MIDLANDS STATE UNIVERSITY

FACULTY OF COMMERCE

DEPARTMENT OF ECONOMICS

CAUSAL RELATIONSHIP BETWEEN GOVERNMENT SPENDING AND THE GROSS DOMESTIC PRODUCT IN ZIMBABWE

(1960-2016)

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THIS DISSERTATION IS SUMBMITTED TO THE DEPARTMENT OF ECONOMICS IN PARTIAL FULFILLMENT OF THE BACHELOR OF ECONOMICS (HONOURS) DEGREE

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SUPERVISOR'S APPROVAL FORM

The undersigned certify that they have supervised ELVIS MASTER's dissertation entitled: CAUSAL RELATIONSHIP BETWEEN GOVERNMENT SPENDING AND THE GROSS DOMESTIC PRODUCT IN ZIMBABWE (1960-2016), submitted in partial fulfilment of the requirements for the Bachelor of Commerce Economics Honours Degree at the Midlands State University.

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CHAPTER TWO	**…….……..**
CHAPTER THREE	**……**
CHAPTER FOUR	**……**
CHAPTER FIVE	**…….……...**

APPROVAL FORM

The undersigned certify that they have supervised, read and recommend for acceptance, a research project entitled: CAUSAL RELATIONSHIP BETWEEN GOVERNMENT SPENDING AND THE GROSS DOMESTIC PRODUCT IN ZIMBABWE (1960-2016), submitted by **ELVIS MASTER** in partial fulfilment of the requirements for the Bachelor of Commerce Economics Honours Degree at Midlands State University.

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DECLARATION

I, ELVIS MASTER, do hereby declare that this research represents my own work, and that it has never been previously submitted for a degree to this or any other university.

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DISCLAIMER

This dissertation is submitted in partial fulfilment of the Bachelor of Commerce Honours Degree in Economics at Midlands State University. The ideas in this dissertation represent solely those of the author. Therefore, the University, Economics Department and the Supervisor are not liable for errors and mistakes in this dissertation.

DEDICATION

This piece of work is dedicated to my father (Happyson Master), my mother (Janet Master) and my brothers (Everest Master and Evan Master).

ACKNOWLEDGEMENTS

Firstly I would like to give my deepest gratitude to God for giving me the strength to start this research and the strength to finish it. I also wish to extend my gratitude to my supervisor Mr Charumbira, Mr Mandishekwa, Mr Ndlovu, Mrs Manzote and all the lecturers in the economics department for their guidance and unwavering support throughout my academic life at Midlands State University which was crucial for the progress of this study. Further gratitude goes to my parents who made a huge sacrifice towards my education and for believing in me even at times when I doubted myself. Thank you a million times.

ABSTRACT

The thrust of this study is based on two debatable backbones that is the Wagner's Law and The Keynesian hypothesis. The Wagner's law states that the government spending is stimulated by the gross domestic product whilst the Keynesian hypothesis states that the reverse is true. The study examined the causal relationship between the growth in Government Expenditure and the Gross Domestic Product in Zimbabwe from the 1960 up to 2016, using data from the World Bank at current United States dollars which allows us to see the effects of the fiscal policy. The size of the sample was also large and this provided precision for robust results. Using the Autoregressive Distributed Lag bounds test approach and the Granger causality test, evidence cointegration and the Wagner's law was found in Zimbabwe. Basing on the results obtained from the study, the researcher recommended that the government of Zimbabwe should be cautious on their spending decisions since this will not stimulate the gross domestic product in the future. Thus government expenditure has turned out to be an ineffective policy instrument for fostering economic growth in Zimbabwe.

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LIST OF ABBREVIATIONS/ACRONYMS

ADF	Augmented Dickey Fuller
AIC	Akaike information Criterion
ARDL	Auto Regressive Distributed Lag
C	Government final consumption expenditure
FMOLS	Fully Modified Ordinary Least Squares
GDP	Gross Domestic Product
GE	Government expenditure
GFCE	Government final consumption expenditure
HIC	Hanna-Quinn information criterion
I(0)	Integration of order 0
I(1)	Integration of order 1
I(2)	Integration of order 2
IMF	International Monetary Fund
P	Population
RBZ	Reserve Bank of Zimbabwe
SIC	Schwarz information criterion
US	United States
ZIMASSET	Zimbabwe agenda for socio-economic transformation

CHAPTER ONE

INTRODUCTION

1.0 Introduction to the study

Economists such as Demirbas (1999), Dada and Adewale (2013) seem to agree on the fact that the gross domestic product (GDP) and government spending have a relationship, but the element of consensus on what should be the lead or the lag variable has not been universally reached. The study on the causal relationship between government spending and the gross domestic product is based on two debateable backbones that is the "Wagner's law" and the "Keynesian hypothesis".

Both these theories have in common that there is a functional relationship between government expenditure and the gross domestic product but however they differ in the perspective to which variable is the lead and/or the lag variable. The Keynesian hypothesis posits that causality runs from government expenditure to the GDP whilst the Keynesian view posits that causality runs from government expenditure to the GDP.

To cut the story short, this study seeks to establish the long run relationship between government spending and the GDP in Zimbabwe and to determine the direction of the causal relationship between the variables in question. Therefore this chapter will cover the background of the study, problem statement, hypothesis and significance of the study.

1.1 Background of the study

Wagner (1883-1912) came up with a law originally known as the law of increasing state activity to explain these dynamic changes in government spending and the GDP. This law later became known as the "Wagner's law". The law emphasises that there is a long run tendency of government activities to grow relative to the gross domestic product (GDP). Keynes (1936) also introduced another dimension to this study and popularised a contrary theory to the Wagner's law and as such these two theories are the backbones of this research. This study emerged many decades ago mainly due to changes in government expenditure in many developed countries after the Second World War which so seems to be the current developments in particular to Zimbabwe after the introduction of the multi-currency system in 2009.

In Zimbabwe the nexus between the GDP and government spending does not have many empirical studies to support it. There are currently two empirical research studies on the causality between government expenditure and the GDP in Zimbabwe which are the works of Kunofiwa (2014) and Mandishekwa (2012), even though Kunofiwa's research focused solely on military expenditure whilst Mandishekwa's research does not account for the period after the introduction of the multi-currency system in Zimbabwe.

Looking at the economic cycles followed by Zimbabwe as evidenced in the graphical presentation below, there is reason to believe that the variables in question are correlated. But Henrekson (1992) emphasises on the need to look at causation rather than correlation alone. The Zimbabwean trends have a story to tell on this subject and as shown by the graphical presentation in fig 1.1 below, there is sufficient evidence that the GDP and government spending share a strong relationship. The trends in this study contain annualised time series data from the World Bank 1960 up to 2016.

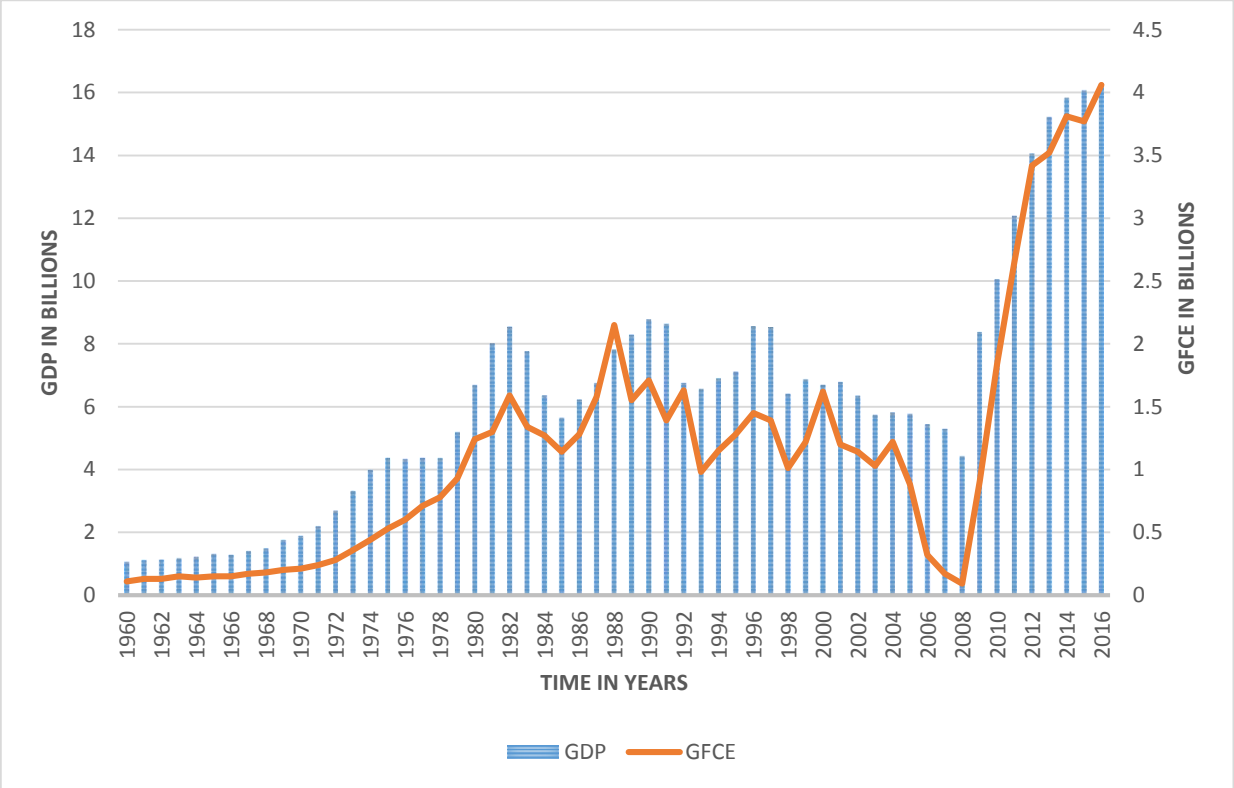

Fig 1.1: Trends of GDP and government expenditure in Zimbabwe.
Source: Author's computation using data from the World Bank

Looking at fig 1.1, the graphical presentation shows steep trends for both the gross domestic product (GDP) and government spending (GFCE). These steep trends imply rapid growth in Zimbabwe though this is not sufficient to answer the question to which variable is stimulating the other as supported by the two theories backing this discussion. The GDP increased by 55.54% whilst government spending increased by 52.3% after the adoption of the United States dollar as an official currency of Zimbabwe. Looking at the trend from 2009 up to 2016, the changes in government spending and the GDP greatly outweigh the changes that Zimbabwe experienced in the periods when there was price stability.

There is a significant increase in the level of government spending when we compare the expenditure as at 1960 where it was recorded to be 0.11 billion US dollars as compared to the latter that is of 2016 which is 4.06 billion US dollars. The GDP on the other hand has significantly increased from 1960 where it was 1.05 billion and 2016 where it is 16.29 billion dollars. This provides evidence of how much the economic climate years changed over the years. Hence the nexus between government expenditure and the GDP, is a cause for investigations in Zimbabwe following the sluggish GDP growth as evidenced by the period between 2000 and 2008 where the lowest GDP was at 4.42 billion US dollars whilst the lowest growth rate was at -17.67% in 2007.

Looking at the fig 1.1, the Zimbabwean economy fell by over 40% from 1997 to 2006. During these periods, government spending seemed to be falling too proving that under the Keynesian perspective, there is limited scope to stimulate government spending even though the multiplier effect should have made some significant changes during those periods. Keynes believed that government expenditure should be increased during economic declines and or recessions thus it would have been logical for the government of Zimbabwe to have increased government spending but this changed after 2008.

Furthermore, in the period between 1960 and 1971, government expenditure and the gross domestic product were low and stable as shown by the gentle slopes in the trends shown in fig 1.1. The level of government expenditure changed from 1972 up to 1992 which seems to be the case for the gross domestic product in Zimbabwe. What is more interesting is how the gross domestic was constant in periods between 1974 and 1978 whilst government spending was increasing. The behaviour of the variables in this study tend to make this analysis more interesting since there is need to understand why government expenditure was not stimulating

the GDP. However the increase in government expenditure can be explained by the adoption of an expansionary fiscal policy since there is reason to believe that the government was trying to promote GDP growth in Zimbabwe as part of its macroeconomic objectives.

The Wagner's law on the other hand proves to clearly explain the changes from 1997 to 2008 since both the GDP and government expenditure were both falling which is reasonable since the government of Zimbabwe would have increased spending to stimulate the GDP. Thus we should assume that the Wagner's law should be evident in Zimbabwe even though previous studies have not found the evidence of the Wagner's law in Zimbabwe.

After 2008 there was a turning point in the economic performance of Zimbabwe. These changes have not been factored into the discussion hence the need to provide supporting evidence to other similar studies carried out in Zimbabwe. This being said the only logical port of call is to engage in research and tests to prove whether the Wagnerian view is true for Zimbabwe or otherwise.

1.2 Statement of a problem.

Looking at the behaviour of the trends between government spending and the GDP in Zimbabwe shown in fig 1.1, we lack the incentive to explain whether government spending can stimulate the GDP though there is evidence of a strong correlative relationship between the two. Policy changes in Zimbabwe such as the Zimbabwe Agenda for sustainable development (ZIMASSET) require higher government spending by the government. In the long run we should be able to establish if these policies were successful thus if there is insufficient evidence on the causality of government spending in Zimbabwe we are likely to face future problems if there is evidence of the Wagner's law in Zimbabwe which implies that current expenditure does not stimulate GDP growth.

The government being the centre of the causal argument, it carries different implications under the "Wagner's law" and the "Keynesian hypothesis". Government expenditure in the Wagner's law is stimulated by the gross domestic product and hence does not stimulate economic growth in the long run whilst under the Keynesian perspective government spending is a stimulant to the gross domestic product hence promotes growth in national income through the multiplier effects. Therefore there is need to test for causality in order to determine the way forward.

1.3 Objectives

This research seeks to:

- ❖ Establish the long run relationship of government spending and the gross domestic product.
- ❖ Determine the direction of causality between the GDP and government spending.
- ❖ Give policy implications and recommendations from the results of the investigation.

1.4 Significance of study

Although a similar study was carried out in Zimbabwe by Mandishekwa in 2012, the study does not fully account for the period after dollarisation. Thus there is need to revisit the study to account for the seven year gap not covered by Mandishekwa's research. Adding to the time gap, another research study by Kunofiwa (2014) does not account for total expenditure by the government. Unlike to countries such as Turkey, in Zimbabwe this subject has limited empirical studies to support it.

Following the lessons of the Turkish incident, where Demirbas (1997) finds contradictory results to earlier researches, there is an increased need to establish supporting evidence to this study since this gives assurance on whether the findings are true or untrue. Thus due to the lessons we have learnt in the case of Turkey, this expresses the essence of revisiting previous studies so as to certify and validate the findings of previous studies. Thus re-visitation of the study provides scope to establish the validity and the consistency of the findings which is very important on the credibility of the results of this study.

Though supporting evidence on the direction of causality between countries has produced mixed results, it does not imply that researchers should look another way. Mixed findings under this subject have also encouraged renewed calls to look at the unique features found in countries that have found evidence of the "Wagner's law". Mandishekwa (2012) posits that the Wagner's law is mostly evident in industrialised communities or countries (economically developed countries).

Furthermore the mixed findings have inferred an ideology of heterogeneity between economies that is the unique relationships embedded in the macroeconomic variables of both the developed societies and the developing communities. Hence this study defies the belief that economic

systems function in the same manner thus implying the way national income (GDP) relates to government spending is not the same in all countries. This thus implies that the so called universal solutions are not so universal and hence the need to look into the applicability of these notions so as to reach a conclusive judgement in particular to Zimbabwe.

Henrekson (1992) argued that there is need to look at the time series behaviour of government spending and the gross domestic product and added to this analysis, the importance of the length of the timeframe in this study. He provided strong emphasis on that it should be long so as to see the full effects of government spending on the GDP and vice-versa. Therefore, since the earlier investigation do not cover the period from 2009 up to 2016, the seven year gap adds on the qualitative aspect of this study.

Over the years Zimbabwe has proven to be a unique economy among others. Thus there is need to provide incentives to answer the questions to whether Zimbabwean policies are optimum solutions, to which standards and according to who? Henceforth the researcher is hopeful that this research will provide the much needed support to the empirical studies of Zimbabwe and that the results will help in the answering the current economic questions facing policy makers in Zimbabwe.

1.5 Hypothesis

$H_{0:}$ Government spending granger causes the gross domestic product.

1.6 Delimitations

This study is limited to Zimbabwe only for the researcher was interested in establishing facts on the relationship between the GDP and government expenditure for policy development in Zimbabwe.

1.7 Organisation of the rest of the study

Having looked at the most critical sections in this chapter, which were giving a brief introduction on the study, the background, hypothesis, objectives and delimitations, the study comprises of five chapters where Chapter One introduces the study, Chapter Two reviews the theoretical literature and the empirical literature review backing the study, Chapter Three discloses the methodology employed by the study, Chapter Four focuses on the results presentation and

analysis and lastly Chapter Five concludes the study providing suggestions for future studies and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter seeks to unveil the theoretical literature and empirical literature encompassed by this particular study or investigation. The main objectives of this chapter mainly being to appreciate the efforts by the public finance economists and various researchers who engaged in the same research at some point in their lives, the study seeks to bridge the gap the time gap between past researches and recent ones so as to lend empirical support in the study. Henceforth these aspects will be covered under the following sections in this chapter. There are other theories that will be absorbed by this study since they also explain the relationship between government spending and the GDP.

2.1 Theoretical review

The study at hand is looking into the causal properties of government spending and the gross domestic product. This congruently implies testing for the application of the Wagner's hypothesis. It seems logical to expand on these notions so as to provide a theoretical background of the study. The Wagner's Law being the first to be proposed, it gives assurance that government expenditure is stimulated by the gross domestic product. Wagner (1883), originally called his notion, "The law of increasing state activities". Hypothesising on the government spending nexus, he emphasised that during industrialisation as real per capita income increase, this places an upward pressure on public spending as a proportion of the gross domestic product. The government under the Wagner's law, has to increase its size and spending behaviour to meet the demands brought about by the change in size of the economy.

Giving reference to Iyare and Lorde (2004) and Wahab (2004) there are three reasons why Wagner came to believe that state activities grew in size as the economic performance of a country increased through industrialisation. These reasons are namely the need to increase administrative and protective functions to ensure smooth operations, increased demand for education, cultural activities, health services and social welfare which are income elastic and the need to invest in areas where the private sector is not fond of and to remove monopolistic tendencies in a country.

Basing on the above reasons, Wagner saw how changes in economic activities added on the roles and functions performed by the government. Investments in areas which the private sector is not keen to invest in, requires that the government should increase spending since the burden of filling such gaps is left entirely up to the government. Some of the areas raise concern for the government to direct their funding since they may be necessary for technological progress. Ahmad (2014). Bird (1971) pointed out that there was also need for the government to interfere in the market to ensure or regulate natural monopolies which are strategic industries in the economy, hence, the need to increase the level of government expenditure.

According to Henrekson (1993) and Halicioglu (2003), Wagner did not express his views as a law and avoided definitive formulations though his views were later formulated as a law and became to be known as the "Wagner's law or Wagner's hypothesis". The table below shows different versions of the Wagner's law.

Table 2.1.1: Different versions of Wagner's Law

Version	Model	By
1.	Ge= F(GDP)	Peacock and Wiseman (1968)
2.	C= F(GDP)	Pryor (1969)
3.	Ge= F($\frac{GDP}{P}$)	Goffman (1968)
4.	($\frac{Ge}{GDP}$)= F($\frac{GDP}{P}$)	Musgrave (1969)
5.	($\frac{Ge}{P}$)= F(GDP)	Gupta (1967)
6.	($\frac{Ge}{GDP}$)= F(GDP)	Mann (1980)

Source: Author's computation using information from Kung'u (2014)

These versions are different versions of Wagner's law where Ge represents government spending, C represents government final consumption expenditure, GDP is the gross domestic product and P refers to the total population. Since this chapter's main emphasis is on the literature review, the study will not dwell on the model aspects of the Wagner's law but rather on the theoretical aspects of these propositions.

The Keynesian hypothesis was proposed after the Wagner's law and it is contrary to Wagner's disposition. Keynes (1936) argued that government spending will lead to higher levels of national income through the government spending multiplier. The implications of the spending multiplier or the multiplier effect are that the percentage change in government spending will affect the gross domestic product by a greater magnitude depending on the size of the multiplier. Thus according to Keynesian economics government expenditure determines the level of the gross domestic product.

There are also other theories that lend support to the discussion at hand. The Musgrave Rostow model also explains the relationship between government spending and the GDP. This theory adheres to the Wagner's law. Musgrave (1969), came up with a model that was based on the stages of economic development. Sunde and Charumbira (2011) point out that government expenditure in the Rostow's model, depends on the stages of economic development. The phases or stages of economic development are well summarised in the table on the next page.

Table 2.1.2 Stages of economic development

Phase	**Key players**	**Level of government spending**	**Nature of spending behaviour**
Early development	Government	High	Setting the stages of growth. Infrastructural development such as roads and accommodation.
Rapid growth and economic expansion	Private sector	Low	Control of negative externalities and provision of public services such as law and order.
High income society	Government	High	Infrastructural expenditure such as road maintenance, equity and complimentary infrastructure to meet the increased demand for private goods expenditure

Source: Charumbira and Sunde (2011)

The table summarises the Rostow's model and thus elaborates on how the government should intervene at different stages of economic growth. Thus, under the Rostow's model, government spending is stimulated by the GDP.

The most recent theory on the relationship between government spending is the Rahn's hypothesis (Mitchel, 2005). According to Mitchell (2005), Rahn's hypothesis states that the gross domestic product increases as government expenditure increases but begins to fall upon reaching the optimal size of government spending thus any beyond the optimal size of the government will cause the gross domestic product to fall respectively. Therefore the theory is adherent to the Keynesian exposition in that government spending stimulates the GDP.

2.2 Empirical literature review

Empirical literature review is one of the corner stones in this study. It strengthens the argument on the causal relationship between government spending and the GDP. Empirical studies elaborate on how the other researchers came to conclude their investigations and in-turn provide a basis for further analysis. The study however is concerned on testing the causal relationship between the gross domestic product and government expenditure. Many studies have looked into these dimensions and very few of them have looked into Zimbabwe.

Mandishekwa (2012) being the first to do this research in Zimbabwe, tested for applicability of the Wagner's law in Zimbabwe using sample data and subsample data to test for both the short run and long run existence of the Wagner's law in Zimbabwe. There was no long run applicability of the Wagner's law although it was found in some of the subsample data tested under the empirical research. The research also satisfied Henrekson's argument where he emphasised on the causal test rather than correlation analysis and also strengthened his argument on the fact that the tests should cover a long period of time and consider the use of panel regression to solve spurious regressions in tests encompassed by cross sectional analysis between countries.

Kunofiwa (2014) also examined the Wagner's law in Zimbabwe paying particular attention to military expenditure from 1960 to 2012. The causality relationship between government military expenditure and economic growth in Zimbabwe received support from Wagner (1890) and Keynes (1936). The conclusions reached in these investigations using the ARDL bounds test approach to cointegration and the Granger causality test suggested that military expenditure does not directly influence economic growth whilst economic growth does also not directly influence military expenditure both in the short and long run.

Dada and Adewale (2013) carried out investigations on the validity of Wagner's Law in Nigeria during from the period of 1961 up to 2011. Study established the long run relationship through and the existence of Wagner's law through the granger causality test. Srinivasan (2013) also looked in the causal nexus between public expenditure and economic growth in India using cointegration approach and error correction model. The analysis was carried out over the period 1973 to 2012. The Cointegration test result ascertained the existence of long-run equilibrium relationship between government expenditure and GDP growth in India. The results based on the error-correction model unveiled a one-way causality running from economic growth to government expenditure in the short run and long-run supporting the Wagner's law of government expenditure.

In Bolivia the Wagner's law is tested using nine versions of the Wagner's law and bidirectional causality was found. Bojanic (2013) employs the ARDL bounds test and the error correction model in his analysis on a data set stretching from 1940 up to 2010. The study also used the pairwise granger causality test on a series of data sets.

Santiago (2014) investigated Wagner's Law in Chile, Colombia, Honduras, Panama, and Paraguay during the period 1980-2012. Study found evidence of cointegration between gross domestic product and government expenditure in these countries. According to this study, there was existence of Wagner's law in all countries. Furthermore, the Granger pair wise causality tests showed causal relationship running from gross domestic product to government spending and not the other way round.

Pahlavani *et al* (2011) investigated the application of Wagner's law making use of the share of total government expenditure as a proportion of GDP and economic growth in Iran during the period of 1960–2008. The study concluded that economic growth is co integrated with size of government. This study proved the application of the Keynesian hypothesis. Also Granger causality approach showed that a unidirectional causal flowed from economic growth to size of government.

Dogan (2006) examined the causal relationship between government expenditure and economic growth for five South East Asian countries (Indonesia, Malaysia, Philippines, Singapore, and Thailand) using the Johansen-Juselius cointegration method which found evidence of cointegration in Indonesia alone. The results of Granger causality tests indicated that Wagner's

law is not supported by the data of five countries. The Granger causality tests specified that the Keynesian hypothesis is supported only by the Philippines's data, signifying that the course of causality is from government expenditure to national income respectively.

Demirbas (1999) also tested for the applicability of Wagner's law and the results were found to be inconclusive due to the use of old models employed in the cointegration analysis. There was no relationship found in Turkey but latter researches proved that there is in fact a long run relationship between government spending and the gross domestic product. From the employment of the ARDL cointegration technique, the relationship was found to exist in Turkey, thus implying spurious results from previous tests since ARDL models are more efficient than the older models which have been shown to yield spurious results in some researches as pointed out by Atasoy and Gür (2016).

Henrekson (1993) also analysed the 1861-1990 period for Sweden where found the results inconclusive in the long run relationship which he posed to be a result of spurious regression. It is according to Henrekson's conclusion that previously made studies did not account for the true relationship in the causality argument and hence advocated for use of panel analysis between countries to reduce problems of spurious regression.

Antonis *et al* (2013) a dataset dating more than one hundred years before the time of their study that is (1833-1938). Their investigations established evidence of the Wagner's law in Greece. The motive behind the use of such data (old data) was to effectively weigh both theories under the conditions they are both expected to manifest. The timeframe was particularly regarded as a growth, industrialisation and modernisation of the Greece economy. The empirical examination employed the auto regressive distributed lag model (ARDL) cointegration method and tested for the existence of probable structural breaks. The results established a progressive and statistically significant long run causal relationship running from economic performance towards the public size thus backing the Wagner's proposition in Greece. The Keynesian hypothesis on the other hand did not find support in the same period thus failed to hold under the study.

Summary of empirical literature review

The empirical literature under this study has been summarised and presented in a tabular presentation in table 2.2 on the next page

Table 2.2 Summary of empirical literature

Name of the researcher	Country or countries covered by the study	Evidence of the Wagner's law
Henrekson (1993)	Sweden	No
Demirbas (1999)	Turkey	No
Dogan (2006)	Indonesia, Malaysia, Philippines, Singapore and Thailand.	Yes
Pahlavani *et al* (2011)	Iran	Yes
Santiago (2014)	Chile, Columbia, Honduras, Panama and Paraguay	Yes
Bojanic (2013)	Bolivia	Bidirectional causality
Dada and Adewali	Nigeria	Yes
Kunofiwa (2014)	Zimbabwe	Bidirectional causality
Mandishekwa (2012)	Zimbabwe and Zambia	No
Srinivasan (2013)	India	Yes
Atasoy and Gur (2016)	China	Yes
Antonis *et al* (2013)	Greece	Yes

Looking at the summary table, the Wagner's law seems to apply in most recent studies. This might be due to changing economic conditions in many countries (modernisation). Most countries are now industrialising especially in Africa, thus there is there is reason to agree with Mandishekwa (2012) on that the Wagner's law seems to be evident in modernised countries.

2.3 Conclusion

The study on the causal relationship between government spending and the GDP has transformed in that it now gives more emphasis to cointegration and the most dominant approach being the ARDL bounds test approach. Looking at empirical literature review in this study, the Wagner's law found more support than the Keynesian hypothesis. Having concluded on the theoretical literature review and the empirical literature review of this study, we can thus proceed to the methodology or the criterion used to establish the findings in this study.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

In this chapter, the researcher reviews how the null hypothesis of no long run relationship and that of government spending's inability to stimulate GDP will be proven to be true or untrue. This chapter provides details approach on how the researcher will reach the conclusions to whether the gross domestic product stimulates government expenditure or the other way round. Justification of the variables and the sources of data will also be disclosed by the researcher as required by the study. The researcher has also added some information that will be vital to the subject at hand such as the optimum lag criteria and other diagnostic tests to give strength and credibility to the results the researcher wishes to obtain.

3.1 Model specification

Under this section, the researcher defines the models that will be adopted in the discussion at hand. The researcher under the cointegration test adopted the Auto Regressive Distributed lag (ARDL) bounds test model. The Granger Causality as a dominant causality test in many recent studies is going to be employed in testing for the causal relationship which is the centre of this discussion. This is a commonly used approach and is one of the most reliable conventions in testing direction of causality. It facilitates bidirectional analysis and hence provides the much needed conclusion on the test for the application of the Keynesian hypothesis or the Wagner's law. The following system of equations adopted from Santiago (2014) will be employed in the test for causality between government spending and the GDP.

$$\Delta GFCE = \sum_{j=1}^{m} \vartheta_j \, \Delta GFCE_{t-j} + \sum_{j=1}^{m} \omega_J \; \Delta GDP_{t-j} + \; \mu_{1t} \; \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

$$\Delta GDP = \sum_{j=1}^{m} \varphi_j \, \Delta GFCE_{t-j} + \sum_{j=1}^{m} \lambda_J \, \Delta GDP_{t-j} + \; \mu_{2t} \; \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .2$$

Where $\omega, \vartheta, \varphi and\ \lambda$ are the parameters to be estimated in the model. GFCE refers to government final consumption expenditure and GDP is the gross domestic product. M in all equations represent the lag operator. Lastly μ_{1t} and μ_{2t} are the white noise error terms. The Wagner's law will apply if GDP granger causes the GFCE and the Keynesian Hypothesis if GFCE.

3.2. Justification of Variables.

Considering the fact that Wagner did not present his notions in mathematical form, he was not explicit in the mathematical formulation of his hypothesis (Dutt and Gosh, 1997). However, different versions of the Wagner's law have been mathematically formulated over the years thus providing scope to investigate the evidence of the Wagner's law. The researcher looked at the direct relationship between government spending and the gross domestic product in monetary terms since other similar researches in Zimbabwe did not look into that dimension. Government spending is measured in so many ways, for-instance as a percentage of the GDP but in this case the parameter that was used is government final consumption expenditure which is sometimes termed total government expenditure. The researcher did not obtain data under the study at constant United States dollars but preferred to obtain it at current United States dollars since this allows us to see the full effects of the fiscal policy as posed by the World Bank website and the Global Economy website. Under the following subheadings, the variables in the study were independently justified.

3.2.1 Government final consumption expenditure (GFCE)

It refers to value of final goods and services consumed by the government and it is a parameter used to estimate the level of government spending in the economy by the government. It was first employed in the study by Pryor (1969). According to the Global Economy website, government final consumption expenditure also includes expenditure on defence and thus covers all the types of government expenditure. According to theoretical literature, government spending is stimulated by the gross domestic product (Wagner, 1883) and vice versa according to Keynes's perspective (1936).

3.2.2 The gross domestic product (GDP)

This the total value of final goods and services produced within the boundaries of a country that is Zimbabwe in this phenomena. It is the parameter used to define the economic performance of a country or national income. The GDP has not been used in other studies since other studies emphasised more on welfare economics. This study is concerned with the direct relationship

between the GDP and government spending. The GDP in this respect gained acceptance in that it shows the direct relationship as proposed by Mann (1980), Gupta (1960), Pryor (1969) and Peacock and Wiseman (1969).

3.3 Sources

The study employed secondary data. This is because primary data under this study is very costly in terms of time and resources available to the researcher. The time sensitivity nature of the causality argument as posed in the previous chapters also acts as a deterrent to the researcher and as so the use of secondary data is the only logical pathway available to the researcher. The data on the gross domestic product and government spending was obtained from the World Bank which is a site fashioned for investors, policy makers, countries and business people who constantly need to assess the economic data.

3.4 Diagnostic tests

To avoid running a spurious regression, there is need to test for unit root. Though the optimal lags criterion is not treated as a diagnostic test but since it is crucial to establishing the best results in this research paper it shall also be treated as a diagnostic test. Lastly cointegration is also another diagnostic test in this study. Having said all this, the researcher will expand on the stated diagnostic tests as required by the study.

3.4.1 Unit root

Many macroeconomic time series data contain unit roots even though this varies from time to time due to some series being stationary at first difference and others at second difference. Time series data also has a tendency of being dominated by stochastic trends. Though the ARDL test can be used regardless of the presence of I(1) and I(0) variables, the F-statistic produced on I(2) variables series is untrue since only 1(0) and I(1) can be estimated under the ARDL bounds test approach. Henceforth the Augmented Dickey fuller (ADF) test is employed to ascertain that there are no I(2) variables. The ADF test follows the following hypothesis as stated below.

Hypothesis

H_0 : There is no unit root

H_1 : There is unit root

Decision rule: Reject the null hypothesis if the P-values are less than 0.05

3.4.2 Cointegration test

The test for cointegration is very important in that it provides the basis for the estimation of the Granger causality test. The ARDL bounds test approach has definite econometric advantages in relation to other cointegration tests such as the Engle and Granger (1987), Johansen (1988), Johansen and Juselius (1990). The ARDL bounds test approach is used to test the level of relationship between variables. Testing for cointegration is highly crucial as it gives a degree of certainty on the relationships between variables. Unlike other techniques the ARDL bounds test minimises the endogeneity problems and all the variables are presumed to be endogenous. The long run and short run variables are estimated simultaneously thus removing problems associated with omitted variables and autocorrelation. The order of integration is not very important in the ARDL bounds test approach unless the data is I(2) since the critical lower bound and upper bounds values for 1(2) variables are not defined. This being said, the ARDL bounds test follows the hypothesis as shown below.

Hypothesis

H_0 : There is no cointegration

H_1 : There is cointegration

Decision rule: Reject the null hypothesis if the F-statistic is greater than the upper bound and the lower bound values.

3.4.3 Optimal Lags

Optimal lag selection is a very crucial stage and this ensures that we get the optimal estimates under the ARDL bounds test as well as the granger causality since both techniques are sensitive to the lags employed during the estimation of the models. The researcher employed the Schwarz information criteria in selecting the optimal lags under this study.

3.5 Conclusion

The methodology of this study was shaped through the theoretical framework of the study. Since and the researcher is following the footsteps of other researchers, the adopted models and diagnostic test procedures have been adopted with the fullest confidence that they will meet the objectives of the study. Having looked at the methodology aspects of this discussion, we can therefore move on to the practical aspects of this discussion.

CHAPTER FOUR

RESULTS PRESENTATION AND INTERPRETATION

4.0 Introduction

In this chapter, the results on the findings under the study on the causal relationship between the gross domestic product (GDP) and government expenditure (GFCE). The results will also be interpreted such that the findings may be meaningful to all the scholars and students that may be interested in the subject.

4.1 Diagnostic tests

As mentioned earlier, diagnostic tests help in the detection of errors before running regression and after running regression. Diagnostic tests also provide evidence of robust estimates since the absence of errors such as serial correlation and stationarity imply that the findings are without fault more reliable. The stability diagnostic tests also provide evidence that we are not running a spurious regression model.

4.1.1 Unit root test

The order of integration is not important in the ARDL bounds test but it is carried out to ascertain that we do not have variables integrated of order 2 that is I(2) variables. The ARDL bounds test assumes I(1) and I(0) variables thus if there are I(2) variables, there is need to adopt other techniques such as the Philips and Hansen (FMOLS) or the Johansen cointegration technique. The stationarity test results are as shown in the below tabular presentation.

Table 4.1.1: Unit root test results

Variable	ADF statistic	Critical Values		Intercept	trend	P values	Order of integration
GDP	-4.920723	1%	-3.555023	Yes	no	0.0002	I (1)
		5%	-2.915522				
		10%	-2.595565				
GFCE	-5.507649	1%	-3.555023	Yes	no	0.0000	I (1)
		5%	-2.915522				
		10%	-2.595565				

See appendices 2 and 3 for detailed information.

Hypothesis

H_0 : There is no unit root

H_1 : There is unit root

Decision rule: Reject the null hypothesis if the P-values are less than 0.05

From table 4.1.1, it was established that all the series are stationery at first difference for variables GFCE and GDP. The P-values are well below 5%, we reject the null hypothesis of no unit root and conclude that there is in fact the presence of unit root in all variables thus implying that all the series are stationary. The order of integration was found to be one because at level, for all the variables that is GDP and GFCE had P-values that were well below 5% level of significance. Having tested for the order of integration, and performing the unit root test, the researcher can now proceed to the important aspects in this section.

4.1.2 Optimal lag length selection

The optimal lag criteria is very important as it gives us the lags that obtain the best results in both the Granger causality test and the ARDL bounds test approach. The optimal lag criterion is identified by the conventions that are namely Akaike information criterion (AIC), Schwarz information criterion (SC) and the Hannan-Quinn information criterion (HQ)

All these criterions can define the optimal number of lags even though in some circumstances they are not the same hence require the researcher to choose a convention that may be believed to have advantages over the others. Most researchers usually favour the Schawrz information criterion. The table bellows the findings under the optimal lag criterion investigations.

Table 4.1.2: Optimal lag selection

Lag	Schwarz Information Criterion
0	0.444616
1	0.153904*
2	0.182212

See appendix 4 for detailed information.

The highlighted area showing (*) on the numerical figures in table 4.1.2 are the determining factors on which optimal lags to be employed. In this case, the researcher will employed 1 using the Schwarz information criterion. Having presented on the optimal lag criterion the researcher proceeds to present the results from the ARDL bounds test approach.

4.2 Cointegration test.

Under the ARDL bounds test approach, the researcher used Eviews 9 to test for the long run relationship. In the bivariate approach, the bounds test is accompanied with the Pesaran tables (Pesaran *et al,* 2001) which show the critical upper bound values and the critical lower bound values crucial in the determining whether there is a long run relationship or not. Using the built in engines in Eviews 9, the researcher obtained the following cointegration results in the table on the next page table 4.2.

Table 4.2 Cointegration results

Test Statistic	Value	K
F-statistic	6.351058	1
Critical Value Bounds		
Significance	Lower bound	Upper Bound
5%	4.94	5.73

See appendix 7 for detailed information.

Hypothesis

H_0 : There is no cointegration

H_1 : There is cointegration

Decision rule: Reject the null hypothesis if the F-statistic is greater than the upper bound and the lower bound values.

After estimating the ARDL model in long run form and performing the bounds test procedure, the researcher found favourable results. In the table above, we are mostly concerned with the 5% significance level thus we will make our conclusions basing on the 5% level of significance. K in the table represents the number of independent variables in our model (number regressors).

The F-statistic is higher than both the lower bound critical values and the upper bound critical values and this implies that we can proceed to the most important section in this discussion.

4.3 Granger causality test results

The main discussion centred on the causal relationship between the level of government spending and the gross domestic product. Having established there is cointegration between variables in the study, the granger causality test was employed with the assurance that in the long run the findings will still be relevant. The tables below, show the results obtained in the Granger causality test.

Table 4.3a: Granger causality results

Null Hypothesis:	F-Statistic	Prob.
D(GFCE) does not Granger Cause D(GDP)	3.68506	0.0604
D(GDP) does not Granger Cause D(GFCE)	7.40921	0.0088

See appendix 8 for detailed information.

Table 4.3b: Granger causality results

Null Hypothesis:	F-Statistic	Prob.
GFCE does not Granger Cause GDP	0.01918	0.8904
GDP does not Granger Cause GFCE	8.07523	0.0064

See appendix 8 for detailed information.

Decision rule: Reject the null hypothesis if the P-values are less than 0.05

Since the data was I(1), there was need to difference the data before running granger causality and the test results are shown in table 4.3a. D represents the first difference operator in table 4.3a. Looking at the null hypothesis which states that GFCE does not granger cause the GDP, the P-values are above 5% which implies that we should not reject the null hypothesis. In the second null hypothesis which states that GDP does not granger cause GFCE, the P- value is less than 5% which means that we should reject the null hypothesis and conclude that the Gross domestic product granger causes the level of government expenditure in Zimbabwe.

Table 4.3b shows results for undifferenced data. In other studies, researchers usually run the granger causality test without differencing the data. The findings in table 4.3b where the difference operator was not employed, also support the findings in table 4.3a. Thus we can

safely conclude that there is evidence of the Wagner's law in Zimbabwe since the GDP stimulates the level of government expenditure but not the other way round.

This is however contradictory to the previous findings but since the data captured a seven year gap not captured in the previous study, this can justify why the results differed. Another reason might be the case of different data sources. However looking at other studies where researchers employ different versions of the Wagner's Law, there are some cases where mixed findings are obtained. Thus the parameters used in this study have a great impact on the results under the study.

4.4 Conclusion

The ARDL bounds test was employed because of its advantages over other techniques and the results from the bounds test approach showed that there is a long-run relationship between the Gross domestic product and government spending respectively. The results obtained from the Granger Causality test, proved that the Wagner's law holds in Zimbabwe thus implying that the gross domestic product is the lead variable and government spending is the lag variable in the case of Zimbabwe.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS.

5.0 Introduction

This chapter covers the summary, conclusions and policy recommendations which are based on the results obtained from the investigations carried out in this research. Thus this section provides meaning to the findings and how the findings can benefit other researchers and Zimbabwe in general. It is also the last chapter and a very important section since expresses the thoughts of the researcher on the findings of this study.

5.1 Summary

In this study, the researcher looked into the causal relationship between government final consumption expenditure and the gross domestic product using Zimbabwean data stretching from 1960 up to 2016. The parameters used to test the relationship found support from Pryor's version of the Wagner's law (1969) previously mentioned in Chapter Two, table 2.1.We looked at the time series properties of the two variables and established stationarity at first difference was crucial procedure to avoid running a spurious regression. After identifying that both variables are stationary at first difference, they were tested for cointegration and the ARDL bounds test approach established a long run relationship between the two variables since the critical bounds values were lower than the F-statistic. Identifying the optimal lags provided the basis for the Granger causality test which found evidence of the Wagner's law in Zimbabwe and satisfied the main objective of the study.

5.2 Conclusion

The researcher is satisfied with the findings since after dollarisation of Zimbabwe, the economy has significantly changed over the past seven years. The objectives of the study were met by the employment of the Auto regressive distributed lag bounds test model and the Granger Causality test results which found evidence of the Wagner's law and cointegration. Thus in the light of the results provided under this study, one can tentatively conclude that growth of government expenditure in the case of Zimbabwe will not stimulate the gross domestic product in the future and that it is an ineffective policy instrument in the case of Zimbabwe.

5.3 Policy Recommendations

In this paper, we found evidence of the Wagner's Law using aggregate full sample data stretching from 1960 to 2016 which implies that government spending will not stimulate the Gross Domestic Product. In light to these findings, the government should be conscious on its spending behaviour. The World Bank (WB) and the International Monetary Fund (IMF) (2016) emphasised that the government should reduce the size of its public sector's wage bill which has been taking a big chew of the nation's revenue over the years. This shows that international development institutions are concerned with the spending decisions of Zimbabwe and the economic well-being of Zimbabwe. However due to the fact that the private sector cannot absorb the economically active work group, reducing the wage bill by retrenching workers will be a very costly and cruel some measure since it will worsen the standards of living in Zimbabwe. Henceforth the government should revise its growth policies such that the economy's GDP grows faster and in turn stimulate future levels of government expenditure in Zimbabwe.

Demirbas (1999) points out that government spending is a consequence of many decisions in light of the changing economic conditions. He further posits that it is transformed by the verdicts on how government expenditure must be distributed among different rival groups, whether geographically concentrated or aggregated in organised interests as previously pointed out by Klein (1976). Thus this explains some of the other reasons for the increased size of government expenditure in Zimbabwe.

The government should also prioritise the private sector particularly the manufacturing sector in policy formulations since it is one way to stimulate the GDP without raising many costs which can be damaging as in the present case scenario. This is because by giving priority to the private sector, the government will be setting future growth levels which will impact on future levels of government revenue, increased government roles and increased job opportunities in Zimbabwe. Thus purpose of the government of Zimbabwe under these findings should be to make sure that the economic environment is conducive for new business creation and to reduce infrastructural bottlenecks around key economic enablers which is one of the biggest challenges facing the economy of Zimbabwe (Zimbabwean monetary policy statement, 2014).

5.4 Suggestions for future study

There first suggestion is for the next researchers to disaggregate government spending such that the research can look at government expenditure in a panel analysis or otherwise focus on one or two types of government spending. This is because we have different types of government expenditure which implies that government final consumption is an umbrella variable thus implying that it does not quantify the effects of different types of government expenditure. Hence the true values of this study are lost in the failure to account for each type of government spending in Zimbabwe.

REFERENCES

Ahmad, M. (2014). Government Expenditure and Economic Growth. *International Journal of Social Science and Humanities Research*, 3(2): 79–88.

Antonis, A., Constantinos, K., and Persefoni, T. (2013). *Wagner's law versus Keynesian hypothesis: Evidence from pre-WWII Greece*. Panoeconomicus, 60(4): 457-472.

Atasoy, B. S. and Gür, T. H. (2016). *Does the Wagner's Hypothesis Hold for China? Evidence from Static and Dynamic Analyses.* Panoeconomicus, 63(1): 45-60. Available at http://dx.doi.org/10.2298/PAN1601045A.

Bird, R. M. (1971). *Wagner's 'Law' of Expanding State Activity.* Public Finance 26(1): 1-26.

Bojanic, A. N. (2013). Testing the validity of Wagner's law in Bolivia: A cointegration and causality analysis with disaggregated data. *Revista de Analisis Economico*, 28(1): 25-45.

Charumbira, M. and Sunde, T. (2011) *Public Sector Economics*, Midlands State University.

Dada, M. A. and Adewale, O. A. (2013). Is Wagner's law a myth or a reality? Empirical evidence from Nigeria. *International Journal of Development and Economic Sustainability* 1(1):123-137.

Demirbas, S. (1999). *Cointegration Analysis-Causality Testing and Wagner's Law: The Case of Turkey, 1950-1990.*Paper presented at the annual Meeting of the European public Choice Society held in Lisbon.

Dogan, E. and Tang, T .C. (2006). Government expenditure and national income: Causality tests for five South-East Asian countries. *International Business and Economics Research Journal*, *5*(10): 49-58. Available at http://dx.doi.org/10.19030/iber.v5i10.3516

Dutt, S. D. and Ghosh, D. (1997). *An Empirical Examination of the Public Expenditure-Economic Growth Correlations*. Southwest Oklahoma Economic Review, 12(4): 14-26.

Engel, R. F. and Granger, C. W. J. (1987). *Cointegration and error correction representation, estimation and testing.* Econometrica, 55: 251-276.

Goffman, I. J. (1968). Empirical Testing of Wagner's Law- Technical Note. *Public Finance* (Finances Publiques), 23 (3):359-366.

Gupta, S.P. (1967). *Public Expenditure and Economic Growth: A Time-series Analysis.* Public Finance (Finances Publiques), 22 (4): 423-454.

Halicioglu. F. (2003). *Testing Wagner's law in Turkey, 1960-2000.* Review of the Middle East Economics and Finance, 1(2): 31-42.

Henrekson, M. (1992).*Wagner's Law-A spurious relation*. Public Finance, 47: 491- 495.

Henrekson, M. (1993). *Wagner's law: a spurious relationship*, Public Finance/Finances Publiques, 48(2):406–15.

Iyare, S. and T, Lorde. (2004). *Cointegration, causality and the Wagner's law: Tests for Selected Caribbean Countries*. Applied Economic Letters 11(13): 815-825.

Johansen, S. and Juselius, K. (1990). *Maximum likelihood estimation and inference on cointegration with applications to the demand for money*: Oxford Bulletin of Economics and Statistics 52: 169-210.

Keynes, J. M. (1936). *The General Theory of Interest, Employment and Money*. London: McMillan.

Klein, K. (1976). The politics of Public Expenditure: American Theory and British Practice. *British Journal of Political science,* 6: 401-432.

Kung'u, D. R. (2014). *Empirical investigation of the nexus between government expenditure and GDP growth in Kenya and testing of Wagner's law for the period 1960-2011*: University of Nairobi.

Kunofiwa, T. (2014). *Military expenditure and the economy of Zimbabwe*. Journal of Governance and Regulation, 3(2).

Mandishekwa, R. (2012). *The application of the Wagner's law, 1960-2009:* Midlands State University.pdf

Mann, A. J. (1980) *Wagner's law: an econometric test for Mexico 1925–1976*, National Tax Journal, 33(2):189–201.

Mishkin, F. S. (2004). *The economies of money, banking and financial markets*. 7th ed: Pearson Addison Wesley. New York.

Mitchell, D. J. (2005). *The impact of government spending on economic growth.* Heritage Foundation. Available at Http//www.heritage.org /research/budget/bg1831.cfm

Musgrave, R. A. (1969). Theories of fiscal federalism. *Public Finance* (Finances Publiques), 24(4): 521-36.

Oktayer A. and Oktayer, N. (2003): *Testing Wagner's law for turkey: Evidence from a trivariate causality analysis:* Prague economic papers, 2.

Pahlavani, M., Abed, D. and Pourshabi, F. (2011). Investigating the Keynesian view and Wagner's law on the size of government and economic growth In Iran. *International Journal of Business and Social Science*, 2(13).

Peacock, A.T. and Wiseman, J. (1961). *The growth of public expenditure in the United Kingdom*: Princeton University Press. Princeton.

Peacock, S. M. and Wiseman, J. (1979). *Approaches to the analysis of government expenditure growth*: Public Finance Quarterly 7: 3-23.

Pesaran, M., Shin, H. Y. and Smith, R. J. (2001). 'Bounds testing approaches to the analysis of level relations'. *Journal of Applied Econometrics* 16(3): 289-326.

Pryor, F. L. (1969) *Public Expenditures in Communist and Capitalist Nations*, London: George Allen and Unvin Ltd.

Reserve Bank of Zimbabwe. (2014). *The Monetary Policy Statement of Zimbabwe 2014.*

Santiago, G. (2014). National income and government spending: Co-integration and Causality results for selected Latin American countries. *International Journal of Economics, Commerce and Management,* 2(4)

Srinivasan, P. (2013). Causality between public expenditure and economic growth: The Indian Case. *International Journal of Economics and Management, 7*(2): 335-347.

The Global Economy. (2016). *The Zimbabwean economic indicators.* Available at: Http//www.theglobaleconomy.com

Wagner, A. (1883). Three extracts on public finance in R. A. Musgrave and A. T. Peacock (eds) (1958). *Classics in the Theory of Public Finance*. London: Macmillan.

Wagner, A. **(**1893). *Grundlegung der Politischen Okonomie.* 3rd ed. Leipzig: C. F. Winter.

Wagner, A. (1912). *Les fondements de l'économie politique*. M. Giard and E. Brière.

Wagner, A. (1958). Three Extracts on Public Finance. In R. A. Musgrave, and A. T. Peacock (Eds.), *Classics in the Theory of Public Finance* (pp. 1-15). London: Macmillan.

Wahab, M. (2004). *Economic Growth and Government Expenditure:Evidence from a new Test specification.* Applied Economics, 36: 2125-2135.

World Bank. (2017). *Zimbabwe World Bank Economic Indicators*. Available at: https://data.worldbank.org/country/Zimbabwe.

APPENDICES

Appendix 1: Dataset

Years	GDP US Dollars	GFCE US Dollars
1960	1052990400	111069000
1961	1096646600	127335000
1962	1117601600	134728700
1963	1159511700	149187400
1964	1217138000	142450900
1965	1311435800	147380000
1966	1281749500	153952100
1967	1397002000	165124800
1968	1479599900	180240700
1969	1747998800	195520900
1970	1884206300	207022100
1971	2178716300	235643500
1972	2677729400	278755200
1973	3309353600	360897000
1974	3982161400	444942500
1975	4371300700	526980200
1976	4318372000	598399900
1977	4364382100	713670400
1978	4351600500	781449700
1979	5177459400	926985700
1980	6678868200	1236362800
1981	8011373800	1297397300
1982	8539700700	1587813500
1983	7764067000	1342635100
1984	6352125900	1272979000
1985	5637259300	1138918500
1986	6217523700	1283795600
1987	6741215100	1575127200
1988	7814784100	2148056100
1989	8286322700	1548747800
1990	8783816700	1708112700
1991	8641481700	1392982800
1992	6751472200	1631025400
1993	6563813300	981098000
1994	6890675000	1150315700
1995	7111270700	1280950400
1996	8553146600	1448888900
1997	8529571600	1391606100
1998	6401968200	1010489900
1999	6858013100	1220101700
2000	6689957600	1623341300
2001	6777384700	1199101800
2002	6342116400	1136730400
2003	5727591800	1026170400
2004	5805598400	1219212100
2005	5755215200	875441400
2006	5443896500	320246200
2007	5291950100	169775000
2008	4415702800	90394800

2009	8366794000	912702200
2010	10052045200	1844254600
2011	12071733500	2647483100
2012	14058378300	3423989500
2013	15223528900	3520135400
2014	15834069900	3813378900
2015	16072380200	3768540600
2016	16289212000	4056585200

Source: The World Bank

Appendix 2: Unit Root Test GDP

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.919337	0.0002
Test critical values:	1% level	-3.555023	
	5% level	-2.915522	
	10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Date: 08/10/17 Time: 08:02
Sample (adjusted): 1962 2016
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-0.626420	0.127338	-4.919337	0.0000
C	1.74E+08	1.24E+08	1.404805	0.1659

R-squared	0.313470	Mean dependent var	3148647.
Adjusted R-squared	0.300517	S.D. dependent var	1.06E+09
S.E. of regression	8.83E+08	Akaike info criterion	44.07077
Sum squared resid	4.13E+19	Schwarz criterion	44.14376
Log likelihood	-1209.946	Hannan-Quinn criter.	44.09899
F-statistic	24.19988	Durbin-Watson stat	2.012677
Prob(F-statistic)	0.000009		

Appendix 3: Unit Root Test GFCE

Null Hypothesis: D(GFCE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.521975	0.0000
Test critical values:	1% level	-3.555023	
	5% level	-2.915522	
	10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GFCE,2)
Method: Least Squares
Date: 08/10/17 Time: 08:03
Sample (adjusted): 1962 2016
Included observations: 55 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GFCE(-1))	-0.734511	0.133016	-5.521975	0.0000
C	53786018	42969688	1.251720	0.2162

R-squared	0.365210	Mean dependent var	4941429.
Adjusted R-squared	0.353233	S.D. dependent var	3.88E+08
S.E. of regression	3.12E+08	Akaike info criterion	41.98961
Sum squared resid	5.15E+18	Schwarz criterion	42.06260
Log likelihood	-1152.714	Hannan-Quinn criter.	42.01783
F-statistic	30.49221	Durbin-Watson stat	2.107670
Prob(F-statistic)	0.000001		

Appendix 4: Optimal Lag Selection

VAR Lag Order Selection Criteria
Endogenous variables: GFCE
Exogenous variables: C GDP
Date: 08/10/17 Time: 08:04
Sample: 1960 2016
Included observations: 52

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1085.127	NA	8.44e+16	41.81258	41.88763	41.84135
1	-1075.636	17.88709	6.09e+16	41.48600	41.59857*	41.52915
2	-1074.422	2.241462	6.04e+16	41.47776	41.62786	41.53530
3	-1072.259	3.908914	5.78e+16	41.43305	41.62067	41.50498*
4	-1071.936	0.571831	5.94e+16	41.45909	41.68423	41.54540
5	-1069.512	4.196147*	5.62e+16*	41.40430*	41.66697	41.50500

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix 5: Estimation of the ARDL bounds test model

Dependent Variable: GFCE
Method: ARDL
Date: 08/10/17 Time: 08:05
Sample (adjusted): 1961 2016
Included observations: 56 after adjustments
Maximum dependent lags: 8 (Automatic selection)
Model selection method: Schwarz criterion (SIC)
Dynamic regressors (8 lags, automatic): GDP
Fixed regressors: C
Number of models evalulated: 72
Selected Model: ARDL(1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GFCE(-1)	0.636524	0.108961	5.841777	0.0000
GDP	0.214068	0.032363	6.614648	0.0000
GDP(-1)	-0.116612	0.043206	-2.698982	0.0094
C	-1.79E+08	69721112	-2.569682	0.0131

R-squared	0.952708	Mean dependent var	1.17E+09
Adjusted R-squared	0.949980	S.D. dependent var	1.00E+09
S.E. of regression	2.24E+08	Akaike info criterion	41.35892
Sum squared resid	2.60E+18	Schwarz criterion	41.50359
Log likelihood	-1154.050	Hannan-Quinn criter.	41.41501
F-statistic	349.1857	Durbin-Watson stat	2.043031
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Estimation Command:
==========
ARDL(DEPLAGS=8, REGLAGS=8, IC=BIC) GFCE GDP @

Estimation Equation:
==========
GFCE = C(1)*GFCE(-1) + C(2)*GDP + C(3)*GDP(-1) + C(4)

Substituted Coefficients:
==========
GFCE = 0.636524340136*GFCE(-1) + 0.214068361384*GDP - 0.116612468191*GDP(-1) - 179161077.733

Cointegrating Equation:
D(GFCE) = 0.214068361384*D(GDP)
-0.363475659864*(GFCE- (0.26812220*GDP(-1) -492910798.48338884))

Appendix 6: Estimation of the ARDL bounds test in long run form

ARDL Cointegrating And Long Run Form
Dependent Variable: GFCE
Selected Model: ARDL(1, 1)
Date: 08/10/17 Time: 08:07
Sample: 1960 2016
Included observations: 56

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP)	0.214068	0.032363	6.614648	0.0000
CointEq(-1)	-0.363476	0.108961	-3.335841	0.0016

Cointeq = GFCE - (0.2681*GDP -492910798.4834)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	0.268122	0.024008	11.167926	0.0000
C	-492910798.483389	165254074.656458	-2.982745	0.0043

Estimation Command:
==========
ARDL(DEPLAGS=8, REGLAGS=8, IC=BIC) GFCE GDP @

Estimation Equation:
==========
GFCE = C(1)*GFCE(-1) + C(2)*GDP + C(3)*GDP(-1) + C(4)

Substituted Coefficients:
==========
GFCE = 0.636524340136*GFCE(-1) + 0.214068361384*GDP - 0.116612468191*GDP(-1) - 179161077.733

Cointegrating Equation:
D(GFCE) = 0.214068361384*D(GDP) -0.363475659864*(GFCE - (0.26812220*GDP(-1) -492910798.48338884))

Appendix 7: Bounds test results

ARDL Bounds Test
Date: 08/10/17 Time: 08:09
Sample: 1961 2016
Included observations: 56
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	6.351058	1

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	4.04	4.78
5%	4.94	5.73
2.5%	5.77	6.68
1%	6.84	7.84

Test Equation:
Dependent Variable: D(GFCE)
Method: Least Squares
Date: 08/10/17 Time: 08:09
Sample: 1961 2016
Included observations: 56

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP)	0.214068	0.032363	6.614648	0.0000
C	-1.79E+08	69721112	-2.569682	0.0131
GDP(-1)	0.097456	0.027389	3.558227	0.0008
GFCE(-1)	-0.363476	0.108961	-3.335841	0.0016

R-squared	0.530370	Mean dependent var	70455646
Adjusted R-squared	0.503276	S.D. dependent var	3.18E+08
S.E. of regression	2.24E+08	Akaike info criterion	41.35892
Sum squared resid	2.60E+18	Schwarz criterion	41.50359
Log likelihood	-1154.050	Hannan-Quinn criter.	41.41501
F-statistic	19.57513	Durbin-Watson stat	2.043031
Prob(F-statistic)	0.000000		

Estimation Command:
==========
ARDL(DEPLAGS=8, REGLAGS=8, IC=BIC) GFCE GDP @

Estimation Equation:
==========
GFCE = C(1)*GFCE(-1) + C(2)*GDP + C(3)*GDP(-1) + C(4)

Substituted Coefficients:
==========
GFCE = 0.636524340136*GFCE(-1) + 0.214068361384*GDP - 0.116612468191*GDP(-1) - 179161077.733

Cointegrating Equation:
D(GFCE) = 0.214068361384*D(GDP) -0.363475659864*(GFCE - (0.26812220*GDP(-1) -492910798.48338884))

Appendix 8: Granger Causality Test results

Pairwise Granger Causality Tests
Date: 08/10/17 Time: 08:10
Sample: 1960 2016
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
GDP does not Granger Cause GFCE	56	8.07523	0.0064
GFCE does not Granger Cause GDP		0.01918	0.8904

Pairwise Granger Causality Tests
Date: 08/10/17 Time: 08:11
Sample: 1960 2016
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
D(GDP) does not Granger Cause D(GFCE)	55	7.40921	0.0088
D(GFCE) does not Granger Cause D(GDP)		3.68506	0.0604