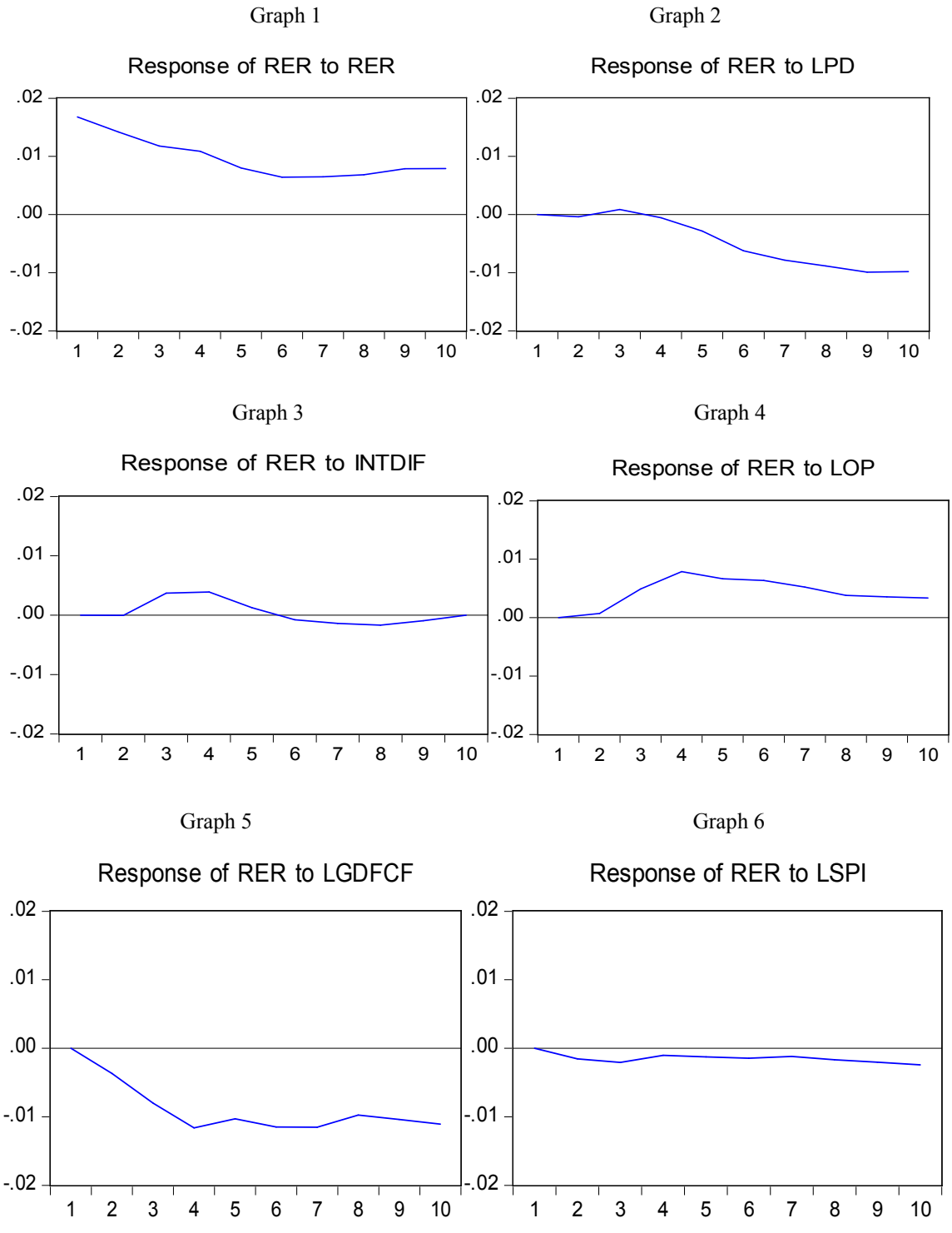
results from the impulse response analysis and the focus is only on the reactions of the real exchange rate from shocks arising from its innovation and innovations from other sources.



Source: Author's calculation

Figure 2: Impulse response of the real exchange rate

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In graph 2, a one standard deviation shock to productivity differential seems to have no effect on real exchange rate during the first two quarters after which it slightly depreciates the real exchange rate in quarter 3 and then it appreciates the real exchange rate starting from quarter 4. This result is compatible with the short-run and long-run behavior of the real exchange rate as indicated by the VECM and the long- run co-integration vector.

A shock to the innovation of interest differential initially increases the real exchange rate then appreciates it in the long-run before leveling off to zero after two years (see graph 3). The reaction of openness to the real exchange rate is zero during the first two quarters, and then it depreciates for the following two quarters before appreciating after the first year (see graph 4). The responses of real exchange rate to one standard deviation shocks to gross domestic fixed capital formation (graph 5) and share price index (graph 6) are negative over the entire period. In other words, positive shocks to gross domestic fixed capital formation and share price index cause an appreciation of the real domestic currency over time.

Generally, the impulse response functions reveal the expected patterns and confirm the short-run and long-run results obtained from the VECM and co-integration analysis.

g) Real exchange rate misalignment

In order to assess the misalignment of real exchange rate from its steady rate value, the long-run equilibrium real exchanges are calculated and compared to the actual real exchange rate. For this purpose, the fundamentals are first decomposed into their transitory and permanent components by using the Hodrik-Prescott method and then the latter are substituted into the long-run co- integration to obtain the equilibrium real exchange rates.

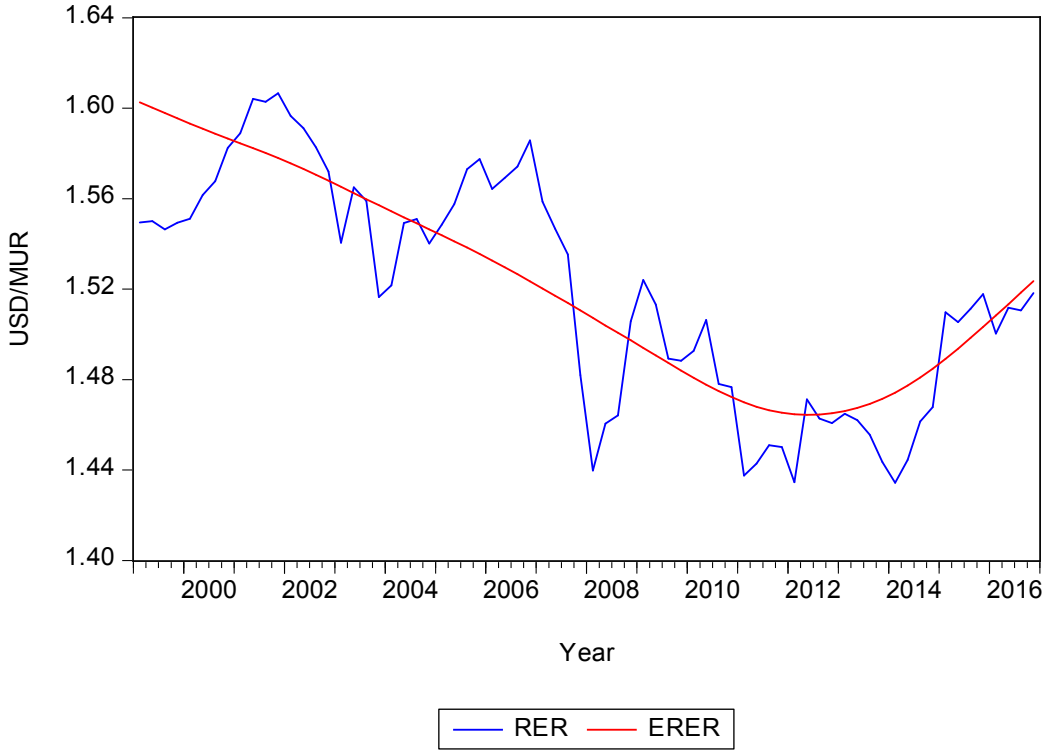

Figure 3: The equilibrium and actual real exchange rates

Figure 3 jointly shows the actual (RER) and long-run estimated equilibrium real exchange rate (ERER) estimated by VECM model. The Mauritian rupee has been overvalued over the periods 1999- mid 2001, 2003-2005, 2007-2008, 2011-2014 and in 2016. It has been undervalued over the periods mid 2001-2002, 2005-2007, 2009-2010 and in 2015. The trends of both actual and equilibrium real exchange rate are similar. This means that the estimated model fit the observations quite well; the explanatory variables are the main determinants of real exchange rate; and the chosen methodology is appropriate for the analysis.

V. Conclusions and Recommendations

This paper analyzes the relationship between the real exchange rate and its fundamental determinants by using quarterly data from 1999Q1 to 2016Q. An econometric model relating real exchange to its potentials determinants is specified. In the short-run, productivity differential and interest differential drive real exchange rate. In addition to productivity and interest differentials between Mauritius and US, openness, share of gross domestic fixed capital formation on GDP and share price index are the main long-run triggers of real

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exchange rate. However, in short-run the predictions of productivity and interest differentials on equilibrium real exchange rate are in sharp contrast with their long term counterparts.

In recent years, Mauritius has made a big stride in technological improvement, innovation, infrastructure development, addressing the skill mismatch through training, labor market efficiency and improving constitutional quality. Moreover, initiatives have been introduced to enhance the business climate, construct innovative capacity and establish robust investment ties with the continent of Africa through Africa Strategy. The government reaffirmed its ambitions to increase public investment expenditure notably on road construction, sea port, airport, utilities and sport complexes. According to the findings of this study, all these measures will strengthen the value of MUR through their effects on macroeconomic fundamentals. The authorities should allow the real exchange rate to adjust to its new higher equilibrium level to reflect the changes in its fundamentals values and refrain from intervening in the exchange market during the adjustment periods. Additionally, monetary and stock market policies should take into account the exchange rate as disturbances in these two markets can perpetually endanger real exchange rate stability. The strengthening of the equilibrium real domestic currency can be mitigated by opening the country to more international trade and integrating to the global economy. The government should continue to dismantle barriers of trade and should consolidate the global business, information and communications technology (ICT), and financial sectors to better integrate to the world economy. Furthermore, maintaining the real exchange rate to its long-run equilibrium value will spare the domestic economy from the undesirable consequences of overvaluation and undervaluation of real home currency.

However, the findings should be interpreted with some precautions as this empirical investigation is not free from weaknesses. VECM usually yields unbiased estimators in large samples and the sample period used in this study is relatively small. Moreover, VARs are very often claimed to be atheoretical and each variable is assumed to influence other variables in the system.

Finally, this study open venues for further research as this type of work can be replicated in other developing countries and SIDS. In addition, other sampling strategies and econometric modelling techniques can be deployed to examine the determinants of real exchange rate.

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Global Journal of HUMAN-SOCIAL SCIENCE: E
Economics
Volume 21 Issue 2 Version 1.0 Year 2021
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

Households' Response Strategies to Rubber Land Deal Shocks in the Ahanta West District, Ghana

By Christina Appiah-Adjei & Isaac Gershon Kodwo Ansah

Abstract- Sustainability of food crop production depends on secure land tenure arrangements. Yet, food crop farmers in many developing countries face various land deals and land grabbing that often deprive them of their sources of livelihoods. One source of land deal shocks in the Ahanta West district of Ghana is the massive production of Para rubber. This study examined food crop farmers' perceptions of rubber land deal shocks and the corresponding response strategies used to cope and adapt in the Ahanta West district of Western region. The survey found a total of nine (9) key response strategies, with participation in off-farm activities being the most dominant, while seasonal migration was the least used coping measure. A multivariate probit model was used to analyze the factors determining the choice of response strategies. The findings indicate that households' perceptions, household size, farm size, distance to nearby community market, years of rubber ownership, age, sex, years of education, land source and land tenure are significant determinants of various response strategies adopted.

Keywords: *land deal shocks, multivariate probit, response strategies, para rubber, ahanta west, ghana.*

GJHSS-E Classification: *FOR Code: 349999p*



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Households' Response Strategies to Rubber Land Deal Shocks in the Ahanta West District, Ghana

Christina Appiah-Adjei [α] & Isaac Gershon Kodwo Ansah [σ]

Abstract- Sustainability of food crop production depends on secure land tenure arrangements. Yet, food crop farmers in many developing countries face various land deals and land grabbing that often deprive them of their sources of livelihoods. One source of land deal shocks in the Ahanta West district of Ghana is the massive production of Para rubber. This study examined food crop farmers' perceptions of rubber land deal shocks and the corresponding response strategies used to cope and adapt in the Ahanta West district of Western region. The survey found a total of nine (9) key response strategies, with participation in off-farm activities being the most dominant, while seasonal migration was the least used coping measure. A multivariate probit model was used to analyze the factors determining the choice of response strategies. The findings indicate that households' perceptions, household size, farm size, distance to nearby community market, years of rubber ownership, age, sex, years of education, land source and land tenure are significant determinants of various response strategies adopted. Furthermore, there are both synergies and trade-offs in the use of these response strategies. Sustaining food production to ensure livelihood of the poor requires revisiting the land tenure arrangements in the study area, to ensure proper land demarcation for cash crop and food crop production in the district.

Keywords: land deal shocks, multivariate probit, response strategies, para rubber, ahanta west, ghana.

I. Introduction

Agriculture remains the only sector that employs majority of the people in rural, peri-urban and urban Ghana, as in most developing countries. Besides employment, agriculture provides the bulk of food consumed by the people in the country. Specifically, in the western region of Ghana, rural, peri-urban and urban folks generate their livelihoods through the production of food and/or cash crops. In the past two decades, one of the important and apparently profitable cash crops that has attracted great interest in the Western and Central regions of Ghana is Para rubber (*Hevea brasiliensis*). Since its introduction in 1898 and subsequent establishment of a rubber plantation in 1957 at Dixcove in the Western region, it has assumed an important position in the economy of this region. Ahanta West district in the Western region of Ghana is an area where rubber is predominantly grown and viewed as 'White Gold' because of its relative profitability. The establishment of the rubber factory in the district underscores the importance of rubber production in the area.

In the district, the common case is that farmers who cultivate food crops are mostly tenants because they do not have their own lands, while cash crop producers are often landlords that own lands. Consequently, food crop farmers often rent lands from land owners or enter into various kinds of land contractual arrangements with the landlords. Therefore, sustainable source of land-based livelihoods for the food crop farmers depend on their continued use of the land allotted to them by the landlords. According to report by Rubber Board (2004) smallholder farmers who cultivate rubber in countries such as Thailand is about 90% of total farmers that produce rubber; in India and Malaysia, this is about 89%, while in Indonesia it is approximately 83% of total rubber farmers. Thus, rubber production is mostly done by smallholder farmers in these countries. However, the case is different in Ghana where rubber production is commercialized with the bulk of it produced by large scale commercial outfits. Recently, smallholder farmers are losing their lands for food production because the relative affluent and powerful in society are consistently taking over rubber production in the district.

These developments have displaced most smallholder farmers from food crop production and other land markets, and consequently rendered them landless. The socioeconomic implications of these dynamics are reported to be significant and large (Yeboah et al., 2017). As a result, land acquisition and use patterns have changed dramatically following the pressure on land generated by rubber production. In addition, the commercialization of land for real estate establishment has increased due to the recent oil find in the region. Lands that were initially allocated as communal, family or lineage properties for which the chiefs and family heads served as custodians, and so were not sold out have now had a new fate. Various families have their family and share cropped lands sold or rented out for many years of rubber production (rubber has an estimated economic lifespan of 35 years, including 5 years of immature stage and about 25 years of productive stage). While many food crop farmers have completely lost their lands, other farming households have the sizes of their food crop farming

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lands drastically reduced, and those who do not own lands are heavily affected and devastated.

Furthermore, within the cultural context of Ghana there are often strict adherence to gender roles. For example, women are mostly seen as responsible for provision of food at household level (King & Bugri, 2013). In the Ahanta West district, these gender roles are also well observed, where women are primarily responsible for food crop production. Therefore, these land deals and their consequences mean a lot for the livelihood of women and their families. If attention is not paid to these events, it could mimic the well-known 'Dutch Disease' phenomenon, where the discovery of one resource may work to retard the development of an area (Corden, 1984). To avoid a possible 'Dutch Disease' scenario, it may require that proper regulations on land use are enacted to reduce the heavy dependence of livelihoods on rubber production in the district.

Since the onset of massive rubber land deals, undocumented evidence suggests that food crop production in the Ahanta West district has been declining consistently. Major staple crops in the district such as cassava, maize, and vegetables are no longer readily available. Therefore, prices of these commodities have increased significantly. The consequences of these high prices on the livelihoods of the resource poor farmers are reported in the local media, community radios and social gatherings. The implications of these dynamics on livelihoods, and the perceptions held by the natives concerning rapid conversion of food crop lands to rubber lands are not documented. Many land owners and family heads continue to sell out their lands for rubber production without considering the very survival of other people whose livelihoods depend on the arable lands that are being quarantined for many years of rubber production. Land is no longer a secure source of livelihood for landless and poor farmers in the rural communities. Due to the shifted attention to rubber production, 'land grabbing' in the district seems to be at its peak. This has led to significant unemployment in the local economy (since majority of the people were food crop farmers), and some of the affected folks are continually resorting to illegal mining (galamsey), sand winning, stone extraction, which are newsworthy issues recently discussed in the Ghanaian media.

Previous research in the domain of natural rubber production have focused on the environmental implications, costs and profits (Aggrey, 2014; Boakye, 2015; Dararath et al., 2011; Mensah, 2014; Yeboah et al., 2017), while giving little or no attention to the impacts that the rubber land deals have on food crop production and farmers' livelihoods. For example, Mensah (2014) investigated the environmental impacts of rubber processing, with focus on land destruction by rubber crumbs and the chemical effects during processing. Boakye (2015) contributed to the literature by investigating the effects of rubber plantations on the nutrient status of soils established under different land use systems. This research revealed that rubber establishment impacted somewhat positively on most of the soil quality parameters analyzed. Finally, Dararath et al. (2011) projected higher profit returns for producing rubber compared to food crops such as maize and cassava production.

While the available literature is noted for narrowing their study to environmental implications and profitability analyses, this study seeks to unravel societal perceptions of affected food crop farmers and how they cope and adapt to these events. Therefore, this study specifically addresses the following three research questions. (1) How do food crop farmers perceive the issue of rubber land deals in the district as a livelihood issue? (2) What coping and adaptation mechanisms are used by food crop farmers affected by rubber land deals in the district? (3) What factors determine the type of coping and adaptation strategies adopted?

The next section describes the research methods, which highlights the study area and sample, as well as the analytical framework. After the methods section, the results and discussions follow, before the last section concludes and provides policy implications for the study.

II. Materials and Methods

a) Study area and data

This study was conducted in Ahanta West district in the Western region of Ghana. The district is one of the largest producers of natural rubber and oil palm in the region. According to Ghana Statistical Service (2016), the district covers a land mass of 591 square kilometers. It shares boundaries with Nzema East Municipal on the west, Tarkwa–Nsuaem Municipal and Mpohor Wassa-East district to the north, and Sekondi-Takoradi Metropolitan Assembly to the east. The district is boarded to the south by the Gulf of Guinea, and the southernmost part of Ghana lies in the district at Cape Three Point where the recent oil find has its focal unit. The district is approximately 25 kilometers from the central business district of Takoradi, and this enhances businesses and trade in particular. According to the 2010 Population and Housing Census the population of the district is relatively young, with over 47% within the age group of 0-17 years.

The district is predominantly rural (70.5%) and has over 123 settlements, with Agona Nkwanta as the district capital. The district is located in the wettest region of Ghana, experiencing a double maxima rainfall of over 1,700 millimeters annually. This abundant rainfall supports agrarian activities in the district, more especially rubber production. Agriculture is therefore the major economic activity undertaken in the district. It is estimated that about 47% of the active population is

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directly involved in agricultural production (WRCC, 2016). Major food crops produced include cassava, plantain, maize, rice and vegetables. Prominent cash crops are natural rubber and oil palm. As reported by GSS, (2014) the estimated average farm size is about one acre per farmer which could be due to numerous industrial and rural developmental activities that are ongoing in the district.

The data for the study was obtained through a cross-sectional survey of farmers solely engaged in food crop production in the district. A total of five communities was selected randomly from within the district including Abura, Agona nkwanta, Apemanim, Ewusiejoe and Dixcove. For each community, a total of 40 respondents were selected with the exception of Abura and Apemanim where 65 respondents each were queried. This was based on the extent of rubber production in the various communities. Close to about equal weight was however accorded to both males and females with the former dominating by one respondent. However, respondents were purely food crop farmers in the areas specified. In total, 250 selected respondents were queried through administering a questionnaire as a survey instrument. Table 1 provides the details of the sampled communities.

Table 1: Distribution of respondents' number across the district

Community	Number of Respondents	Percentage
Apemanim	65	26
Abura	65	26
Agona nkwanta	40	16
Ewusiejoe	40	16
Dixcove	40	16

b) Analytical framework

i. *Econometric modeling of factors that influence adoption of coping and adaptation strategies.*

A multivariate probit (MVP) model is applicable whenever multiple binary decisions are involved for the same individuals. According to Lassafre et al. (1992), the MVP model is the best approach to employ for the study involving joint-decision making process of resource allocation between different strategies and identification of their potential substitutability or complementarity. The multivariate probit analysis explicitly assumes that the error terms across the decisions available are normally distributed with mean vector zero.

The data set shows that there are about nine main response strategies that are used by those affected by the rubber land deal shocks. Therefore, to quantify the factors that influence the coping and adaptation strategies adopted by food crop farmers, the MVP model is employed. We assume that there is an underlying unobserved and unmeasured variable, Y_a^* that is proportional to the unobserved utility that conditions the choice of each of the response strategies. The MVP model is specified as

$$Y_{ia}^* = \beta_{ia} X_{ia} + \epsilon_{ia} \quad (1)$$

where, $Y_{ia} = (a = 1,2 \ldots \ldots .9)$ represents the vector of dependent variables (that is the response strategies used by the various farmers); X_{ia} represents the set of explanatory variables (such as age, household size, sex) that affect farmers' decision to choose a particular response strategy; β_{ia} represents a vector of unknown parameters of interest and ϵ_{ia} represents the vector of error terms. Thus, the MVP model is a model of 9 dependent variables, which is generally specified as;

$$Y_{i(1\ldots9)}^* = \beta_a X_a + \varepsilon_i \quad (2)$$

The latent dependent variables are observed through the decision to make use of a particular response strategy or not, such that

$$Y_{ia}^* = \begin{pmatrix} 1 \; if \; y^* > 0 & a \; particular \;\; response \;\; strategy \;\; is \; chosen \\ 0 \; if \; y^* \leq 0 & the \; particular \;\; response \;\; Strateg \; y \; not \; chosen \end{pmatrix} \quad (3)$$

Accordingly, 14 variables, assumed to have an association with the choice of the 9 response strategies, were selected and tested in the multivariate probit, which are defined in table 2 below.

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Table 2: Variable with their definitions and a priori expectation with respect to response strategies

Variable	Definition and measurement
Off-farm	1 if household adopted off-farm activity as response strategy, 0 if otherwise
Agricultural intensification	1 if household adopted agricultural intensification as response strategy, 0 if otherwise
Change food consumption pattern	1 if household changed food consumption pattern as response strategy, 0 if otherwise
Livestock rearing	1 if household adopted livestock rearing as response strategy, 0 if otherwise
Seasonal migration	1 if household used seasonal migration as response strategy, 0 if otherwise
Credit for family expenditure	1 if household used credit acquisition as response strategy, 0 if otherwise
Credit for productivity	1 if household used credit for productivity as response strategy, 0 if otherwise
Savings	1 if household adopted savings as response strategy, 0 if otherwise
Beg food	1 if household begged for food as response strategy, 0 if otherwise
Household size	Total number of members eating from same pot
Market	1 if market is available, 0 if otherwise
Distance to community market	Distance to community market in walking minutes
Distance to district	Distance to district capital measured in minutes
Farm size	Total farm size for food crop production measured in acres.
Perception index	Measured on a scale of -2 (strongly disagree) to 2 (strongly agree).
Years of rubber ownership	Number of years of owing rubber by self and friends measured in years
Age	Age of respondents in years
Sex	1 = female 0 = male
Marital status	1 if married, 0 if single/separated
Education	Years of education of respondents
Abusa	1 if the farmer has Abusa agreement on cropped land, 0 if not
Abunu	1 if the farmer has Abunu agreement on cropped land, 0 if not
Deed/lease	1 if the farmer has Deed agreement on cropped land, 0 if not
Quasi-freehold	1 if the farmer has quasi-freehold agreement on cropped land, 0 if not
Extended Family	1 if the farmer source its cropped land from extended family, 0 if not
Husband	1 if the farmer sourced cropped land from husband, 0 if not
Non-family member	1 if the farmer sourced cropped land from non-family members, 0 if not
Rented	1 if the farmer sourced cropped land by renting, 0 if not
Inherited	1 if the farmer sourced cropped land by inheritance, 0 if not
Purchase	1 if the farmer sourced cropped land by purchasing, 0 if not
Land deal shock	1 if a farmer has completely lost land, 0 if partial loss or farm size has reduced.

III. Results and Discussions

a) Perceptions on Rubber land deals in the district

To understand how people perceived the effect of the rubber land deals on their welfare, a number of perception questions were posed to the respondents to rate the extent to which they agree or otherwise with the fact that land deals affected their livelihood activities and general wellbeing. The rating starts from -2 (strongly disagree) to 2 (strongly agree). The central value of zero corresponds to neutrality to the statement posed. This means that all values larger than 1 support agreement of the phenomenon, while values close to -2 support disagreement.

The results in table 3 indicate that the respondents strongly agree that the rubber land deals in the district has led to higher food prices, low food availability, reduced food crop production and high cost of land. It is evident that these perspectives are related in one way or the other. The high cost of land arising from the land deals means that the food crop farmers, who are often poor, cannot afford land rental prices. This leads to reduced food crop production, since cultivation of large areas of land becomes impossible, which implies limited food supply and consequently, higher food prices. On the other hand, respondents disagreed with the notion that intensive rubber cultivation causes the illegal mining; they emphasized that illegal mining has been in existence even when rubber plantation was not of interest. Also, respondents emphasized that because of the land deals, the future availability of land cannot be assured. To this end, respondents disagreed with the idea of encouraging the next generation to venture into rubber production mainly because of its profitability. However, respondents were neutral or indecisive on the impacts of rubber land deal on family and community social relationships, as well as the provision of numerous off-farm jobs to the people.

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Table 3: Perceptions of rubber land deals on welfare indicators

Perception variable	Mean	Std. dev.
Rubber production has made household welfare worse off	-.164	1.494671
Rubber production has affected economic life of family	.032	1.257498
Rubber production has affected education of children	-.052	1.219527
Rubber production has affected social relations within the family	.168	1.290907
Rubber production has affected social relation in community	.124	1.285002
Food prices are rising due to rubber production	1.180	1.227038
Food is not readily available due to rubber production	1.104	1.167319
Food crop production has decrease compared to previous years	1.088	1.151329
There is no cultivation of large areas of food crop due to rubber production	.996	1.256303
I now use more fertilizer than previous years of minimal rubber production	.428	1.449559
Youth engage in illegal mining due to rubber production	-.744	1.52307
Family land will be available to future generation despite intense rubber production	.696	1.348651
People face challenges in acquiring land due to rubber production	.892	1.209208
Women face more challenges in securing land than men	.864	1.139605
Land are costly nowadays than previous years due to rubber	1.076	1.171201
Due to rubber production I earn higher income form food crops	.06	1.161809
Due to rubber production I earn higher returns from off-farm work	0	1.130092
There are more off-farm jobs due to rubber production	-.22	1.113805
There is an improvement in overall wellbeing of my family due to rubber production	.256	1.013198
The next generation should be encouraged to venture into rubber production	.54	1.277076

b) *Response strategies to cope with or adapt to Rubber land deal shocks*

The land deal shocks come in two main forms. The first is where food crop farmers are completely deprived of their farming lands, and the second is where the farm size has reduced. A total of 3 composite coping strategies were reported to be used by the respondents in situations where they completely lose their food crop lands due to rubber cultivation. These strategies can be classified into participation in off-farm activities (petty trade, artisanry etc.), change in consumption patterns (relying on less preferred foods, limiting food variety etc.) and seasonal migration (migration to district capital, migration to regional capital, etc.).

As is evident from table 4, the major strategy used for dealing with rubber land deal shocks is petty trading, while the least is photography. This means that majority of the respondents engages in off-farm activities followed by those that alter their food consumption patterns, while only few travels seasonally in and out of the district. The strategic location of the study area could be attributed to many people using petty trade as a coping mechanism. This is because the district market serves a lot of traders and consumers from major towns like Tarkwa, Takoradi and several other urban towns.

On the other hand, composite total of 2 coping strategies that were used by respondents who had their farm sizes reduced as a result of 'land grabbing' for rubber cultivation. These are further classified into agricultural intensification (fertilizer application, herbicide application etc) and livestock production (goat, grasscutter etc), as reported in table 4. However, the other 4 response strategies are used in all cases of rubber land deals.

Table 4: Coping and adaptation strategies used to deal with rubber land deal shocks

Complete Loss of Land				*Partial Loss of Land*		
Response strategy	Freq.	%		Response strategy	Freq.	%
Petty trade	156	62.4		Fertilizer application	136	54.4
Artisanry	74	29.6		Herbicide application	30	12.0
By day Labor	119	47.6		Intercropping	92	36.8
Casual labor	14	5.6		Labor intensification	26	10.4
Beads making	13	5.2		Snail rearing	14	5.6
Photography	5	2.0		Goats/sheep rearing	156	62.4
Consume less preferred food	88	35.2		Grasscutter rearing	14	5.6
Limit food variety	63	25.2		Poultry rearing	132	52.8

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Limit size of meals	46	18.4				
Reduce meals times	87	34.8				
Rely on help	10	4.0				
Restricts consumption	46	18.4				
Migration to district capital	15	6.0				
Migration to regional capital	45	18.0				
Migration outside region	41	16.4				

It can be seen from the results that livestock rearing is used frequently by the people when they have to cultivate small food crop farms due to reduced land sizes. This is probably due to the fact that livestock rearing requires less resources, and individuals can rear them in their homes with limited expenditure on feeds.

Majority reported of making use of intensified farming, which they reported is coupled with huge cost which at times becomes difficult to afford. However, the importance of intensified farming or agricultural production cannot be ruled out, since it could, at least, enhance their output per acre and improve profits from farming.

c) Long term response strategies

Table 5 reports that frequency distribution of the various strategies that farmers use as long-term measures towards rubber land deals. Respondents were also queried on the specific response strategies that they have or intended to put in place in the long term to address the land deal issues. From the field survey, 90.4% said they make use of off-farm activities such as petty trade and by-day labor, among others. Majority of them reported of offering their labor services to the rubber company (Ghana Rubber Estates Limited) on causal basis. In this instance, farmers engage in activities such as slashing, tapping, nursery management, spraying, and similar activities for daily wages. However, the returns made from these services are not adequate for meaningful livelihoods, since the wages are meagre, and also the activities are associated with various health implications. Besides those who serve as laborers, others engage in petty trading due to their strategic location.

Furthermore, about 71% of the respondents employed livestock rearing as a long-term strategy. This included domestic animals such as goat, grasscutter and poultry etc. In addition to providing income, the livestock activities serve as a means of wealth and prestige to the owners. It was reported that snail and grasscutter rearing was a niche response strategy that few people engage in but with huge potential returns. The respondents emphasized that such enterprises needed only a small piece of land, which makes it more efficient to even combine with other ventures on any available small piece of land.

Table 5: Distribution of long term adaptation strategies

Response strategy	Frequency	Percentage
Off-farm activity	226	90.4
Agricultural intensification	108	43.2
Consumption pattern change	106	42.4
Livestock rearing	178	71.2
Seasonal migration	60	24.0
Consumption credit	99	39.6

About 43% of the respondents reported of using agricultural intensification as a long-term strategy. Majority were found to be making use of either fertilizer application or intercropping. Soil fertility tend to decline in situations where land fallowing is hindered due to continuous shrinking of farm sizes. This emphasizes the conclusion made by Giller et al., (2006) and Tittonel et al., (2007) that smallholder farmers are largely unable to benefit from the current yield gains offered by plant genetic improvement due to their farming on depleted soils that are non-responsive to fertilizer application. Therefore, the sustainability of intensification must be considered in dealing with land deal shocks. Nevertheless, the health implications of such acts must not be overlooked.

Unlike those engaging in strategies that do not temper with their consumption, about 42% of the respondents at one time or the other tend to alter their consumption patterns. This comprises of limiting food variety, limiting the size of meals and restricting adult's food consumption for the children etc. Although this strategy to some extent helps to deal with land deal shocks, it is not to be recommended since it has serious nutrition security implications. The fact that some people resort to these kinds of strategies highlights on how adequate food nutrients are forgone to survive these shocks. Such strategies could expose respondents to certain diseases due to poor food and inadequate nutrients intake.

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Also, 39.6% respondents said they accessed credit as a long-term strategy. The sole aim for accessing credit is for families to smooth consumption and also invest in farm production activities. Majority of these credits is acquired from money lenders and family members, which is sometimes coupled with exorbitant interest rates. Farmers gave various reasons why they tend to use informal credit sources, including market imperfections such as collateral demands, guarantees, high interest rates in the formal banking sectors which impedes their access. If market imperfections are minimized, to some extent this strategy may help. Furthermore, few of the respondents reported of employing seasonal migration in and out of the district as a long-term strategy to combat the rubber land deal shocks. Although few engage in this strategy, it becomes relevant only if they are able to make good living at the other destinations chosen. However, this can lead to draining out potential agricultural labor from the farming communities.

d) Determinants of household coping and adaptation strategies towards Rubber rand deal shocks

The multivariate probit model allows identifying the possible correlation among different response strategies. There is a variation in the combination of response strategies indicating a possibility that farmer's choice of one response strategy could correlate with others. In view of that, the correlation coefficient across the residuals of the multivariate probit is calculated (see table 6). Positive correlation coefficients indicate the possibility of using two strategies together (complimentary) and negative sign indicates that one strategy could be used instead of the other (substitutes).

There is a positive significant correlation between acquiring credit for family consumption and change in consumption patterns, credit for farm production and credit for consumption, begging for food from individuals and off-farm as well as soliciting food from individuals and seasonal migration at 10%, 1%, 5% and 5% level of significance respectively. For example, credit for farm production and credit for consumption were found to be complementary practices. This means that households that seek credit for production reasons are also more likely to seek credit to support their family in consumption smoothing. From the literature, this helps farmers to make productive use of the acquired loans for production and also helps smoothen their consumption all year round. This justifies the assumption and finding that farmers using multiple response strategies.

Table 6: Correlation between different response strategies

	Agricultural intensification	off-farm	Change in consumption pattern	Livestock rearing	Seasonal migration	Access consumption credit	Access production credit	Rely on savings	Beg for food
Agricultural intensification	1								
off-farm	-0.120* (0.120)	1							
Change in consumption pattern	-0.329*** (0.010)	-0.155 (0.120)	1						
Livestock rearing	0.123 (0.110)	-0.075 (0.130)	-0.052 (0.109)	1					
Seasonal migration	-0.015 (0.108)	0.169 (0.123)	0.020 (0.113)	-0.325** (0.112)	1				
Access consumption credit	0.086 (0.115)	0.040 (0.138)	0.199* (0.111)	0.058 (0.121)	-0.130 (0.115)	1			
Access production credit	0.108 (0.106)	-0.012 (0.123)	0.068 (0.107)	0.062 (0.116)	-0.143 (0.109)	0.570*** (0.084)	1		
Rely on Savings	0.111 (0.125)	0.123 (0.140)	-0.126 (0.124)	0.029 (0.129)	-0.078 (0.121)	-0.115 (0.130)	-0.292** (0.180)	1	
Beg for food	0.137 (0.165)	0.380** (0.194)	0.095 (0.167)	-0.150 (0.187)	0.379** (0.134)	0.192 (0.180)	-0.104 (0.179)	-0.232 (0.166)	1

*The significance level is indicated as follows: ***1%, **5%, *10%. Joint significance test of independent equations Chi-square (154) = 251.48; Prob>Chi2=0.000 N=250 Note: standard errors in bracket*

There is a negative significant correlation between agricultural intensification and off-farm activities, change in consumption pattern and agricultural intensification, seasonal migration and

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livestock rearing as well as savings and production credit at 10%, 1%, 5% significance levels respectively. This is so because time spent in seasonal migration lowers the amount of time left to dedicate to livestock rearing. For example, farmers can choose to either make use of agricultural intensification or participation in off-farm activities and vice versa. Whereas the main motive for a farmer to intensify is to generate more output and/or profit, off-farm activities also help in generating revenues as well. Thus, a farmer will find it more prudent to specialize in either agricultural intensification or off-farm activities due to the fact that either of the said response strategies requires some amount of funds/capital and maximum attention to achieve their said response strategies.

e) Determinants of adoption of response strategies

Household size was found to have a significant positive relationship with the probability of using response strategies such as off-farm activity and change in consumption patterns at 10% level. Larger households will need to adopt either off-farm activity or change in consumption patterns in order to cope with the shock imposed. Usually, larger family size means more mouths to feed and larger food expenditure. Where the options to earn more income to support consumption is limited due to partial or total loss of land, it becomes necessary to probably adopt a change in food consumption patterns. The poverty literature has it that *"people living in larger and generally households with younger members are typically poorer"* (Lanjouw et al., 2001). This finding is in consistent with Iqbal et al. (2015) that increasing family sizes induces off-farm participation but contrary to Rana et al. (2012) who found that increase in household size increases the possibility of engaging in farm activities rather than off-farm activities.

Distance to nearby community market was found to have a significant positive influence on livestock rearing, credit for family consumption and credit for production. The hypothesis regarding distance to markets is that the farther away a village or a household is from input and output markets the lower the likelihood that they will make use of an improved technology (Kassie et al., 2013). But contrary to other studies, the results rather depict distance as an incentive for respondents to choose livestock rearing, credit for family consumption and credit for production. But it is contrary to studies by Mohammed (2003) and Quoc (2012) that distance to market had negative effects on loan acquisition for either family consumption or farm production. Respondents might not consider the cost involved in accessing credit due to their quest to offset negative effects due to rubber land deals. However, distance to district capital was found to have negative but significant relationship with the probability of choosing livestock rearing as response strategy.

It was relevant to identify whether farm size had any influence on households' response strategies used. The result portrayed farmers' likelihood of engaging in off-farm activities, soliciting for food and credit for family expenditure at 5%, 5% and 10% significant levels respectively. This is in line with the findings of Iqbal et al. (2015) which emphasized that increasing farm size increases the chances that respondents would venture into off-farm activities. One could reason that increasing farm size makes it possible to obtain higher farm earnings, which could in turn make it possible to venture into other off-farm activities.

Table 7: Parameter estimates from multivariate probit for estimating determinants of Response Strategies

Explanatory variables	Off-farm activity	Agricultural intensification	Change in consumption patterns	Livestock rearing	Seasonal migration	Credit	Credit for productivity	Savings	Beg for food
Household size	**0.096*** (0.056)	0.017 (0.045)	**0.077*** (0.046)	0.005 (0.047)	0.057 (0.048)	-0.015 (0.051)	0.046 (0.049)	0.026 (0.055)	-0.113 (0.079)
Market	-0.190 (0.239)	-0.085 (0.100)	-0.135 (0.192)	-0.144 (0.205)	-0.147 (0.202)	0.267 (212)	0.041 (0.200)	0.213 (0.220)	0.375 (0.308)
Distance	0.057 (0.042)	0.029 (0.033)	0.035 (0.026)	**0.119*** (0.037)**	0.023 (0.031)	**0.057* (0.030)**	**0.055* (0.032)**	0.078 (0.051)	-0.039 (0.063)
Minute to district	0.016 (0.021)	0.005 (0.017)	-0.028 (0.017)	**-0.055*** (0.019)**	0.025 (0.018)	0.001 (0.018)	-0.004 (0.017)	-0.009 (0.021)	0.038 (0.027)
Farm size	**0.079** (0.033)**	0.008 (0.024)	-0.008 (0.023)	0.028 (0.026)	0.024 (0.025)	**0.046* (0.026)**	0.032 (0.025)	-0.023 (0.029)	**0.081** (0.038)**
Perception index	**-0.323** (0.136)**	**-0.178* (0.107)**	0.161* (0.096)	0.025 (0.107)	**0.232** (0.111)**	**-0.443*** (0.110)**	**-0.337** (0.110)**	**-0.250* (0.141)**	0.224 (0.199)

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Years of rubber ownership	-0.036 (0.029)	0.007 (0.023)	-0.006 (0.023)	**-0.053** (0.026)**	**-0.054** (0.025)**	0.029 (0.025)	0.012 (0.024)	-0.014 (0.027)	0.043 (0.040)
Age	**-0.050*** (0.017)**	0.008 (0.014)	**0.024* (0.014)**	0.001 (0.014)	-0.007 (0.014)	0.020 (0.015)	0.013 (0.014)	-0.017 (0.016)	-0.010 (0.020)
Sex	**0.622** (0.287)**	0.159 (0.213)	0.033 (0.204)	0.235 (0.225)	**-0.446* (0.233)**	-0.029 (0.230)	**0.515** (0.222)**	0.128 (0.266)	0.205 (0.349)
Marital status	-0.369 (0.256)	0.286 (0.200)	0.113 (0.198)	0.291 (0.210)	0.178 (0.212)	0.037 (0.218)	-0.014 (0.206)	-0.369 (0.253)	-0.429 (0.299)
Years of education	0.019 (0.022)	-0.003 (0.018)	-0.000 (0.017)	**-0.054** (0.019)**	0.020 (0.018)	-0.022 (0.019)	0.012 (0.018)	**0.065** (0.022)**	**-.111** (0.038)**
Land source									
Extended Family	0.373 (0.324)				-0.050 (0.294)	-0.279 (0.241)	-0.627 (0.641)	0.280 (0.391)	-0.990 (0.925)
Husband	-0.079 (0.438)				0.298 (0.379)	0.117 (0.332)	-0.561 (0.672)		-1.658 (1.049)
Non-family member	**0.627* (0.340)**				**0.616** (0.297)**		-0.507 (0.623)	0.027 (0.352)	-1.131 (0.868)
Rented	4.616 (133.662)				0.371 (0.739)	0.184 (0.645)		-0.646 (0.879)	
Inherited						-0.277 (0.318)	-0.800 (0.673)	0.137 (0.455)	-0.643 (0.987)
Purchase	-0.382 (0.408)				0.589 (0.405)	0.033 (0.355)	-0.360 (0.683)	0.165 (0.557)	-0.747 (1.058)
Land Tenure									
Abusa		**0.572* (0.344)**							
Abunu		4.618 (120.478)			0.197 (0.639)		-0.185 (0.629)		
Deed/lease		-0.121 (0.197)			-0.287 (0.353)		-0.486 (0.333)		
Quasi-freehold					0.069 (0.341)		-0.165 (0.316)		
Shock form	0.056 (0.267)	-0.107 (0.217)	0.006 (0.212)	-0.203 (0.236)	0.162 (0.220)	-0.288 (0.220)	-0.057 (0.218)	-0.304 (0.271)	-0.069 (0.329)
Constant	1.308 (0.907)	-0.821 (0.686)	-1.036 (0.655)	0.473 (0.708)	-0.581 (0.802)	**-1.906** (0.757)**	-1.393 (0.998)	0.796 (0.865)	-0.364 (1.358)

Perception of respondents concerning rubber land deals significantly and positively influenced their decisions to make use of changing consumption patterns and seasonal migration at 10% and 5%, respectively. In line with finding by Rana et al. (2012), perception was found to be a major driving force in famers' decision making process. Thus, the more farmers perceive that rubber land deals is a livelihood issue, the higher the likelihood of making use of changes in consumption patterns or seasonal migration. However, perception had a negative but significant influence on credit for family consumption (at 1% level), off-farm activities (at 5% level), production credit (at 5% level), agricultural intensification (at 1% level), and savings (at 10% level).

Results from table 7 indicates that years of rubber ownership by respondent's friends, families and themselves also influence the use of seasonal migration

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and livestock rearing as response strategies. According to World Bank (2010), people only migrate if they make poor living back home. However, the result in this study contradicts studies by Kosec et al. (2018) who indicated that individuals diversify their livelihoods through migration when subject to land scarcity. However, it is less likely for respondents to migrate in the study area possibly due to relatively better living conditions in their area compared to other destination. As years of rubber ownership prolongs it is less likely to engage in livestock production. This is consistent with findings by Tuner (2004), which stated that land is an important asset that supports production of livestock. Thus it is less likely for respondents to engage in livestock rearing when years of rubber ownership prolong due to land scarcity.

Age of a respondent was found to have a negative and significant (at 1% level) relationship with the probability of engaging in off-farm activities. This means that older farmers are less likely to engage in off-farm activities. In line with studies by Vanwey (2013) and Beyene (2008), accumulation of knowledge through education, skills and network as individuals age suggest that the likelihood of working off the farm initially increases with age and decline later in life course. According to these studies, older farmers have higher farm productivity and hence their reservation wage. Though ageing may also increase off-farm productivity, the studies argue that this may not be as strong as productivity from farm, thus influencing such decisions. However, age of a respondents was associated with a positive influence on the probability to use change in consumption patterns as a response strategy. Thus, older respondents are more likely to change their consumption patterns when faced with partial or total loss of food crop land. This is in line with studies that find that people "tend to eat less and make different food choices as they get older" (Drewnowski et al., 2001), which implies that the aged will be seen particularly using response strategies such as change in consumption patterns. Such strategies have undesirable health implications as outlined in the literature (Drewnowski et al., 2001).

Sex of respondents had a positive significant effect on the choice of off-farm activities and production credit as response strategies and were significant at 5% level. Females are more likely to acquire credit for production than males. This can be partially due to the fact that the men are actively engaged in cash crop production and thus have more funds to support their agricultural activities, unlike the women who are mainly into subsistence food crop production, often with little or no funds to support their activities. Also, over 70% of Ghana's agricultural production done by smallholder farmers is mostly women, who normally have limited access to production resources, especially with credit as their biggest challenge. Therefore, confined to their key roles as food crop farmers, women usually access credit to boost their production activities. This finding disagrees with Akudugu et al. (2009) who stipulated that credit access by men outweighs that of women. However, sex had a negative but significant influence on the choice of response strategy such as seasonal migration at 10% significance level. This means that females are less likely to seasonally migrate than males. This can be due to mutual understanding that females play important caregiving roles for both the young and elderly left behind. Thus, the male seeks for sources to support them back home.

Years of formal education acquired by a respondent was found to positively affect the likelihood of farmers choosing savings as a response strategy. This supports the work of Mishra et al. (2009) that the higher a person is educated the more likely they would save. Thus, a year increase in formal education makes it more likely for respondents to make use of savings as response strategies. However, years of education showed a negative but significant influence on livestock rearing and soliciting for food from either family members, friends or relatives. Also, the more one is educated the less the likelihood of using begging for food as a response strategy, because the educated are expected to acquire some form of descent work rather than begging.

Land source that consists of whether land was acquired from extended family, husband, non-family member, rented, inherited, purchase was also assessed on its influence on the choice of response strategies. Land sourced from non-family members was positively significant on the likelihood of farmers choosing seasonal migration and off-farm activity at 5% and 10% respectively. Thus farmers with land sourced from non-family members are more likely to seasonally migrate than those that were sourced through inheritance. This can be due to the diverse land use security between the two sources, since farmers are better secured on land inherited than lands given to them for use by non-family members, which then induces the rate of migration when faced with the land deal shocks. Land tenure consisting of Abusa, Abunu, Deed/lease and Quasi-freehold was also found to exert positive significant effects on farmers' choice of agricultural intensification as a response strategy when faced with rubber land deal shocks. Farmers with tenure arrangement as Abusa are more likely to engage in agricultural intensification than those with quasi-freehold tenure arrangement. This is because the more secured your land the higher the probability of investing more in improving its productivity. It must be highlighted that agricultural intensification includes fertilizer application, herbicide application, intercropping and labor intensification, of which some are capital intensive. The result is in line with the findings of Manyong et al., (2000) that some form intensification is facilitated by improved form of tenure security.

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IV. Conclusions

The study was motivated by the massive commercial rubber production in the Ahanta West district, in the Western region of Ghana at the expense of food crop production, which has made many food crop farmers landless. Using 250 food crop farmers from the district, we sought to understand how these farmers perceive land deals for commercial rubber production as a livelihood issue, and the corresponding strategies they use to deal with such shocks. Furthermore, we were interested in the factors that drive the choice of the various response strategies, which was accomplished using the multivariate probit model. The results from the analysis revealed that respondents affected by land deal shocks make use of the following response strategies: off-farm activity, agricultural intensification, change in consumption patterns, credit sourcing and seasonal migration etc. Farmers' perceptions of commercial rubber production as a livelihood issue to some extent made respondents engage in response strategies such as seasonal migration however, respondents were willingly engaging in credit sourcing despite their perception of the situation at hand. Studies furthermore reveals that majority of the cropped land were soured from non-family members with quasi-freehold tenure agreement. This translates into land insecurity that respondents are subjected to in the study area. Off- farm participation was the preferred response strategy due to the strategic positioning of the district. Other factors informing the choice of response strategies are household size, farm size, age, sex etc.

Based on the results, the following policy measures are recommended. Credit acquisition either to support family expenditure or to improve productivity was among the most preferred response strategies that was used unconditional. Therefore, it is important that policies that support microfinance establishment and proper operation are implemented to make credit readily available to farmers. This can help to offset the negative effects imposed by rubber land deals in the study area. Also, Land tenure agreement must be revisited in the study area. Restructuring land rights could lead to a positive impact on food security and broader development outcomes, such as household investment, agricultural productivity, women's empowerment and nutrition. Since secured land rights is threatened in the area due to rubber production, an effort to improve it will ensure secure land rights, which could motivate farmers to invest more in their lands and improve agricultural productivity. Finally, farmers must be supported with more viable off-farm income-earning activities to help recover the losses in revenue due to rubber production. Priority must be given to women.

Data Availability

Data for this manuscript is available from the authors upon a reasonable request.

Declaration of Interest Statement

The authors declare that they have no conflict of interest.

Funding statement

This project did not receive any specific funding from any organization. The research was done as part of the requirement for the award of degree in BSc Agribusiness. Authors solely funded the research.

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Global Journal of HUMAN-SOCIAL SCIENCE: E Economics
Volume 21 Issue 2 Version 1.0 Year 2021
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

Study of Green Brand Image, Company Reputation, and Product Quality against Customer Loyalty through Moderating Customer Satisfaction Variables

By Anissatri Anjarwati

Abstract- The purpose of this study was to determine the effect of green brand image, company reputation, and product quality on consumer loyalty through the moderating variable customer satisfaction at consumers of PT. Natural Nusantara Wonogiri branch. The population in this study are all who have used the products of PT. Natural Nusantara. The sampling technique used nonprobability sampling with purposive sampling method. And obtained a sample of 100 respondents who have used the product of PT. Natural Nusantara. The variables in this study used three variables, namely the dependent variable, the independent variable, and the moderating variable. For the dependent variable (Y) of this study is consumer loyalty. The independent variables include: green brand image (X1), company reputation (X2), and product quality (X3) and the moderating variable is customer satisfaction (Z). The research method used is a quantitative method. The data analysis method uses the original Structural Equation Modeling (SEM). Meanwhile, for data processing using the IBM SPSS AMOS 24 program.

Keywords: *green brand image, company reputation, product quality, customer satisfaction, customer loyalty.*

GJHSS-E Classification: *FOR Code: 149999*

STUDYOFGREENBRANDIMAGECOMPANYREPUTATIONANDPRODUCTQUALITYAGAINSTCUSTOMERLOYALTYTHROUGHMODERATINGCUSTOMERSATISFACTIONVARIABLES

Strictly as per the compliance and regulations of:

Research | Diversity | Ethics

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Keywords: green brand image, company reputation, product quality, customer satisfaction, customer loyalty.

I. Introduction

Environmental sustainability needs to be considered by companies, so they want to find new approaches to apply green marketing in selling their products in the environmental era (Huang, Wang et al. 2020). Green marketing has become an important way to attract consumers who are concerned about environmental protection, more companies want to build an environmentally friendly green brand image to differentiate their green products (Wu and Lin 2016). The growing business world makes it difficult for a company to maintain customer loyalty because of the increasing number of competitors that come up with new innovations. This can lead to a reduction in customers in a company.

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A company is required to improve its company's performance, so that the company can maintain customer loyalty or even increase the quality and quantity of its company. Customer satisfaction can be given to consumers through a green brand image, good company reputation, and good quality of the company's products. With this customer satisfaction, it can be expected that consumers will make purchases repeatedly, so that customer loyalty can be formed, so that the goals of the company can be achieved.

Lee (2010) green brand image can provide an intention to repurchase, an intention to recommend to others and a willingness to pay. Previous research said that the green brand image of a product can have an impact on satisfaction (green satisfaction) from the consumer side. So that the higher the green brand image, the customer loyalty to a company will increase (Astini 2016).

A company is expected to provide services in accordance with consumer expectations or even exceed consumer expectations. The reputation of the company is also an important factor that can make customers loyal to the company. With a good company reputation, a company will be seen as good in the eyes of consumers. Researchers have proven that a company's reputation can increase customer loyalty. Previous research has discussed several aspects of a company's reputation. According to (Balqiah, Setyowardhani et al. 2011) a good company reputation can enhance a company's ability to create value within the company. In line with the research of Gaines-Ross, (2008) that a good reputation is not only beneficial for the company to get capital, but also attracts employees to improve their skills. The admired company will increase sales from customer loyalty, attract business partners, ensure the public that the company operates ethically, can reduce problems, even if the company offers a higher price (Balqiah, Setyowardhani et al. 2011).

A company definitely wants to have a good product quality. With the creation of product quality, it is likely that these consumers will recommend it to others. So that the higher the quality of the product will increase customer satisfaction, and then customers will become loyal to the company's products. Previous research has discussed several aspects of product quality. Previous research has discussed that product quality affects

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consumer loyalty through brand reputation. This influence occurs when customers will be more loyal to the company if the reputation they have is good (Hermawan 2011). This study agrees with the research of Bei and Chiao (2006) that product quality has an effect on increasing customer satisfaction and customer loyalty (Halim, Swasto et al. 2014).

Loyalty is the behavior of a person in making decisions to make continuous purchases of goods or services in a company (Astini 2016). This means that a customer uses the product for a long time and for the future, it is unlikely that a consumer will switch to the use of a competitor's product, even though a competitor's product has been found to change, both in terms of price and other factors. Loyal customers will always give positive comments and recommendations about the company to others (Andrean, Sumargo et al. 2012).

One of the companies that compete in the environmentally friendly sector is PT. Natural Nusantara. PT. Natural Nusantara is a business that runs in the fields of agro-complex, health and beauty. PT. Natural Nusantara has a goal of empowering the potential of natural resources and sustainable human resources.

This study aims to determine the extent to which environmentally friendly brands, company reputation, product quality, customer satisfaction are applied by PT. Natural Nusantara has an effect on consumer loyalty.

II. Materials and Methods

a) Overview of Research

This research was conducted on visitors of PT. Natural Nusantara Wonogiri branch which is located in Bulukerto, Wonogiri district, Central Java. This research was conducted by distributing online questionnaires in the Surakarta Residency, online questionnaires were created using Google Drive and distributed through social media. After making the questionnaire format along with the questions, the researchers distributed the questionnaire to the visitors of PT. Natural Nusantara Wonogiri branch on various social media. The number of respondents who participated in filling out the research questionnaire totaled 135 respondents. After being analyzed, there were several respondents who did not meet the requirements. And there are 100 respondents who can be researched at a later stage. There are 25 questions with five variables. Five questions about green brand image, five questions about corporate reputation, five questions about product quality, five questions about customer satisfaction, and five questions about customer loyalty. Sampling using non-probability sampling technique with purposive sampling method. Analysis of research data using analysis of Structural Equation Modeling (SEM), with IBM SPSS AMOS 24.

b) Research Methods

The population in this study are all who have used the products of PT. Natural Nusantara Wonogiri branch. Those in the Surakarta Residency are Surakarta district, Sukoharjo district, Sragen district, Klaten district, Karanganyar district, Wonogiri district.

The samples taken in this study were 100 respondents who had used Natural Nusantara products in Wonogiri branch. The technique used in this research is nonprobability sampling technique, because in this study it is not known the number of population that will be taken. And part of the sample taken is representative of the population. The method used in this research is purposive sampling which can be understood that the required information can be obtained from a target group that is desired and meets the criteria desired by the researcher. (Ferdinand 2014).

III. Results and Discussion

a) Research Results

i. *Instrument Test*

ii. *Validity test*

Validity testing is done using Confirmatory Factor Analysis (CFA). According to (Ghozali 2017) to measure the validity can be seen from the loading factor. The factor loading must be 0.50 or more and ideally 0.70.

Table 1: Validity test

Variable	Indicator	Loading standard	Conclusion
Green Brand Image	GBI1	0.850	VALID
	GBI3	0.957	VALID
Corporate Reputation	CR2	0.825	VALID
	CR3	0.793	VALID
Product Quality	PQ1	0.889	VALID
	PQ3	0.841	VALID
	PQ5	0.809	VALID
Customer Satisfaction	CS1	0.864	VALID
	CS3	0.879	VALID
	CS4	0.840	VALID
Customer Loyalty	CL1	0.901	VALID
	CL3	0.903	VALID
	CL5	0.904	VALID

Source: primary data AMOS 24 output (2021)

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In table 1, it can be seen that all question indicators from green brand image, corporate reputation, product quality, customer satisfaction, and customer loyalty are declared valid because each question indicator which is an indicator of each variable has a loading factor of ≥ 0.50.

iii. *Reliability Test*

The reliability test carried out for measurement can give relatively the same results if it is carried out by re-measuring on the same subject. According to (Ferdinand 2014) The variable is said to be reliable if it has a reliability level for Construct Reliability of ≥ 0.70 and the level of reliability for Variance Extracted is ≥ 0.50.

Table 2: Reliability Test

Variable	Contruct Reliability	Variance Extracted	Conclusion
Green Brand Image	0.900	0.820	Reliable
Corporate Reputation	0.791	0.655	Reliable
Product Quality	0.900	0.718	Reliable
Customer Satisfaction	0.896	0.742	Reliable
Customer Loyalty	0.930	0.815	Reliable

Source: primary data AMOS 24 output (2021)

In table 2, it can be seen that all variables show the value of construc reliability≥ 0.70 and the value of the variance extracted ≥ 0.50 so that all variables are declared reliable.

iv. *Goodness Off Fit Testing*

The testing phase of the SEM model aims to see the suitability of the model, the results of testing the suitability of the model in this study are nine criteria used to judge whether a model is considered feasible or not. The results of the AMOS output in this study are as follows:

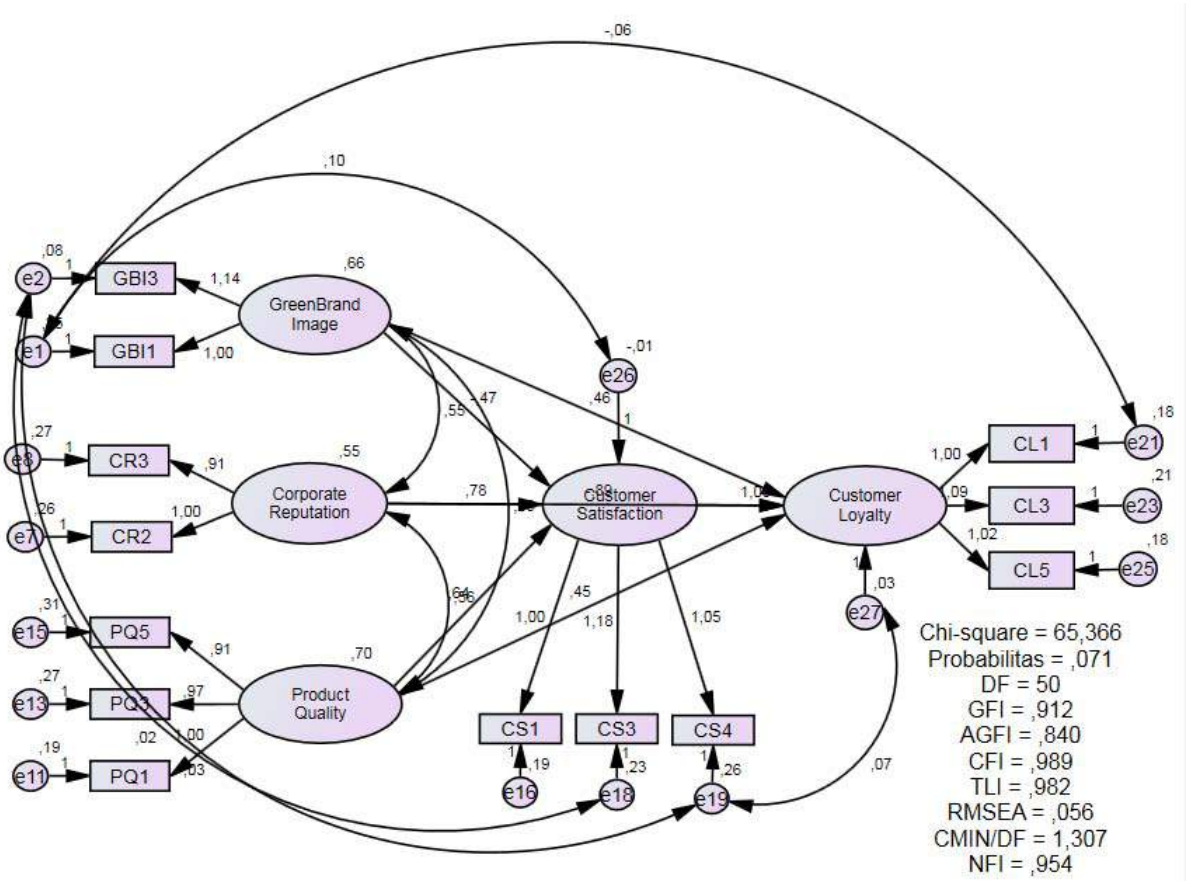

Fig. 1: SEM Analysis Results

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The results of SEM analysis testing after modification indices are presented in table 3

Table 3: Goodness of Fit Testing

Goodness of Fit	Cut off Value	Test result	Information
X2 - Chi-square	67,5048		
	65,366	It is expected that a small value, with DF = 50, the test result is 65.366 smaller than the cut off value	
67,5048.			
Probability	≥ 0.05	0.071	Good
DF		50	
GFI	≥ 0.90	0.912	Good
AGFI	≥ 0.90	0.840	Marginal
CFI	≥ 0.95	0.989	Good
TLI	≥ 0.95	0.982	Good
RMSEA	≤ 0.08	0.056	Good
CMIN / DF	≤ 2.00	1,307	Good
NFI	≥ 0.90	0.954	Good

Source: Primary data AMOS 24 output (2021)

From the overall measurement of goodness of fit above, it indicates that some models are showing well so that the model proposed in this study can be accepted and can be continued to hypothesis testing.

v. *Hypothesis test*

After the criteria for the goodness of fit of the structural model can be met, the next stage will be testing the hypothesis. This research hypothesis testing was carried out based on the Critical Ratio (CR) value of a causal relationship from the results of SEM processing as in Table 4.

Table 4: Regression Weights

			Estimate	SE	CR	P	Label
			Estimate	SE	CR	P	Label
Customer Satisfaction	<---	Green Brand Image	-, 465	, 235	-1,976	, 048	par_7
Customer Satisfaction	<---	Corporate Reputation	, 779	, 283	2,753	, 006	par_8
Customer Satisfaction	<---	Product Quality	, 637	, 206	3,090	, 002	par_9
Customer Loyalty	<---	Product Quality	, 451	, 288	1,566	, 117	par_10
Customer Loyalty	<---	Green Brand Image	, 460	, 191	2,412	, 016	par_11
Customer Loyalty	<---	Customer Satisfaction	1,061	, 302	3,515	***	par_12
Customer Loyalty	<---	Corporate Reputation	-, 887	, 395	-2,242	, 025	par_16

Source: Primary data AMOS 24 output (2021)

Criteria on hypothesis testing according to (Ghozali 2017) the value of critical ratio (CR)> 1.96 and p-value with a comparison of the significance level (a = 5%) or <0.05, it has a significant effect.

From table 4 it can be concluded that the green brand image variable has the effect of green brand image on aging. The company reputation variable has a significant effect on satisfaction, product quality has a significant effect on satisfaction, the green brand image variable has an influence on customer loyalty, the company reputation variable has a significant effect on customer loyalty, the satisfaction variable has a significant effect on customer loyalty. product quality variable does not have a significant effect on customer loyalty.

b) Discussion

Analysis of the effect of Green Brand Image on Customer Satisfaction. The results of this study indicate that the green brand image variable has a P number of 0.048, this number is below 0.05 and the CR is -1.976 barada below 1.96 so that H1 is accepted. In the sense that green brand image has a negative and significant effect on customer satisfaction. The results of this study are in line with the research conducted by (Astini 2016) which states that the Green Brand Image has a significant effect on satisfaction (Green Satisfaction) from the consumer side.

This can be interpreted that the green brand image contained in the product does not guarantee customer satisfaction in purchasing PT. Natural Nusantara. It is known that green brand image does not guarantee customer satisfaction so that the green brand image provided by PT. Natural Nusantara is not a reinforcement for visitors to remain loyal in using PT. Natural Nusantara.

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The effect of Corporate Reputation on Customer Satisfaction. The results of this study indicate that the corporate reputation variable has a P number of 0.006, this number is below 0.05 and CR is 2.753 barada above 1.96 so that H2 is accepted. In the sense that corporate reputation has a positive and significant effect on customer satisfaction. The results of this study are in line with the results of research conducted by Sia & Subagyo, (2013); Huang, (2016) stated that corporate image has a positive and significant effect on customer satisfaction(Hermawan, Basalamah et al. 2017).

It can be interpreted that the corporate reputation contained in the product can increase customer satisfaction in purchasing PT. Natural Nusantara. The higher the corporate reputation in the company, the higher the customer satisfaction of PT. Natural Nusantara. On the other hand, the lower the corporate reputation in the company, the lower the customer satisfaction of PT. Natural Nusantara.

The effect of Product Quality on Customer Satisfaction. The results of this study indicate that the variable product quality shows that the P number is 0.002, this number is below 0.05 and the CR is 3.090 barada above 1.96 so that H2 is accepted. In the sense that product quality has a positive and significant effect on customer satisfaction. The results of this study are in line with the results of research conducted by Jahanshahi et al. (2011), and Senthilkumar (2012) who prove that product quality can increase consumer satisfaction (Hermawan 2011).

It can be interpreted that the product quality contained in the product can increase customer satisfaction in purchasing PT. Natural Nusantara. The higher the product quality in the company, the higher the customer satisfaction of PT. Natural Nusantara. Vice versa, the lower the product quality in the company, the lower the customer satisfaction of PT. Natural Nusantara.

The effect of Green Brand Image on Customer Loyalty. The results of this study indicate that the variable green brand image shows that the P number is 0.016, this number is below 0.05 and the CR is 2.412 barada above 1.96 so that H5 is accepted. In the sense that green brand image has a positive and significant effect on customer loyalty. The results of this study are in line with research conducted by Chen, (2013); Martínez, (2015), emphasized that if an organization wants to increase its loyalty, the organization must increase two types of benefits, namely green brand image and utilitarian benefits (Leckie 2017).

This can be interpreted that the green brand image contained in the product does not guarantee customer loyalty in purchasing PT. Natural Nusantara. It is known that green brand image does not guarantee customer loyalty so that the green brand image provided by PT. Natural Nusantara is not a reinforcement for visitors to remain loyal in using PT. Natural Nusantara.

The effect of Corporate Reputation on Customer Loyalty. The results of this study indicate that the corporate reputation variable shows the P number is 0.025, this number is below 0.05 and the CR is -2.242 barada below 1.96 so that H7 is accepted. In the sense that corporate reputation has a negative and significant effect on customer loyalty. The results of this study are in line with the results of research conducted by (Fernandes and Solimun 2018) which states that the existence of expectations, suitability, and achievement of services provided by the company will result in customer satisfaction, which in turn will result in customer loyalty.

It can be interpreted that the corporate reputation contained in the product can increase customer loyalty in purchasing PT. Natural Nusantara. The higher the corporate reputation in the company, the higher the customer loyalty of PT. Natural Nusantara. On the other hand, the lower the corporate reputation in the company, the lower the customer loyalty of PT. Natural Nusantara.

The effect of Product Quality on Customer Loyalty. The results of this study indicate that the variable product quality shows that the P number is 0.117 this number is above 0.05 and the CR is 1.566 barada below 1.96 so that H4 is rejected. In the sense that product quality has a non-significant effect on customer loyalty. The results of this study are in line with the results of research conducted by (Kusumasasti, Andarwati et al. 2017) which states that product quality does not have a major influence on customer loyalty.

This can be interpreted that the product quality contained in the product does not guarantee customer loyalty in purchasing PT. Natural Nusantara. It is known that product quality does not guarantee customer loyalty so that the product quality provided by PT. Natural Nusantara is not a reinforcement for visitors to remain loyal in using PT. Natural Nusantara.

The effect of Customer Satisfaction on Customer loyalty. The results of this study indicate that the variable customer satisfaction shows that the P number is 0,000, this number is below 0.05 and the CR is 3.515 barada above 1.96 so that H6 is accepted. In the sense that customer satisfaction has a positive and significant effect on customer loyalty. The results of this study are in line with the results of research conducted by(Fernandes and Solimun 2018) yang menyatakan bahwa adanya harapan, kesesuaian, dan pencapaian layanan yang diberikan oleh perusahaan akan menghasilkan kepuasan pelanggan, yang pada akhirnya akan menghasilkan loyalitas pelanggan.

Hal ini dapat diinterpretasikan bahwa customer satisfaction yang terdapat dalam produk dapat meningkatkan loyalitas pelanggan pada pembelian

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produk PT. Natural Nusantara. Semakin tinggi customer satisfaction dalam perusahaan maka akan senakin tinggi pula loyalitas pelanggan PT. Natural Nusantara. Begitu sebaliknya semakin rendah customer satisfaction dalam perusahaan maka akan semakin rendah loyalitas pelanggan PT. Natural Nusantara.

IV. Conclusion

Berdasarkan hasil pengujian SEM pada bab sebelumnya, maka dapat disimpulkan bahwa:

Variabel green brand image memiliki pengaruh terhadap kepuasan pelanggan. Dalam artian semakin tinggi green brand image dalam suatu produk, maka kepuasan mereka terhadap produk akan meningkat. Variabel corporate reputation memiliki pengaruh terhadap kepuasan pelanggan. Dalam artian semakin baik reputasi dalam perusahaan, maka kepuasan mereka terhadap produk akan meningkat. Variabel product quality memiliki pengaruh terhadap kepuasan pelanggan. Dalam artian semakin tinggi kualitas produk, maka kepuasan mereka terhadap produk akan meningkat. Variabel green brand image berpengaruh terhadap customer loyalty. Dalam artian semakin tinggi green brand image, maka loyalitas mereka terhadap produk akan meningkat. Variabel corporate reputation memiliki pengaruh terhadap customer loyalty. Dalam artian semakin baik reputasi perusahaa, maka loyalitas mereka terhadap produk akan meningkat. Variabel product quality tidak berpengaruh terhadap customer loyalty.. Dalam artian semakin tinggi kualitas produk, tidak menjamin loyalitas pelanggan. Variabel customer satisfaction memiliki pengaruh terhadap customer loyalty. Dalam artian semakin tinggi kepuasan pelanggan, maka loyalitas mereka terhadap produk akan meningkat.

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Tips for writing a good quality Social Science Research Paper

Techniques for writing a good quality homan social science research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of homan social science then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.



6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.
Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

19. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

20. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

21. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

22. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

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Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.



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Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.



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Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."



Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

Criterion for Grading a Research Paper (Compilation) by Global Journals

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

INDEX

A

Accumulation · 4, 43

C

Cassava · 35, 36
Consensus · 2, 20
Crucial · 1, 27

D

Decade · 1
Deficit · 1, 20, 21, 23
Depicted · 27
Depreciating · 22
Deprived · 38
Desired · 47
Detrimental · 2
Devaluation · 22
Devastated. · 35

E

Endogeneity · 20
Exhibiting · 3
Exogenously, · 2

F

Fiscal · 1

I

Implementing · 1, 20
Implications · 35, 39, 40, 43
Inflation · 1, 2, 3, 4, 5
Influences · 20, 21

P

Perceived · 37
Perpetually · 32
Persistent · 2
Predicts · 21
Predominantly · 34, 36

R

Remittances · 24
Revealed · 1, 2, 22, 35, 44

S

Simultaneous · 20, 25
Slashing, · 39
Spurious · 2
Stride · 32

V

Variance · 3, 23, 28,
Venture · 38, 41

W

Willingly · 44



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ISSN 975587

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