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IMPACT OF MAIZE, TOBACCO AND COTTON EXPORTS ON ECONOMIC GROWTH IN ZIMBABWE FROM 1985 TO 2017.

TALENT MUDZVITI

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AUTHOR'S ADDRESS 763 GRANARY PARK
SNAKE PARK
HARARE

DATE 15 APRIL 2019

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To my late father and mother, rest in external peace.

ABSTRACT

The main objective of the present analysis is to explore and quantify the impact of maize, cotton and tobacco exports on economic growth in Zimbabwe. The study estimated the impact of maize, tobacco and cotton exports on economic growth in Zimbabwe from 1985 to 2017, employing the ordinary least squares (OLS) technique on time series data using E-views 8 statistical package software. The results of this research have revealed that tobacco and cotton exports had a positive and significant relationship to economic growth trajectory in Zimbabwe and hence recommend that more investment and attention should be directed at tobacco and cotton farming as these have been discovered to have a positive impact in inducing economic growth. Tobacco and cotton products have to be specifically for exports as foreign markets have proved to be sustainable in causing economic growth. Thus according to this study, exports of cash crops will likely induce economic growth while staple cereals like maize need to be kept for domestic consumption.

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ACRONYMS

ADAF	Agricultural Development Assurance Fund
ADB	African Development Bank
ADF	Augmented Dickey Fuller
AFC	Agricultural Finance Corporation
AGDP	Agricultural Gross Domestic Product
AGRIBANK	Agricultural Development Bank of Zimbabwe
ARDA	Agricultural and Rural Development Authorities
AREX	Agricultural Research and Extension Services
ARP	Agrarian Reform Programme
BLUE	Best Linear Unbiased Estimator
CMB	Cotton Marketing Board
D-W	Durbin-Watson
ECOWAS	Economic Community of West Africa States
ELG	Export-led growth
EPZ	Export Processing Zones
ERF	Export Revolving Fund
ERS	Export Retention Scheme
ESAP	Economic Structural Adjustment Program
EU	European Union
FAO	Food and Agriculture Organisation
FTLRP	Fast Track Land Reform Programme
GATT	General Trade Agreement on Tariffs and Trade
GDP	Gross Domestic Product

GoZ	Government of Zimbabwe
IMF	International Monetary Fund
JB	Jarque-Bera
JOC	Joint Operation Command
LSC	Large Scale Commercial Farmers
MTC	Mashonaland Tobacco Company
NCC	National Cotton Council
NGO	Non-Governmental Organization
OLS	Ordinary Least Square
SSA	Sub-Saharan African Countries
SSC	Small Scale Commercial Farmers
TIMB	Tobacco Industry and Marketing Board
UNCTAD	United Nations Conference on Trade and Development
WTO	World Trade Organisation
ZFU	Zimbabwe Farmers Union
ZIMPREST	Zimbabwe Programme for Economic and Social Transformation
ZIMSTAT	Zimbabwe National Statistical Agency
ZITMA	Zimbabwe Textile Manufacturers Association
ZLT	Zimbabwe Leaf Tobacco Company

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CHAPTER I

1.1 Introduction

Cotton, tobacco and maize exports are the major crops grown in Zimbabwe with the potential to generate substantial export earnings for the country. Growing of cash crops is very important because they have a high return on the market and they can be produced by both large scale and small scale farmers (FAO, 1999). The government can easily manage its funding because cash crops such as cotton, maize and tobacco generally are short season meaning they don't take long to be ready for market.

Zimbabwe's exports are predominantly raw and semi-finished agricultural commodities. These are low-value products in as far as export earnings are concerned. In addition, government policy indirectly stimulated export production through relatively low government-set producer price for maize, which made many commercial farmers diversify into cash crops destined for more lucrative export markets (Government of Zimbabwe, 1995).

The aim of this study is to investigate the impact of maize, cotton and tobacco exports on economic growth in Zimbabwe from 1985 to 2017. This chapter highlights the background of the study, problem statement, and objectives of the research as well as the definition of major terms used in the study.

1.2 Background of the study

Agriculture is the key driver of Zimbabwe's economy because Zimbabweans are mainly rural based people who derive their living from agriculture and other related rural economic activities. Rukuni *et al*, (2006), also added that the Zimbabwean agricultural sector was also accounting for more than 40% of total national exports. In 1986, the government took measures to stimulate production through export incentives, introducing the Export Retention Scheme (ERS) and the Export Revolving Fund (ERF) and foreign exchange allocations in favour of exporters (Tagwira, 2001).

Export Led Growth (ELG) is the key to sustainable growth and development to developing nations such as Zimbabwe (Michaely, 1977). Zimbabwe is promoting agricultural production through its command agriculture, contract farming and use of AGRITEX as to avail much needed information to farmers as to increase agricultural output (Muir, 1994). Several other organizations provide agricultural services to large scale and small scale farmers. These services range from NGO-funded, community-based production oriented projects. AGRITEX

is used by the Government as a technical service to back- up NGO's funded projects. AGRITEX mobilizes the farmers, helps to organize them so they can receive the service and commercial services to agricultural producers. In addition, AGRITEX services are used to provide farmers with technical backup and advice on utilizing the technologies (Tekere, (2003).

Zimbabwe is one of the major tobacco exporters in the world according to ZIMSTAT Data (2000). "More so, tobacco is Zimbabwe's most valuable agricultural commodity, accounting for approximately 26% of GDP and 61% of agricultural exports," Ruzivo Trust, (2016). Anseeuw et al, (2012) suggests that, approximately 98% of tobacco produced in Zimbabwe is exported to over 80 countries. The remaining 20% is processed locally by four cigarette-manufacturing plants.

According to Woodend, (2003) the government attempted to spearhead various contract farming arrangements with little success after fast-track land reform programme (FTLRP) started in 2000 as to increase agricultural exports on cotton, maize and tobacco. Tobacco contract farming started in Zimbabwe in 2004 (Murota, Jera and Masara, 2009), at a time when tobacco finance and production were declining. There were 16 contracting companies operating nationally according to TIMB, (2015). These include Boost Africa, Chidziva Tobacco Processors, Curverid Tobacco, Gold Leaf Services, and Leaf Trade Company, Tribac, Tian Ze, and Midriver Enterprises, Northern Tobacco Company, and Mashonaland Tobacco Company, Intercontinental Leaf Tobacco, TSL Classic Leaf, and Zimbabwe Leaf Tobacco (ZLT). These companies stimulate tobacco production and therefore boosted exports.

The advent of the chaotic and violent land reform in 2000 was followed by an increase of tobacco farmers from 8 537 in 2000 to 60 047 in 2012 (TIMB, 2012) who inherited a vandalized tobacco infrastructure which compromised the quality and quantity of tobacco on the auction floors. New tobacco communal farmers with no collateral and expertise in tobacco production could not access finance from commercial banks that traditionally financed the tobacco crop. Further information asymmetry problems in a declining economy led to extensive credit rationing to the unbanked communal farmers. Tobacco production fell from a high of 237 000 kilograms in 2000 to 48.7 thousand kilograms in 2008 (TIMB, 2012; Dawes et al., 2009).

However, increased tobacco production uptake by small-scale farmers was followed by declining yields (Leaver, 2004). Participation of small-scale farmers in agricultural value chains is hindered by lack of 'production resources', credit constraints, low use of technology and market imperfections that impedes farmers' access to markets (Minot, 1986). Only about

one percent of formal bank credit goes to the farming sector due to perceived risks and transaction costs associated with lending to this sector (International Finance Corporation (IFC), 2012).The credit was likely to benefit the established large-scale commercial farmers in Zimbabwe as they have collateral security.

Cotton is the second most essential cash crop in Zimbabwe and is mostly grown by small scale farmers. According to Jarvis, (2008) cotton contributes 12.5% of agricultural GDP and 22% of the value of agricultural exports. 70 to 80% of cotton lint is exported. Cotton seed is an essential input for the domestic vegetable oil and stock feed industries. Jarvis, (2008) postulated that cotton is almost exclusively grown by smallholder scale farmers whose activities were not disrupted by FTLRP.

Contract farming gained popularity in communal lands because there are no banks prepared to lend smallholder farmers without collateral. Smallholder farmers enter into ginner driven contracts for cotton seed production due to availability of funding and inputs from the contractors which are provided on credit. The cotton crop in Zimbabwe is mostly grown under contract arrangements with ginners providing inputs and buying the cotton seed. Cotton companies which provide contracts were Cargill, Farmers World FSI Agrico and among others to boost cotton output. Under contract farming arrangements, the ginners were required to supply a minimum input support package to contracted farmers, through an input credit scheme. This system removes the burden of financing the crop from the farmer. However, the farmer in turn can only continue producing the crop if returns are favourable.

The GoZ has made a move to reverse the decline in production by issuing free inputs (seed, fertilizer and crop chemicals) to cotton farmers (Tekere, 2001). According to observers, the point at which the GoZ has chosen to assist the cotton industry is unlikely to make an impact to cotton production as this is fraught with bureaucratic inefficiencies. Most of the time inputs are delivered late and being free inputs, some farmers divert these to crops of their choice and there is no guarantee that they will be used to grow cotton. To some extent, free inputs have sometimes been exchanged for cash by hungry farmers wanting to satisfy immediate needs. Generally, the issuance of free inputs is fueling side marketing because nobody wants to repay credit if there is a conduit to sell to a buyer who does not deduct sales proceeds to recover input cost.

Maize accounts for 14% of agricultural GDP and remains essentially an industrial input (Tagwira, 2001). It is grown by over 90% of farmers and is a staple food for the majority of

the population. According to Tagwira, (2001) national maize production peaked at to about 2.8 million tonnes in 1985 with average crop yields peaking at about 2.2 tonnes per hector that same year.

The extension of marketing and agricultural support services to rural farmers resulted in rapid growth in production of maize and other grains creating a record surplus of maize and small grain which increased the marketed output.

Furthermore, Maize production fell by 25% from 1991 to 33% in 1992. There was pressure to import food due to inadequate capacity to cater for the whole population and more loans were needed due to scarcities in foreign currency. According to World Bank (2004) Zimbabwe has introduced Drought Relief Loans, Structural Adjustment Loans and Project Loans so as to boost maize production but this was unsuccessful because some of the money from the loans was diverted to other uses not related to maize production.

In November 2005, the Zimbabwe government started execution of "Activity Taguta, or "Task Eat Well". This Command Agriculture program was first freely alluded to by Central Bank Governor. The Joint Operations Command (JOC), comprising of the military, police, detainment facilities, and the intelligence service was responsible to monitor distribution of inputs in relation to the farm size around the country. It has included the deployment of armed force units on arable, purportedly under used land around the nation, to attempt and shape maize production in Zimbabwe. This was successful to some extend as it boost maize output through efficient use of inputs.

Gono, (2005) pronounced that Command Agriculture was to enhance output by requiring a minimum input for food or export crops, and is central to agriculture as well as general economic recovery. According to Gono, (2005) he revealed in his 2005 Fourth Quarter Monetary Policy Review Statement that there had been a considerable abuse of heavily sponsored diesel supplies, intended for agricultural use. A probe was prompted and senior government and secret service officials were concerned in having fraudulently claimed huge sums of diesel, evidently for agriculture, but then selling it on the parallel market. All of the mentioned above lead to reduced agricultural output and a decline in exports.

Table 1.1 Commodity contribution to agricultural GDP in Zimbabwe.

Commodity	Contribution to agricultural GDP, 2008 (%)	Total 2008 ('000 mt)	Total 2009 ('000 mt)	Change, 2009 (%)	Contribution to Agricultural GDP growth rate, 2009
Tobacco	22.5	45	56.5	26	2.69
Maize	14.0	575	1240	116	6.69
Cotton	12.5	242	210	-13	-0.68

Source: World Bank and Government of Zimbabwe (2010)

The productivity of maize, tobacco, and cotton declined mainly due to lack of seed and fertilizer unavailability as well as negative effects of hyperinflation, price controls, reduced private agro-dealer activities in rural areas, limited affordable sources of finance a majority of them cannot purchase adequate inputs on time and thus remain unorganized and with limited access to the market. Lack of collateral security is a major challenge faced by small scale farmers to access credit schemes in the Zimbabwean economy.

However, some of the inputs and land are availed to people without knowledge on how to farm and those given inputs divert them to other crops and exchange for something. Education is known to improve human capital on agriculture. On farm training, effective extension services and routine field visits could compensate for the educational deficiency and therefore boost production to stimulate exports.

1.3 Statement of the problem

Zimbabwe major agricultural exports are maize, tobacco and cotton. Zimbabwe was once the bread basket of Africa. Maize, tobacco and cotton exports are still declining and funding is directed to people without knowledge and some divert the inputs to another uses. Some of the communal farmers have no collateral to access finance from commercial banks which finance these subsectors (Dawes et al., 2009). The Government of Zimbabwe (GoZ) and private players have provided funding for the three subsectors (Tekere, 2003). There are complaints on whether it has been beneficial to the players and to the economy as a whole (Mapfumo et al, 2012). Overtime this funding has been on the increase without expressly translating to a corresponding expansion in agricultural output. Zimbabwe is still in a recession if export challenges evidenced by tobacco, maize, and cotton. This research, therefore, wants to find the impact of maize, tobacco and cotton exports on economic growth, to assess the effect of exogenous factors such as drought and inflation on AGDP and to assess the trend of maize,

cotton and tobacco exports overtime through funding, education and routine field visits as to promote ELG and sustainable development.

1.4 Objectives of the study

Since the Zimbabwean economy is driven by export led-growth, the research seeks to primarily:

1. To assess the trend of agriculture exports over time.
2. To assess the effect of exogenous factors such as drought and inflation on AGDP.
3. To evaluate the impact of maize, tobacco and cotton exports on economic growth.
4. To make appropriate policy recommendations.

1.5 Significance of the study

Government

Policy formulation especially through the Ministry of Agriculture. Exports are crucial as they promote sustainable development and they jump start the economy. It helps the government to allocate funds to few selected cash crops such as tobacco, cotton, and maize under study. Directs agricultural policy formulation and highlights areas of diversification in increasing exports as much as exports earnings are concerned. The government can issue licenses at a low price to companies which concentrate on contract farming in targeted cash crops so as to increase production and therefore, boost exports.

Financers

Financers will get to know the markets of cotton, maize and tobacco. Highlights investment opportunities as well as established markets associated with, maize, tobacco and cotton production.

Agricultural sector

The sector will get to know its performance as exports of tobacco, cotton are evidenced by the researcher. The sector as a whole will benefit from much knowledge in areas of diversification, what to produce and where to sell the product. More so, the sector will able to identify cash crops with a high return on the market.

Community

The community at large will benefit from the findings of the study so they have knowledge on the impact of agricultural exports on economic growth in Zimbabwe. The farmers will get to know the goods with high return on the market and the proportion of exports of the selected cash crops.

Scholars

The study helps other students who want to study in the same area with knowledge, skills and a reference source to those who wish to pursue similar research. The study will widen the knowledge of other students on the importance of maize, cotton and tobacco exports on Zimbabwe's economic growth as a less economically developed country. The research assists students on attachment who are employed in the Ministry of Agriculture in coming up with policies and innovations to boost confidence in the agricultural sector especially the export side.

1.6 Assumptions

During the research process the researcher made the following assumptions:

- The agricultural performance is measured using the total maize, cotton and tobacco exports from 1985 to 2017.

1.7 Scope of the study and delimitation of the study

The study focus on the Zimbabwean maize, tobacco and cotton exports alterations as economic growth changes. It will be limited to the Zimbabwean economy. The researcher use published statistics and other approved documents and the research has been restricted to a period of 33 years, thus from1985 to 2017.

- This study assessed the impact of tobacco, cotton and maize exports on economic growth in Zimbabwe by using yearly total exports data from 1985 to 2017.
- Secondary data –It is the only available source of data dating back to periods such as 1985.
- Variables – the variables used are maize, cotton, tobacco exports which are significant drivers of economic growth in Zimbabwe. Drought is the dummy variable and inflation rate affects the exchange rate.

1.8 Limitations of the study

In developing countries like Zimbabwe it is not a disputable phenomenon that, data problems in terms of quality, consistency, accuracy and reliability are very acute. Hence the researcher used data from other sources such as World Bank, ZIMSTAT, Ministry of lands and rural development in Zimbabwe, ZIMRA, The Reserve Bank of Zimbabwe, United Nations Food and Agricultural Organization Statistics Agency (FAOSTAT), TIMB, ZTA and UNCTAD Trade and Development Statistics in the study.

Lack of control over the secondary data quality (Saunders, 2009). Government and other official institutions are often a guaranteed of quality data, but it is not always the case. In the past the secondary data was often confined to libraries or particular institutions. Top of that, not always general public gained access. Having internet connection is frequently the only requirement to access. The researcher make use of internet to access data from different sources for reliability.

1.9 Definition of Terms

Agricultural GDP is the Gross Domestic Product (GDP) coming from the agricultural sector (Anim, 2010). Total GDP is defined as the sum of the value added from Total agriculture, industry and the services sectors. If the value added of these sectors is calculated at purchaser values, total value added is derived by subtracting net product taxes from GDP (Bakari, 2017).

Contract farming: is agricultural production carried out according to an agreement between a buyer and farmers, which establishes conditions for the production and marketing of a farm product (Tekere, 2003)

Economic Growth: Is the steady process by which the productive capacity of the economy is increased over time to bring about rising levels of national output and income (Todaro and Smith, 2005). Economic growth is the increase in the inflation-adjusted market value of the goods and services produced by an economy over time. It is conventionally measured as the percent rate of increase in real gross domestic product, or real GDP (IMF, 2012).

Export-led growth is where a significant part of the expansion of real GDP, jobs and per capita incomes flows from the successful exporting of goods and services from one country to another (Michaely, 1977).

1.10 Summary

This chapter introduced the study looking chiefly at the background of the study, problem statement, research objectives and questions, the statement of the hypothesis, and the assumptions used for the study.

CHAPTER II

LITERATURE REVIEW

2.0 Introduction

A huge body of literature is available on the role of agricultural exports on economic growth. The literature related to impact of maize, cotton and maize exports on economic growth is looked at and judgmentally assessed into detail so as to come up with a study based on what is commonly known in Zimbabwe for the period 1985-2017. The theoretical and empirical literature related to this topic is discussed in this chapter.

2.1 Theoretical Review

2.1.1 Cobb-Douglas Production Function

Cobb-Douglas production function was developed by Charles W. Cobb (mathematician) and Paul H. Douglas (economist) in 1928. The Cobb-Douglas production function is widely used in economic studies. This function describes the economic output as a function of two factors, capital and labour. Cobb-Douglas production function is used in the modeling the substitution between capital input, labour services and technical change. This model implies the elasticity of substitution equals one. The Cobb-Douglas production function is given by

$$Q = f(K,L) = A(L^{\alpha}, K^{\beta}) \quad \ldots\ldots 1$$

Where Q is total production (The monetary value of all goods produced in a year), (usually use AGDP), A is productivity of existing technology (total factor productivity) (Technical process, economic system etc.), K is investment capital input which is present by the total investment in fixed assets (the monetary worth of all machinery, equipment and buildings) and L is the quantity of the labour input (the total number of person- hours worked in a year) (COBB, C. W. and Douglas, P.,H 1928). Parameter α and β are the output elasticities to capital and labour, respectively.

Output elasticity measures the responsiveness of output to a change in levels of either labour or capital used in production amd given by,

$\alpha = \partial Q/Q/\partial L/L$, (Output elasticity coefficient of capital) ……2

$\beta = \partial Q/Q/\partial L/L$, (Output elasticity coefficient of labor) ……3

Cobb-Douglas production function allow us to change the magnitude of inputs response to factor price changes. One of the limitation of model is that use two factor input to explain the production (Liao, Q., Wu, Z. and Xu, J., 2010). This model is appropriate as we need, capital, technology and labour to come up with agricultural in Zimbabwe.

2.1.2 The High Payoff Input Model

The key to transforming a traditional agricultural sector into a productive source of economic growth is an investment designed to make modern, high-pay off inputs available to farmers in poor countries. Peasants, in traditional agricultural systems were viewed as rational, efficient resource allocators. They remained poor because in most poor countries, there were only limited technical and economic opportunities to which they could respond. According to Ruttan, (1977) the new high pay-off inputs were classified into three categories.

a) The capacity of public and private sector research institutions to produce new technical knowledge.

b) The capacity of the industrial sector to develop, produce and market new technical inputs.

c) The capacity of farmers to acquire new knowledge and use new inputs effectives.

The enthusiasm with which the high pay off input model has been accepted and translated into economic doctrine has been due in part to the proliferation of studies reporting high rates of returns to public investment in agricultural research. It was also due to the success of efforts to develop new, high productivity grain varieties suitable for the tropic. "New high-yielding wheat varieties were developed in Mexico, beginning in the 1950s, and new high-yielding rice varieties were developed in the Philippines in the 1960s," Ruttan, (1977). Zimbabwe should develop high productivity grain varieties which are high responsive to industrial inputs such as fertilizer and other chemicals and to more effective soil and water management. However, high returns associated with the adoption of the new varieties and the associated technical inputs and management practices have led to rapid diffusion of the new varieties among farmers in several countries in Asia, Africa and Latin America.

2.1.3 Tobacco Diversification and False Paradigm Development Theory

This study was primarily motivated by the false paradigm development theory. According to Todaro (1998) states that underdevelopment of developing nations is as a result of faulty, inappropriate advice by well-meaning but uninformed experts from developed country assistance agencies and multi-national donor organizations. Zimbabwe's experience with

ESAP (the Washinton Consenus) which resulted in de-industrialisation, increasing poverty and food and nutrition security as a result local companies succumbed to regional and international competition is testimony that the false paradigm development theory is a reality. Before Zimbabwe can pin all its hopes for agriculture intensification and diversification through transfer of successful tobacco production and marketing models, it is important that the benefits of the tobacco production and marketing models to Zimbabwe and the farming community be examined closely and a clear understanding of the industry dynamics established to understand sources of productivity and provide policy guidelines.

2.1.4 The Frontier Model

According to Ruttan, (1977) intensification of land use in existing villages was followed by pioneer settlement, the establishment of new villages and the opening up of forest or jungle were a series of successive change from Neolithic forest fallow to system of shifting cultivation on bush and grass land fallowed first by short-fallow systems and in recent years by annual cropping. As regard to the above, where soil conditions were favorable, as in the great river basins and plains, the new villages gradually intensified their systems of cultivation. While where soil resources were poor, as in many of the hill and upland areas, new areas were opened up to shifting cultivation or to nomadic grazing.

Crop yields were typically low- measured in terms of output per unit of seed rather than per unit of crop area. Output per hectare and per man hour tended to decline - except in the Delta areas such as in Egypt and South Asia, and the wet rice area of East Asia (Ruttan, 1977). In some areas, the result was to worsen the wretched conditions of the peasantry while there are relatively few remaining areas of the world where development along the lines of the frontier model will represent an efficient source of growth during the last quarter of the 20th century. The 1960s saw the “closing of the frontier” in most areas of South East Asia, in Latin America and Africa, the opening up of new lands awaits the development of technologies for all control of pests and diseases (such as the Tetse fly in Africa) or for the relation and maintenance of productivity of unfertile soil. In Zimbabwe there was FTLRP which enables farmers to relocate to productive areas so as to boost agricultural output.

2.1.5 Harrod Domar Theory

The potential of Zimbabwe to grow based on the tobacco, cotton and maize can also be illustrated using the Harrod Domar (H-D) development theory. According to Todaro (1998), the theory would require that the tobacco, maize and cotton industry must save (S) and invest

(I) to increase the capital stock (K) which will bring about growth. According to the H-D theory of development (Todaro, 1998), the net savings ratio (s) is a fixed proportion of the national tobacco, maize and cotton output (Y)

S- sY

Total Investment (I) is determined by the level of Savings (S).

I = S = sY ……. (1)

New investment is defined as a change in capital stocks (K).

I = ΔK ……..…… (2)

The total capital stock K has a direct relationship to national tobacco, maize and cotton output denoted by (Y) where the capital – output ratio is k as given below

K/Y = k …….. (3)

ΔK/ΔY = k ……. (4)

ΔK = k Δ Y…….. (5)

Based on Equation 1, 2 and 5 it follows that

I = ΔK = k ΔY = sY

K Δ Y = sY

Δ Y/Y =s/k

Hence based on the H-D model, the growth rate of the tobacco, maize and cotton economy is determined jointly by the net savings (s) and the tobacco, cotton and maize capital output ratio (k). The more the tobacco, cotton and maize industry saves and invest in capital stocks, the more the industry and the country will grow. The higher the capital output ratio the lower the growth rates.

2.1.6 Solow–Swan model

Robert Solow and Trevor Swan developed what eventually became the main model used in growth economics in the 1950s. This model assumes that there are diminishing returns to capital and labor. Capital accumulates through investment, but its level or stock continually decreases due to depreciation. Due to the diminishing returns to capital, with increases in capital per worker and absent technological progress, economic output per worker eventually

reaches a point where capital per worker and economic output per worker remain persistent because annual investment in capital equals annual depreciation. This condition is called the 'steady state'.

In the Solow–Swan model if productivity increases through technological progress, then output per worker increases even when the economy is in the steady state. If productivity increases at a constant rate, output per worker also increases at a related steady-state rate. As a consequence, growth in the model can occur either by increasing the share of GDP invested or through technological progress. But at whatever share of GDP invested, capital per worker eventually converges on the steady state, leaving the growth rate of output per worker determined only by the rate of technological progress. Each country has a different level of GDP per worker determined by the share of GDP it invests, but all countries have the same rate of economic growth. Poor countries can become rich by increasing the share of GDP they invest. One important prediction of the model, mostly borne out by the data, is that of conditional convergence; the idea that poor countries will grow faster and catch up with rich countries as long as they have similar investment (and saving) rates and access to the same technology.

In the Solow-Swan model countries with less capital per worker such as Zimbabwe have a higher return on investment due to the diminishing returns to capital. As a consequence, capital per worker and output per worker in a global financial capital market should converge to the same level in all countries.

2.1.7 The Theory of Economic Development (Fei-Ranis, 1961)

Developing countries like Zimbabwe can hope to move from the condition of stagnation to one of self- sustained growth if the agricultural sector is developed so that surplus labour force is absorbed by the new industries (Fei and Ranis, 1961).

Omowale (1979) also viewed agriculture as a means of reducing dependence on certain importations, earning foreign exchange and thus absorbing many new entrances to the labour market and increasing farmers' income.

Helleiner (1966) argued that, no matter how much development and structural transformation is achieved, agriculture will still remain dominant in the economy for many decades to come. For many developing countries, agriculture remains the gateway to several desired ends which include poverty reduction, rural transformation, and employment creation.

2.2 Empirical evidence

During the last three decades, a bulk of empirical research has been conducted to explore the effects of agricultural exports on economic growth or the export-led growth hypothesis. These studies have used time series data with divergent conclusions.

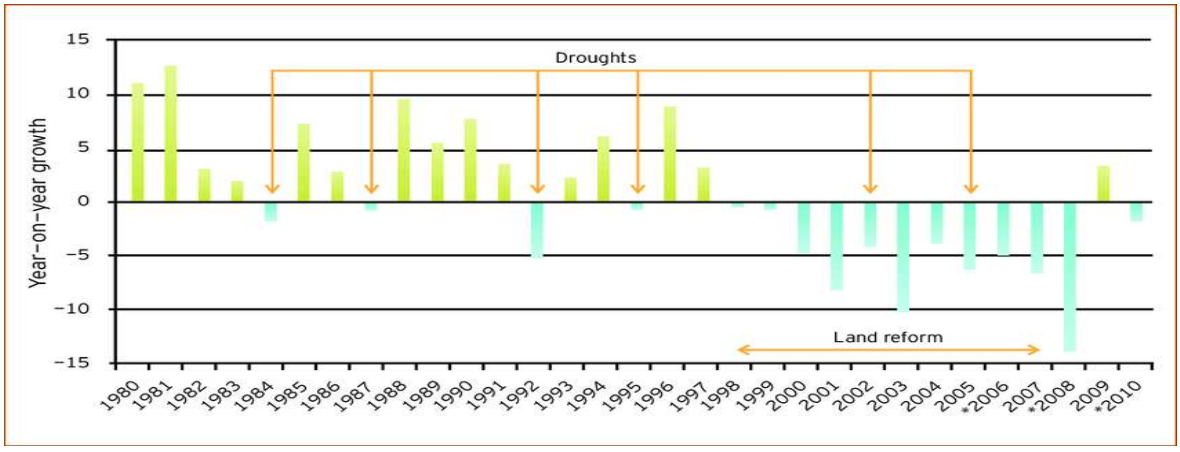
2.2.1Empirical studies that depict the link among agricultural exports and economic growth.

There are several studies that have shown that increased exports have positive and beneficial effects on economic growth. Among these studies, we can cite the work done by Asmah, (1998); Tyler, (1981); Savvides, (1995); Edward, (1998) and Ram, (1987).

The nexus between agricultural exports and economic growth

Various economies like Johnston and Mellor (1961); Levin and Raut (1997); Ekanayake (1999), Karp and Perloff (2002); Ardeni and Freebairn (2002); Schiff and Valdes (2002); Lopez (2002) agrees that the boost in exports in the agricultural sector plays a pivotal role in economic growth.

Figure 2.1 Trends in Zimbabwe's economic growth rate



Links between annual GDP growth rates and natural and socio-political events in Zimbabwe, 1980-2010 Source: Adapted from Robertson (2009).

Fig 2.1 is showing annual economic growth rate influenced by activities such as FTLRP and natural disasters such as drought. According to Saungwene (2013) postulated that economic meltdown and unfinished land reform agenda resulted in resettled farmers experiencing severe constraints in accessing agricultural markets and finance. Severe budgetary constraints and lack of donor support meant that agriculture infrastructure and finance was poorly supported and hence the need for an integrated financing model. Since the advent of liberalisation of the

economy in 1990 and land reform in 2000, there has been very limited research to inform policy formulation and hence government is now taking initiative to engage consultants on contract farming (Mandizha, 2013; Dawes *et al*., 2009).

Table 2.2: Studies related to the relationship between agricultural exports and economic growth

No	Authors	Countries	Periods	Empirical analysis	Results
1	Sanjuan-Lopez and Dawson(2010)	42 Developing Countries	1970 - 2004	Cointegration Analysis FMOL	AX => Y
2	Forgha and Myovella (2016)	Cameroon	198 - 2014	Cointegration Analysis VECM Granger Causality Tests	AX => Y :SR AX => Y: LR
3	Alam and Myovella (2016)	Tanzanian	1980 - 2010	Cointegration Analysis Granger Causality Tests	AX => Y
4	Edeme et al (2016)	ECOWAS Countries	1980 - 2013	Fixed Effect Model Random Effect Model	AX => Y
5	Mehrara and Baghbanpour (2016)	34 Developing Countries	1970 - 2014	Fixed Effect Model Random Effect Model Hausman Test	AX # Y
6	Oluwatoyese et al (2016)	Nigeria	1981 - 2014	Cointegration Analysis VECM Granger Causality Tests	AX => Y: LR AX # Y: SR
7	Bakari (2017)	Tunisia	1070 - 2015	Cointegration Analysis VECM	AX => Y: LR AX => Y: SR
8	Kalaitzi and Cleeve (2017)	United Arab Emirates	1981 - 2012	Cointegration Analysis VECM Granger Causality Tests	AX # Y: SR, LR
9	Mahmood and Munir (2017)	Pakistan	1970 - 2014	Cointegration Analysis Granger Causality Tests	AX <= Y
10	Matandare (2017)	Zimbabwe	1980 - 2016	OLS	AX => Y

Source: Author's computation

Note: Y means Economic Growth, AX means Agricultural Exports, LR means Long Run, SR means Short Run.

In Less Developed Countries (LDCs) like Zimbabwe, agricultural production has been regarded by several studies as a paramount prerequisite for industrialization and economic growth (Mapfumo, 2012). The idea behind this view is that, as agricultural production increases, countries are able to produce more food with less labour input which allows them to feed their growing population while releasing labour for the manufacturing sector and other sectors of the economy hence the process will lead to economic growth. Mapfumo, (2012) uses the Log linear growth regression model where GDP was the dependant variable and the

explanatory variables were the major crop products and factors which affect it. Four major crops which were included in the model were tobacco, maize, coffee and cotton.

Moreover, a dummy variable for the prevailing weather conditions was also included in the model. The regression analyses were performed using Econometric-views 3 (E-views 3) statistical package. Regression was carried out on time series data for the period 1980 to 2010. The data was tested for stationarity and for autocorrelation. Problems of non-stationarity of data were corrected by differencing the trending series. Results from the empirical analysis provide strong evidence indicating that agricultural production is important in improving the wellbeing of countries especially in LDCs. "The results from this study suggest that the value of agricultural production of tobacco, maize and cotton positively affects economic growth in Zimbabwe from 1980 to 2010," Mapfumo, (2012).

Zimbabwe has experienced a continuous deterioration in its terms of trade for agricultural commodities over a long period, which has adversely affected its agricultural trade performance (UNCTAD Trade and Development Statistics, 2000). Table 1.1 illustrates that world prices of Zimbabwe's agricultural exports have been on a downward trend. Prices of all major agricultural exports are below their 1990 levels.

Table 2.2 World commodity prices for Zimbabwe's major agricultural exports (US$)

Commodity (US$/tonne)	**1980**	**1985**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Cotton	2843	1921	1819	1641	1999	1204	1600	1785	1553	1622
Tobacco	3161	3807	3392	3425	3227	2536	239	2214	2671	3277
Maize	174	164	109	105	98	96	98	104	145	109

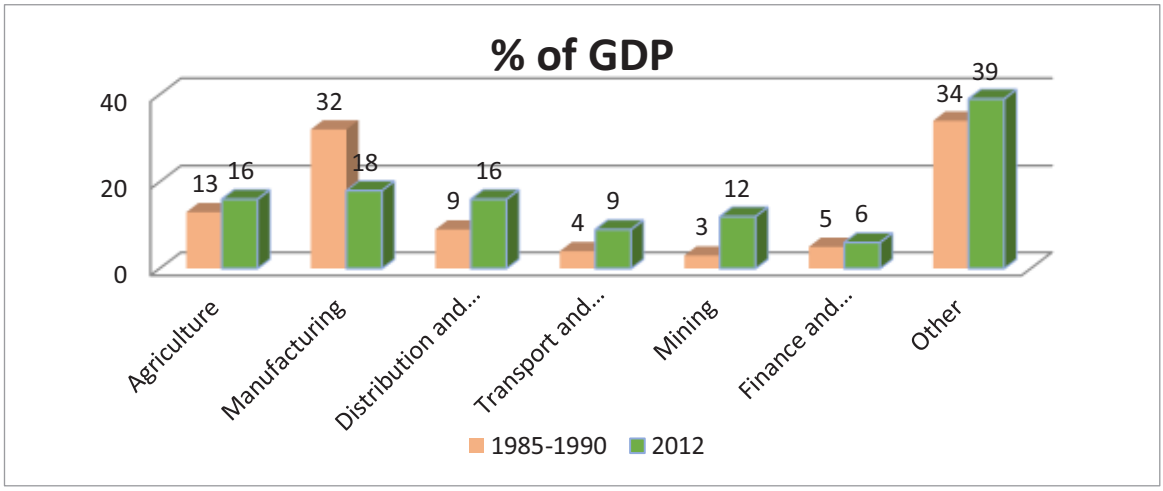
Source: UNCTAD Trade and Development Statistics (2000).

Zimbabwe enjoyed a balance of trade surplus in its trade with European Union (EU) from 1994 to 1997 and from 2000 to 2001. Exports to the EU accounted for about 36% of the country's total exports which were tobacco, cotton, and other products. Zimbabwe has experienced a continuous deterioration in its terms of trade for agricultural commodities over a long period which has adversely affected its agricultural trade performance (World Bank, 2014).

During the period 1980-1990, the economy of Zimbabwe was categorized by strong economic linkages: the backward and forward sectorial acquaintances stimulated growth and development. The dual agricultural sector was profoundly supported by the government to deliver the much needed maize, tobacco and cotton for export and to the local manufacturing

sector. The manufacturing sector was the foremost economic growth driver, trailed by agriculture and the retail and hotel industry. The middling sectorial contribution to the gross domestic product (GDP) for the period 1985-1990 and 2012 was as shown on the graph below figure 2.1.

Figure 2.1 Sectorial contribution to GDP



Source: Saungweme (2013)

Output growth decelerated since 1997 with real GDP falling by 5.5% by 2000 and a further 7.5% by 2001, mainly because of the poor performance of the agricultural sector. The annual growth rates during this period ranged between 3 to 4%, with the highest growth rate of 7.6% recorded in 1988. The economic growth after 1990, which averaged 3.2%, was accompanied by the adoption of a series of major market oriented economic reforms, chief of them being the Economic Structural Adjustment Programme (ESAP) of 1991. ESAP was prospered by ZIMPREST (1996-2002), whose objective was to complete and consolidate all achievements of ESAP in a way that would excite the nation. However, by as early as 1998, the country started to experience effects of economic slowdown and afterward entered into a recession in 2000 (Saungweme, 2013).

Tobacco is a standout amongst the most profitable crops in numerous nations. For instance, in Zimbabwe, tobacco is around multiple times more profitable than the following best yield (Maravanyika, 1997). Tobacco is a cash crop for some farmers in developing nations. Therefore, tobacco has been a harvest that farmers like to develop in about all delivering countries.

As Oya (2012) points out, much of the literature on contract farming has focused on operational and business issues, and the particular design and consequences of contracts, often framed by the concerns of new institutional economics. There has been less analysis on the implications

of new relations created by contract farming in out grower arrangements, and the adoption of contracted crops more broadly, for patterns of agrarian transition. Contract farming was successful in Zimbabwe as it boos exports in tobacco and cotton subsectors.

Governments in some developing countries likewise finance tobacco farmers with credit, power, and so on, which balances the taxation. The degree of taxation, be that as it may, has been diminished as of late because of the decrease of incorporated syndication obtaining because of GATT/WTO necessities, economic transition in previous Easter-alliance countries and IMF mandates in a few East Asian countries (Jacobs et al., 2000). In spite of taxation, tobacco is still more productive than options in most developing countries.

Shida (2008) analyzed the linkage between Agricultural Exports and Economic Growth in Pakistan. The study estimates three simultaneous equations representing GDP, agricultural exports, and total imports while incorporating factors such as income remittances from abroad, investment, and manufactured exports as independent variables by using the three stage least squares systems (3SLS) approach. The study found that, in GDP equation agricultural export was positive and statistically significant, that is a 1% increase in per capita agricultural exports would ultimately result in an increase of 0.22 to 0.36% in per capita GDP and in the agricultural export equation where GDP is independent variable, positive and significant relationship was found indicating the much larger parameter of GDP than Agricultural export was in GDP equation. Therefore, the larger magnitude of GDP compared to Agricultural exports imply that GDP growth has a much greater impact on Agricultural exports growth than Agricultural export growth has on GDP growth. Based on the empirical results, the study suggested these options; either transferring labor out of agriculture to the industrial or the services sectors, or increasing agricultural labor productivity as two alternatives for increasing the rate of economic growth.

The contribution of agricultural exports to economic growth of 42 selected under developed countries was done using panel co-integration techniques. Agricultural and non-agricultural exports were used as independent variables to determine the dependent variable which is economic growth (GDP).The results showed that 33 developing countries had positive elasticity for agricultural exports. By the same token for 37 countries, the elasticity of non-agricultural exports was also positive. Based on the empirical results, the study suggested that the poor countries should adopt balanced export promotion policies but the rich countries might attain high economic growth from non- agricultural exports (Sanjuan-Lopez and Dawson, 2010).

Al-Yousif (1997), tests the export-led-growth (ELG) hypothesis in four Arab Gulf oil-producing countries. These countries are Saudi Arabia, Kuwait, the United Arab Emirates and Oman. The study covers the period 1973 -1993. In order to examine the relationship between exports and economic growth, Al-Yousif (1997) estimates two models for each country. One of the models has a basic form of the production function while the other is a sectoral model. To determine the long run relationship between exports and economic growth, Al-Yousif (1997) performs co-integration. The study found no long-run relationship between exports and economic growth. However, export is found to have a positive and significant impact on economic growth in all countries.

In the same line, Bbaale and Mutenyo (2011) confirms that agricultural exports-led to an increase in income per capita in Sub-Saharan African Countries using panel data analysis. In the same way, Shombe (2008) also confirms that agricultural export-led economic performance in Tanzania. Onogwu (2014) finds out that intra-industry trade in cereal crop has positively impacted the gross national income per capita in the Economic Community of West African States (ECOWAS). Arguably, both exports and imports growth rates of these commodities fluctuate over time. Similarly, some studies (Bbaale and Mutenyo, 2011; Gbaiye et al., 2013; Ojo, Awe, and Ogunjobi, 2014) have also confirmed the hypothesis that agricultural export-led economic growth in Nigeria.

Nevertheless, agricultural exports can accelerate a balanced growth in all countries involved if only issues (trade restrictions and distortions) related to the world trade in primary agricultural trade are addressed or drastically reduced (Anderson and Martin, 2005; McCally and Nash, 2007; Laborde and Martin, 2012; Verter, 2015). Empirically, Sanjuán-López and Dawson (2010) determine the connection between GDP and agricultural and non-agricultural exports in 42 countries using panel co-integration methods. Their findings indicate that a long-run relationship exists between the variables in the model. The results further show that agricultural exports Granger cause economic growth. Thus, confirming the export-led growth hypothesis for the 42 countries under study.

Similarly, Henneberry and Curry (2010) examine the relationship between agricultural exports and economic growth in Pakistan. Using three simultaneous equations representing GDP, agricultural exports, and imports, they find a favorable relationship between agricultural exports and economic growth in the country. Kang (2015) investigates the evidence of the export-led growth in major rice exporting countries using some econometric approaches. The

results confirm that agricultural export-led growth in the major rice exporting countries such as Pakistan, Vietnam, and Thailand.

In contrast to agricultural export-led growth arguments above, proponents of the opposite viewpoint opine that the agricultural export does not have a robust connection for fostering economic growth. Studies by Marshall, Schwart, Ziliak (1988) and Faridi (2012) do not support the hypothesis that agricultural exports-led growth in the developing countries. Even though agricultural production and exports have been severely neglected for oil in recent decades (Verter, 2014), it is still the major nonoil foreign exchange earner other Sub-Saharan African countries (SSA) like Zimbabwe.

One of the key factors, however, is that exports promote thresholds effects due to economies of scale, increased capacity utilization, productivity gains, and greater product variety. It is also argued that exports of goods and services provide the opportunity to compete in the international markets that lead to technology transfer and improvement in managerial skills. Indeed, a recent review by Gunter, Taylor, and Yeldan (2005) concludes that any gains from trade liberalization are often associated with external effects that are dynamic in nature.

Michaely (1977) finds an optimistic association sandwich between export and growth of economics. Vohra (2001) investigated the role of export-growth linkage in India, Pakistan, Philippines, Malaysia, and Thailand respectively. Time series data for the period from 1973-1993 was used. The empirical results show that exports have a positive and significant impact on economic growth. Young (2002) found that export growth is a positive contributor to economic development in low-income countries like Zimbabwe as well as middle-income countries. Though, the impact is somehow stronger in middle-income countries than in low-income countries.

It is observed that most literature focused on the total exports as the only source of growth, but agriculture's share of total exports is generally substantial in developing economies. It is very astonishing that empirical research on the contribution of agricultural exports to economic growth has been to some extent ignored in the literature despite its role in the development process being long recognized. Over the past few decades, exports of agricultural products such as tobacco, cotton and maize have played a pivotal role in the economic growth of many developing countries. Agricultural exports continue to be the most important source of foreign exchange for the majority of Sub-Saharan African countries (Gilbert 2009).

Aurangzeb (2006) studied the relationship between economic growth and exports in Pakistan based on the analytical framework developed by (Feder, 1983). It tested the applicability of the hypothesis that economic growth increased as exports expanded by using time series from 1973 to 2005. The findings of the study showed that the export sector had significantly higher social marginal productivities. Hence the study concluded that an export-oriented and outward-looking approach was needed for high rates of economic growth in Pakistan.

Kwa and Bassoume (2007) examined the linkage between agricultural exports and sustainable development. The study provided case studies of different countries that were involved in agricultural exports. Nadeem (2007) provided the empirical analysis of the dynamic influences of economic reforms and liberalization of trade policy on the performance of agricultural exports in Pakistan. The author examined the effect of both domestic supply-side factors and external demand on the performance of agricultural exports. The major finding of the study was that export diversification and trade openness contributed more in agriculture domestic side factors performance. The results of the study suggested that agricultural exports performance is more elastic to change in domestic factors.

2.3 Conclusion

It has been observed that different literature hypothetically support export-led economic growth in different standpoints with a significant positive impact of agricultural exports on economic growth being observed in Less Economically Developed Countries. Hence this literature will be used to assist in the research being carried out on the impact of agricultural exports on economic growth in Zimbabwe.

CHAPTER III

RESEARCH METHODOLOGY

3.0 Introduction

This chapter outlines the methodology used in carrying out the research. It gives an outline of model specification, justification of variables, data sources as well as the summary. It is a brief explanation of how the data will be scrutinized and presented in an endeavor to fix an uncertain economic picture of how maize, cotton and tobacco exports, inflation and drought impact on economic growth in Zimbabwe.

3.1 Research design

Research design is that plan selected by the researcher to answer research questions Saunders, et al. (2003). This study used quantitative analysis tools and an econometric model was applied to analyze the impact of agricultural exports on economic growth in Zimbabwe. The study used secondary data obtained from The World Bank, Zimbabwe National Statistics Agency, Ministry of lands and rural development in Zimbabwe, ZIMRA, The Reserve Bank of Zimbabwe, United Nations Food and Agricultural Organization Statistics Agency (FAOSTAT), TIMB, ZTA and UNCTAD Trade and Development Statistics. Research design mainly takes into account the various ways in which research questions have been tackled.

3.2 Model specification

3.2.1 Theoretical model

In 1928 Charles Cobb and Paul Douglas published a study in which they modeled the growth of the American economy during the period 1899 - 1922. They considered a simplified view of the economy in which production output is determined by the amount of labor involved and the amount of capital invested. While there are many other factors affecting economic performance, their model proved to be remarkably accurate.

The function they used to model production was of the form:

$$\mathbf{Q= f(K,L) = A(L^{\alpha}, K^{\beta})} \quad \ldots\ldots 1$$

Where:

- Q = total production (the monetary value of all goods produced in a year), (usually use GDP)
- L = labour input (the total number of person-hours worked in a year)

- K = capital (the monetary worth of all machinery, equipment and buildings)
- A is productivity of existing technology (total factor productivity)
- α and β are the output elasticities to capital and labour, respectively. These values are constants determined by available technology.

Output elasticity measures the responsiveness of output to a change in levels of either labour or capital used in production, ceteris paribus. For example if α = 0.15, a 1% increase in labour would lead to approximately a 0.15% increase in output.

Further, If: α + β = 1 the production function has constant returns to scale. That is, if L and K are each increased by 20%, then Q increases by 20% (Farida, 2012).

3.2.2 Empirical model

To determine the direct impact maize, cotton and tobacco exports on economic growth in Zimbabwe, the study applied the Cobb-Douglas production function that describes the situation of countries characterized by an open economy. The study adopted and modified a model by Farida (2012) who examined the contribution of agricultural export to economic growth in Pakistan. Farida established an econometric model based on a generalized Cobb Douglas production function and came up with the following model.

$$\mathbf{Y= f (L^{\alpha}, K^{\beta})} \quad \text{.....(1)}$$

Where: Y = output (sometimes is denoted by Q)

L = labour

K = capital

The above model was modified to suit the Zimbabwean situation by adding drought and inflation as independent variables. The augmented production function including all the variables is expressed as:

$$\mathbf{Y_t = AK^{\beta 1} L^{\beta 2} X^{\beta 3} Drought^{\beta 4} Inflation^{\beta 5}} \quad \text{.....(2)}$$

Where:

- Y = total production (the monetary value of all goods produced in this case AGDP)
- A = technology
- K = capital

- L = labour
- X = agricultural exports.

$$\mathbf{Y_t = AK^{\beta 1}\, L^{\beta 2}\, X^{\beta 3}\, Drought^{\beta 4}\, Inflation^{\beta 5}} \quad \ldots\ldots (3)$$

In equation (3): A show the level of technology utilised in the country which is assumed to be constant. The returns to scale are associated with capital (K), labour (L), export (X), Drought and inflation, which are shown by β_1, β_2, β_3, β_4 and β_5 respectively.

The researcher then turned all the variables into logarithms. The Cobb-Douglas production function is given in the linear functional form as follows:

$$\mathbf{Log\ (Y_t) = log\ (A) + \beta_1 log\ (K_t) + \beta_2\ log\ (L_t) + \beta_3 log\ (X_t) + \beta_4 log\ (Drought_t) + \beta_5\ log\ (Inflation_t) + \mu_t} \quad \ldots\ldots (4)$$

By keeping technology constant, the linear model can be written as follows:

$$\mathbf{Log\ (Y_t) = \beta_0 + \beta_1 log\ (K_t) + \beta_2\ log\ (L_t) + \beta_3 log\ (X_t) + \beta_4 log\ (Drought_t) + \beta_5\ log\ (Inflation) + \mu_t} \quad \ldots\ldots (5)$$

The researcher focused on agricultural exports (X). To suit the Zimbabwean case, this study separated exports into 3 strips which are tobacco exports (TOE), cotton exports (COE) and maize exports (MAE).

$$\mathbf{X = MAE + COE + TOE} \quad \ldots\ldots (6)$$

Equation (6) presented the export division (X). (MAE), (TOE) and (COE) are transmitted into logarithms in order to transfer out linear the nonlinear for Cobb- Douglas production.

$$\mathbf{Log(X) = Log\ (MAE) + Log\ (TOE) + Log\ (COE)} \quad \ldots\ldots (7)$$

When equations 5 and 7 are merged, they obtain the following equation which presents this studies final model for estimation. This study assumed labour and capital is included in agricultural exports and came up with equation (8)

$$\mathbf{Log\ (Y_t) = \beta_0 + \beta_1 log\ (MAE) + \beta_2 log\ (COE) + \beta_3 log\ (TOE) + \beta_5\ log\ (Inflation) + \beta_4 log\ (Drought) + \mu_t} \quad \ldots\ldots (8)$$

In equation (8): Y, TOE, COE, MAE, Drought and Inflation present respectively economic growth, tobacco exports, cotton exports , cotton exports, drought and inflation which are shown

by, β_1, β_2, β_3, β_4 and β_5 respectively. The above model ultimately becomes this study's final model of estimation.

Since economic growth is determined by all sectors in the economy, the researcher choses AGDP as a proxy for economic growth from agricultural sector. The units of measurement tend to differ from variable to variable, for example, AGDP is measured in monetary terms, which is dollar terms, while maize exports, tobacco and cotton can be measured in volumes (tonnes), the data is logged to introduce some uniformity in the model.

Based on a priori expectations, there should be a positive relationship between economic growth and maize exports, cotton exports, tobacco exports, with an exception for drought and inflation such that; $\beta 1>0$, $\beta 2>0$, $\beta 3>0$, $\beta 4<0$ and $\beta 5<0$.

The regression analysis for this study was performed using E-views 8 statistical package.

3.3 Variables used in the study

Agricultural Gross Domestic Product

In this research, it is regarded as a proxy to measure economic growth. Agricultural GDP, the measure of real rate of return of agricultural economic activities, has been preferred for its ability to capture changes in output adjusted for inflation, a key factor in both economic growth and development. AGDP is the dependent variable, which is purported to be influenced by tobacco, maize and cotton exports, inflation and drought.

Maize exports

Maize exports is going to measure all exported grain and maize cobs. $\beta_1>0$ which is the parameter of maize exports coefficient. Maize ranks first in terms of the number of producers, area grown and total cereal production in Zimbabwe. Maize is the staple food crop of the nation and is also an important cash crop. During good production periods, surplus maize is exported, earning much- needed foreign exchange (Grain Marketing Board (GMB), 2010). Therefore, maize is a special crop for Zimbabwe and throughout eastern and southern Africa (Byerlee and Eicher, 1997).

Cotton Exports

Cotton exports is going to measure all exports of raw cotton and processed cotton. $\beta_2>0$ which is the parameter of cotton exports coefficient. The introduction of an input credit scheme and deregulation of cotton marketing have resulted in a massive surge in production. Zimbabwe

produces high-quality cotton which contributes 10-22 percent of agricultural exports (ZIMSTAT, 2014).

Tobacco Exports

Tobacco exports is going to measure all the exports of raw tobacco and processed tobacco Zimbabwe is one of the major tobacco exporters in the world. Tobacco is the top foreign currency earner cash crop among all cash crops in Zimbabwe. $\beta_3>0$ which is the parameter of tobacco exports coefficient.

Inflation

Inflation is measured using the Consumer Price Index (CPI). This is a measure of change in prices of consumer goods and services such as food, clothing and other basic commodities in price index including agricultural produce. Zimbabwe experienced low and hyperinflation during the period under study. Inflation is introduced into the model to take into account the general increase in costs of production. The effect of inflation on production profitability will depend on whether the wages and other operating expenses increase at a faster rate than production. This inflationary environment resulted in lower levels of agricultural productivity. Also high rate of inflation reduces the purchasing power of consumers and thereby reduce the size of the market. Both the effects results in low investment due to small market which also affected economic growth. In line with this notion, it is expected that inflation rate might have a negative impact on economic growth: $\beta4 < 0$.

Drought (Dummy variable)

The dummy variable represents drought. Zimbabwe as an agro-based economy has an inseparable relationship between agricultural output and the changes in economic growth hence the need to incorporate drought in the research. A dummy variable can be defined as a qualitative representative variable incorporated into a regression model, such that it assumes the value one (1) whenever the category it represents occurs and zero otherwise. The dummy variable assigns the value of zero (0) during the period when there was no drought and the value of one (1) during the period when Zimbabwe experienced severe droughts. The greatest influence of drought was felt in the years 1992, 2002 and 2008. The expected sign of the coefficient is negative $\beta5<0$.

Stochastic term (μ)

The stochastic term was used to capture all the errors in the relationship. The stochastic term is justified on omissions of the influence of innumerable chance events and measurable errors (Gujarati, 2005).

The intercept (β_0)

This is included since it ensures that the model will be unbiased, that is, the mean of the residuals will be equal to zero (Gujarati, 2005).

Time period (t)

Since the researcher uses time series data is denoted by subscript t for period (1, 2, 3 ……33)

3.4 Ordinary Least Squares (OLS) Estimation

The method of least squares (OLS) is used in the determination of the regression coefficient and other statistical parameters required in the analysis. Gujarati (1995) emphasized that the method of least squares gives the Best Linear Unbiased Estimates (BLUE) which are efficient. The simple OLS regression model is used to analyse the time series data which was collected and also the interpretation of parameters will also be essential to analyse the contribution of agricultural exports on economic growth.

3.5 Data Linearization, Sources and Reliability

The data used in this study was linearized by introducing natural logarithms in order to avert the problem of inconsistency of the data. Political environment, inflation, dollarization, conversions of the values of national accounts as well as other irregular phenomenon have been fingered as major causes of data inconsistencies and have greatly influenced some variables under study. As such, linearization brings uniformity to the data hence guaranteeing equal units of measurements. However, inflation rate was not put in to natural logs as its values included negative values.

3.6 Diagnostic Tests

Unit Root Test

This is the test for stationarity or non-stationarity under time series variables (Gujarati, 2008). The study employs the Augmented Dickey-Fuller (ADF) test to examine the variables in the test. It is thus formulated as follows:

$Y_t = \rho Y_{t-1} + \mu_t$ where; $-1 \leq \rho \leq 1$

If we subtract Y_{t-1} from both sides we obtain;

$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + \mu_t$

$= (\rho-1)Y_{t-1} + \mu_t$

Which can be alternatively written as;

$\Delta Y_t = \partial Y_{t-1} + \mu_t$

Where $\partial = \rho - 1$ and Δ is the first difference operator.

The Hypothesis Test for Unit Root is thus as follows:

H_0: P=0 (unit root)

H_1:P≠0 (no unit root)

Therefore, the decision rule entails that: If t*<ADF (critical value), reject the null hypothesis, that is, unit root does not exist.

Multicolinearity

Multicolinearity is the existence of a perfect or exact linear relationship among some or all explanatory variables of a regression model (Gujarati, 2008). This emanates from the fact that in real life we cannot have orthogonal variables since most economic variables which are expected theoretically not to be related are interdependent. However, the problem arises when the degree of multicolinearity is high, that is, above 0.8. In this study, the correlation matrix was used to test for multicolinearity.

Heteroscedasticity

This refers to a situation whereby the variance of each disturbance term, conditional on the chosen values of the explanatory variables, is not constant and this is caused, among other causes, by the presence of outliers (Gujarati, 2008). On the other hand, homoscedasticity is one of the co-pillars of the regression model as it conform the data to the dictates of the classical linear regression model. Heteroscedasticity leads to larger confidence intervals. As a result, this study employed the Breusch-Pagan-Godfrey test for heteroscedasticity.

Autocorrelation

The term autocorrelation can be defined as correlation between members of series observations, ordered in time (as time series data) or a space (as in cross-sectional data). In regression, the classical linear regression model assumes that such autocorrelation does not exist in the disturbances (Gujarati, 2005).

The Durbin Watson (D-W) test is used to test for autocorrelation. More formally, the D-W test statistic measures the linear association between adjacent residuals from a regression model. If there is no serial correlation, the D-W statistic will be around 2. If there is a positive serial correlation, it will be below 2, (in the worst case), it will be near zero. If there is a negative correlation, the D-W statistic will lie somewhere between 2 and 4 (Gujarati, 2008).

Positive serial correlation is the most commonly observed form of dependence. As a rule of thumb with 50 or more observations and only a few independent variables, a D-W statistic below 1.5 is a strong indication of positive first order serial correlation.

3.7 Descriptive Statistics

Descriptive statistics for all the variables were presented in order to explain the general behavior of the data. They depicted the basic features of the data in the study such as the summaries of the sample and the measures describing what the data shows. The statistics include skewness, kurtosis, mean and the Jaque-Bera statistic and these were analyzed according to the estimates obtained in the study.

3.8 Summary

This chapter presented the OLS technique that was used to estimate the impact maize, cotton and tobacco exports on economic growth in Zimbabwe from 1985 to 2017. The variables under consideration are maize, tobacco and cotton exports from the agricultural sector, inflation and a dummy for drought. The chapter reviewed the model that will be used in the testing of the impact of maize, cotton and tobacco exports on economic growth as well as the sources of data. The next chapter analysed and presented the results obtained.

CHAPTER IV

DATA PRESENTATION AND ANALYSIS

4.0 Introduction

This section will present the results of the data analysis that was carried out with the intention of establishing the relationship among maize, cotton and tobacco exports and economic growth. The main procedure used to answer the research questions is the Regression analysis. Data was then collected and it was entered in the E-views software for estimation of the results. This chapter will provide the results obtained from the research and their econometric meaning.

4.1 Descriptive Statistics

Table 4.1 Descriptive Statistics

	LAGDP	LMAE	LTOE	LCOE	DROUGHT	INFLATION
Mean	7.4542	5.96588	6.164129	6.273266	0.212121	221.3455
Median	7.499029	6.069814	6.339301	6.481424	0	22.5
Maximum	7.978654	6.689475	6.903245	6.839905	1	2310.8
Minimum	6.374121	4.607168	4.839451	4.69043	0	-3.9
Std. Dev.	0.357788	0.623368	0.524733	0.546133	0.415149	497.6619
Skewness	-0.809718	-0.991378	-0.923511	-1.612305	1.408374	2.857314
Kurtosis	3.775701	2.782301	3.127889	4.788059	2.983516	11.11294
Jarque-Bera	4.433388	5.47073	4.713285	18.6935	10.90971	135.4055
Probability	0.108969	0.06487	0.094738	0.000087	0.004275	0
Sum	245.9886	196.874	203.4163	207.0178	7	7304.4
Sum Sq. Dev.	4.096402	12.43479	8.811039	9.544351	5.515152	7925357
Observations	33	33	33	33	33	33

Source: Author's computation using E-views 8

The table 4.1 above present descriptive statistics of the variables under study. Of the 33 observations in the variables under study, and it can be noted that inflation had the largest variations over the study period as shown by the standard deviation of 497.6619. Relatively smaller variation was experienced in economic growth as shown by agricultural GDP which had 0.357788. A low standard deviation shows that the data tend to be close to mean and high standard deviation shows that data is spread out over large range of values. Agreeably, higher variability is to be expected in the Zimbabwean case given that the country experienced a decade long period of macro-economic instability from 1997 to 2008.

Skewness is referred to as the direction of inclinations or biasedness of the distribution observations during the study period. In this study, drought and inflation were found to be positively skewed meaning there were unusually high value observations to the left of their distributions. This is exhibited by the fact that from 1985 to 2008, drought occurred more frequently on average than from 2009 to 2017. Correspondingly, inflation levels for the period 1995 to 2007 were higher on average than for the period 2008 to 2017. Contrariwise, agricultural GDP, maize exports, tobacco exports and cotton exports were highly negatively skewed for the study period. This can be attributed to unusually low values in some parts of their distributions.

The Jaque-Bera statistic tests the normality of distribution for the variables under the null hypothesis of normal distribution. Thus, we fail to reject the null hypothesis of normality on agricultural GDP at 10% level of significant. However, all the other variables were found to be not normally distributed. Though, failure of some variables to satisfy the normality assumption do not disqualify the regression model since the assumption is only for convenience purposes hence the assumption can be relaxed and still get intended results (Green, 2002).

4.2 Model Diagnostic Tests

4.2.1 Stationarity Tests

In this section the researcher used unit root tests to check stationarity of the five variables. The Augmented Dickey-Fuller (ADF) test is used to test for stationarity of the series. In the model, non-stationarity is corrected by using differenced series. The variables ensure that they are stationary when the absolute Augmented Dicky Fuller (ADF) is greater than the test statistic.

Table 4.2 Unit Root Tests in Levels

Variable	ADF t-statistic	5% Critical value	1% Critical value	Decision
LAGDP	-2.828816	-3.557759	-4.273277	Non-Stationary
LMAE	-3.718615	-3.568379	-4.296729	Stationary
LTOE	-3.037159	-3.568379	-4.296729	Non-Stationary
LCOE	-3.675846	-3.557759	-4.273277	Stationary
INFL	-2.809088	-3.557759	-4.273277	Non-Stationary

Source: Author's computation using E-views 8

From the table 4.2, it is derived that log of agricultural GDP, log of tobacco exports, and inflation were found to be not stationary whilst log of maize exports and log of cotton exports

were found to be stationary in levels. Thus we carried out unit root tests at first difference for the variables which were not stationary in levels. This is shown in the table below.

Table 4.3 Unit Root Tests at First Difference.

Variable	ADF t-statistic	5% Critical value	1% Critical value	Decision
LAGDP	-5.383574	-3.562882	-4.284580	Stationary
LTOE	-5.071228	-3.562882	-4.284580	Stationary
INFL	-7.195801	-3.562882	-4.284580	Stationary

Source: Author's computation using E-views 8

From the table 4.3 above, the unit root tests indicates that all the variables became stationary after first differencing. This means that we can now reject the null hypothesis that there is a unit root at 1% level of statistical significance. Therefore, we can continue to estimate without the possibility of spurious relationship.

4.2.2Multicolinearity Test

Table 4.4 Multicolinearity Test

	LAGDP	LMAE	LTOE	LCOE	DROUGHT	INFLATION
LAGDP	1					
LMAE	0.694938	1				
LTOE	0.648832	0.846159	1			
LCOE	0.532937	0.540375	0.323589	1		
DROUGHT	-0.588323	-0.683889	-0.517527	-0.364754	1	
INFLATION	-0.102909	0.073463	0.135691	0.142307	0.407435	1

Source: Author's computation using E-views 8

The table 4.4 shows the correlation values of all the variables in the model. It can be noted that all the values, except log of maize exports and log of tobacco exports, are below the threshold of 0.8 the highest being 0.84. Although it is recommended that there should be no multicolinearity, Gujarati (2008) revealed that, multicollinearity, especially in time series data, may be due to that the regressors included in the model share a common trend, that is, they all increase or decrease over time. Thus leading to collinearity among these variables. The findings of this study are not uncommon given that all the variables that affect the productivity of maize and tobacco are highly likely to be the same.

4.2.3 Heteroscedasticity Test

Table 4.5 Heteroscedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	2.640708	Prob. F(5,26)	0.0465
Obs*R-squared	10.77743	Prob. Chi-Square(5)	0.0560

Source: Author's computation using E-views 8

The table 4.5 shows that the probability value obtained from the data is 0.0560 meaning that, although the model is homoscedastic at 1% and 5% level of significance, the model is heteroscedastic at 10% level of significant but can still yield reliable results. The presence of heteroscedasticity in this model is attributed to outliers as most economic data in Zimbabwe suffers from outliers in the period leading to 2008.

4.2.4 Autocorrelation

The autocorrelation of a model is shown by its Durbin-Watson statistic. The DurbinWatson's critical value is approximately 2 (Gujarati, 2004). The DW statistic should be close to 2 so that we fail to reject the null hypothesis of no autocorrelation. In this study, the DW statistic was found to be 1.875759 hence it can be concluded that we fail to reject the null hypothesis of no autocorrelation since the value is close to 2.

4.3 OLS Estimation Results

Table 4.6 OLS Estimation Results

Dependent Variable: DLAGDP				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-0.678570	0.465388	-1.458073	0.1568
LMAE	-0.047985	0.074516	-0.643964	0.5252
DLTOE	0.327373	0.074168	4.413914	0.0002
LCOE	0.157849	0.063124	2.500603	0.0190
DINFL	-2.79E-05	6.49E-05	-0.429429	0.6711
DROUGHT	-0.127580	0.097375	-1.310189	0.2016
R-squared	*0.669968*			
Adjusted R-squared	*0.606500*			
Durbin-Watson stat	*1.875759*			
F-statistic	*10.55604*			
Prob(F-statistic)	*0.000013*			

Source: Author's computation using E-views 8

The model that was estimated is:

DLAGDP= -0.678570 -0.047985LMAE +0.327373DLTOE +0.157849 LCOE --2.79E-05 DINFL -0.127580DROUGHT

4.4 Significance of the model

The model has R-Squared of 0.669968 and adjusted R-Squared of 0.606500. This entails that around 67% of the variations in LAGDP, proxy for economic growth, are determined by the model and about 33% are accounted for by the residual. However, about 61% of the variations in LAGDP were being explained by the independent variables despite taking into account the degrees of freedom as shown by the adjusted R-Squared. On the other hand, the probability value of the F-statistic 0.000013 is less than 0.01 meaning that the overall regression model is significant at 1% level. This means that regression parameters are non-zeros hence confirms the validity of the model in fitting the data thereby meaning the model is credible.

4.5 Result Interpretation and Analysis

Maize Exports (LMAE)

Maize exports had a p-value of 0.5252. This means that the variables was statistically insignificant at all levels of significance. However, a coefficient value of -0.047985 shows that there is a negative relationship between increased maize exports and economic growth. Thus a 1% increase in maize exports is likely to induce a 0.04% reduction in economic growth on average. However, these results were in opposition to those found by Foster (1997) who found that maize exports was significant in influencing economic growth.

The negative relationship between maize exports and economic growth emanates from the fact that maize is regarded as the staple cereal in Zimbabwe. That said, from the early 2000s until recent years the country has not been able to restore its food sufficient levels. Thus an increased exports of maize in such instances lead to reduced economic growth tough the effect was found to be statistically insignificant.

Tobacco Exports (DLTOE)

With a p-value of 0.0002, tobacco exports were found to be highly statistically significant in influencing economic growth in Zimbabwe. A coefficient value of 0.327373 reveals that there is positive relationship between tobacco exports and economic growth in Zimbabwe. Accordingly, a 1% increase in tobacco exports will increase economic growth by 0.33% on average. These results were in tandem with those found by Anderson et al. (2005) who found that there is a long run relationship between agricultural exports and economic growth.

The findings of this study are not uncommon. This emanates from the fact that tobacco is Zimbabwe's largest foreign currency earner as in 2017 it brought record breaking figure of US$991 million. This was also fingered as the greatest economic pillars at far as liquidity challenges are concerned.

Cotton Exports (LCOE)

Cotton exports had p-value of 0.0190 meaning that the variable was statistically significant at 5% level. The coefficient value of 0.157849 suggest a positive relationship between cotton exports and economic growth. Thus according to this study, a 1% increase in cotton exports will induce a 0.15% increase in economic growth in Zimbabwe on average. This was in tandem with a study carried out by Curry (2010) in Pakistan. True to this study's findings, although from the 1990s the Zimbabwe's cotton industry had declined reaching its lowest in 2001, the industry embarked on a downward trend from 2006 especially amid higher levels of investment in the textile by the Chinese and the Russians.

Inflation (DINFL)

The inflation rate in Zimbabwe was found to be statistically insignificant in influencing economic growth as shown by a p-value of 0.6711. Though insignificant, the variable exhibited a negative relationship with economic growth as shown by a coefficient value of -2.79E-05, a rather expected phenomenon from economic theory. Accordingly, a 1% increase in inflation rate will lead to a 2.7% reduction in economic growth on average. This relationship was also observed by Shombe (2008). The insignificance of inflation in influencing agricultural GDP and therefore economic growth can be attributed to that international agricultural commodity prices has remained generally sticky over the years.

Drought (Drought)

Although it was found to be statistically insignificant as shown by a p-value of 0.2016, drought exhibited a negative relationship with economic growth as shown by a coefficient of -0.127580. A regression coefficient of -0.127580 means that the occurrence of a drought will result in about 0.13% reduction in country's economic growth on average. The above findings relationship moves in sync with those found by Al-Yousif (1997) in the Arab countries. However, some economists and researchers have found the variable significant given the devastating impacts of the 1991, 1992, 2002, 2003 and the 2007 to 2009 drought stretch.

4.6 Conclusion

This chapter estimated and interpreted the regression results. The results indicated that tobacco and cotton exports positively and significantly affect economic growth in Zimbabwe whilst inflation, drought and maize exports negatively influence the Zimbabwean economic growth though insignificantly. Thus the findings reject the null hypothesis that agricultural exports has no association with economic growth. In doing so it also managed to prove that maize, tobacco and cotton are related to economic growth in Zimbabwe. The study has managed to answer the research questions and achieve its objectives of determining the relationship between economic growth, maize exports, tobacco exports, cotton exports, inflation and drought.

CHAPTER V

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

5.0 Introduction

The main thrust of this study was to examine the impact of maize, cotton and maize exports on economic growth in Zimbabwe. Thus this chapter focuses on policy recommendations based on results obtained in the previous chapter. It discusses some policy options that can be employed to increase the efficiency and productivity in the agricultural sector.

5.1 Summary of the study

The research was carried out in order to find the impact of maize, cotton and tobacco exports on the economic growth in Zimbabwe from 1985 to 2017. To position this study within the framework of existing ones and against the background of the main objectives of the study, a detailed review of both theoretical and empirical literature was carried out. The study clearly achieved its intended objectives. That is, the researcher managed to explore the relationship between maize, tobacco and cotton exports and economic growth in Zimbabwe. The outcomes of this study highlight that tobacco and cotton exports have a positive impact on the economic growth of Zimbabwe whilst maize exports have a negative impact to the same. In addition, inflation and drought were found to have negative but insignificant relationship to economic growth. These findings are based on the OLS method with the use of E-views 8 statistical package.

5.2 Conclusions

The results of this research have revealed that agricultural exports in the form of tobacco and cotton had a positive and significant relationship to economic growth trajectory in Zimbabwe. Accordingly, the empirical tests show that we reject the null hypothesis that agricultural exports have not influenced economic growth in Zimbabwe. This was in agreement with economic theory. However, a point to note is that maize exports were found to have a negative though insignificant relationship to economic growth in Zimbabwe. Thus according to this study, exports of cash crops will likely induce economic growth while staple cereals like maize need to be kept for domestic consumption. This scenario can also be linked to that since the fast-track land reform program of the 2000s, the country has not been able to restore its bread-basket of Africa status especially in the production of maize.

This study has also deduced that inflation and drought had a negative but insignificant relationship to economic growth in Zimbabwe. Although the relations were expected and in tandem with economic theory, the revelations that these variables were not intense in affecting economic growth is rather eye opening. This is despite a wide range of research material in empirical literature review having found out in contrast.

5.3 Policy Recommendations

Having observed and concluded that agricultural exports have a bearing on the economic path that the country take, this study recommends that the government should prioritize investment in agricultural industry. This is also buttressed by the fact that Zimbabwe's economy is agro-based. More emphasis should be put in maize production in order to attain food sufficiency level. In that regard, the command agriculture program since 2016/2017 agricultural seasons, is a step in the right direction. However, according to this study, though the country is recommended to produce more, maize exports should be limited as this has led to reduced economic growth.

More investment and attention should be directed at tobacco and cotton farming as these have been discovered to have a positive impact in inducing economic growth. The products have to be specifically for exports as foreign markets have proved to be sustainable in causing economic growth. Thus the current momentum in the tobacco industry is recommended to be maintained and even fine-tuned and improved if the need be.

Although found insignificant in influencing economic growth, the government should also strive to maintain a single digit inflation rate. This is achieved by production oriented supply side policies such as reduced import duties for raw materials, low interest lending rates and low corporate taxes.

5.4 Suggestions for further studies

Due to limited time constraint, financial resources and accessibility to data, the researcher feels that the study was not exhaustive and future studies should focus on:

- The real relationship between maize exports and economic growth. This emanates from the fact that although it can be justifiable as in this study's empirical tests, the findings do not move in tandem with economic theory. Exports bring in foreign currency into the sector regardless of the type of the product.
- The decade 1997 to 2008 was marred by higher levels of inflation and price rigidities. As such some studies have empirically found the variable to have a greater impact on

economic growth. Therefore, future studies should actually establish if the findings of this study is a sector specific phenomenon or peculiar to the economy as a whole.

- The researcher suggests that if one carries a study like this in future should carry out the error correction mechanism or Vector-Auto regression model to determine the short run deviations from the long run equilibrium. The error correction mechanism (ECM) developed by Engle and Granger (1987) is a means of reconciling the short-run behavior of an economic variable with its long-run behavior.

REFERENCES

.

Ahmad, J. and Kwan, A. C. C. (1991). Causality between exports and economic growth. Economic Letters.

Al-Yousif, Y. K. (1997), "Exports and Economic Growth: Some empirical evidence from the Arab Gulf countries," Applied Economics, Journals, vol. 29(6).

Anderson, K. and Martin, W. 2005. Agricultural trade reform and the Doha development agenda. World Bank Policy Research Working Paper 3607. Washington, D.C.: World Bank.

Anim, F.D.K. 2010. Effects of extension services of firms offering contract farming: A case study of small scale maize farmers in Limpopo province of South Africa. African Journal of Agricultural Research.

Aurangzeb (2006). Exports, productivity and economic growth in Pakistan: a time series analysis. The Lahore Journal of Economics.

Bakari S, Mabrouki M (2017). Effect of Agricultural Exports on Economic Growth in South-Eastern Europe; Department of Economics Sciences, MaCMA, Higher Institute of Companies Administration University of Gafsa, (Tunisia).

Balassa, B. (1978), "Exports and growth: further evidence", Journal of Development Economics.

Bbaale, E. and Mutenyo, J. 2011. Export composition and economic growth in Sub- Saharan Africa: A panel analysis. Consilience: The Journal of Sustainable Development, 6(1).

Chimhowu A & Woodhouse, P (2008). Communal Tenure and Rural Poverty: Land Transactions in Svosve Communal Area, Zimbabwe, Development and Change Vol.39, No. 2. Dawes, M., Murota, R., Jera, C., Masara, C. & Sola, P. 2009. Inventory of smallholder contract farming practices in Zimbabwe. The Hague: SNV Netherlands Development Organisation.

Dawson, P.J. (2005), "Agricultural exports and economic growth in less developed Countries". Agricultural Economics.

Eicher, C. K., (1995), 'Zimbabwe's maize-based green revolution: preconditions for replication', in World Development 23(5).

Faridi, M. Z. (2012). Contribution of Agricultural Exports to Economic Growth in Pakistan. Bahauddin Zakariya University, Multan, Pakistan.
Feder, G. (1983), "On exports and economic growth". Journal of Development Economics No., 12.

Food and Agriculture Organisation of the United Nations (FAO). 2013c. ICT uses for inclusive agricultural value chains. Rome: FAO.
Ghauri, P. N. (2005). Research methods in business studies: A practical guide. Pearson Education.
Government of Zimbabwe (1995). Zimbabwe's Agricultural policy framework 1995-2020. Harare. Government printers, Harare.

Government of Zimbabwe. 2010. Ministry of Agriculture, Mechanisation and Irrigation Development (MAMID) Review and Stocktaking Report. Harare: Government of Zimbabwe.
Granger and Newbold; (1995) Statistics for Business and Economics, (4th Edition), Prentice Hall: Englewood Cliff. Growth, Sociological Focus.

Gujarati D. N. (1995). Basic Econometrics. Third Edition, McGraw-Hill, Inc.

Gujarati D. N. and Porter D.C. (2008): Basic Econometrics. McGraw Hill Co New Delhi.

Gujarati, D. N. (2005). Basic Econometrics. (4th edition), McGraw-Hill, Inc.
Harrod, 1939 and Domar E.D., (1947) Expansion and Employment‖, American Economic Journal.

Helleiner, A. E. (1966). "Contemporary Economics" 4th edition. Worth Publishers, Inc., USA.
Intermediate Development Technology Group-Zimbabwe, IDTG-Z survey in 1998.
Henneberry, D. M., and Curry, K. (2010); Agricultural import demand in large markets: An aggregate analysis with high and low growth subgroups. Journal of Food Products Marketing.
Jacobs, R., Gale, F., Capehart, T., Zhang, P. & Jha, P. (2000). The supply-side effects of tobacco control policies. In P Jha &. F.J. Chaloupka, eds. Tobacco control policies in developing countries, Oxford University Press.
Kang, H. (2015); Agricultural exports and economic growth: Empirical evidence from the major rice exporting countries. Agricultural Economics – Czech.

Kwa and Bassoume (2007). Exploring the linkages between agricultural exports and sustainable development. Ecofair trade dialogue [Discussion Paper].
Leaver, R. 2004. Measuring the supply response function of tobacco in Zimbabwe. Agrekon.

Li, J. F., Zhao, J. & Zhu, J. (2010). Empirical study on the influencing factors of building industry's performance based on the Cobb-Douglas production function. 2010 International Conference on E-Product E-Service and E-Entertainment (ICEEE), IEEE.

Liao, Q., Wu, Z. & Xu, J. (2010). A new production function with technological innovation factor and its application to the analysis of energy-saving effect in LSD. Modelling and Simulation.

Mapfumo, A. (2012). Agricultural Expenditure for Economic Growth and Poverty reduction in Zimbabwe. PhD Thesis. University of Fort Hare, South Africa.

Maravanyika, E. 1997. The economics of tobacco in Zimbabwe. Economics of Tobacco Control Project, Update No. 9: University of Cape Town.2

Maravanyika, E. 1998. The search for an optimal tobacco control policy in Zimbabwe. In: I.

Marshall, H., Schwart, M. and Ziliak, J. P.1988. Agricultural specialization and economic

Michaely, M. (1977). Exports and growth: an empirical investigation. Journal of Development Economics.

Minot, N. 2011. Contract farming in sub-Saharan Africa: Opportunities and challenges. Washington, DC: International Food Policy Research Institute.

Moyo, M. (2014). Effectiveness of a contract farming arrangement: A case study of tobacco farmers in Mazowe District in Zimbabwe (doctoral dissertation). Stellenbosch: Stellenbosch University.

Moyo, S & W. Chambati (Eds.) (2013). Land and agrarian reform in Zimbabwe: Beyond white-settler capitalism. Dakar: Codesria.

Muchapondwa, E. (2009). Supply response of Zimbabwean agriculture: 1970-1999, Volume 3 No1 March 2009. School of Economics, University of Cape Town

Muir-Leresche, K., Agriculture and macro-economic reforms in Zimbabwe: A political economy perspective, TMD Discussion Paper No 29, Trade and Macroeconomics Division, IFPRI, Washington DC, 1998.

Ojo, E. J., Awe I. T., Ogunjobi, J. O. (2014).Agricultural export and economic growth in Nigeria: A multivariate Johansen cointegration analysis. International Journal of Arts and Commerce.

Omowale, A. I. (1979). “Economics for Professionals” Best Printing Company, Ibadan, Nigeria.

Online sources

Onogwu, G. O. (2014). Determinants of the intraindustry trade in cereal and miscellaneous edible preparations: The evidence for Nigeria and the ECOWAS partners. Agricultural Economics – Czech.

Palmer, R. 1990. Land reform in Zimbabwe, 1980-1990. African Affairs.

Phillips, P. C. B. and Perron, P. (1988); Testing for a unit root in time series regression. Biometrika.

Reserve Bank of Zimbabwe; "Monetary policy statement; 2014". Harare, Zimbabwe.

Rotjanapan, (2005) Agricultural Growth Strategy in Nigeria. Nigeria Strategy Support Program, Brief No.1. International Food Policy Research Institute, Maitama.

Rukuni M, Eicher C. K. & Blackie (2006) Zimbabwe Agricultural Revolution, Re-visited.UZ Publications, Harare.

Ruttan VW (1977) Induced innovation and agricultural development. Food Policy 2(3).

Sanjuan-Lopez, A. I. and Dawson, P.J. (2010), "Agricultural exports and economic growth in developing countries: A panel co-integration approach". Journal of Agricultural Economics.

Saunders, M. N., Saunders, M., Lewis, P., & Thornhill, A. (2011). Research Methods for Business Students, 5/e. Pearson Education India.

Saungweme, T. (2013). Trade dynamics in Zimbabwe (1980-2012): The untold trade story of Zimbabwe. Russian Journal of Agricultural and Socio-Economic Sciences.

Shida, R.H. and Muhammed, E. K. (2000).An Analysis of the Linkage between Agricultural Exports and Economic Growth in Pakistan. Journal of International Food & Agribusiness Marketing.

Shombe, N. H. (2008), Causality relationships between total exports with agricultural and manufacturing GDP in Tanzania. Institute of Development Economies, Discussion paperNo.136.

Tagwira, F. (2001) 'The state of economic indigenization of the agriculture sector in Zimbabwe', report on the state of economic indigenization in Zimbabwe, SIRDC/ UNDP/Ministry of Industry and International Trade.

Tattersfield, J, R.1982 'The role of research in increasing food crop potential in Zimbabwe', in Zimbabwe Science News.

Tekere, M. 2003. WTO agreement on agriculture: The implementation experience. [Online] Available: http://www.fao.org/docrep/005/Y4632E/y4632e0y.htm#fn114 Accessed: 18 February 2019.

Tobacco Industry and Marketing Board (TIMB). 2012. National Tobacco workshop: Consolidating growth with equity. Harare: Tobacco Industry and Marketing Board.

Tobacco marketing Board (TIMB) (2014) Annual Statistical Report.

Todaro, Michael, P., and Steven Smith C., (1998); Economic Development. Pearson Education Limited, Eighth Edition.

UNCTAD, (2002) Agricultural Economy and Policy Report-Brazil. Online on www.fas.unctad.gov/country/Brazil/Brazil%20

Verter, N. and Bečvářová, V. 2014. Analysis of some drivers of cocoa export in Nigeria in the era of trade liberalization. Agris On-Line Papers in Economics and Informatics.

Verter, N. and Osakwe, C. N. 2015. Market competitiveness of the Czech economy in the era of globalization: Some new empirical insights. Mediterranean Journal of Social Sciences.

Woodend, J.J. 2003. Potential of contract farming as a mechanism for the commercialisation of smallholder agriculture the Zimbabwe case study. Rome: Food and agriculture Organisation.

World Bank (2010) Building Competitiveness in Africa‟s Agriculture, A Guide to Value.

World Bank (2014). Country Brief. The World Bank Group, Available at www.worldbank/zimbabwe

World Food Programme (WFP) (2009). “Crop and food security assessment mission to

World Trade Organisation (2019) Times series data available at www.wto.org/Statistical

Young, L.M. & Hobbs, J.E. 2001. Vertical linkages in Agri-food supply chains in Canada and the United States. [Online] Available: www.agr.ca/policy/epad. Accessed: 12 June 2014.

Appendix A: Raw Data

Years	AGDP	MAE	COE	TOE	Drought	Inflation
1985	2413	605.5	653.2	644.9	0	19.1
1986	1806	485.3	566.4	566.4	0	21.3
1987	1585	393.1	482.9	386.5	0	22.5
1988	1139	314.4	398.7	244.0	0	25.3
1989	1088	274.2	188.9	682.5	0	18.5
1990	1307	414.4	688.1	745.9	0	17.4
1991	997	112.8	126.5	289.3	1	33.3
1992	586	100.2	108.9	126.4	1	42.1
1993	1207	396.6	583.1	381.7	0	27.6
1994	1668	597.4	707.1	481.2	0	22.3
1995	1892	640.7	712.5	566.8	0	22.6
1996	2083	429.1	694.9	629.4	0	21.4
1997	2448	710.6	814.4	714.5	0	18.7
1998	2193	599.9	652.9	547.6	0	31.8
1999	2886	612.3	916.5	627.0	0	58.5
2000	1943	209.2	421.9	338.4	0	67.9
2001	2078	154.1	790.5	204.4	0	76.7
2002	1513	119.8	653.3	199.4	1	140.1
2003	1365	104.8	345.9	145.9	1	431.7
2004	1721	602.5	476.9	433.5	0	682.4
2005	1876	680.2	697.5	656.9	0	802.1
2006	1941	754.5	726.1	784.8	0	1096.7
2007	1675	432.2	608.9	792.6	1	1289
2008	1332	388.9	738.7	586.4	1	2310.8
2009	1038	199.3	596.5	300.9	1	-3.9
2010	1557	313.6	845.5	414.2	0	3
2011	1722	506.8	894.6	462.2	0	3.3
2012	2077	615.1	934.4	598.5	0	3.9
2013	2364	585.6	715.1	555.9	0	1.6
2014	2505	692.3	624.1	647.6	0	-0.2
2015	2854	803.9	346.7	857.9	0	-2.4
2016	2918	692.2	620.9	963.6	0	-1.6
2017	2537	432.6	191.7	995.5	0	0.9

Sources: World Bank (2019), World Trade Organisation (2018) and ZIMSTATS (2018)

Appendix B: Linearized data

YEAR	LAGDP	LMAE	LTOE	LCOE	DROUGHT	INFLATION
1985	7.788727	6.406055	6.469095	6.481883	0	19.1
1986	7.499029	6.184767	6.339301	6.339301	0	21.3
1987	7.368274	5.974064	5.957132	6.17981	0	22.5
1988	7.037805	5.750666	5.497168	5.988209	0	25.3
1989	6.991671	5.613858	6.525763	5.241218	0	18.5
1990	7.175131	6.026832	6.614592	6.533934	0	17.4
1991	6.904373	4.725616	5.667464	4.840242	1	33.3
1992	6.374121	4.607168	4.839451	4.69043	1	42.1
1993	7.095514	5.982928	5.944635	6.368359	0	27.6
1994	7.419669	6.392587	6.176283	6.561172	0	22.3
1995	7.545434	6.462561	6.340007	6.56878	0	22.6
1996	7.641668	6.06169	6.444767	6.543768	0	21.4
1997	7.803184	6.56611	6.571583	6.702452	0	18.7
1998	7.693054	6.396763	6.305545	6.481424	0	31.8
1999	7.967679	6.417222	6.440947	6.820562	0	58.5
2000	7.572142	5.343291	5.824229	6.044768	0	67.9
2001	7.639111	5.037602	5.320079	6.672666	0	76.7
2002	7.321799	4.785824	5.295313	6.482036	1	140.1
2003	7.219262	4.652054	4.982921	5.84615	1	431.7
2004	7.450827	6.401088	6.071892	6.167307	0	682.4
2005	7.537127	6.522387	6.487532	6.547503	0	802.1
2006	7.571125	6.626055	6.665429	6.587688	0	1096.7
2007	7.423372	6.068888	6.675319	6.411654	1	1289
2008	7.194701	5.963322	6.374002	6.604892	1	2310.8
2009	6.945391	5.294811	5.706778	6.391079	1	-3.9
2010	7.350636	5.748118	6.026349	6.739928	0	3
2011	7.451273	6.228116	6.135998	6.796377	0	3.3
2012	7.638587	6.421785	6.394427	6.839905	0	3.9
2013	7.768091	6.372637	6.320588	6.572422	0	1.6
2014	7.826021	6.540019	6.473273	6.436311	0	-0.2
2015	7.956405	6.689475	6.754488	5.84846	0	-2.4
2016	7.978654	6.539875	6.870676	6.43117	0	-1.6
2017	7.838738	6.069814	6.903245	5.255932	0	0.9

Appendix C: Descriptive Statistics

	LAGDP	LMAE	LTOE	LCOE	DROUGHT	INFLATION
Mean	7.454200	5.965880	6.164129	6.273266	0.212121	221.3455
Median	7.499029	6.069814	6.339301	6.481424	0.000000	22.50000
Maximum	7.978654	6.689475	6.903245	6.839905	1.000000	2310.800
Minimum	6.374121	4.607168	4.839451	4.690430	0.000000	-3.900000
Std. Dev.	0.357788	0.623368	0.524733	0.546133	0.415149	497.6619
Skewness	-0.809718	-0.991378	-0.923511	-1.612305	1.408374	2.857314
Kurtosis	3.775701	2.782301	3.127889	4.788059	2.983516	11.11294
Jarque-Bera	4.433388	5.470730	4.713285	18.69350	10.90971	135.4055
Probability	0.108969	0.064870	0.094738	0.000087	0.004275	0.000000
Sum	245.9886	196.8740	203.4163	207.0178	7.000000	7304.400
Sum Sq. Dev.	4.096402	12.43479	8.811039	9.544351	5.515152	7925357.
Observations	33	33	33	33	33	33

Appendix D: Multicolinearity

	LGDP	LMAE	LTOE	LCOE	DROUGHT	INFLATION
LGDP	1.000000	0.694938	0.648832	0.532937	-0.588323	-0.102909
LMAE	0.694938	1.000000	0.846159	0.540375	-0.683889	0.073463
LTOE	0.648832	0.846159	1.000000	0.323589	-0.517527	0.135691
LCOE	0.532937	0.540375	0.323589	1.000000	-0.364754	0.142307
DROUGHT	-0.588323	-0.683889	-0.517527	-0.364754	1.000000	0.407435
INFLATION	-0.102909	0.073463	0.135691	0.142307	0.407435	1.000000

Appendix E: Stationary Tests at First Difference

LAGDP

Levels

Null Hypothesis: LGDP has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 0 (Automatic - based on SIC, maxlag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-2.828816	0.1980
Test critical values:	1% level		-4.273277	
	5% level		-3.557759	
	10% level		-3.212361	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(LGDP)				
Method: Least Squares				
Date: 03/23/19 Time: 14:28				
Sample (adjusted): 1986 2017				
Included observations: 32 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP(-1)	-0.365699	0.129276	-2.828816	0.0084
C	2.559816	0.933620	2.741818	0.0104
@TREND("1985")	0.009900	0.004915	2.013981	0.0534
R-squared	0.235503	Mean dependent var		0.001563
Adjusted R-squared	0.182780	S.D. dependent var		0.260390
S.E. of regression	0.235393	Akaike info criterion		0.033939
Sum squared resid	1.606886	Schwarz criterion		0.171352
Log likelihood	2.456971	Hannan-Quinn criter.		0.079488
F-statistic	4.466731	Durbin-Watson stat		1.766750
Prob(F-statistic)	0.020368			

At First Difference

Null Hypothesis: D(LGDP) has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 0 (Automatic - based on SIC, maxlag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-5.383574	0.0007
Test critical values:	1% level		-4.284580	
	5% level		-3.562882	
	10% level		-3.215267	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(LGDP,2)				
Method: Least Squares				
Date: 03/23/19 Time: 14:30				
Sample (adjusted): 1987 2017				
Included observations: 31 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDP(-1))	-1.015408	0.188612	-5.383574	0.0000
C	-0.039825	0.104322	-0.381747	0.7055
@TREND("1985")	0.002993	0.005464	0.547735	0.5882
R-squared	0.510955	Mean dependent var		0.004832
Adjusted R-squared	0.476023	S.D. dependent var		0.368561
S.E. of regression	0.266787	Akaike info criterion		0.287036
Sum squared resid	1.992915	Schwarz criterion		0.425809
Log likelihood	-1.449065	Hannan-Quinn criter.		0.332273
F-statistic	14.62723	Durbin-Watson stat		2.004076
Prob(F-statistic)	0.000045			

LMAE

Levels

Null Hypothesis: LMAE has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 2 (Automatic - based on SIC, maxlag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.718615	0.0365
Test critical values:	1% level		-4.296729	
	5% level		-3.568379	
	10% level		-3.218382	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(LMAE)				
Method: Least Squares				
Date: 03/23/19 Time: 14:32				
Sample (adjusted): 1988 2017				
Included observations: 30 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LMAE(-1)	-0.784877	0.211067	-3.718615	0.0010
D(LMAE(-1))	0.405923	0.189747	2.139290	0.0424
D(LMAE(-2))	0.235063	0.192202	1.223003	0.2327
C	4.374362	1.204345	3.632149	0.0013
@TREND("1985")	0.016247	0.011541	1.407711	0.1715
R-squared	0.371907	Mean dependent var		0.003192
Adjusted R-squared	0.271413	S.D. dependent var		0.599032
S.E. of regression	0.511318	Akaike info criterion		1.647361
Sum squared resid	6.536151	Schwarz criterion		1.880894
Log likelihood	-19.71042	Hannan-Quinn criter.		1.722071
F-statistic	3.700763	Durbin-Watson stat		2.071918
Prob(F-statistic)	0.016875			

LTOE

Levels

Null Hypothesis: LTOE has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 2 (Automatic - based on SIC, maxlag=8)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.037159	0.1393
Test critical values:	1% level		-4.296729	
	5% level		-3.568379	
	10% level		-3.218382	
*MacKinnon (1996) one-sided p-values.				

Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(LTOE)				
Method: Least Squares				
Date: 03/23/19 Time: 14:39				
Sample (adjusted): 1988 2017				
Included observations: 30 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LTOE(-1)	-0.711337	0.234211	-3.037159	0.0055
D(LTOE(-1))	0.395967	0.196251	2.017653	0.0545
D(LTOE(-2))	0.051283	0.201880	0.254026	0.8016
C	4.121601	1.390587	2.963930	0.0066
@TREND("1985")	0.014760	0.009724	1.517902	0.1416
R-squared	0.349563	Mean dependent var		0.031537
Adjusted R-squared	0.245493	S.D. dependent var		0.498644
S.E. of regression	0.433134	Akaike info criterion		1.315473
Sum squared resid	4.690128	Schwarz criterion		1.549006
Log likelihood	-14.73209	Hannan-Quinn criter.		1.390182
F-statistic	3.358924	Durbin-Watson stat		1.982038
Prob(F-statistic)	0.024831			

At First Difference

Null Hypothesis: D(LTOE) has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 0 (Automatic - based on SIC, maxlag=8)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-5.071228	0.0015
Test critical values:	1% level		-4.284580	
	5% level		-3.562882	
	10% level		-3.215267	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(LTOE,2)				
Method: Least Squares				
Date: 03/23/19 Time: 14:41				
Sample (adjusted): 1987 2017				
Included observations: 31 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTOE(-1))	-0.957830	0.188875	-5.071228	0.0000
C	-0.079830	0.197559	-0.404079	0.6892
@TREND("1985")	0.005734	0.010315	0.555855	0.5827
R-squared	0.478813	Mean dependent var		0.005238
Adjusted R-squared	0.441585	S.D. dependent var		0.682046
S.E. of regression	0.509674	Akaike info criterion		1.581675
Sum squared resid	7.273491	Schwarz criterion		1.720448
Log likelihood	-21.51596	Hannan-Quinn criter.		1.626911
F-statistic	12.86175	Durbin-Watson stat		1.963534
Prob(F-statistic)	0.000109			

LCOE

Levels

Null Hypothesis: LCOE has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 0 (Automatic - based on SIC, maxlag=8)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.675846	0.0389
Test critical values:	1% level		-4.273277	
	5% level		-3.557759	
	10% level		-3.212361	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(LCOE)				
Method: Least Squares				
Date: 03/23/19 Time: 14:36				
Sample (adjusted): 1986 2017				
Included observations: 32 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCOE(-1)	-0.723521	0.196831	-3.675846	0.0010
C	4.368920	1.192904	3.662424	0.0010
@TREND("1985")	0.009370	0.010972	0.854003	0.4001
R-squared	0.321463	Mean dependent var		-0.038311
Adjusted R-squared	0.274667	S.D. dependent var		0.629422
S.E. of regression	0.536056	Akaike info criterion		1.679905
Sum squared resid	8.333335	Schwarz criterion		1.817318
Log likelihood	-23.87848	Hannan-Quinn criter.		1.725453
F-statistic	6.869491	Durbin-Watson stat		1.886563
Prob(F-statistic)	0.003613			

INFLATION

Levels

Null Hypothesis: INFLATION has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 0 (Automatic - based on SIC, maxlag=8)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-2.809088	0.2045
Test critical values:	1% level		-4.273277	
	5% level		-3.557759	
	10% level		-3.212361	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(INFLATION)				
Method: Least Squares				
Date: 03/23/19 Time: 14:49				
Sample (adjusted): 1986 2017				
Included observations: 32 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLATION(-1)	-0.439249	0.156367	-2.809088	0.0088
C	46.31490	154.0047	0.300737	0.7658
@TREND("1985")	3.234423	8.401462	0.384983	0.7031
R-squared	0.215994	Mean dependent var		-0.568750
Adjusted R-squared	0.161925	S.D. dependent var		464.6766
S.E. of regression	425.3950	Akaike info criterion		15.03297
Sum squared resid	5247867.	Schwarz criterion		15.17039
Log likelihood	-237.5276	Hannan-Quinn criter.		15.07852
F-statistic	3.994755	Durbin-Watson stat		2.097613
Prob(F-statistic)	0.029352			

At First Difference

Null Hypothesis: D(INFLATION) has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 0 (Automatic - based on SIC, maxlag=8)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-7.195801	0.0000
Test critical values:	1% level		-4.284580	
	5% level		-3.562882	
	10% level		-3.215267	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(INFLATION,2)				
Method: Least Squares				
Date: 03/23/19 Time: 14:52				
Sample (adjusted): 1987 2017				
Included observations: 31 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLATION(-1))	-1.298105	0.180398	-7.195801	0.0000
C	60.99986	179.9681	0.338948	0.7372
@TREND("1985")	-3.638646	9.372087	-0.388243	0.7008
R-squared	0.649033	Mean dependent var		0.009677
Adjusted R-squared	0.623964	S.D. dependent var		759.9782
S.E. of regression	466.0322	Akaike info criterion		15.21815
Sum squared resid	6081207.	Schwarz criterion		15.35693
Log likelihood	-232.8814	Hannan-Quinn criter.		15.26339
F-statistic	25.88979	Durbin-Watson stat		2.058762
Prob(F-statistic)	0.000000			

Appendix F: Ordinary Least squares estimation results

Dependent Variable: DLAGDP				
Method: Least Squares				
Date: 03/23/19 Time: 16:38				
Sample (adjusted): 1986 2017				
Included observations: 32 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.678570	0.465388	-1.458073	0.1568
LMAE	-0.047985	0.074516	-0.643964	0.5252
DLTOE	0.327373	0.074168	4.413914	0.0002
LCOE	0.157849	0.063124	2.500603	0.0190
DINFL	-2.79E-05	6.49E-05	-0.429429	0.6711
DROUGHT	-0.127580	0.097375	-1.310189	0.2016
R-squared	0.669968	Mean dependent var		0.001563
Adjusted R-squared	0.606500	S.D. dependent var		0.260390
S.E. of regression	0.163341	Akaike info criterion		-0.618588
Sum squared resid	0.693691	Schwarz criterion		-0.343762
Log likelihood	15.89741	Hannan-Quinn criter.		-0.527491
F-statistic	10.55604	Durbin-Watson stat		1.875759
Prob(F-statistic)	0.000013			

Appendix G: Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey				
F-statistic	2.640708	Prob. F(5,26)		0.0465
Obs*R-squared	10.77743	Prob. Chi-Square(5)		0.0560
Scaled explained SS	6.929244	Prob. Chi-Square(5)		0.2260
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 03/25/19 Time: 14:04				
Sample: 1986 2017				
Included observations: 32				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.254000	0.077880	3.261438	0.0031
LMAE	-0.034154	0.012470	-2.738973	0.0110
DLTOE	0.029114	0.012412	2.345703	0.0269
LCOE	-0.004343	0.010563	-0.411168	0.6843
DROUGHT	-0.010089	0.016295	-0.619164	0.5412
DINFL	2.13E-06	1.09E-05	0.196012	0.8461
R-squared	0.336795	Mean dependent var		0.021678
Adjusted R-squared	0.209255	S.D. dependent var		0.030739
S.E. of regression	0.027334	Akaike info criterion		-4.194002
Sum squared resid	0.019426	Schwarz criterion		-3.919177
Log likelihood	73.10404	Hannan-Quinn criter.		-4.102905
F-statistic	2.640708	Durbin-Watson stat		2.393026
Prob(F-statistic)	0.046474			