T.C.
ANKARA YILDIRIM BEYAZIT UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES

ESSAYS ON MONETARY POLICY

PhD DISSERTATION

MOMODOU O. JALLOW

DEPARTMENT OF ECONOMICS

ANKARA, 2022

T.C.
ANKARA YILDIRIM BEYAZIT UNIVERSITY
THE INSTITUTE OF SOCIAL SCIENCES

ESSAYS ON MONETARY POLICY

PhD DISSERTATION

MOMODOU O. JALLOW

ECONOMICS DEPARTMENT

PROF. DR. MESUT MURAT ARSLAN
SUPERVISOR

ANKARA, 2022

APPROVAL PAGE

The thesis prepared by Momodou O. JALLOW titled "Essays on Monetary Policy" has been accepted by the jury members as Doctoral thesis at Ankara Yıldırım Beyazıt University, Graduate School of Social Sciences, Department of Economics.

Jury Members		Institution	Signature
Prof. Dr. Mesut Murat ARSLAN		Ankara Yildirim Beyazit University	
Accept [X]	Reject [ ]		
Asst. Prof. Dr. Fatma Özgü SERTTAŞ		Ankara Yildirim Beyazit University	
Accept [X]	Reject [ ]		
Asst. Prof. Dr. Koray GÖKSAL		Ankara Yildirim Beyazit University	
Accept [X]	Reject [ ]		
Prof. Dr. Murat ATAN		Ankara Hacı Bayram Veli University	
Accept [X]	Reject [ ]		
Asst. Prof. Dr. Zaim Reha YAŞAR		Kırıkkale University	
Accept [X]	Reject [ ]		

Thesis Defense Date: 03.03.2022

I certify that this thesis fulfills all the requirements to be deemed a doctoral thesis at Ankara Yıldırım Beyazıt University, Institute of Social Sciences, Department of Economics.

Director of the Institute of Social Sciences Assoc. Prof. Dr. Seyfullah YILDIRIM

PLAGIARISM PAGE

I hereby declare that all information in this thesis has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work; otherwise, I accept all legal responsibility. 03.03.2022

MOMODOU O. JALLOW

To my late parents; Maimuna Gaye and Omar Jallow

ACKNOWLEDGEMENTS

First of all, I will register my sincere thanks to Allah for the gift of life and for giving me the ability, knowledge and wisdom in the pursuit of my academic dreams thus far. The journey was long and sometimes rough but with endurance and patience, I was able to overcome it all.

I want to sincerely thank Prof. Dr. Mesut Murat, my supervisor for his support, time and insightful comments during the writing of this dissertation. Your patience and rigor helped shaped this dissertation into what it is today. Words cannot summarize how grateful I am to have you as my supervisor. To my thesis committee members Assistant Prof. Dr. Fatma Özgü Serttaş and Prof. Dr. Murat Atan, I wish to express my sincere appreciation for your time and valuable suggestions throughout the writing of this dissertation. You all have availed me of your precious time whenever I needed it, for that, I say a big thank you.

I also want to express my appreciation to the staff and management of the Ankara Yildirim Beyazit University Institute of Social Sciences for their open-door policy to graduate students whenever it was needed. To the staff and lecturers of the economics department, I sincerely thank you for making me feel at home during my entire academic time at this University. There is no doubt the amount of knowledge amassed during my time here will shape my professional and career path going forward. For that, I am grateful.

My sincere appreciation also goes to the management and staff of the Central Bank of The Gambia for supporting me throughout the four years of my programme. Without your timely intervention, this could not have materialised. To the Turkish Government, I want to extend my appreciation for providing me with the scholarship to be able to pursue a PhD programme.

To my wife and kids, Sira, Omar and Maimuna, I want to thank you for the patience, sacrifice and forever support in the past four years. You all were my strength during this time. I pray Allah guide and protect you. To my Demba and Khalilu, thank you for the encouragement, support and being a brother's keeper while I was away.

ÖZET

Para Politikası Üzerine Makaleler

Bu tez para politikası konularını içerir ve iki bağımsız makaleden oluşur.

İlk makale, mali disipline sahip olmayan, yardıma bağımlı düşük gelirli ülkeler için ideal para politikasına odaklanmaktadır. Basitleştirilmiş bir DSGE modeli kullanarak, dış yardıma yüksek bağımlılığı olan, kaynak yönünden zengin olmayan, düşük gelirli bir ekonominin özelliklerini modelledik. Analizimizi, yardımla ilgili gelirlerin tamamının mali otorite tarafından harcandığı bir senaryo ile mali disiplinsizlik olarak adlandırılan bir durumla sınırlandırdık. Bunun yanı sıra, ideal politika rejimini oluşturmak için para otoritesi aşağıdaki alternatifleri seçme durumundadır: parasal hedefleme, sabit döviz kuru ve fiyat hedefleme rejimleri. Simülasyon sonuçları, artan dış yardım girişlerinin, yardım alan ekonomide ticarete konu sektörde küçülme ve döviz kurunda reel değerlenme olarak ortaya çıkan Hollanda hastalığı etkisine neden olduğunu göstermektedir. En önemlisi, para otoritesi bir parasal hedefleme çerçevesi izlerse, refah ve büyümeyi azaltarak Hollanda hastalığının etkisini sınırlayabilir. Mali otorite disiplinsiz olduğunda ve dış yardım tamamen absorbe edildiğinde bile, parasal hedefleme hem fiyat hedeflemesinden hem de sabit döviz kuru hedeflemesinden daha iyi performans göstermiştir.

İkinci çalışma, Gambiya'da 1998'in ilk çeyreğinden 2020'nin son çeyreğine kadarki dönemde para politikası aktarımının banka kredi kanalını araştırdı. Çalışmada SVAR ve PSVAR metodları kullanıldı, ayrıca analizin sağlamlık kontrolü için de BVAR kullandı. Bulgular Gambiya'da kısmi bir aktif banka kredi kanalı olduğunu göstermektedir. Ek olarak, büyük ekonomik sektörlerin para politikası şoklarına tepkileri arasında heterojenlik vardır.

Anahtar Kelimeler: para politikası, DSGE, Hollanda hastalığı, banka kredi kanalı, SVAR, PSVAR, BVAR

ABSTRACT

Essays on Monetary Policy

This dissertation contains topics in monetary policy and is composed of two independent essays.

The first essay focuses on optimal monetary policy for aid-dependent low-income countries with fiscal indiscipline. We captured the characteristics of a non- resource-rich low-income economy with a high dependency on foreign aid using a simplified DSGE model. We limited our analysis to the case where the aid-related revenues are fully spent by the fiscal authority, a scenario referred to as fiscal indiscipline. On the other hand, to establish the optimal policy regime, the monetary authority has the latitude to choose the following: monetary targeting, fixed exchange rate and price targeting regimes. The simulation results show that increased foreign aid inflows cause the Dutch disease effect in the recipient economy evident in the shrinking tradable sector and real appreciation of the exchange rate. Importantly, if the monetary authority pursues a monetary targeting framework, it can limit the Dutch disease effect by cushioning welfare and growth. Even when the fiscal authority is indiscipline and foreign aid is fully absorbed, monetary targeting outperformed both price targeting and fixed exchange rate regimes.

The second study investigated the bank lending channel of monetary policy transmission in The Gambia from the period 1998Q1 to 2020Q4. The study used an SVAR and PSVAR as well as BVAR for robustness check to perform the analysis. The findings suggest that there is a partially active bank lending channel in The Gambia. Moreover, there is heterogeneity among major economic sectors in their response to monetary policy shocks.

Keywords: monetary policy, DSGE, Dutch disease, bank lending channel, SVAR, PSVAR, BVAR

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

ADF	: Augmented Dickey Fuller
AIC	: Akaike Information Criteria
BLC	: Bank Lending Channel
BL	: Bank Loans
BLR	: Bank Lending Rate
BVAR	: Bayesian Vector Autoregressive
CB	: Central Bank
CBG	: Central Bank of The Gambia
CEMAC	: Central African Economic and Monetary Community
CFA	: Communaute financière d'Afrique (CFA)
CPI	: Consumer Price Index
DSGE	: Dynamic Stochastic General Equilibrium
EAC	: East African Community
ECB	: European Central Bank
ECOWAS	: Economic Community of West African States
ERP	: Economic Recovery Programme
FMOC	: Federal Open Market Committee
FMOLS	: Fully Modified Ordinary Least Squares
FOC	: First Order Condition
FR	: Funds Rate
GBoS	: Gambia Bureau of Statistics
GDP	: Gross Domestic Product
GMD	: Gambia Dalasi
GMM	: Generalised Methods of Moments
GNI	: Gross National Income
IFS	: International Financial Statistics
IMF	: International Monetary Fund
IRF	: Impulse Response Function
KSW	: Kashyap, Stein and Wilcox
LIC	: Low-Income Countries
MDG	: Millennium Development Goals

MPC	: Monetary Policy Committee
MPR	: Monetary Policy Rate
NBER	: National Bureau of Economic Research
NDA	: Net Domestic Assets
NEER	: Nominal Effective Exchange Rate
NFA	: Net Foreign Assets
ODA	: Official Development Assistants
OECD	: Organisation for Economic Corporation and Development
OLS	: Ordinary Least Squares
PIP	: Policy Ineffectiveness Proposition
PSC	: Private Sector Credit
PSVAR	: Panel Structural Vector Autoregressive
PVAR	: Panel Vector Autoregressive
RBC	: Real Business Cycle
REER	: Real Effective Exchange Rate
RER	: Real Exchange Rate
RGDP	: Real Gross Domestic Product
RHS	: Right Hand Side
SADC	: Southern African Development Community
SEI	: Stock Exchange Index
SSA	: Sub-Sahara Africa
SVAR	: Structural Vector Autoregressive
TFP	: Total Factor Productivity
TZM	: Tourism
UK	: United Kingdom
USA	: United States of America
USD	: United State Dollars
VAR	: Vector Autoregressive
VISACA	: Village Saving and Credit Association
WAMZ	: West Africa Monetary Zone
WCPI	: World Commodity Prices Index
WFPI	: World Food Price Index

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

In the field of macroeconomics, a great deal of appreciation and trust for the use of demand management policies – fiscal and monetary policies – to address macroeconomic imbalances ensued following the work of Keynes in 1936 – an era known as the great depression in economic history. Because of its appealing nature to both politicians and experts as well as its success in pulling out countries from severe economic downturns, fiscal and monetary policies became the order of the day in macroeconomic research and policy. In fact, Keynesian stabilisation policies during the great depression did not only lift most advanced countries out of the woods but also ignited stronger support for government commitment to higher employment and stable inflation (Snowdon et al, 2005, p.15). The success stories of government stabilisation programmes continued in the golden age era until the late 1960s when crises began to loom in again.

Despite the enormous challenges experienced in the macroeconomic discipline in the 1970s and the rise of the neoclassical dichotomy questioning the efficacy of fiscal and monetary policy, the role of government in influencing real economic outcomes remained plausible. In fact, the emergence of the policy-ineffectiveness proposition (PIP) which was the bedrock of Robert Lucas work in 1976 later known as the so-called Lucas's critique derived its motivation, in part, from the earlier work of Friedman and Schwartz (1963) and more from Friedman (1968) presidential address 'the role of monetary policy'[1]. In essence, according to Mankiw and Reis (2017), after the publication of "the monetary history of the United State and the great presidential address" by Friedman, which my many economists, marked the turning point in macroeconomic thinking, it became convincing to most economists that, "at least in the short run, monetary policy has real effect on the macroeconomy" (Bernanke and Gertler, 1995). The amount of empirical work on the potency of monetary policy that followed after this publication is clear evidence in support of this proposition. What remains of the debate to an extent was (is) how monetary policy impacts the economy taking into account various caveats – country/region, time, methodology and state.

[1] For more work on the PIP and rational expectation hypothesis, see Muth (1961), Sargent and Wallace (1975), Lucas (1976) and Fischer (1977).

In line with this seemingly unfinished debate at least for low-income economies, this dissertation covers two independent essays on monetary policy with a focus on low-income economies in Sub-Sahara Africa. This is done to contribute to the much-needed empirical evidence on the role of monetary policy in low-income countries which until the recent past has not seen much work on the subject. To this end, the first study in this dissertation focuses on optimal monetary policy for aid-dependent low-income countries with fiscal indiscipline. After the success of the so-called Marshal's plan in reviving Europe from its economic wreckage after World War II, the idea of foreign aid as a saviour to the economic woes of low-income countries especially those in Africa was the agenda in most international forums (Moyo, 2012). This call did not only stop in mobilising support for what is seen as a moral duty for rich nations but a huge foreign aid denominated in foreign currency flooded in low-income countries in Africa. In fact, despite the disagreement on the effectiveness of aid to the continent (Easterly 2003, Boone 1995, Elbadawi 1999, Bayale 2020, Moyo 2012), from 1965 to 2019, Africa as a continent has received about US$1.3 trillion in the form of Official Development Assistance (ODA). While this without a doubt has contributed to the improvement in the livelihoods of people in these countries, it also came with huge macroeconomic challenges in the recipient countries.

Increased foreign aid inflows could exert a real appreciation of the exchange rate creating the Dutch disease effect – shrinking tradable sector and a booming non-tradable sector, (see Corden 1982, 1984, 1987) on the concept of the Dutch disease. Moreover, if the fiscal budget depends on foreign aid, the increased foreign aid inflows could affect fiscal policy in aid-receiving countries. The negative effect of increased foreign aid on fiscal policy could exacerbate if the fiscal authority is indiscipline – a phenomenon present in most aid-dependent low-income countries in Africa. Using a simplified DSGE model, this study investigates the possibilities of the presence of the Dutch disease and the optimal monetary policy in such a scenario by modelling a low-income aid-dependent economy with fiscal indiscipline. This is the main contribution of this study in addition to focusing on low-income aid-dependent non-resource rich economies, a first of its kind as far we know.

The second study focuses on the bank lending channel of monetary policy transmission in The Gambia. While the transmission of monetary policy through various channels is probably one of the most researched areas in monetary macroeconomics, the conclusion on the effectiveness of these channels remains inconsistent. In other words, the effectiveness of any channel of monetary transmission depends on a host of caveats – state of the economy,

country/region, time and even methodology. For example, the interest rate and asset prices channels of monetary transmission are more potent in countries with well-developed financial and legal systems such as those found in the US, Euro area and some Asian countries. On the other hand, the exchange rate channel and to an extent the broad credit channel may work well in developing, emerging and low-income countries. While there has been a lot of empirical work on the topic in advanced and emerging economies, low-income economies in Africa did not receive the same attention. Moreover, even the available studies on channels of monetary transmission in the region arrive at different conclusions see (Mishra et al, 2011, 2014) for a comprehensive survey on effective monetary transmission in developing countries.

This study, therefore, focuses on The Gambia - a low-income country with a shallow financial market – to investigate the monetary transmission mechanism from the bank lending channel point of view, the first of its kind for The Gambia as far as we know. Secondly, we extend the credit channel to account for the distributional impact of monetary policy on the supply of credit to major economic sectors in The Gambia. Until the time of writing this paper, there is no known study in the literature of monetary transmission that has done this type of work for The Gambia. Therefore, this contribution will add to the body of existing literature on monetary transmission, particularly in Sub-Saharan Africa.

The rest of the dissertation is organised in the following: Each of the two essays contains an introduction, literature review, methodology, empirical results and findings. The dissertation ends with a concluding chapter.

2. OPTIMAL MONETARY POLICY FOR AID-DEPENDENT LOW-INCOME COUNTRIES WITH FISCAL INDISCIPLINE

2.1. Introduction

The idea of providing foreign aid to developing and Low-Income Countries (LICs) perhaps can be traced back to the famous Marshall Plan of 1947. In his original proposal, Marshall outlined an aid package geared to saving Europe from the wreckages of the second world war. He proposed USD$20 billion (more than USD$100 billion in today's terms) to help reconstruct Europe, make available the needed hard currency for the economic recovery programme and help in revitalising critical institutions that will promote governance and a path to economic prosperity (Moyo, 2012). This plan was successful in turning Europe from a state of economic stagnation to economic booms in the immediate past and a highly developed region as we witnessed later.

As a result, in subsequent years not far in the future, as developing and LICs began to be confronted with huge economic challenges (high poverty rates, massive unemployment, high inflation, soaring debts and economic stagnation) the suggestion to trigger a "Marshall Plan" in view of helping these nations dominated the debate agenda in international economic cooperation. Subsequently, billions of dollars were sent to developing countries and LICs in the form of foreign aid with the conviction that as in the case of Europe, developing countries and LICs will come out with heads high in terms of economic progress and development. Sub-Sahara Africa was not an exception and continues to attract huge foreign inflows despite the disagreement on the effectiveness of aid to the continent (Easterly 2003, Boone 1995, Elbadawi 1999, Bayale 2020). From 1965 to 2019, Africa as a continent has received about UDS$1.3 trillion in the form of Official Development Assistance (ODA) (OECD geographical distribution of official development assistance disbursements). This staggering amount of aid to Africa was influenced by efforts of developed nations to support African countries to overcome huge macroeconomic challenges in the region. That is why in the beginning of the new millennium (year 2000), members of the G-8 nations renewed their support to the developing world by announcing a USD$50 billion increase in Official Development Assistance (ODA) at a summit in Scotland (Prati and Tressel, 2006). This was meant to help developing countries and LICs countries achieve the Millennium Development

Goals (MDGs). This move, without doubt, has played a significant role in the development trajectory of these countries despite the caprices foreign aid may have come with.

However, increased inflows of foreign aid to developing countries and LICs is not all-in-all a good story. For instance, though foreign aid inflows have increased since inception, aid tends to show some volatility over the period posing serious macroeconomic challenges for policy makers in the region (Berg, 2005, Prati and Prati, 2006). The question, therefore, is what are the macroeconomic challenges and response to increased aid inflows to Sub-Sahara Africa? Notably, increased foreign aid inflows are expected to exert upward pressure on the real exchange rate leading to an appreciation of the exchange rate - the relative price of tradable goods to price of non-tradable goods falls as aid pushes up the demand for non-tradable - thus increasing imports (Prati and Tressel, 2006, Feilding, 2012, Elbadawi, 1999). This in the literature is referred to as the Dutch disease effect and has serious economic consequences on the recipient country. Similarly, aid could impact the macroeconomy through the fiscal channel by increasing public expenditure and government revenue of the recipient country (Osei et al 2005, Adam 2003 and Thornton 2014). Aid also could impact consumption, productivity and growth depending on how it is spent by the recipient authorities (Arellano et al, 2005, Temple, 2017).

Since the publication of Corden (1982, 1984 and 1987) on the concept of the Dutch disease, many studies have emerged trying to understand the efficacy of foreign aid inflows in place of natural resource curse in resource-rich countries (Prati and Tressel, 2006, Lartey, 2008). The extension to include aid in place of natural resource revenues is because aid inflows have the same tendency as natural resource revenues of propagating windfall spending by the fiscal authority. This in turn makes the fiscal budget dependent on and susceptible to external shocks (donor fatigue, bilateral shivering of ties, and new orientation of aid flows, etc.). Thus, in a similar vein, aid-receiving countries are expected to suffer from the effect of the Dutch disease in that they will turn away from other revenue-generating sectors and depend entirely on aid. The finding of most studies mentioned above shows inconsistency in results which is attributable to data issues, different methodological approaches and even country-specific features such as quality of institutions and policies.

The contribution of this study, therefore, comes in two-fold: firstly, we are focusing on aid receiving least developed countries with no natural resource export. This is an important

addition to the existing literature because unlike the other aid receiving countries who are endowed with natural resource abundance and has occupied the centre stage of research on aid and Dutch disease effect, non-resource rich aid receiving LICs depends mostly on aid to meet the foreign currency demand and other budgetary commitments. As a result, increase aid inflows could, on the one hand, reallocate resources from the tradable sector to the non-tradable sector causing Dutch disease and on the other hand reducing efforts in domestic revenue mobilization thus making public institutions and public policy entirely dependent on aid. Secondly, following the approach used by Aliyev (2015) on natural resource-rich countries, this study will explore whether, in the presence of fiscal indiscipline, monetary policy could help mitigate the Dutch disease effect from increased aid inflows. In addition, if indeed monetary policy can mitigate the Dutch disease effect, then which monetary policy framework is optimal in this regard. To our knowledge, we are the first to use this method in non-resource rich low-income countries.

2.1.1. Research Objective

The objective of this research is to investigate the optimal monetary policy for an aid-receiving country with the presence of fiscal indiscipline. Specifically, it seeks to understand whether

i. an aid-receiving country faces the effect of the Dutch Disease when the foreign aid revenue is entirely spent by the fiscal authority (a scenario of fiscal indiscipline)?
ii. monetary policy could help mitigate the effect of the Dutch Disease?
iii. if the answer to (ii) is in the affirmative, then which monetary policy is optimal in this regard?

2.1.2. Organisation of the Study

This study is organized as follows. Section 2.1 as shown above presents the introduction talking in detail about the world of foreign aid inflows to developing countries and LICs. Section 2.1.1 talks about the objectives of this study highlighting the specific research questions we sought to answer. Section 2.1.2 shows the overview of chapters while section 2.2 deals with the literature review on both the theoretical as well as empirical evidence. In section 2.3, we look at Aid in Africa with a focus on West Africa is presented and also discuss the macroeconomic developments and foreign aid in The Gambia. Section 2.4 deals

with the methodology while section 2.5 presents model calibration and the simulation results. And finally, section 2.6 presents the conclusion and policy recommendations.

2.2. Literature Review

This section of the dissertation presents the literature review on foreign aid inflows and macroeconomic policy response. In doing so, both the theoretical framework and empirical evidence are examined.

2.2.1. Theoretical Framework

The concept that foreign aid inflows could exhibit similar tendencies as natural resource revenue on the recipient economy is based on the potential Dutch disease effect that both could cause. The Dutch disease concept was first introduced by Corden (1982) showing the resource curse arising from windfall revenues from the discovery of oil and gas in the Netherlands in the 1960s. This windfall natural resource revenues cause a real appreciation of the exchange rate, therefore, reallocating resources from the tradable sector to the non-tradable sector hurting both exports and the manufacturing sector. Many studies have shown almost all resource-rich nations have suffered the phenomenon of the resource curse in one way or the other except for Norway. Therefore, many propositions on how to manage natural resource revenues have emerged – saving part of the natural resource revenues outside the economy, balancing government expenditure of natural resource revenues between the tradable and non-tradable sectors of the economy, etc – such that the gains of natural resource revenues will outweigh the cost.

Similarly, foreign aid inflows as stated earlier could generate identical outcomes if not properly managed. Theoretically, there are two possible ways how donor-recipient countries could respond to increased foreign aid inflows: *absorption* and *spending* of the aid revenues (Hussain et al, 2009). Absorption is defined as the sales of aid-related foreign currency by the central bank to finance the current account deficit – imports. Monetary authority controls the absorption part while fiscal authority determines the spending aspect of aid inflows. The impact of aid on the macroeconomy, therefore, depends on the interaction of the fiscal and monetary authorities in response to increased aid inflows.

The possible interaction between the fiscal and monetary authorities is illustrated in Figure 2.1 below. We can think of this as a simple game where the fiscal authority could cooperate (coordinate policy response) with the monetary authority or do otherwise (pursue individual policy response) in deciding the policy response option to take. If the government decides

not to spend foreign aid inflows while the monetary authority does not sell the foreign currency, then there will be no impact on the real exchange rate. However, this is not likely to happen because of two reasons: first, for LICs, in almost all cases they are required by donors to spend the aid in prior agreed projects or sectors. Despite the fungibility of aid and the possible delay in its spending, what is certain is eventually the government will spend aid revenues because they must respect the donor's agreement. Secondly, if the government does not spend the aid revenue, then it must finance its expenditure (an increased budget deficit) by domestic borrowing which will crowd out private investment. This action of government will be inflationary (money supply will increase) forcing the central bank to sell foreign currency to absorb the liquidity in the system to return inflation to the desired level. Thus, this policy response is not viable.

Similarly, the *options absorb not spent* and *spent not absorb* are not optimal as a policy response to aid inflows. This is because as highlighted above government must spend the aid in one way or the other. Second, the central bank must absorb aid for the transfer of resources to aid-financed projects to actually occur. Therefore, the most likely policy response as suggested by theory and as highlighted in red in Figure 2.1 is for government to spend the aid revenues and the central bank absorb it by selling the foreign currency equivalence. This will lead to real exchange rate appreciation (Dutch disease effect). The degree of real appreciation will obviously depend on how aid inflows are spent between the tradable and non-tradable sectors. If the government spends the entire aid revenue on non-tradable goods, then there will be a large real exchange rate appreciation if the supply response in the non-tradable sector is inelastic. On the other hand, if the government spends the aid revenue on tradable goods and imports, then there will be no real exchange rate appreciation, but productivity and growth may rise.

Fiscal Authority

Monetary Authority	Spend	Not Spent
Absorb	Gov't spends aid CB sells foreign currency Real exchange rate appreciation	Gov't does not spend aid CB sells foreign currency Real exchange rate appreciation
Not Absorb	Gov't spends aid CB does not sell foreign currency Real exchange rate depreciation	Gov't does not spend aid CB does not sell foreign currency No impact on real exch. rate

Note: CB stands for Central Bank and Gov't is short form of Government

Source: Author's Compilation

Figure 2.1. Game representation between the fiscal authority and monetary authority

For the fact that the most likely policy response of aid recipient countries at least theoretically is to spend and absorb aid as discussed above, it is, therefore, safe to suggest that foreign aid could cause the Dutch disease phenomenon.

2.2.2. Empirical Evidence

Owing to the theoretical postulations of foreign aid inflows and its potential impact (Dutch disease) on the macroeconomy, a vast literature trying to understand this phenomenon exists. The literature can be divided into three folds: (i) studies that investigate whether foreign aid inflows cause the Dutch disease effect (ii) others who wish to know how aid impacts government expenditure and revenue such that aid revenue becomes a significant player on the fiscal budget (iii) finally, those studies that investigated the most effective macroeconomic policy response to increase aid inflows (specifically those that are focused on monetary policy response).

As stated earlier, studies on the Dutch disease effect were pioneered by Corden (1982, 1984, 1987) after the discovery of oil and gas in the Netherlands in the 1960s. His analysis was based on a three-sector economy: a tradable sector - consisting of a booming and lagging sector - and a non-tradable sector. The booming sector causes real exchange rate appreciation leading to a contraction in the lagging sector thus causing the Dutch disease effect as the manufacturing and the exporting sector are hurt because of the real appreciation. On a similar front, many studies investigated whether foreign aid inflows – measured in this paper as Official Development Assistance (ODA) – cause Dutch disease in developing countries.

However, the findings of these studies are mixed. Studies such as Elbadawi (1999), Adam and Bevan (2003), Lartey (2008) and Fielding and Gibson (2012) find that foreign capital inflows lead to real exchange rate appreciation thus causing Dutch disease. Other studies find that foreign aid inflows do not cause Dutch disease in developing countries, see (Nyoni, 1997, Ogun, 1998, Sackey, 2001 and Ouattara & Strobl, 2003).

To provide an empirical basis for these research conclusions, Elbadawi (1999) in a panel of 62 developing countries including 28 African countries examined the relationship between Official Development Assistance (ODA), Real Exchange Rate (RER) and Non-traditional exports. Foreign aid inflows (ODA) were shown to cause substantial partial overvaluation of the RER in many African and non-African developing countries. Further, his study revealed that exceptionally high aid-dependent African countries have or are likely to experience overall overvaluation of RER pointing to the presence of Dutch disease effects in these countries. In addition, he showed that there is a Laffer curve-type relationship between aid and non-traditional exports through the misalignment in RER. This conclusion suggests that the Laffer curve-type relationship points to aid dependency in African countries since increases in aid are only beneficial up to a threshold after which aid reduces exports. A similar study by Adam and Bevan (2003) on aid, public expenditure and Dutch disease conclude that aid causes the Dutch disease effect at least in the short run. Their study employed a highly stylized two-sector two-goods model to analyse the Dutch disease effect arising from aid-financed public infrastructure investment. To account for the magnitude of such effects, they simulated this model for Uganda and find that increased aid inflows have a little initial effect on GDP, but it does cause the real exchange rate to appreciate leading to a contraction in exports.

Lartey (2008) simulated a general equilibrium RBC-type model for least developing countries with capital inflows. He finds that increased capital inflows induce the Dutch disease effect if the monetary policy is designed to keep the nominal exchange rate fixed. Additionally, estimating a Vector Autoregressive (VAR) model for twenty-six Sub-Saharan African countries from 1970 to 2009, Fielding and Gibson (2012) find that in all the had-pegged exchange rate countries covered, increased aid inflows are associated with real exchange rate appreciation and the results are statistically significant except for a few. For the flexible exchange rate countries, only Mauritius where aid induces real appreciation and The Gambia where aid causes a real depreciation show statistically significant results.

On the contrary, other studies did not find increased aid-induced Dutch disease effects in Sub-Sahara Africa. In a study on "foreign aid and economic performance in Tanzania", Nyoni (1997) used cointegration techniques and an error-correction model to estimate the relationship between foreign aid and the long-run and short-run equilibrium real exchange rate. He found that among other things, foreign aid inflows cause real depreciation of the exchange rate suggesting that foreign aid inflows do not cause the Dutch disease effect in Tanzania. Similarly, Ogun (1998) studied "real exchange rate movements and exports growth in Nigeria" from 1960 to 1990 and reached a similar conclusion. Sackey (2001) investigated "external aid inflows and the real exchange rate in Ghana" from 1962 to 1996. Using a single-equation model of cointegration technique, the results show that though aid dependency is very high, however, aid inflows cause a depreciation of the real exchange rate refuting the widely held belief of aid-induced Dutch disease effect in the case of Ghana.

Ouattara and Stobl (2003) investigated "whether aid inflows cause Dutch disease in Communaute Financiere Africaine (CFA)[2] Franc countries in Sub-Sahara Africa". The CFA Franc countries are a bit different from other countries in Sub-Sahara Africa in that they belong to a monetary union of the CFA zone where their CFA Franc is pegged to the French Franc initially and later to the Euro. Therefore, macroeconomic management of aid is somewhat different from what obtains in other countries because individual fiscal policies must resonate with others in the zone and no monetary policy exists for individual countries. In addition, the zone enjoys relatively stable exchange rate movements and a low inflation environment. Thus, using dynamic panel analysis for twelve countries in the zone, they show that foreign aid inflows do not generate the Dutch disease effect in these countries. The results suggest that countries in the CFA zone could continue to attract increased foreign aid inflows without compromising their international competitiveness.

The literature on aid extends to cover the impact of foreign aid inflows on government expenditures and revenues. This is important in the quest to understand how fiscal operations are affected in the face of increased aid inflows. Moreover, understanding this will ultimately lead us to the conclusion of the presence or otherwise of Dutch disease effect given the dependency of the fiscal budget on aid revenues. To this end, Adam and Bevan (2003)

[2] The English language equivalent is African Financial Community

simulated a model for aid and expenditure for Uganda and found that, except in the short run where the Dutch disease effects are present, aid induced public infrastructure expenditure leads to productivity bias towards non-tradable sector production. This delivers the largest gains from aid and the real exchange rate appreciation could be downsized or eliminated thus boosting exports. Similarly, Osei et al. (2005) examined the fiscal effects of aid in Ghana from 1966 through 1998. Using a Vector autoregressive (VAR) method on annual data to analyse the fiscal effect of aid, they find that increased aid inflows are associated with low domestic borrowing and increased tax revenue as public spending increases. The results point to the fact that aid is associated with improved fiscal performance. On the other hand, Thornton (2014) reached a different conclusion in a study on 'does foreign aid reduce tax revenue'. Because of the endogeneity issues in aid inflows, he used instrumental variables in a panel of 93 countries to uncover the effect of aid on tax revenue. The results show that tax revenue to GDP ratio (tax-to-GDP ratio) decreases as aid inflows increase – a one Standard Deviation increase in aid inflows leads to a 0.52 percentage point fall in tax-to-GDP ratio. Furthermore, he noted that the fall in tax revenue could be attributable to the grants' element of aid – grants are free monies to recipient countries which is likely to weaken domestic revenue mobilization efforts. However, the aid inflows in the form of loans are seen to improve the tax-to-GDP ratio as it becomes obligated on the recipient country to repay these monies later.

On the impact of foreign aid on the macroeconomy – monetary and fiscal policy response to increased aid inflows – several studies have investigated this phenomenon across countries. In addition to the different methodological approaches, empirically there is no unanimous agreed policy response to increase in aid as far as we know. Berg (2005) studied the policy response to increased aid inflows in Ghana for the periods 1996 to 2003 and the results show that during high inflows of foreign aid in Ghana (average 5.8 percent of GDP in 2001, 2002 and 2003), Ghana avoided Dutch disease or real exchange rate appreciation. This occurs in tandem with fiscal restraints as the government exercises fiscal consolidation and monetary authority absorbs foreign inflows by selling foreign exchange to the market. Thus, in response to increased aid inflows in Ghana, authorities were able to coordinate policies to avoid real exchange rate appreciation and Dutch disease effects.

More recently, Hansen and Headey (2010) employed a dynamic econometric model (VAR model) that accounts for the absorption, spending effect and change in GDP arising from a

sudden increase in foreign aid inflows. They divided the sample of twenty countries into small aid-dependent countries and small non-aid dependent countries and the sample extends from 1972 through 2003. The results show for small aid-dependent countries, authorities acted in a more coordinated manner – the central bank doing the absorption and government managing the spending aspect of aid monies – after a sudden increase in foreign aid inflows. This goes further to suggest that in aid-dependent small countries, a sudden increase in aid inflows is less likely to cause any macroeconomic imbalances. However, the same conclusion was not reached in the case of non-aid dependent small countries, in that there was no systematic absorption and spending of aid inflows raising concerns of aid-induced macroeconomic imbalances.

Moreover, Prati and Tressel (2006a) revealed that monetary policy is indeed effective in reducing trade balance volatility. In a study from 1960 to 1998 and more recently in five African countries (Ghana, Ethiopia, Mozambique, Uganda and the United Republic of Tanzania), they showed that the most common monetary policy tool used in response to increased aid inflows is sterilization – the reduction of the central bank's net domestic assets (NDA)[3]. They concluded that monetary policy should slow down consumption and accumulate international reserves in periods of high foreign aid inflows and deplete international reserves to support consumption in periods of low aid inflows. Similarly, Prati and Tressel (2006b) reached the same conclusion that among other things, monetary policy can mitigate the effect of Dutch disease through changes in its NDA – a variable that reflects both monetary and fiscal policy. See Hussain et al. (2009) for similar conclusions and the importance of policy coordination between the fiscal and monetary authorities in managing increased aid inflows to avoid undesired macroeconomic imbalances.

Lartey (2008) analyse "capital inflows, Dutch disease effects and monetary policy in small open economies". Using a general equilibrium model for a small open economy, he calibrated the model for nine recipient countries with data spanning from 1993 to 2003. He

[3] Upon receipt of aid inflows, the foreign currency is deposited at the central bank thus increasing the net foreign assets of the central. The equivalent domestic currency is deposited in government consolidated revenue account at the central bank thus increasing government deposits. The NDA is central bank net claims on government (central banks advances to government minus government deposits with the central). Therefore, allowing government deposits to build up (because of the increase in aid inflows), the CB is effectively reducing its NDA.

finds that Dutch disease effects occur when monetary policy is bent on keeping the nominal exchange rate fixed. However, if monetary policy follows a Taylor-liked interest rate rule, then capital inflows do not cause the Dutch disease effect. His finding goes to support previous studies that monetary policy is indeed effective in managing foreign inflows. On the other hand, Mwabutwa et al. (2012) used a "Bayesian Dynamic Stochastic General Equilibrium (DSGE) Model to account for a short-run monetary policy response to increase aid inflows in Malawi with quarterly data spanning from 1980-Q1 to 2010-Q4". The results show no aid-induced Dutch disease effect and that monetary policy reduces the impact of foreign aid inflows on depreciation and inflation when it follows a money targeting framework rather than the Taylor rule.

Finally, Aliyev (2015) investigated monetary policy in resource-rich countries using a DSGE model. The study revealed that in the presence of fiscal indiscipline – government spends all the resource revenues – monetary policy in the form of exchange rate targeting or price level could help reallocate resources and reduce the Dutch disease effect. What is clear from the empirical literature, therefore, is foreign aid/capital inflows exert Dutch disease effects on the macroeconomy of the recipient country. However, monetary policy could play a significant role in averting this problem. As for which monetary policy framework is optimal in this regard is highly dependent on the country's response strategy adopted – coordination between fiscal and monetary policy.

2.3. Aid in Africa with a Focus on West Africa

As noted earlier, Africa as a continent is not left out of the aid gimmicks since the inception of development assistance to the so-called third world countries. From 1965 to 2019, Africa has received a cumulative figure of US$1.3 trillion on official development assistance representing around 3 percent of the region's GNI or 4 percent of GDP on average. Of this amount, West Africa recorded US$310 billion or 25 percent of this total during the same period.

In the West African region, Nigeria has the highest aid receipt in absolute terms during this period followed by Ghana, Senegal, Ivory Coast and Mali. However, in share of GNI, Liberia with 25 percent, Sierra Leone with 17 percent and The Gambia with 12.5 percent register the highest shares on average (2015 - 2019). This indicates not only how significant a role

aid inflow could play in the development of these countries but also the macroeconomic challenges it presents.

Table 2.1. Foreign Aid Inflows 10 Year Average for ECOWAS Countries and Africa

	1965 - 1974		1975 - 1984		1985 - 1994		1995 - 2004		2005 - 2014		2015 - 2019	
Country	*In Mil US$*	*% of GNI*	*In Mil US$*	*% of GNI*	*In Mil US$*	*% of GNI*	*In Mil US$*	*% of GNI*	*In Mil US$*	*% of GNI*	*In Mil US$*	*% of GNI*
Benin	19.87	5.4	70.78	7.0	213.38	13.0	264.82	8.2	566.82	5.8	558.84	4.4
Burkina Faso	33.89	6.0	162.96	10.9	335.93	14.5	427.69	16.6	997.29	0.0	1,035.52	7.7
Cabo Verde	1.04	0.0	40.49	41.4	97.66	35.2	116.43	20.0	218.72	14.2	125.66	7.3
Côte d'Ivoire	49.40	3.4	134.81	2.0	578.09	6.7	605.82	5.5	1,088.70	4.3	851.57	1.7
Gambia	**4.67**	**8.2**	**36.69**	**19.3**	**89.40**	**26.0**	**48.57**	**7.1**	**106.14**	**8.1**	**183.72**	**12.0**
Ghana	53.89	2.6	135.15	3.6	548.09	9.8	744.82	11.1	1,420.03	5.1	1,271.31	2.3
Guinea	12.16	0.0	66.96	0.0	300.50	12.3	291.51	8.8	327.96	5.1	550.68	5.4
Guinea-Bissau	2.26	3.4	48.97	38.0	106.79	55.1	99.64	34.5	111.15	13.4	135.86	10.5
Liberia	19.50	0.0	76.74	0.0	96.65	0.0	101.85	13.6	739.78	43.9	743.15	25.7
Mali	39.11	9.6	192.70	15.2	416.87	19.1	436.29	13.2	1,055.53	10.7	1,425.93	9.5
Mauritania	24.06	6.1	181.60	20.3	232.58	15.9	245.56	12.4	330.53	6.4	357.81	5.3
Niger	44.46	5.6	163.10	10.0	345.08	15.1	313.10	11.6	671.88	9.2	1,147.27	10.2
Nigeria	81.70	1.0	42.88	0.1	186.98	0.5	248.47	0.4	3,349.80	1.3	3,022.19	0.7
Saint Helena	1.44	0.0	7.25	0.0	20.49	0.0	16.51	0.0	77.15	0.0	74.23	0.0
Senegal	60.45	4.2	252.24	7.2	607.57	10.2	551.44	8.0	968.98	6.2	990.32	4.8
Sierra Leone	10.64	2.6	50.18	5.0	119.63	16.8	230.49	23.2	478.25	16.8	656.77	17.7
Togo	19.83	6.7	80.84	10.4	170.74	13.6	95.39	6.4	273.77	7.8	284.25	5.7
Western Africa, Total	467.72		1,744.35		4,466.45		4,838.39		12,782.49		13,443.16	
Africa, Total	2,072.22	3.86	9,148.22	3.53	19,844.59	4.76	20,486.05	3.42	47,596.68	2.74	53,899.18	2.41

Source: Author's Calculations based on data from OECD

2.3.1. Macroeconomic developments and Foreign Aid in The Gambia

To further the idea of this study, we use The Gambia which meets the characteristics of a least developed aid-dependent country as an example. We understand that many other countries fit the descriptions of a least developed aid-dependent country, but unlike most of its peers in the region, The Gambia has no natural resource exports yet that could generate foreign exchange inflows apart from its tourism sector and little peanuts exports. Thus, the choice for The Gambia is appropriate and is to illustrate how well our model can depict the realities in such countries.

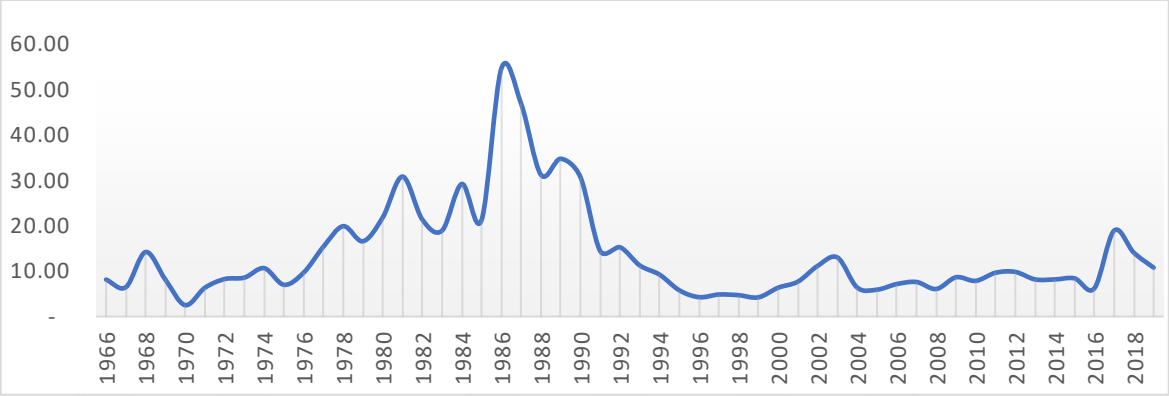
After attaining its independence from Britain in 1965 and becoming a republic in April 1970, The Gambia was seen by many political commentators including its former colonial master as an improbable state (Rice, 1967). This was premised on the country's lack of resources

and human capital to be able to function as an independent nation in addition to its smallness in size (about 11000 square kilometres). As a result, Britain provided grants-in-aid of about £745,000 to pay for wages of the civil service and other current expenditures in 1965 and this marked the beginning of episodes of foreign aid inflows to The Gambia (Sallah, 1990).

2.3.1.1. The Gambian Economy - Some Stylize Facts

Growth in the Gambia has been sluggish and volatile where growth in GNI per capita averaged around negative 0.25 percent from 2004 to 2019. This is premised on the volatile nature of economic growth as well as the high population growth experienced during these periods. For the period 1965 to date, The Gambia has experienced a huge jump in population growth to reach 2.3 million in 2019 compared to 440 thousand in 1973 and according to the 2013 population census by Gambia Bureau of Statistics (GBoS), the population annual growth rate is around 3 percent. Therefore, without a significant improvement in economic growth, the country is going to continue experiencing low-income levels and poverty. Further, during the same period, the structure of The Gambian economy has become more of a services-based economy accounting for 54.5 percent of GDP in 2019 while the share of agriculture continues to decline to reach 21.8 percent of GDP in 2019 from 32 percent of GDP in 2004. A shrinking productive sector of the economy means The Gambia depends more on imports from the rest of the world to meet its consumption demand thus worsening the current account balance as net export continues to deteriorate. In 2019, the current account balance stood at negative US$35.7 million. With the absence of natural resource revenue and a weak exporting sector, this means the Gambia will need to finance the gap in the current account by either borrowing from international capital markets and/or multilateral institutions as well as bilateral borrowings or relying on foreign aid. However, going to the capital markets to borrow is not possible for The Gambia given its limited capacity to repay loans at market rate and the absence of any form of collateral – natural resources such as oil, gas, and other mineral deposits. Thus, the only alternative is to seek very concessional loans and grants from multilateral institutions such as the World Bank and the IMF as well as some bilateral borrowings. Because of the shrinking productive sector of the economy, domestic revenue mobilization is also affected making the fiscal budget heavily dependent on external financing. To this end, The Gambia as a country is highly aid-dependent to meet its expenditure obligations.

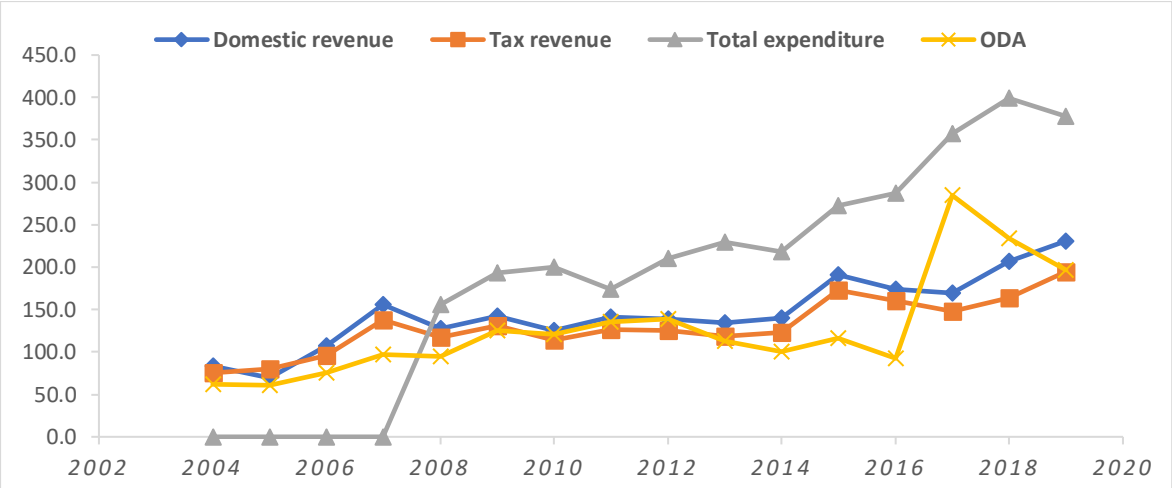
Because of data unavailability in government fiscal operations during the first republic, it is difficult to say if there are any differences in terms of the impact of aid on fiscal behaviour. However, what is clear is that foreign aid inflows as a percentage of GDP remain significant during each of these periods.



Source: Author's calculations based on data from OECD

Figure 2.2. Official Development Assistance (ODA) in percent of GDP

Foreign aid inflows as a percentage of GDP have averaged between 10 to 20 percent over the period under review. From 1970 to 1990, The Gambia saw a significant rise in official development assistance peaking at 54.6 percent of GDP in 1986 the same time the country was under the Economic Recovery Programme (ERP) with IMF and the World Bank. During this period, a lot of assistance was received to support the macroeconomic stabilization programme and jump-start the needed economic recovery. Aid inflows moderated along with the period average and by 2019, it stood at 10.8 percent of GDP. Fiscal variables during the period 2004 to 2019 trend together suggesting that aid inflows do not stifle domestic revenue mobilization in The Gambia. One of government's most crucial variables – expenditure happens to follow a similar pattern pointing to the possibility of aid inflows are being spent by the fiscal authorities among other forms of revenues.



Source: Author's Calculations based on data from GBoS and OECD

Figure 2.3. ODA and selected Fiscal Variables (in millions of US$)

2.3.1.2. Foreign Aid Inflows and some macroeconomic indicators in The Gambia

To understand whether aid inflows could cause the Dutch disease effect in The Gambia, we look at the behaviour of aid inflows vis-a-vis some key macroeconomic indicators during the period under review. According to Nyoni (1995), for least developed aid-dependent countries, the effects of increased aid inflows may not be seen on the tradable sector but rather on a decline in trend in agricultural output as resources are reallocated to the services sector which mostly constitutes non-tradables in LICs.

From Table 2.2, while aid inflows and remittances remain strong (11% and 15% of GDP in 2019), the agricultural sector continues to dwindle from a peak of 31.5 percent of GDP in 2004 to 21.8 percent in 2019 while services as a share of GDP rose from 51.1 percent to 54.5 percent of GDP in the same period. The industry sector which includes the manufacturing sub-sector shows an average share to GDP of 13.5 percent during the period without any significant jump. For the fact that the industrial sector has not declined and exports as a percent uptick somewhat during the period, one might conclude that aid did not hurt the tradable sector. However, this is not true. Manufacturing in The Gambia mainly is on non-export goods – water, electric pipes, detergents, flour, etc for local consumption. Moreover, traditional exports such as peanuts have declined to a negligible level leaving the volume of exports to be driven by re-export (goods imported to The Gambia then re-exported to the neighbouring countries). At the same time and in addition to the decline in agriculture,

imports have grown significantly reaching 34.9 percent of GDP in 2019 from 25.7 percent in 2004.

Table 2.2. Aid and some Key Macroeconomic Indicators in Percent of GDP except otherwise stated

	Agriculture	Industry	Service	Exports	Imports	ODA	Remittances	REER % change
2004	31.5	11.5	51.1	18.2	25.7	6.3	6.3	-1.4
2005	32.1	11.5	50.7	18.2	26.2	5.8	5.8	6.3
2006	25.6	12.1	55.6	19.1	30.0	7.1	6.0	-0.5
2007	23.6	11.9	57.4	20.4	28.1	6.8	4.3	8.4
2008	29.8	11.2	53.0	16.4	23.0	7.3	4.1	5.7
2009	31.7	10.2	51.1	11.9	23.6	8.7	5.5	-9.6
2010	35.2	9.8	49.2	13.2	20.4	7.8	7.5	-2.7
2011	27.2	11.5	54.9	16.9	25.7	9.9	6.5	-7.5
2012	27.4	12.0	54.5	19.4	27.8	10.4	7.5	-3.8
2013	26.2	11.9	55.1	19.0	26.5	8.8	8.0	-8.3
2014	22.5	13.2	56.4	21.8	36.4	8.8	11.2	-9.6
2015	22.2	17.1	51.9	19.6	33.3	7.8	9.9	-0.7
2016	21.9	20.9	48.8	15.9	30.1	6.3	14.0	21.3
2017	21.0	17.9	53.4	16.8	36.5	19.3	15.2	1.7
2018	19.9	17.3	54.9	21.7	41.4	14.4	12.2	-1.5
2019	21.8	15.8	54.5	20.6	34.9	11.0	15.1	4.4

Source: Author's Calculations based on data from GBoS, OECD and World Bank Indicators

Therefore, because aid inflows serve as an alternative form of foreign exchange earnings, The Gambia has neglected the agricultural sector which used to be the main foreign exchange earner ultimately hurting traditional exports of the country and this is a sign of the presence of the Dutch disease effect. However, the real effective exchange rate on average during the review period appreciated just by 0.1 percent (average from 2004 – 2019 measured as a percent change) suggesting that even if the Dutch disease effect is present, then it is very mild.

2.3.1.3. Monetary Policy Response to Increased Aid Inflows in The Gambia

The formulation and implementation of monetary policy in The Gambia are entrusted with the Central Bank of The Gambia (CBG). According to the CBG Act (2018), the primary objective of monetary policy is price and exchange rate stability. To achieve this objective, 'CBG follows a monetary targeting framework with reserve money as its operating target and broad money (M2) as its intermediate target' (CBG Act, 2005, 2018). The CBG sets targets for these variables and uses weekly open market operations to keep the targets within the desired level. In 2003, the monetary policy committee was constituted, and it became the

apex body responsible for monetary policy. The Committee meets every quarter to review economic and financial sector developments and sets the monetary policy rate.

CBG has other instruments like the deposit reserve requirement for banks and foreign exchange market interventions to manage liquidity and to smoothen large fluctuations in the exchange rate. In September 2019, an interest rate corridor system was launched with the introduction of standing lending and deposit facilities to improve short-term liquidity management as well as reduce interest rate volatility. Another notable reform of monetary policy implementation includes the introduction of CBG bills. Previously government short-term debt instruments (treasury bills and Sukuk Al-Salam bills) were used both for monetary operations and government deficit financing. The launch of its bill ensures the separation of the two.

Like many central banks in the region, the CBG acts as the government's bank and handles the payment and receipts of government transactions. Specifically, the government keeps its accounts (Treasury Main Expenditure Account and the Consolidated Revenue Account) at CBG. On receipt of foreign aid inflows, the central bank account abroad is credited while the government consolidated revenue account at the central bank is credited in local currency equivalent by the central bank. By this action, the Net Foreign Assets (NFA) of CBG increases while its Net Domestic Assets (NDA) declines – because of the increase in government deposits. Given that aid inflows to The Gambia are mostly for budgetary support, government spends the aid monies without many delays thus increasing CBG's NDA and money supply respectively. CBG respond by sterilization of the increased government spending using government treasury bills to mob the extra liquidity in the system[4]. In addition, CBG needs to accumulate international foreign currency reserves to serve as an anchor to the Gambian Dalasi and meet government's foreign currency payments requirements – because the supply of foreign currency to the country is mainly from foreign aid inflows, remittances, and tourism. Therefore, since CBG does not sell the foreign currency receipts while government increases its spending of the aid monies, we have a

[4] CBG uses government bills to sterilize this action for the simple reason that during the second republic which data is available, there was high fiscal dominance where CBG balance sheet was very weak to handle the sterilization.

scenario of *spend* but not *absorbed* as known in the aid literature against the optimal option of *spend* and *absorb*. Consequently, because of the inflationary nature of this policy option, there is massive crowding out of the private investment due to treasury bills deficit financing

2.4. Methodology

This section of the dissertation contains the model and econometrics package used for the simulation. Specifically, it contains the following sections: **2.4.1** will present the model used in this study. We adopt a simplified 'Dynamic Stochastic General Equilibrium (DSGE)' to be estimated in a MATLAB environment and Dynare toolbox. The calibration and simulation will be done in section **2.5**.

2.4.1. The Model

Unlike original Dutch disease models that focus on the effect of resource revenue on industrialisation (see Corden 1982,1984, 1987), and those that look at the effect of windfall foreign exchange inflows from natural resource exports on economic growth see (Van Wijnbergen, 1984; Krugman, 1987; Sachs & Warner, 1995; Torvik, 2001; Gylfason et al., 1999), this study adopts a model similar to the one in Aliyev (2015). As a result, the model structure and most of its notations are taken from Aliyev (2015) and Mwabutwa et al. (2013). The model however differs in content from the one in Aliyev (2015) in that we use foreign aid inflows instead of oil revenues and we take into account government consumption of both tradable and non-tradable which plays an important role in showing the spending effect of aid revenue. Our model also differs from the one in Mwabutwa et al. (2013) in that we assume households have no access to financial markets a feature that fits the characteristics of households in LICs.

The model is constructed to suit the characteristics of a small, open, and low-income non-resource rich economy with two sectors. The economy produces two goods; a tradable good and a non-tradable good and four agents representing the four blocks of the model: Households, firms, fiscal authority and the monetary authority (the central bank). The tradable good faces international world prices which the domestic economy is too small to influence. Borrowing from Prati and Tressel (2006), it is a notable feature of low-income aid-receiving countries to face limited international capital mobility thus we assume consumers cannot hold interest-bearing assets. This assumption depicts what obtains in most LICs as the majority of households depend on low labour income to meet their consumption demand with no room for savings to invest in interest-bearing assets. Furthermore, even in

periods of high-interest rates, it is observed that non-resource rich LICs are unable to attract capital from the rest of the world[5].

A. Households

There is an infinitely lived representative household endowed with one unit of time of which $(1-L_t)$ is devoted to leisure where L_t is the amount of labour supplied by households. Households are also fortunate to receive transfer of $\tau_t A_t$ from government where A_t is the foreign aid inflow in foreign currency. This makes household consumption dependent on the foreign aid inflows such that volatility in aid will affect their consumption optimization behaviour. Households derive utility from consumption (C_t), real money balances $\left(\frac{M_t}{P_t}\right)$ and leisure $(1-L_t)$. Since we assumed that households have no access to the financial market, they do not hold financial wealth or receive any interest income therefrom. Rather, they receive interest on rental payments on capital (K_t) and dividend/profit $\prod_t$ from firms. The representative household maximizes his lifetime utility by choosing consumption, real money balances and labour supply as follows:

$$Max\{C_t, M_t, L_t\} \qquad E_0 \sum_{t=0}^{\infty} \beta^t \left[\eta \ln(C_t) + \varphi \ln\left(\frac{M_t}{P_t}\right) - \psi \ln(1-L_t) \right] \tag{1}$$

Subject to the following budget constraint:

$$M_{t-1} + W_t L_t + \prod_t + R_t K_t + e_t \tau_t A_t = P_t C_t + M_t \tag{2}$$

E_0 is the expectation operator, $\beta \in [0,1]$ is the discount factor while η and ψ is the intertemporal elasticity of substitution of consumption and the inverse of labour supply elasticity respectively. φ measures the importance of real money balances to households consumption. R_t is nominal interest rate while *e* is nominal exchange rate quoted as the domestic currency per unit of foreign currency. Thus, $e_t \tau_t A_t$ will be the domestic currency equivalent of the aid money transferred to households by government.

[5] For example, in The Gambia during the period 2003 – 2016 when interest rates on the one-year treasury bill rate averaged around 17.3, there were no capital inflows from outside to capitalise on the high-interest rates.

For concreteness, $C_t = \left(\frac{C_t^T}{\theta}\right)^{\theta}\left(\frac{C_t^N}{1-\theta}\right)^{1-\theta}$ where C_t^T is household consumption of tradable goods, C_t^N is consumption of non-tradable goods and θ is the share of household consumption of tradable goods in aggregate consumption. The composite price index $P_t = \left(P_t^T\right)^{\theta}\left(P_t^N\right)^{1-\theta}$ consists of the price of tradable goods P_t^T and the price of non-tradable goods P_t^N. Since tradable goods are sold at the international market, foreign price is taken as given and normalised to one. Therefore, the domestic price of tradable goods is $P_t^T = e_t$. The first-order conditions from the optimization problem proceed as follows[6]:

$$\frac{1-\theta}{P_t^N C_t^N} = \frac{\theta}{e_t C_t^T} \tag{9}$$

$$\frac{\varphi}{M_t} = \frac{\eta\theta}{e_t C_t^T} - \beta\frac{\eta\theta}{e_{t+1} C_{t+1}^T} \tag{10}$$

$$\frac{(1-L_t)W_t}{e_t C_t^T} = \frac{\psi}{\eta\theta} \tag{11}$$

Equation (9) represents the ratio of consumption of tradable goods and non-tradable goods which depends on the share and ratio of the two goods. While equations (10) and (11) show the relationship between consumption, money supply and leisure. In effect, the trade-off between consumption and leisure depends on the elasticity of substitution in consumption and the inverse of labour supply elasticity.

B. Firms

In this model, there are two sectors in the economy producing two goods – tradable and non-tradable goods. The economy is populated with a continuum of identical firms that produce both tradable and non-tradable goods facing the same factors of production and technology. However, there exist differences in productivity and factor intensities between sectors. The aggregate capital stock is fixed such that $\overline{K}_t = K_t^T + K_t^N$. Firms face a Cobb-Douglas production function with constant returns to scale (CRS) in both sectors.

[6] The detailed derivation of the households and firms optimization problem is found in Annex 3 and Annex 4 respectively under Appendix A.

i. Tradable Sector

Technology under the tradable sector is represented by:

$$Y_t^T = X\left[K_t^T\right]^{\alpha}\left[L_t^T\right]^{1-\alpha} \tag{12}$$

A representative firm maximizes the following optimization problem

$$Max\{K_t^T, L_t^T\}\left[P_t^T Y_t^T - W_t L_t^T - R_t K_t^T\right] \tag{13}$$

$$\ell = P_t^T\left(X\left[K_t^T\right]^{\alpha}\left[L_t^T\right]^{1-\alpha}\right) - W_t L_t^T - R_t K_t^T$$

FOCs:

$$\alpha X P_t^T\left(K_t^T\right)^{\alpha-1}\left(L_t^T\right)^{1-\alpha} = R_t \tag{13.1}$$

$$(1-\alpha) X P_t^T\left(K_t^T\right)^{\alpha}\left(L_t^T\right)^{-\alpha} = W_t \tag{13.2}$$

ii. Non-Tradable Sector

The representative firm maximizes the following problem:

$$Max\{K_t^N, L_t^N\}\left[P_t^N Y_t^N - W_t L_t^N - R_t K_t^N\right] \tag{14}$$

$$\ell = P_t^N\left(Z\left[K_t^N\right]^{\varepsilon}\left[L_t^N\right]^{1-\varepsilon}\right) - W_t L_t^N - R_t K_t^N$$

FOCs:

$$\varepsilon Z P_t^N\left(K_t^N\right)^{\varepsilon-1}\left(L_t^N\right)^{1-\varepsilon} = R_t \tag{14.1}$$

$$(1-\varepsilon) Z P_t^N\left(K_t^N\right)^{\varepsilon}\left(L_t^N\right)^{-\varepsilon} = W_t \tag{14.2}$$

Combining the FOCs, we obtain the following:

$$\left(\frac{\alpha}{\varepsilon}\right)^{\alpha}\left(\frac{1-\varepsilon}{1-\alpha}\right)^{\alpha-1}\frac{X}{Z}\left(\frac{K_t^N}{L_t^N}\right)^{\alpha-\varepsilon} = \frac{P_t^N}{P_t^T} \tag{18}$$

The price ratio depends on the productivity ratio and the factor intensity ratio. This is important because an increase in the price of non-tradables for example will alter the capital/labour ratio in that sector.

Fiscal Authority

The fiscal sector is characterised in the following simple way. Government like households consumes tradable goods and non-tradable goods in the form:

$$g_t = \Omega_g g_t^N + (1-\Omega_g) g_t^T \tag{19}$$

Where Ω_g represents the degree of biasness in consumption of non-tradable goods. Thus, government demand functions for the two goods are $g_t^N = \Omega_g g_t$; $g_t^T = (1-\Omega_g) g_t$ respectively. Fiscal policy rule is determined by government deposits.

$$D_t = \rho_d D_{t-1} + (1-\tau_t) e_t A_t \qquad (20)$$

Government initial spending on increased aid inflows is measured by the fraction τ_t and ρ_d represents the rate at which aid-related deposits are withdrawn. If the fiscal authority behaves in an indiscipline manner by spending aid monies at impact, i.e. ($\tau_t = 1$), then aid-induced increase in deposits will be zero and this is referred to as the spending effect of aid inflows in this study.

C. Monetary Authority

The monetary authority chooses between three monetary policy regimes to reallocate resources such that the effect of the Dutch disease is mitigated/eliminated. Here, we assume a case such that the realities observed in LICs are adequately represented in terms of policy regimes. To that end, the central bank has to choose between fixed exchange rate, price targeting and targeting monetary aggregates (money supply)[7]. Therefore, at every point in time as the central bank chooses one regime, one of these variables is fixed: e_t, M_t and P_t.

Central Bank uses open market foreign exchange interventions to mop or inject domestic currency (M_t) as well as sell (absorb) a fraction (μ_t) of foreign aid (A_t). This is used to control money supply in the economy. A simplified central bank balance sheet is as follows:

$$\Delta M_t = \Delta NFA + \Delta NDA \qquad (23)$$

[7] We decided not to consider inflation targeting for two reasons even though inflation targeting has been the order of the day for many central banks around the world including central banks in developing countries. Firstly, the presence of fiscal indiscipline resulting in central bank financing of government activity is very pronounced and this makes it impossible for central banks most LICs in SSA to pursue inflation targeting as of now. Secondly, for the purpose of generalisation of results, we want to simulate an economy that captures the taxonomy of a least developing economy with a reflective fiscal and monetary framework as it obtains in such economies. As a result, inflation targeting may not appropriately reflect the current monetary policy frameworks in least-developing countries thus its omission.

Where ΔM_t is changes in money supply, ΔNFA and ΔNDA are changes in the Net Foreign Assets and changes in Net Domestic Assets of the central bank respectively. For simplicity, we assume changes in NDA are only affected by changes in government deposits and changes in NFA are only affected by changes in international reserves accumulation. The reserves accumulation policy rule is as follows:

$$I_t^r = I^r{}_{t-1} + (1-\mu_t)A_t \qquad (24)$$

Where I_t^r is international reserves accumulation process. If $\mu_t = 1$ which corresponds to full absorption of aid, then the central bank sells all the associated foreign currency aid inflows. On the other hand, if $\mu_t = 0$, it means the central bank accumulates all aid inflows as reserves which correspond to non-absorption of aid as defined in this study.

D. Equilibrium Conditions

We begin by looking at the equilibrium in the labour market given by the following equation:

$$L_t^s = (L_t^T)^d + (L_t^N)^d \ ,$$

where labour demand in the two sectors equals total labour supply in the economy. The capital market is also in equilibrium as shown by the following:

$$\overline{K} = (K_t^T)^d + (K_t^N)^d \ ,$$

Again, total capital stock in the economy is the sum of the capital stock in the two sectors. Equilibrium in the non-tradable goods market is captured by the sum of households and government consumption of non-traded goods which is equal to total output in that sector. This is given by following: $C_t^N + g_t^N = Y_t^N$,

In addition, equilibrium in the tradable goods market follows the same process and given by:

$$C_t^T + g_t^T = Y_t^T + (\tau_t - \mu_t)e_t A_t \ ,$$

Money market equilibrium is given by:

$$M_t - M_{t-1} = NFA_t - NFA_{t-1} + NDA_t - NDA_{t-1},$$

Since we assumed changes in NFA is as a result of changes in international reserves and changes in NDA is as a result of changes in government deposit, the equilibrium in the money market can be rewritten as follows:

$$M_t - M_{t-1} = (\tau_t - \mu_t) e_t A_t \ ,$$

Where changes in money supply depend on the actions of government and the central bank in relation to the foreign aid receipts. We also introduce real GDP as the sum of productions in the two sectors as shown here: $Y_t = P^N Y_t^N + e Y_t^T$.

Therefore, equilibrium in the economy is characterized as follows:

Given the process of foreign aid revenue $\{A_t\}_{t=0}^{\infty}$, symmetric equilibrium of $\left\{C_t^T, C_t^N, M_t, L_t, K_t^T, K_t^N, L_t^T, L_t^N, \tau_t, \mu_t, P_t^T, P_t^N, e_t, R_t, W_t\right\}_{t=0}^{\infty}$, such that the household utility problem (1) and the firms' optimization problem (13) are solved as well as equilibrium conditions in the markets as stated above are met. The structural form of the model is presented in Annex 5 under Appendix A.

2.5. Calibration

For this study, the structural parameters of the model are based on the structure of the Gambian economy or adopted from the economic literature[8]. The value of the discount factor β was calibrated to 0.99 consistent with many studies (see Mwabutwa 2013 & Aliyev 2015). Similarly, the intertemporal elasticity of consumption was taken from Adam et al (2009). Using data from the national accounts of The Gambia, we calibrated the household preference for consumption of traded goods to be 0.35. Similarly, taking the ratio of capital to traded and non-traded sectors output, we calibrated the parameters α and ε for the share of capital in traded and non-traded sectors to 0.6 and 0.3 respectively. Information on how other parameters were calibrated and their source can be found in Annex 1 and Annex 2 and Table 3 below. For the case of capital stock, a review of relevant existing literature on The Gambia shows inconsistent values, see for example Ayeni (2019) whose value for K was 6.05 while Beddies (1999) obtain a different value of 1.6. For this reason, we calibrated the value of capital stock to be 1.8 using national accounts data from the World Penn Tables (PWT10.0).

[8] The Gambia is use only as an example for aid-dependent low-income country but this does not suggest that it was the Gambian economy that was modelled in this study. We understand there are many aid-dependent LICs out there but the Gambia being one of those, we are convinced that using it as an example is appropriate and further lend credibility to the model.

Table 2.3. Calibration of Parameters

	Parameter Description	Value	Source
β	Discount factor	0.99	Mwabutwa, Aliyev & Gali (2013, 2015 & 2005)
Ψ	Inverse of labour supply elasticity	2	Mwabutwa (2013)
η	Intertemporal elasticity of consumption	2	Adam et al (2009)
ϕ	Coefficient of money in utility	0.08	Estimated by Author
θ	Share of traded goods in consumption	0.35	Author's calculations based on national accounts
α	Share of capital in tradable sector	0.6	Author's calculations based on national accounts
ε	Share of capital in non-tradable sector	0.3	Author's calculations based on national accounts
X	Total factor productivity in tradable sector	1.4	Koomson (2019)
Z	Total factor productivity in non-tradable sector	1.25	Koomson (2019)
Ω	Biasness in non-tradable goods consumption	0.9	Author's calculations based on fiscal accounts
K	Capital Stock	1.8	Author's calculations
ρ	Parameter on AR model	0.9	Author's calculations

Source: Author's Calculations

2.5.1. Simulation Results

This section presents the simulation results of the model and discusses the effects of some shocks. For the simulation and computation of the model, we used MATLAB software and Dynare toolbox. We explored the case for permanent shock using the deterministic form of the model as well as the case where foreign aid is stochastic using the stochastic form of the model.

The deterministic model is used to show a permanent shock in foreign aid inflows in order to observe the response of key variables and how they transitioned from the initial steady-state to the new steady state. This is also helpful in understanding the case where foreign aid is stochastic (volatile). There are a host of reasons why foreign aid could be volatile however, in the literature of foreign aid, donor fatigue, lack of coordination among donors on disbursement and the conditionalities attached to aid are among the reasons why aid could be volatile. We are limiting our analysis to the case where the fiscal authority is indiscipline such that the increase in foreign aid revenue is fully spent by government.

A. The case of a permanent increase in foreign aid

As stated earlier, a sudden and permanent shock at t=5 on foreign aid inflows is applied on the determinist model and the results of the initial and aftershock steady-state values are presented in Table 2.4 below. The results are generally in line with what theory suggests. For instance, a permanent increase in foreign aid shifts production from the tradable sector to the non-tradable sector in all monetary policy regimes except for the case of a fixed exchange rate regime. Similarly, the results reveal that there is resource reallocation from the tradable sector into the non-tradable sector under the three monetary regimes (K^T falls while K^N increases). However, the same is not observed for the case of labour except under the fixed exchange rate regime.

In addition to the evidence of the effects of Dutch disease so far, the results show there is both nominal and real appreciation of the exchange rate following a sudden but permanent increase in foreign aid and this is the case under all monetary policy regimes except under fixed exchange rate regime. This further supports the presence of the Dutch disease effect. The real exchange rate here is defined as the ratio of the price of tradables over the price of non-tradables. Except under the monetary targeting regime, both prices increased following a positive shock on foreign aid but the price of non-tradables rises faster than the price of tradables thus causing the real exchange rate to appreciate.

The nominal interest rate falls under the monetary targeting and price targeting regimes but increases under the fixed exchange rate regime while the wage rate increases to respond to the reallocation of resources from the tradable to non-tradable sector. In order to observe the changes to D, g, g^T, g^N and M, given their small values in the steady states, we look at the after-shock steady states as a ratio of the initial steady states. Government deposits denominated in domestic currency increase significantly as a ratio to its value in the initial steady-state following a sudden increase in foreign aid to stand at 10.6, 1.0, 14.1 under money targeting fixed exchange rate and price targeting respectively. This reflects what obtains in aid receiving countries as the domestic currency equivalent of foreign aid revenues are deposited in government revenue account with the central bank. Therefore, naturally, a sudden increase in foreign aid will correspond to a sudden increase in government deposit before the spending of the monies actually begin. Government total consumption and government consumption of tradable and non-tradable goods as ratio of its initial

steady-state value stand at 11.3, 1.1 and 14.8 under the three monetary policy regimes respectively. This goes to support the theory that government most notable response to a surge in foreign aid is by spending it. Similarly, under all regimes except for the fixed exchange rate regime, money supply increases in response to a sudden increase in aid. It is also observed that foreign currency reserve was the same after increasing from its initial steady-state under all regimes. Again, this is a familiar feature of aid-dependent LICs where the central bank receives the foreign currency revenues of foreign aid which is deposited outside the domestic country as international foreign currency reserves.

Most importantly, aggregate consumption which is our measure of welfare in this study rises in all regimes except fixed exchange rate regime in response to a sudden increase in foreign aid inflows. Thus, both monetary targeting and price targeting delivers the same welfare improvement which is superior to the one observed under the case of fixed exchange rate. However, when we take income into account, then the order of importance is monetary targeting, price targeting and fixed exchange rate. In the same vein, we observe that households' consumption of tradable goods increases under the money targeting and price targeting regimes but fell under the fixed exchange rate regime. On the other hand, households' consumption of non-tradable goods increases under all monetary regimes and is somewhat higher than the increase in consumption of tradables pointing to a degree of biasness in favour of non-tradable goods in the households consumption basket.

Table 2.4. Initial and after-shock steady-state results

			Steady State after a shock on foreign aid		
		Initial Steady State	Money targeting	Fixed exchange	Price targeting
Y	Total Output in foreign currency	1.11	1.12	0.83	1.11
Y^T	Output of tradable goods	0.21	0.13	0.15	0.12
Y^N	Output of non-tradable goods	0.90	0.99	0.68	0.99
K^T	Capital in tradable sector	0.56	0.36	0.42	0.36
K^N	Capital in non-tradable sector	1.24	1.44	1.38	1.44
P^N	Price of non-tradable goods	1.24	1.20	1.26	1.25
P^T	Price of tradable goods	0.66	0.61	0.67	0.64
e	Nominal exchange rate	0.66	0.61	1.00	0.64
L	Aggregate labour supply	0.22	0.22	0.24	0.21
L^T	Labour in tradable sector	0.03	0.01	0.02	0.01
L^N	Labour in non-tradable sector	0.20	0.20	0.22	0.20
R	Nominal interest rate	0.14	0.13	0.15	0.13
W	Wage rate	2.10	2.11	2.13	2.21
D	Government deposit in local currency	1.00	10.63	1.00	14.05
g	Government consumption	1.00	11.32	1.09	14.82
g^T	Government consumption of tradables	0.10	11.32	1.09	14.82
g^N	Government consumption of non-tradables	0.90	11.32	1.09	14.82
M	Money supply	1.00	1.00	0.99	1.07
I^r	Foreign currency reserves	0.00	1.00	1.00	1.00
C	Aggregate Consumption	0.68	0.73	0.66	0.73
C^T	Consumption of tradables	0.21	0.23	0.15	0.22
C^N	Consumption of non-tradables	0.48	0.51	0.54	0.50
P	Aggregate price level	0.99	0.95	1.01	1.00
s	Real exchange rate	0.67	0.65	0.99	0.64

Source: Author's simulation

Taking into consideration of all these, we can conclude that as far as consumption (welfare) is concerned, monetary targeting and price targeting are the most optimal monetary policy regimes for aid-dependent LICs when the fiscal authority is indiscipline. However, if monetary policy cares about growth (here increase in output Y), then monetary targeting is the most optimal monetary policy regime.

This simulation results pretty much resemble what actual data show in The Gambia during increases in foreign aid inflows. From Table 2.2 in section 2.3.3, we observed that the periods of high Official Development Assistance (ODA) as a percent of GDP correspond to a shrinking tradable sector and a booming non-tradable sector suggesting the presence of the Dutch disease effects.

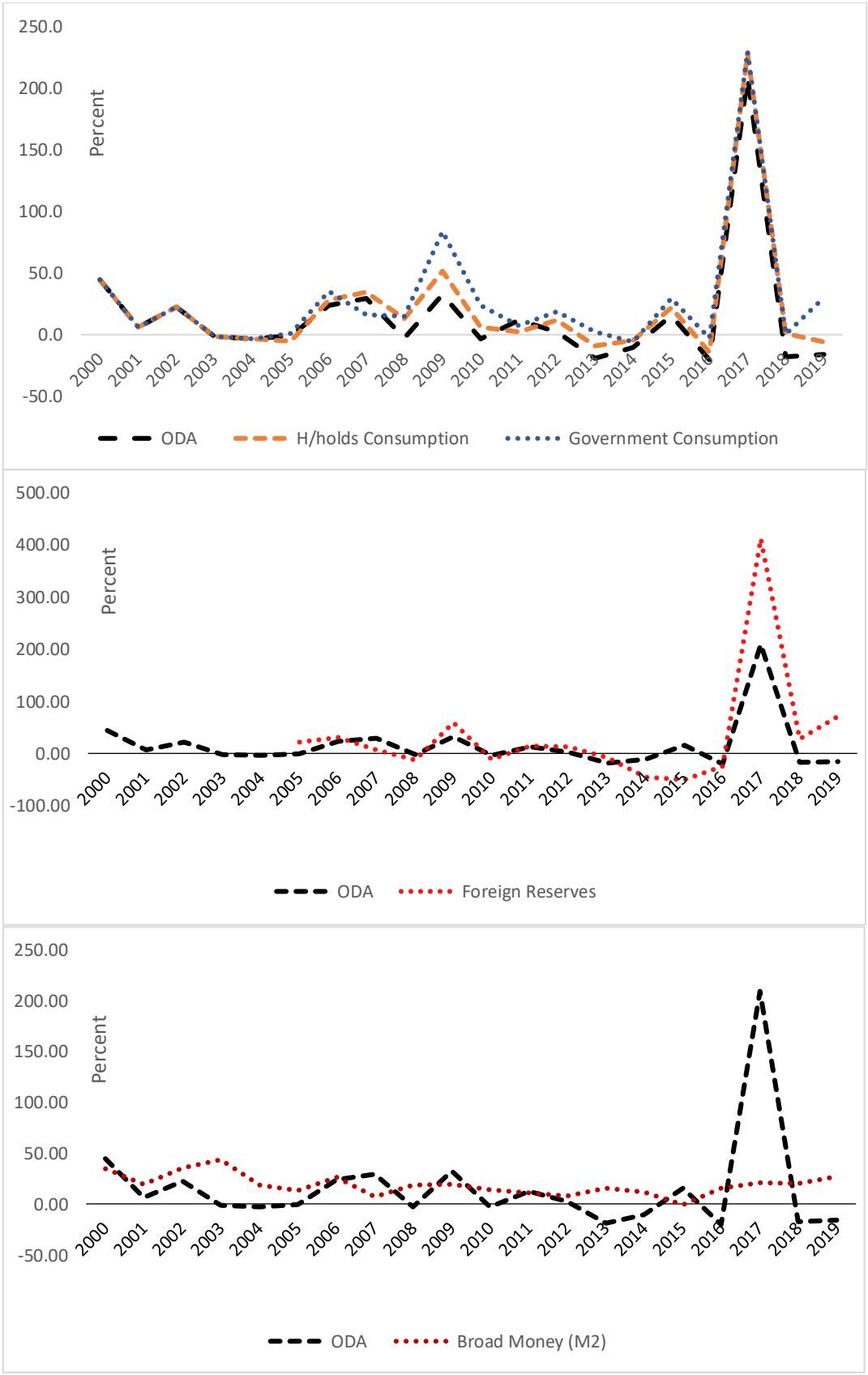


Figure 2.4. Growth rate in Foreign Aid and Key Macroeconomic Variables in The Gambia

Similarly, increases in foreign aid have been associated with a jump in some key macroeconomic variables in The Gambia during the same period see Figure 2.4 above. For instance, in the year 2009 when foreign aid inflows rose by 32.3 percent, households' consumption and government consumption both increased by 19.2 percent and 31.9 percent respectively. This trend is more pronounced in 2017 after the peaceful change of government which came with a lot of goodwill from the international community in the form of donor assistants (foreign aid). Moreover, from Figure 2.4, it could be deduced that whenever there is a surge in foreign aid inflows, there is a corresponding increase in foreign reserves accumulation coinciding with what the model predicts. Though not very obvious, money supply tends to rise somewhat in response to an increase in aid inflows.

To this end, the model used in this study was able to predict what obtains in aid-dependent LICs following a shock on aid revenue. We believe that aid-dependent LICs share a lot in terms of their macroeconomic environment. Thus, observing some key macroeconomic variables in The Gambia react to a shock on foreign aid goes to confirm the suitability of the model for aid-dependent LICs, especially in macroeconomic management of increased aid inflows.

B. The Case when Foreign Aid is Stochastic

We study the case when foreign aid inflows follow a stochastic process. As noted above, there is ample evidence to suggest that aid inflows to least developed countries are very volatile (see Prati and Tressel 2006a, 2006b and Hussain et al 2009). This volatility in aid inflows poses a lot of challenges to the macroeconomic management of aid-dependent LICs. Thus, it is worth examining the appropriate monetary policy response to increased aid inflows in the presence of fiscal indiscipline.

In this study, we model foreign aid inflows to follow an AR(1) stochastics process of the following: $A_t = \rho_A A_{t-1} + \in_t$ where A_t is foreign aid inflow at time t and $0 < \rho_A < 1$ where we assume a high degree of persistence in foreign aid inflows ($\rho_A = 0.9$). The innovation term $\in_t$ follows an iid process with zero mean and constant variance $\in_t \sim N(0, \sigma)$. A standard deviation shock of $\sigma = 1$ is applied on aid inflows and the results under the three monetary policy regimes are presented in Table 2.5 below.

Table 2.5. Stochastic Simulation Results

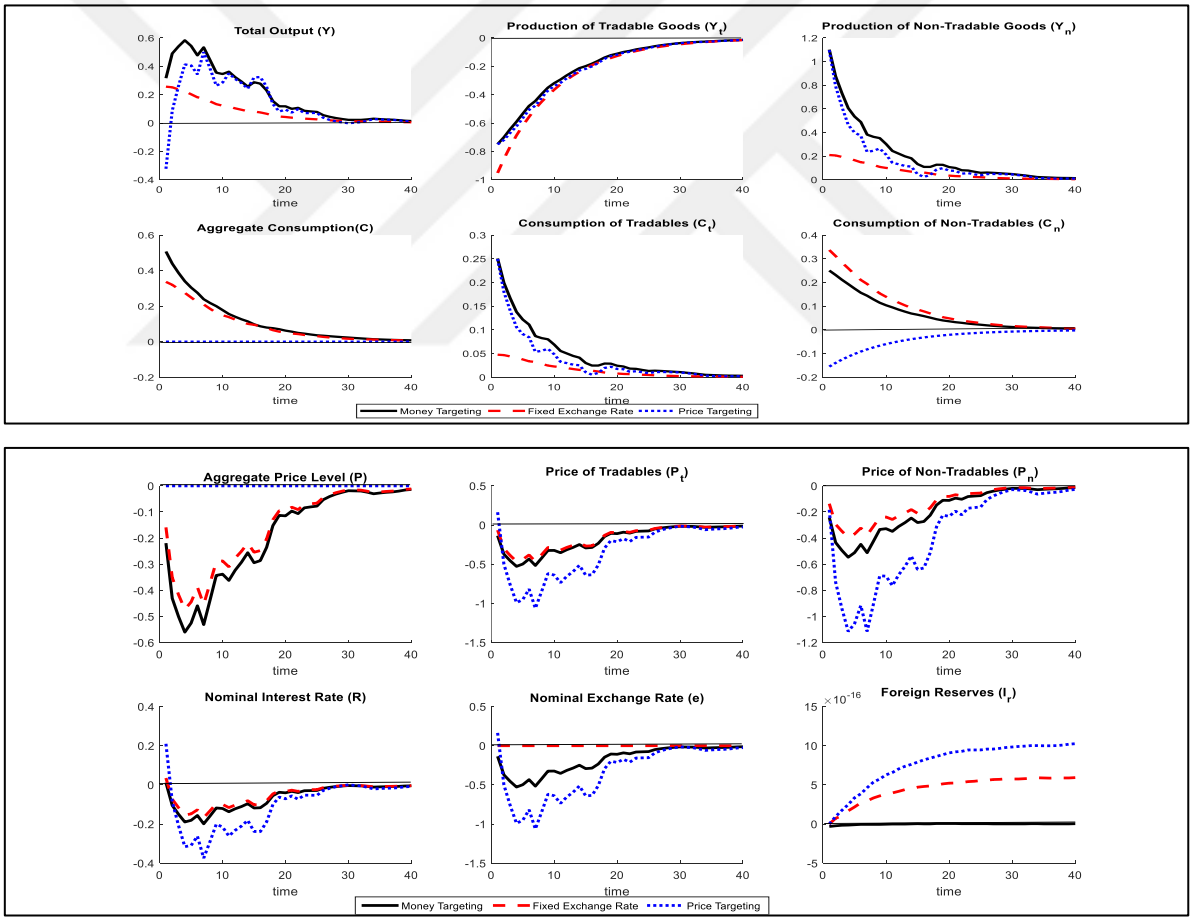
	Discipline Fiscal Authority	Indiscipline Fiscal Authority		
		New Steady State		
	Variation from initial Steady State	Money targeting	Fixed exchange	Price targeting
Aggregate Consumption (C)	0.0000	0.6826	0.6412	0.6705
Total Output (Y)	0.0000	1.1069	0.8512	1.2907
Nominal Exchange Rate (e)	0.0000	0.6626	1.0000	0.5767
Aggregate Labour Supply (L)	0.0000	0.2246	0.2771	0.2514
Aggregate Price Level (P)	0.0000	0.9961	0.9995	1.0000
Government Consumption (g)	0.0000	0.000240	0.000273	0.000308
Money Supply (M)	0.0000	1.0000	0.000150	0.000156

Source: Author's calculations

The results further support the findings in our deterministic case in that consumption, our measure of welfare, is higher under the monetary targeting regime following a positive shock on foreign aid. However, if the central bank cares about growth, then price targeting is the most optimal policy regime under this case. Again, fixed exchange rate regime as before remains the less optimal policy regime when both welfare and growth are central for monetary policy. The Dutch disease effects remain present in the case of stochastic foreign aid inflows as the nominal exchange rate appreciates following a positive shock on aid revenue. . In terms of mitigating the Dutch disease effect, monetary targeting remains the most optimal followed by price targeting and fixed exchange rate. In other words, if the Dutch disease is inevitable, then monetary targeting is the best monetary policy regime for aid dependent LICs in response to increase aid inflows followed by price targeting while fixed exchange rate regime is the least preferred. We also observe a rise somewhat in the aggregate price level. Money supply increases in all regimes reflecting the increase in government consumption after a surge in aid revenue. This is true for aid-dependent LICs as we observe above that following a surge in aid revenue, the foreign currency is accumulated as international reserves by the central bank. Thus, except if the central bank sterilizes the increase in government consumption, the domestic money supply will increase.

To see how some key variables respond to a positive shock on foreign aid revenues and how they transitioned from the old steady-state to the new steady-state, we present the Impulse Response Functions (IRFs) in Figure 2.5 below. The IRFs for each variable under the three monetary policy regimes are plotted to show how the variable behaves under each regime

after an increase in foreign aid revenues. The result from the IRFs is consistent with what we saw in the previous section that monetary targeting is superior when consumption improvement and growth are core objectives of monetary policy. It could be observed that the tradable sector is completely squished out by the non-tradable sector, a phenomenon of the Dutch disease effect. Further, the nominal exchange rate appreciates in the monetary and price targeting regimes but more so under the price targeting regime which goes to support the presence of the Dutch disease effect for LICs who experience an increase in foreign aid. It is also noted that after a sudden rise in aid revenue, there is a significant accumulation of foreign reserves under the fixed exchange rate and price targeting regime but not under monetary targeting. At a first glance, the accumulation of foreign reserves under a fixed exchange rate regime seems counter-intuitive.



Source: Authors calculations

Figure 2.5. Response of Key Macroeconomic Variables to a positive shock on aid revenue

However, for LICs whose main source of foreign currency supply is foreign aid, it makes absolute sense to accumulate foreign reserves at impact which will be used to cushion the

domestic currency later. That is why under the monetary regime as indicated in Figure 2.5, there is no foreign reserve accumulation as the monetary authority uses the foreign currency to sterilize the increase in the supply of domestic currency originating from the rise in government spending of aid revenue. This is necessary if the central bank wishes to keep monetary aggregates (money supply) at the desired targets.

C. Macroeconomic Response to Increase in Foreign Aid Inflows

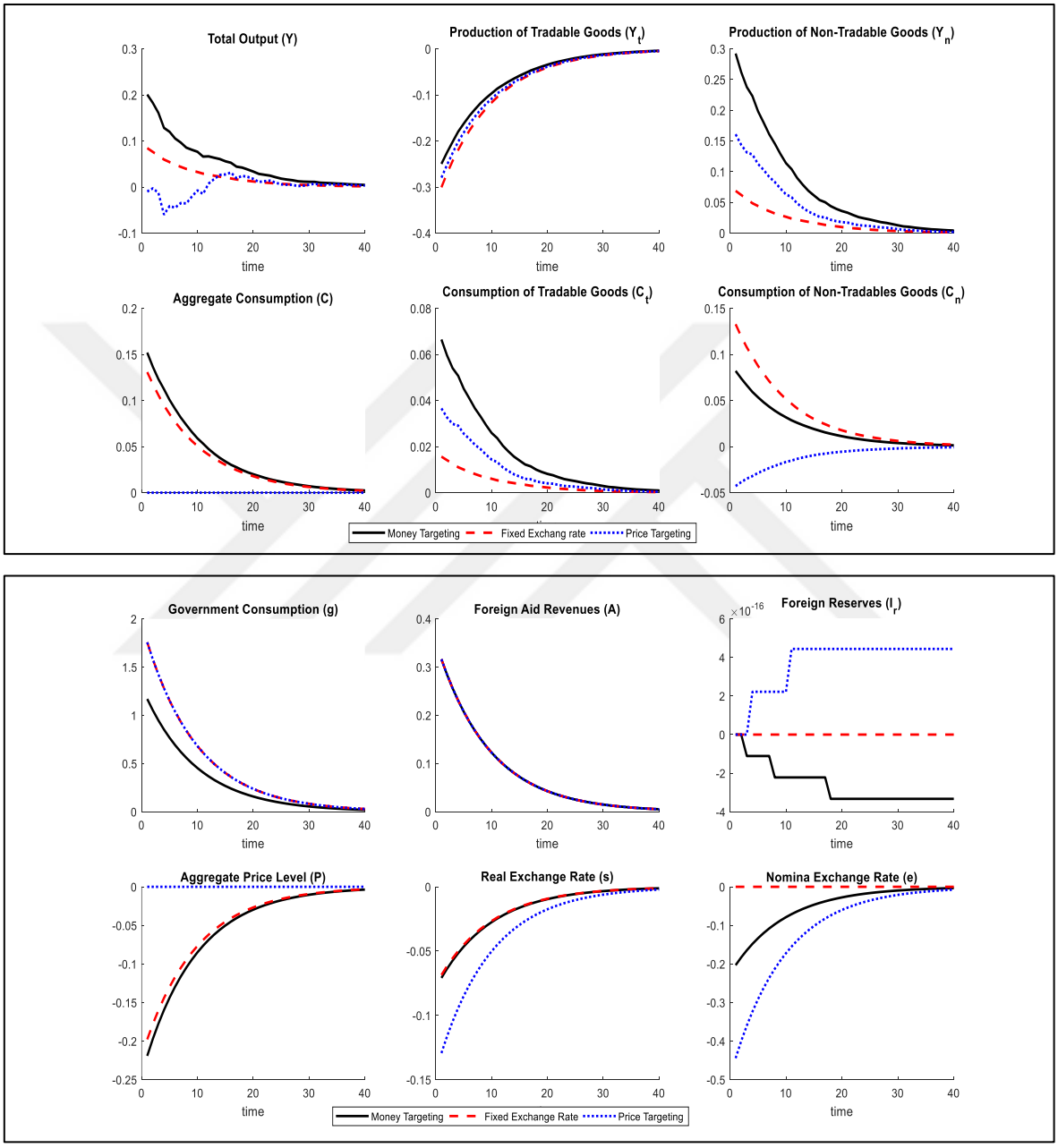
In the literature on foreign aid, there are four approaches on macroeconomic response to increased aid inflows: (i) a scenario when aid is fully spent and fully absorbed, (ii) when aid is fully spent but not absorbed, (iii) when aid is not spent but fully absorbed and (iv) when aid is not spent and not absorbed. As noted in section 2.2.1, for low-income countries, aid is mainly for budgetary support which requires the recipient country to spend the aid-related revenues. Therefore, it may not be appropriate to assume that aid could be saved. Based on the foregoing, we are going to limit ourselves to the scenario when aid is fully spent and fully absorbed because the case when aid is fully spent but not absorbed was used as the baseline and the results are as in Figure 2.5 above.

The case when aid is fully spent and fully absorbed

From Figure 2.6 below, monetary targeting regime outperformed fixed exchange rate and price targeting when aid is fully spent and fully absorbed. That is to say, if fiscal authority is indiscipline (fully spending the increase in aid), then money targeting is the most optimal monetary policy framework when both welfare (increase in consumption) and growth forms central bank's policy objective. However, no matter which monetary regime is pursued, if aid is fully spent and fully absorbed, this will generate the Dutch disease effect as evident in the shrinking tradable sector and the appreciation of both the real and nominal exchange rates. Thus, the results support theoretical postulations that increased aid inflows should be fully spent and fully absorbed only if there are no signs of Dutch disease effects.

Moreover, government consumption increases in all regimes while there is downward pressure on the aggregate price level mainly due to the appreciation of the domestic currency as the domestic economy is flooded with foreign currency. Foreign reserves behave differently in the three monetary regimes following the spending and absorption of increase in aid. Under monetary targeting, there is depletion of foreign reserves given that the central

bank (who fully absorbed the increase in aid) will work to restore money supply to its target. The rise in money supply comes from the increase in government consumption of spending aid revenues and unless the monetary authority acts by depleting its foreign reserves to sterilize this excess liquidity, the money targeting objective will not be met.



Source: Author's Calculations

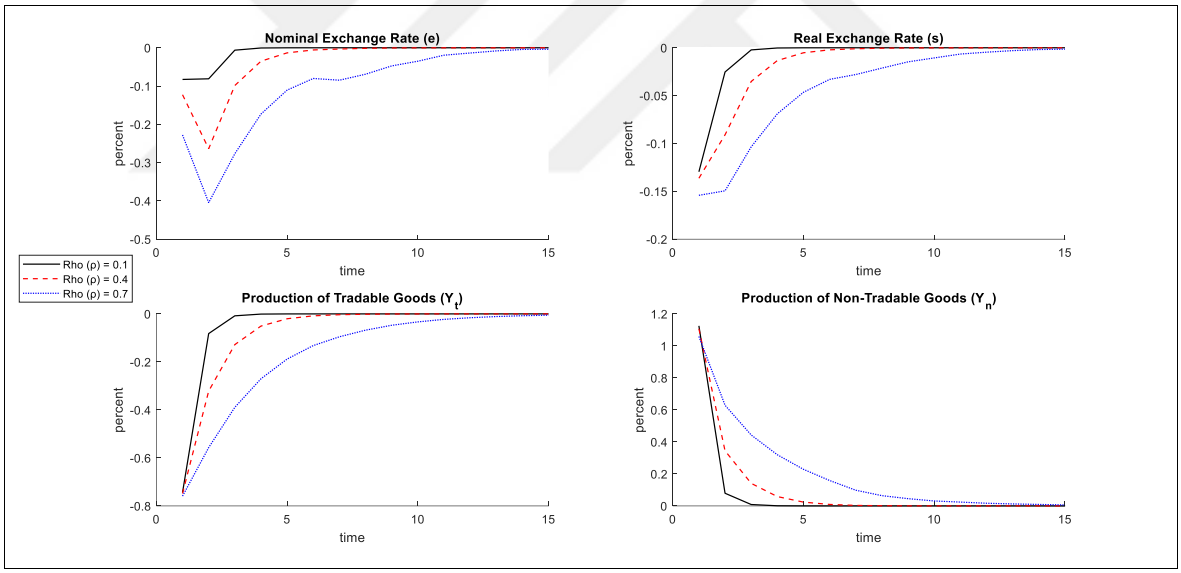
Figure 2.6. Response to Aid Shock – Aid fully spent and fully absorbed

However, under the price targeting regime, there is a massive accumulation of foreign reserves as the monetary authority turns its attention to meeting the desired target for the

price level. No effect on foreign reserves under fixed exchange rate regime following the spending and absorption of increased foreign aid inflows. In this case, the monetary authority may use its foreign currency receipt from the increase in aid to maintain the peg without having to deplete its foreign reserves.

D. Foreign Aid Persistence and Dutch Disease Effects

We also investigated how persistence in foreign aid inflows impact the degree of Dutch disease problem in aid-dependent low-income countries. This is important in showing how transitory shocks and permanent shocks affect the recipient economy when foreign aid is stochastic. We set the rho parameter in the AR model to lower values (0.1, 0.4 and 0.7) than previously done in the baseline to reflect lower persistence in foreign aid inflows. The results are presented in Figure 2.7 below. Given that the results under the three monetary policy regimes are identical, we present here only the results under monetary targeting since it has been the most optimal policy regime throughout.



Source: Author's Calculations

Figure 2.7. The effect of Foreign Aid Persistence on Dutch disease

As expected, lower persistence means a lower degree of Dutch disease effect while higher persistence leads to a higher degree of the Dutch disease problem. In other words, if shocks on foreign aid are transitory, there will be a little worry for the problem of the Dutch disease while the reverse is also true. This could be seen in lower nominal and real exchange rate appreciation following a positive shock in foreign aid inflows. In other words, when shocks in foreign aid inflows are less persistent, there is a milder appreciation of both the nominal

and real exchange rate suggesting a milder Dutch disease effect. In addition, we reach a similar conclusion when we looked at the behaviour of the tradable and non-tradable sectors. Though the magnitude of the shrinking of the tradable sector and the booming of the non-tradable sector at impact is the same for both lower persistency and higher persistency, the transition back to the steady-state is different. In the case of lower persistency, the fall in production of tradable goods and the boom in the production of non-tradable goods tapper off faster than when shocks on foreign aid are highly persistent. This goes to suggest that in the case when foreign aid is less persistent, the Dutch disease problem will disappear faster than in the case when foreign aid is highly persistent.

Therefore, authorities in aid-dependent LICs must take into account the nature of the shock in times of designing policy response to increased aid inflows to avoid unwarranted policy interventions which might be costly.

E. Parameter Sensitivity Check

For robustness check, we investigate how sensitive the model is to changes in the parameters used in the calibration. This is important because changes in the parameters of the model should only affect the steady-state values of the variables and magnitudes but not the order of importance of monetary policy regimes with reference to welfare and growth. The new values are chosen such that they are different from the original values but consistent with those observed in the literature. The adjusted parameters with their initial values are presented in Table 2.6 below.

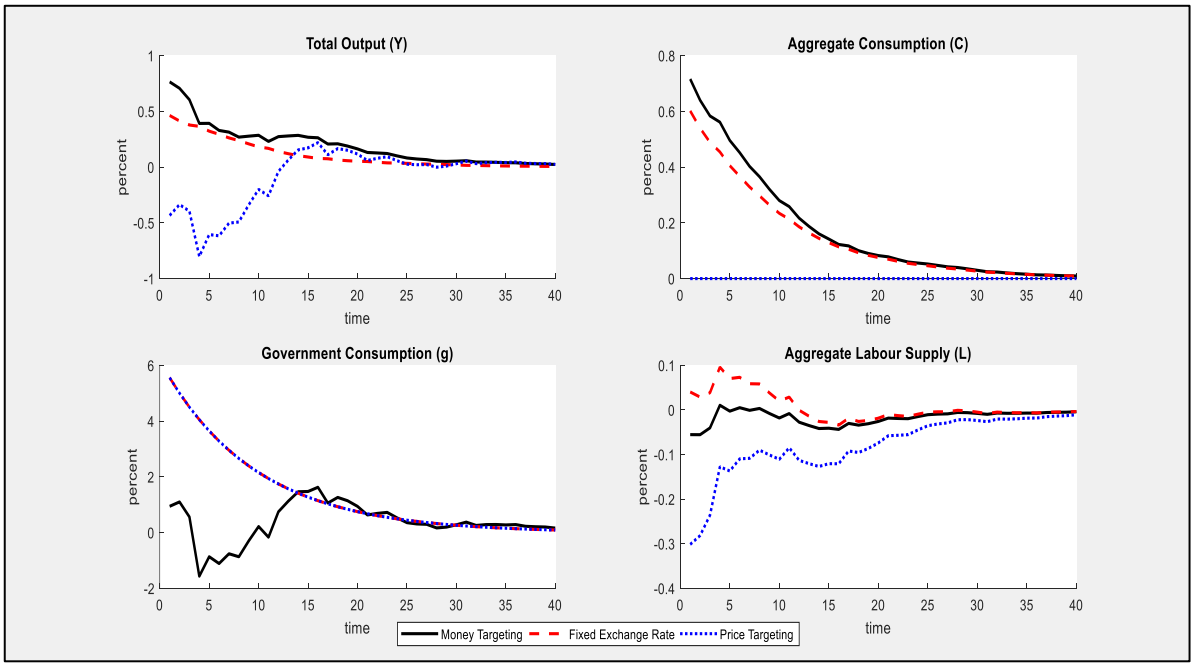
Table 2.6. Re-calibrated parameters

Initial Value	New Value
θ=0.35	θ = 0.4
ψ = 2	ψ = 1.2
α = 0.6	α = 0.4
ε = 0.3	ε = 0.1
Z = 1.25	Z = 2.16
X = 1.40	X = 1.13

Source: Author's Calculations

The result from the simulation incorporating the re-calibrated parameters is shown in Figure 2.8. As expected, the change in parameter only affected the magnitude of change of the variables in response to a positive shock on foreign aid but not on the order of importance

of policy response. In other words, given that the fiscal authority is indiscipline by fully spending the increase in aid revenues, monetary targeting remains to be the most optimal monetary policy regime. From Figure 2.8, consumption is higher under monetary targeting than any other regime, suggesting that monetary targeting offers higher welfare gains and serves as a cushion for external shocks in an environment of volatile aid inflows. In addition, if the monetary authority cares about growth, again monetary targeting remains the most optimal policy regime. This is consistent with what we observed in section B above thus giving credibility to the model.



Source: Author's Calculations

Figure 2.8. Sensitivity Check

2.6. Conclusion

This study investigated the optimal monetary policy response to increased foreign aid inflows for aid-dependent low-income countries using a simplified DSGE model. We limited our analysis to the case where the aid-related revenues are fully spent by the fiscal authority a scenario referred to as fiscal indiscipline. On the other hand, to establish the optimal policy regime, the monetary authority has the latitude to choose the following: monetary targeting, fixed exchange rate and price targeting regimes.

The results show increased foreign aid inflows causes some Dutch disease effects in the recipient country. This is evident in the shrinking of the tradable sector and the booming of the non-tradable sector following a positive shock in aid revenue. Furthermore, the findings of this study revealed that both the real exchange rate and the nominal exchange rate appreciate following an increase in foreign aid inflows suggesting the presence of the Dutch disease effect. The findings of an appreciation of the exchange rate are in line with many studies, such as Elbadawi (1999), Bevan (2003), Fielding and Gibson (2012). However, the results in this study are contrary to those found by Nyoni (1997), Ogun (1998), Sackey (2001), Berg (2005) in that increased aid inflows cause a real depreciation rather than an appreciation.

In other to verify whether the findings in this study resonate with realities in aid-dependent LICs who experience increased aid inflows, we used Gambian data to check key macroeconomic variables' response to increased aid inflows. We observed that macroeconomic variables such as output, consumption, foreign reserves and prices behave exactly as the model predicts following a shock in aid revenue. This is important in that it shows how well the model can capture the structure of aid-dependent LICs thus could be used in related studies in the future.

Furthermore, the study shows that monetary targeting outperformed both fixed exchange rate and price targeting with reference to welfare (higher consumption) and growth. This is consistent in the case of a permanent increase in foreign aid and when aid is volatile. In order words, if the monetary authority follows a monetary targeting regime, the domestic economy will be less affected by external shocks and domestic consumption will be cushion leading to welfare gains following an increase in foreign aid. Price targeting offers the second-best monetary policy response to a rise in aid while fixed exchange rate regime is the least

favourable. The reason for this could be that aid-dependent LICs depend heavily on aid-related foreign currency as a source of foreign currency reserves thus are not in a better position to be able to defend a fixed exchange rate. Rather, aid-related foreign currency is used for balance of payments purposes. Furthermore, the study finds that when aid is fully spent and fully absorbed, monetary targeting is the most optimal policy regime when welfare and growth are an integral part of the central bank's policy objective. However, the model predicts that under the policy response option of fully spent and full absorption of increased aid, a shock in aid leads to the Dutch disease effects. Thus, as revealed in the literature, increased aid inflows should be fully spent and fully absorbed only if there are no signs of the Dutch disease effect. On this note, based on the findings of this study, aid-dependent LICs' best response to managing increased foreign aid inflows is to follow a monetary targeting framework. This will not only mitigate the Dutch disease effects on welfare from a shock in aid but also cushion the domestic economy from external vulnerabilities relating to the stochastic nature of aid inflows.

Finally, this study was limited to the case of foreign aid as official development assistance to least developing countries. Future research could consider expanding this to include capital flows in general as financial globalisation increases and capital mobility is enhanced. This will give a broader picture of how macroeconomic response to increased capital inflows should look like under different policy scenarios.

3. MONETARY POLICY TRANSMISSION MECHANISM IN THE GAMBIA: EVIDENCE FROM A BANK LENDING CHANNEL

3.1. Introduction

The question of whether monetary policy actions have any real effect on the macroeconomy is still one of the most debated topics in economics albeit with some consensus. Following the work of Friedman and Schwartz (1963) on the "monetary history of the United States", they showed that monetary policy actions have real effects on macroeconomic variables such as prices and output. In other words, the monetary authority has the power to influence real outcomes in the economy such that during a recession, for example, it can induce a rise in aggregate demand by lowering its short-term interest rate. The rise in aggregate demand and eventually employment emanate from the rise in interest-sensitive investment spending following lower cost of capital. This publication significantly re-shaped the debate on the impact of monetary policy and most economists came to the agreement that monetary policy, at least in the short, has real effect.

What remains of the debate is which of the channel(s) of monetary policy transmission mechanism is(are) the most effective. Proponents of the neoclassical cost-of-capital theory suggest that monetary policy works through the interest rate/money view channel and empirical work such as that of the Romers (1990) and Ramey (1993) found evidence in support of this proposition. That is to say a tight (ease) monetary policy will increase (decrease) the cost of capital of interest-sensitive investment spending which depresses (boosts) aggregate demand and prices. Other economists argue that the strength of monetary policy actions on the macroeconomy is captured through the asset price channel or wealth channel (application of Tobin's Q (1960)). In other words, a change in monetary policy affects asset prices such as equity and real estate and this is expected to bolster the market value of holders of these assets translating to more investment, wealth and consumption. The exchange rate channel is another mechanism through which monetary policy actions could affect the economy by altering the relative prices of domestic to foreign goods (Mishkin, 1995). Another prominent channel of monetary policy transmission mechanism is the credit channel. Defenders of this channel argue that the magnitude of the impact of monetary policy on output which is unexplained by the interest rate channel is accounted for by the broad credit channel – supply of and demand for bank credit. The potential impact of monetary

policy on bank loans for instance could amplify the propagation of the interest rate effect such that aggregate demand is affected more than the initial effect from the change in interest rates (Bernanke & Blinder, 1988; Gertler & Gilchrist, 1993; Bernanke et al., 1994; Bernanke & Gertler, 1995).

Based on the foregoing, while it is clear that at least in the short run, monetary policy actions have real implications on the economy, the mechanism on how those effects come about remains debatable and may differ from country to country. For example, the interest rate and asset price channels of monetary transmission are more potent in countries with well-developed financial and legal systems such as those found in the US, Euro area and some Asian countries. On the other hand, the exchange rate channel and to an extent the broad credit channel may work well in developing, emerging and low-income countries. Thus, not only establishing the monetary transmission mechanism in each country and region becomes important but also quantifying its magnitude on the economy. Admittedly, there has been a huge literature on monetary transmission mechanism but most of these studies are on advanced and emerging economies with relatively well-developed financial markets. Consequently, little is known on how similar situations augur in low-income countries. Even those studies that focused on low-income countries, the findings are inconsistent and this is more apparent in the case of the credit channel of monetary transmission see (Mishra et al., 2011, 2014) for a comprehensive survey on effective monetary transmission in developing countries.

It is for these reasons that this study investigates the monetary policy transmission mechanism for The Gambia in the context of the Bank Lending Channel (BLC). There are two conditions for the bank lending channel to exist. First, banks cannot fully insure their supply of credit/loans from a change in reserves originating from monetary policy shocks. Secondly, there have to be those firms and households who depend on bank credit/loans for their external finance needs such that a reduction in credit/loan supply during tight monetary policy will limit their investment and consumption spending. As noted above, the empirical findings on the existence of such a channel are inconsistent. We believe one way of resolving the inconsistencies in the effectiveness of the credit channel in general and bank lending channel, in particular, is to have country-specific studies. This is not only important in accounting for the heterogeneity problem that arises in pooled-cross sectional studies but also provides country-base evidence on the transmission mechanism that will guide domestic

policymaking. This is apt for the case of The Gambia which as far as we know, no such literature exists by the time of writing this paper.

Furthermore, we extend the bank lending channel of monetary transmission to account for the impact of monetary policy on credit to major economic sectors in The Gambia. Until now, the credit channel has focused on the effect of monetary policy on the supply of bank loans and the demand for bank credit by households and firms using bank credits, bank characteristics, firm-level data and household balance sheet (Kashyap & Stein, 1993, 1995; Kashyap et al., 1996; Oliner & Rudebusch, 1995; Bougheas et al., 2006). Thus, extending to include the impact of monetary policy on credit to major economic sectors is important in many ways: firstly, in addition to understanding the impact of monetary policy to credit supply in The Gambia, accounting for the potential effect of monetary policy on major economic sectors will reveal the distributional effect of monetary policy on specific economic sectors. This will measure the actions of monetary policy on the sectors of the economy which is crucial in the wake of central banks getting more involved in developmental initiatives of their respective countries. Secondly, in low-income countries where structural bottlenecks continue to persist, the ability to use monetary policy as a stabilisation policy cannot be overemphasized. Thus, understanding how monetary policy affects major sectors such as agriculture, manufacturing and distributive trade will help tailor government policies during stabilization programmes. Finally, this extension will also highlight the lags of monetary policy transmission to the economy at a more disaggregated micro-level in addition to the more conventional macro-level. This is crucial for policymakers as it relates to the timing of monetary policy response.

Specifically, the contributions of this research come in two-fold. Our study focuses on The Gambia – a low-income country with a shallow financial market – to investigate the monetary transmission mechanism from the bank lending channel point of view, the first of its kind for The Gambia as far as we know. Secondly, we extend the credit channel to account for the distributional impact of monetary policy on the supply of credit to major economic sectors in The Gambia. Until the time of writing this paper, there is no known study in the literature of monetary transmission that has done this type of work. Therefore, this contribution will add to the body of existing literature on monetary transmission.

3.1.1. Research Objectives

The aim of this study is to investigate the monetary policy transmission mechanism in The Gambia with a focus on the Bank Lending Channel (BLC) of monetary transmission. Specifically, this paper will test the existence of the BLC by doing the following:

i. Test whether or not monetary policy actions have any effect on the economy
ii. Test whether or not monetary policy actions affect the supply of Bank Credit and by extension whether bank credit has any potent on output (Existence of BLC)
iii. Test the distributional effects of monetary policy on sector-specific credit supply

3.1.2. Organisation of the Study

The rest of the study is organised in the following: Section 3.1 introduces the study with an overview of monetary policy actions and the real economy stressing more on the differing views on how monetary policy actions are transmitted. Section 3.2 covers the theoretical framework as well as the empirical evidence on the literature of monetary transmission while the financial sector developments and monetary policy framework of The Gambia are done in section 3.3. The methodology highlighting the model, data and technique employed is comprehensively covered in section 3.4. Section 3.5 presents the results and discussions while the conclusion, policy implication and suggestions on further research are captured in section 3.6.

3.2. Literature Review

This section of the study presents the literature review on monetary policy transmission. We focus on both the theoretical framework guiding the general discussion on the transmission mechanism of monetary policy to real economic activity and some empirical evidence.

3.2.1. Theoretical Underpinnings of Monetary Transmission Mechanism

Theoretically, the link between monetary policy actions and output is transmitted through the interest rate channel, money channel, credit channel, exchange rate channel, asset prices channel and expectation channel. While these channels could exist at the same time, their effectiveness may vary from country to country or even from time to time. A detailed examination of each is done below.

3.2.1.1. Interest rate channel

The interest rate channel of monetary transmission encapsulates the Keynesian view depicted in the IS-LM model in which interest rate is negatively related to output. In this case, a rise in money supply (easing of monetary policy) leads to a fall in real interest rates due to price stickiness. The fall in real interest rate means lower cost of capital and a rise in interest-sensitive investment spending which eventually leads to a rise in aggregate demand and output. Thus, according to this view, government stabilisation policies – easing of monetary policy during economic downturns for instance – have real effect on the macroeconomy counter to the classical views.

3.2.1.2. Money view channel

Though there are many ways that one could present the money view channel, we use the simplest way of "pure money view" where we have an economy with only two assets – money and bonds. To further the simplification, the banking sector is thought of having influence only on its liability side of its balance sheet which it uses to issue demand deposits while on the asset side of its balance sheet, it does just like the household – invest in bonds. In such a polar view, if the monetary authority uses open market operations to increase the reserves of the banking sector by increasing the money supply, this means the price of bonds increases while the interest rate falls. The fall in interest rate will translate to higher investment and higher output. However, we will show later why this extreme polar view

may not work exactly as depicted here and this will have to do with the bank sector's ability to influence both its asset and liabilities sides of its balance sheet.

3.2.1.3. The credit channel of monetary transmission

In contrast to the "pure money view", the credit view is characterised by an economy with three assets – money, publicly issued bonds and loans. This means the banking sector is not limited to only issuing demand deposits (influencing its liabilities side of its balance sheet) but can also make loans (affecting the asset side of its balance sheet). In this case, monetary policy can work in two ways: its effect on bond interest rate and its independent effect on the loan supply of the banking sector. For example, a tight monetary policy that decreases money supply and the banking sector reserves will have little effect on interest on publicly held bonds (weak money view) but may have serious consequences if the banking sector restraints loan supply. The cutback on loan supply will mean households and firms who depend on bank credit for their external finance need will be affected and this could necessitate a cutback in consumption and investment spending. The fall in consumption and investment will ultimately lead to a decline in aggregate demand.

What we just explained above could be viewed as the broad credit channel of monetary transmission. In support of this view, economists later depicted the existence of the credit channel emanating from the asymmetric information that exists between lenders (banks) and borrowers (household and firms)[9]. They argued that because borrowers are better informed in their creditworthiness than lenders, lenders will always try to insure themselves by charging a cost of verification and monitoring which will create a wedge between internal financing and external financing. This wedge is tied to the borrowers' creditworthiness – high creditworthiness in the sense of high collateral, capitalisation, relationship with lender, etc means lower wedge. Thus, a fall in bank credit following a tight monetary policy could be as a result of both a cutback on supply (by the banks) or a dwindling of demand for bank credit (by households and firms). As a result, this wedge reflecting the presence of

[9] See Bernanke and Gertler (1995), Mishkin (1995)

asymmetric information between lenders and borrowers gives rise to the bank lending channel and the balance sheet channel of monetary transmission[10].

The bank lending channel of monetary transmission is the ability of monetary policy actions to affect bank credit/loan supply such that bank-dependent borrowers will be affected in times of monetary restraints. Two conditions need to hold for this channel to exist: monetary policy should be in a position to affect the supply of bank loans and second, there must be those borrowers (households and firms) that depend on bank credit to finance their spending. Given that this holds, a tight monetary policy in the reduction of money supply and bank reserves will translate to lower credit/loans available to supply therefore constraining consumption and investment spending of households and firms respectively. The decline in consumption and investment will feed into lower economic activity.

The balance sheet channel on the other hand works through the net worth of the borrower. A contractionary monetary policy erodes the value of assets and increases the cost of capital through higher interest rates which lower the net worth of the borrower. The rise in interest rates erodes household and firm cash flows as debt servicing increases. The fall in borrowers' liquidity and net worth means lower chances of obtaining credits/loans from the banks leading to a cutback on consumption and investment spending. The consequence is a decline in aggregate demand and economic activity.

3.2.1.4. The exchange rate channel

In an open economy setting, the exchange rate plays a crucial role in the transmission of monetary policy to the economy, especially for low-income countries. A tight monetary policy stance in the increase of the short-term interest rate means local assets denominated in the local currency become more attractive than their foreign counterparts forcing capital to flow into the economy. This causes a real appreciation of the exchange rate and leads to higher imports which may be good for net-importing countries like those in the low-income category. It comes to be more important for these countries if imports are dominated by intermediate goods for production which means lower cost of inputs for domestic firms. An expansionary monetary policy will cause the reverse which is advocated for by export-

[10] The borrower's balance sheet channel comprises the household and the firms' balance sheets respectively.

oriented experts. As a result, the exchange rate channel serves as an important channel for the monetary transmission mechanism and is mostly put on the radar of monetary authorities in low-income countries.

3.2.1.5. Asset prices channel

Monetary policy is thought to be transmitted to the economy through the prices of key financial assets such as equity and real estate. A contractionary monetary policy (rise in short-term interest rates) leads to lower asset prices mirroring the sluggish investment demand. According to Tobin's Q, a fall in equity prices will erode the market value of a firm relative to the replacement cost of capital. Therefore, a tight monetary policy stance will result to lower demand for equities leading to lower investment and by Modigliani's life cycle hypothesis lower consumption[11].

3.2.1.6. Expectation channel

Expectations play a very important role in economics as it is an embodiment of how economic agents visualize the future. Agents' expectation about future monetary policy stance could feed into medium to long term interest rate which could impact medium to long term investment decisions. For example, an expectation of a tight monetary policy in the future will signal to agents the possible higher inflation and interest rates in the future thus altering their savings, consumption and investment decision which eventually impact aggregate economic activity. Thus, given its relevance, monetary policy oftentimes uses this channel to anchor future inflation and economic activities in line with its pre-determined policy objective.

In sum, theoretically, we can say monetary policy could be transmitted through different channels. However, it is difficult to say with certainty these channels operate independently of each other. What may happen is the effectiveness of these channels may vary from country to country and/or region to region or even with time. Depending on the level of financial sector development, regulatory environment, legal framework and a host of other realities, some channels may be more effective than others. Hence, warranting the necessity of every

[11] See Mishkin 2001, 2006

country or region to not only establish the transmission mechanism for its economy but also do so with time because as the economy's dynamics change, most often the transmission mechanism changes too.

3.2.2. Empirical evidence on the credit channel of monetary transmission with a focus on the bank lending channel

For the purpose of this study, our focus is on the broad credit channel in general and the bank lending channel in particular. As a result, most of the empirical evidence we present here will fall within this circle. Notwithstanding, in a way of spicing the debate of the "money only view" and the "credit only view", we begin by looking at the early works of some key experts in this area.

Starting with a quotation "Is it money, credit, or both or neither of them", Bernanke and Blinder (1988) investigated the role of money and credit in aggregate demand. Unlike in the conventional IS-LM model of a two-asset economy – money and bonds, Bernanke and Blinder developed a model of three asset economy – money, bonds and loans. In this case, both borrowers and lenders choose between bonds and loans depending on the rate of return on the two assets. Note the distinction of their model to the conventional IS-LM model is the assumption that bonds and loans are not perfect substitutes which give each the ability to independently react to monetary policy actions. In estimating their model, their objective is to see whether money or credit is a better indicator of output for the US during the period 1973-1985. Using bank reserves as an indicator of monetary policy stance, their results show that money was a good indicator for future output except when money demand shocks were endogenous (more important than credit demand shocks in the 1980s). Likewise, credit was also a good predictor of future output except if credit demand shocks were endogenous. Therefore, since money demand shocks were found to be more important in the 1980s – authors quoted some papers to this effect – they concluded that credit was the better predictor of output under the review period.

After this paper, several other papers emerged whose conclusions were in contrast to what Bernanke and Blinder (1988) found. Prominent among these was Romer and Romer (1989) in their famous paper "does monetary policy matter: a test in the spirit of Friedman and Schwartz" investigated whether nominal disturbances have any real effects. They did this in a novel way by following what they called "the narrative approach" following the work of

Friedman and Schwartz. Unlike the statistical procedure of identifying causality between money and output, the "narrative approach" uses historical records such as the description of reasons that lead to certain policy decisions in identifying episodes of monetary policy shocks. They define a narrower definition of a monetary shock to mean those instances when the Federal Reserves acted to reduce inflation – when taming inflation is the only reason why the Fed acted. They did this identification using the Federal Open Market Committee (FMOC) and the Board of Government record of policy actions. From this exercise, they identified six episodes which they term monetary shocks which are later referred to as Romers' date in the literature. Using both informal correlations between these six episodes and output as well as formal statistical tests, they found that anti-inflationary monetary policy leads to a fall in industrial production (a proxy for output) of about 12% corresponding to a rise in unemployment of about two percentage points. Therefore, they concluded that demand disturbances do have real and long-lasting effects.

A year later following their publication on Romer and Romer (1989), the authors published another work probably contributing more to the debate of the importance of money and credit variables in the transmission of monetary policy. In the Romer and Romer (1990) paper, they find that the traditional money view of monetary transmission outperformed the conventional credit channel. This is because the ability for banks to raise alternative sources of funds – issuing large certificates of deposits which are subject to dismissal reserve requirements – means banks can fully insure their deposits from a monetary shock making bank loans less likely to be affected. However, monetary policy shocks are going to affect high reserve required transactional balances such that a contractionary monetary policy will raise interest rates. Consequently, monetary policy actions affect only the liabilities side of the bank balance sheet – supporting the money view. The second evidence is about the timing of the response of money-output and loan-output. Specifically, the link between lagged money and output happens to be strong and significant in times of monetary shocks while there was no link between lagged loan supply and output.

To further defend the importance of not only the "money view" channel but also "credit channel in the transmission mechanism", Bernanke and Blinder (1992) investigated whether the innovations in the federal funds rate which is widely accepted as a measure of the stance of monetary policy affects output. The objective here is to find out if monetary policy shocks work through the money and credit channel by its independent effect on loans and deposits

of the banking sector. The results show that the federal funds rate is a good measure of monetary policy stance and stands out as the best forecaster of real variables ahead of money and bond rate. In addition, monetary policy shocks work through the bank loan channel. A contractionary monetary policy leads to a decline of banks' securities holdings with little effect on loans. However, with time, the impact on loans is brunt as banks wind out old loans and refuse to make new ones. The timing in loans reaction to monetary policy shocks corresponds to that of unemployment thus suggesting the presence of the credit channel. In conclusion, they stress the importance of both money and credit channel in the transmission of monetary policy in the United States (Bernanke & Blinder, 1992).

This conclusion was quickly put to the test by Ramey (1993) who studied "how important is the credit channel in the transmission of monetary policy" in the US. Using three credit variables – total loans, bank securities holdings relative to total loans and the difference in the growth of short-term debt of small and large firms – she estimated a model that includes money (M2). The rationale behind this is to quantify how significant is the credit variables vis-à-vis output when money is accounted for. It was observed that credit variables play an insignificant role in the transmission of monetary policy to output while money has significant effects. Furthermore, in contrast to the Bernanke and Blinder (1992) paper which suggests there is portfolio readjustment following a monetary shock, Ramey (1993) opined that in fact fluctuations in bank portfolios do not have a significant impact on output once money is accounted for. The only result in this study that seems to support an independent credit channel is the findings that differences in the growth of short-term debts between small and large firms seem to amplify the shock of monetary policy from the second to the fourth year after impact. Although in a comment on this paper, Bernanke (1993) argue that Ramey's results are rather supportive of both channels if one accounts for the timing in response of loans.

This debate – by no means exhaustively presented here – oriented some economists to look more closely at the viability of the credit channel in transmitting monetary policy. To set the stage for such investigations, linking the credit markets imperfection to the transmission mechanism and the use of disaggregated micro-level data was largely seen as a remedy to put this debate to rest. Along these lines, Gertler and Gilchrist (1993) studied "the role of credit market imperfections in the monetary transmission mechanism" by examining the response to contractionary monetary policy of different kinds of credit and different types of

borrowers. Their results showed that there is a striking difference between small and large borrowers as against between bank credit and non-bank credit following a restrictive monetary stance. In other words, loans to households decline at impact of a monetary shock while loans to businesses (large firms) uptick somewhat. The reason for this is because credit market imperfections force certain types of borrowers (households and small firms) to depend on bank credit such that a cutback on loans following a monetary contraction sharply affects their access to external finance. However, the same is not true for different forms of credit. Similar conclusions were reached by previous papers (Gertler & Gilchrist, 1991; Kashyap et al., 1991). Kashyap and Stein (1994) in furthering the disaggregation of the credit channel, investigated "monetary policy and the bank lending channel". They find strong evidence of the existence of the bank lending channel in that bank credit responds to tight monetary policy which in turn impacts output. Similar results were observed by Bernanke et al. (1994).

Because of the growing interest in establishing the existence of the bank lending channel and quantifying its magnitude in the transmission mechanism, many researchers devoted attention on this subject. Oliner and Rudebusch (1995) extended the work of Kashyap et al. (1993) by investigating the existence of the bank lending channel in monetary transmission mechanism. In addition to analysing the movement of debt for small and large firms following a monetary impulse, their analysis factored in all movements in debt finance as against the narrow debt-mix used in Kashyap, Stein and Wilcox (1993) – henceforth KSW. They argue the reason for this wider debt-mix is because firms could obtain credit from finance companies, insurance companies and trade credit in addition to the longer-term certificates of deposit. Their results showed no support of the bank lending channel but accepted the presence of the broad credit channel with no special role for loans. A stronger conclusion against the bank lending channel by these authors could be found on their specific comments on KSW paper[12]. Although, KSW[13] countered this conclusion in a reply to Oliner and Rudebusch's comments and stated emphatically that the findings of Oliner and

[12] See Oliner and Rudebusch (1996) Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance: Comment

[13] See Kashyap, Stein and Wilcox (1996) Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance: Reply

Rudebusch of heterogeneities between small and large firms of their response to monetary policy impulse do not refute the existence of the bank lending channel.

On a similar setting, Bernanke and Gertler (1995) published a paper that might probably be one of the most influential papers in the debate "on the role of the credit channel in monetary policy transmission". The authors argued that contrary to earlier views of the credit channel as an independent standalone channel of monetary policy transmission, they hold the credit channel to be "factors that amplify and propagate the interest rate effects of monetary transmission". This is done with the impact of monetary policy on the net external finance premium – the wedge between internally raised financing and funds raised externally which is caused by frictions in the credit market. A monetary policy action that changes the short-term interest rate eventually changes the net external finance premium in the same direction and this filters down to the real economy through the balance sheet channel (firms and households) and the bank lending channel. A rise in short-term interest rates erodes the net worth of firms and households thus making them unlikely to access external finance – balance sheet effect of monetary transmission. Similarly, a contractionary monetary policy that leads to the draining of bank reserves means lesser funds available for lending thus a cutback on loan supply – the bank lending effect of monetary transmission. The results show that there is a positive relationship between the federal funds rate and the firm coverage ratio – the coverage ratio is used here as a measure for firm's financial condition. This implies that a rise in the funds' rate leads to an increase in the coverage ratio suggesting a weakening of the firms' balance sheet position thus suppressing its chances of obtaining external finance which leads to lower investment spending. A similar conclusion is reached for the case of households. For the bank lending channel, they observed that a tight monetary policy is accompanied by tight credit conditions suggesting the existence of the bank lending channel. However, because tight credit conditions could reflect both demand and supply conditions, they could not ascertain the significance of the bank lending channel thus concluding rather the existence of the broad credit channel.

The decade that followed showed overwhelming evidence on the significance or otherwise of the BLC of monetary transmission. Bean et al. (2002) investigated "the role of friction in monetary policy transmission mechanism" with a focus on the conventional interest rate channel, credit channel and lending channel. They noted that the stylised fact about the transmission mechanism of monetary policy in the Euro area, UK and US are largely similar.

Furthermore, in support of the broad credit channel, they find some significant evidence of credit effects on investment following a monetary shock. For the bank lending channel, the results show that the response of bank lending to monetary policy changes depends on the bank size and liquidity. Thus, they opined that when financial frictions are evident, monetary policy should be more coerced in mitigating fluctuations in output and inflation. On the same lines of research but with emphasis on the balance sheet effect of monetary transmission, Bougheas et al. (2005) studied the impact of monetary policy on firm-specific characteristics – the external finance theory. Based on a study on UK-based firms, their results show small, young and risky firms are more affected by tight monetary policy than large, old and safe firms. A similar study on Euro area firms and UK firms by De Haan and Sterken (2006) arrived at similar conclusions.

On the impact of monetary policy through the bank lending channel, Kishan and Opiela (2000) investigated the bank lending channel in the US from 1980 to 1995 accounting for bank-specific characteristics such as bank size and bank capital. The results show loan shifts for small banks, whether undercapitalised or otherwise, are significantly impacted by tight monetary policy. This result implies that bank portfolio structure should be taken into account in monetary policy decision-making because it has the potential of affecting the distributional effect of monetary policy on bank loan supply. Similar results were obtained by Kishan and Opiela (2006) where low-capital banks are severely impacted by a tight monetary policy but not expansionary monetary policy. For more empirical evidence on the bank lending channel in 'the monetary transmission mechanism' with a focus on bank-specific characteristics for both the US and Euro area see (Ashcraft, 2006; Sorensen & Werner, 2006; Pruteanu-Podpiera, 2007; Matousek & Sarantis, 2009; Franta et al., 2014; Gabriel et al, 2012; Cicarreli et al., 2010; Kucharcukova et al., 2013).

So far, the empirical evidence presented is concentrated on advanced economies – US and Euro area countries. We turn our attention to those from developing and low-income countries where, as will be seen later, the interest on the credit channel and bank lending channel of monetary transmission is alive and present. However, unlike the advanced economies with well-developed financial markets and legal environments, developing and low-income countries are characterised by shallow financial markets with acute bottlenecks in the regulatory and legal environments. This is expected to weigh on how monetary policy is transmitted to the real economy in these countries. Therefore, we expect even more

inconsistencies in terms of results on the credit channel and bank lending channel than we have seen in the case of advanced economies. See (Mishra et al, 2011, 2014) for a 'comprehensive survey on the effectiveness of monetary policy transmission mechanism in developing countries'.

Aleem (2009) studied "the transmission mechanism of monetary policy in India" from 1996 to 2007. Firstly, the results show that monetary policy actions impact output – an innovation in the overnight rate leads to a decline in Gross Domestic Product (GDP) and prices. Secondly, to account for the different channels of monetary policy through which monetary policy shocks are transmitted, the author included bank loans into a vector autoregression model with GDP, prices and overnight rate. The result shows that loans decline immediately following a monetary policy shock and the same is true for GDP and prices. The results also suggest that GDP responds more when loans are endogenized in the model than when it is not thus pointing to the importance of the bank lending channel in India. Similarly, the author included the 'Stock Exchange Index (SEI)' and the 'Real Effective Exchange Rate (REER)' to account for the asset prices channel and exchange rate channel of the monetary transmission mechanism. The results show that there is no difference in GDP response to overnight rate when SEI and REER are endogenized or exogenized suggesting that these channels are not operational in India. A similar study on Turkey by Çatik and Martin (2012) investigates the changes in monetary transmission mechanism following monetary policy reforms. They find that for the periods studied, the transmission mechanism of monetary policy changed in response to macroeconomic shocks in Turkey just like in other market economies.

In Sub-Sahara Africa (SSA), there have been several studies on the transmission mechanism following a seemingly unsettled debate on the subject. To this end, the approach is on both cross-country studies as well as country-specific studies. Having said that, we focus on the evidence on the BLC in the region in line with the objective of this research. To start with, Lungu (2007) studied the existence of 'the banking lending channel' in five Southern African Countries – known as the Southern Africa Development Community (SDC). The study employed bank-level data for the individual countries from 1990 to 2006 to perform the analysis. The results showed that monetary policy shocks are transmitted through the 'bank lending channel' in the region. In other words, the study reported the existence of the bank lending channel. However, the timing of the response to a monetary policy shock differs

from country to country signalling some heterogeneities among the countries. Similarly, Amidu (2014) investigated what influences bank lending in a panel of 24 countries in SSA. The results showed in addition to bank-specific characteristics influencing bank lending, there is strong evidence of the existence of the bank lending channel. In other words, the study revealed that a tight monetary policy restraints bank lending to the private sector in SSA and the results are statistically significant.

Ackim (2016) investigated "the impact of monetary policy through the BLC for a panel of thirty-one countries in SSA". To narrow down the analysis, the sample was further divided into economic blocks – SADC, ECOWAS, CEMAC, EAC and others[14]. The study revealed that there is strong evidence of the bank lending channel in all economic regions in SSA albeit some regional differences when it comes to other balance sheet variables. Therefore, for regions that are in monetary unions or proposing one could factor in the possibility of monetary policy actions being transmitted through the bank lending channel.

In a similar setting but on a country level, Simpasa et al, (2014) investigated "the bank lending channel of monetary policy transmission in Zambia: empirical evidence from bank-level data". Their study revealed that monetary policy is transmitted through the bank lending channel but the effect is significant for large banks. Furthermore, they showed that monetary policy effects are transmitted through prices rather than quantities and the ability of monetary policy to influence real outcomes depends on its ability to affect large banks. Chileshe (2017) did a similar study for Zambia and reached similar conclusions – evidence of the existence of the bank lending channel and bank-specific characteristics such as size and liquidity affect bank credit supply. For similar studies on monetary policy transmission mechanism in general and the bank lending channel in particular for Kenya, Malawi and Uganda, see (Cheng, 2006; Mwabutwa et al., 2013; Opolot & Nampewo, 2014).

Country-specific studies within the West Africa region apart from those featured in panel studies focused on Ghana and Nigeria. Nyumuah (2018) studied the transmission mechanism in Ghana and found that monetary policy shocks are transmitted to the real economy through the money supply channel and the exchange rate channel. However, the existence of the

[14] ECOWAS stands for Economic Countries of West African States, CEMAC stands for Central African Economic and Monetary Community and EAC stands for East African Community respectively.

interest rate channel and the credit channel cannot be established in the study. A similar conclusion on the rather weak transmission mechanism through the interest rate channel in Ghana was reached in an earlier paper by Kovanen (2011). Matousek and Solomon (2017) carried a similar work on the bank lending channel for Nigeria. Using a panel of 23 banks in Nigeria, they tested and confirmed the existence of the bank lending channel and that loan growth was more responsive to bank size and capitalisation. For studies on countries with fixed exchange rates (monetary union) in West Africa, see Samake (2010).

A summary of the empirical evidence on the monetary transmission mechanism in general and the credit and bank lending channel in particular shows the existence of voluminous literature on the topic. However, the debate on which channel is the most effective in the transmission mechanism seemed unresolved as findings remain inconsistent across regions and countries. Even in instances when results are supportive in some regions, country-specific effects such as macroeconomic environment and institutional effects such as bank characteristics often turn out to be significant in the transmission mechanism. Thus, as stated previously, we believe one way of addressing these inconsistencies in results is to have country-specific studies. This will eliminate the cross-country heterogeneities and give domestic policymakers an idea of how domestic monetary policy actions are transmitted to the real economy (Jallow, 2021). For our purpose, this is timely because to the best of our knowledge, there is no known study of the monetary transmission mechanism and bank lending channel in particular for The Gambia. Therefore, this study will bridge this gap going forward.

3.3. Financial Sector Developments and Monetary Policy Framework in The Gambia

This chapter of the dissertation presents developments in the financial system of The Gambia as well as the conduct of monetary policy since the liberalisation of the economy in the 1980s. For the sake of clarity and brevity, we discuss these developments in the following context: financial sector developments, monetary policy framework and monetary transmission and the bank lending channel in The Gambia.

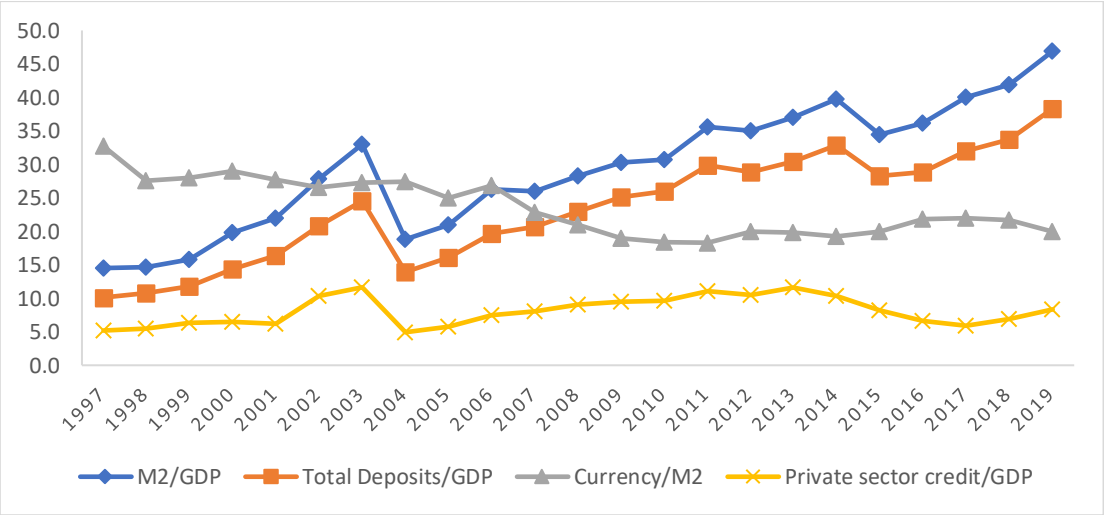
3.3.1. Financial Sector Developments

There has been a noticeable development in the financial system of The Gambia since independence albeit with some structural impediments. The financial system remains

shallow and composed of 12 commercial banks of which one is an Islamic bank, 11 insurance companies, three finance companies, 68 credit unions, 14 VISACAs[15] and 97 foreign exchange bureaus (CBG Annual Report, 2018). Commercial banks continue to dominate the financial system accounting for over 85 percent of the total assets of the financial system. Considerable financial deepening has been seen recently in that both commercial bank branches (87) and automated teller machines (69) have increased and are present around the country[16]. The banking industry is dominated by the three largest banks with 53.8 percent of total industry assets. All the commercial banks are foreign-owned except three which are Gambian-owned.

This picture is different from what obtained in 1986 shortly after the liberalisation of the economy when there were only three commercial banks and the central bank with limited financial activities (Hadjimichael et al, 1992). With the removal of the financial restrictions such as credit ceilings, interest rate controls and allowing a competitive interbank market, not only did we see an increase in the number of banks and other financial institutions but also financial intermediation have improved significantly. As shown in Figure 3.1 below, indicators of financial developments have generally improved, for example, deposits and broad money both as a ratio of GDP trend upward suggesting the presence of strong financial intermediation. However, credit to the private sector as a ratio of GDP which is an indicator of both bank intermediation and the effectiveness of monetary policy transmission to the real sector averaged below 10 percent. In fact, The Gambia and Sierra Leon have the lowest ratio of private sector credit to GDP in the West Africa Monetary Zone (WAMZ) as of 2020 (World Bank Indicators). This as will be seen later has serious consequences for the effectiveness of monetary transmissions as frictions in the financial sector could inhibit the flow of resources to the most in need sectors of the economy.

[15] Village Saving and Credit Association (VISACA)
[16] A similar trend is seen in microfinance institutions with 112 branches around the length and breadth of the country as well as 452 foreign exchange bureaus as of end 2018 (see CBG annual report, 2018).

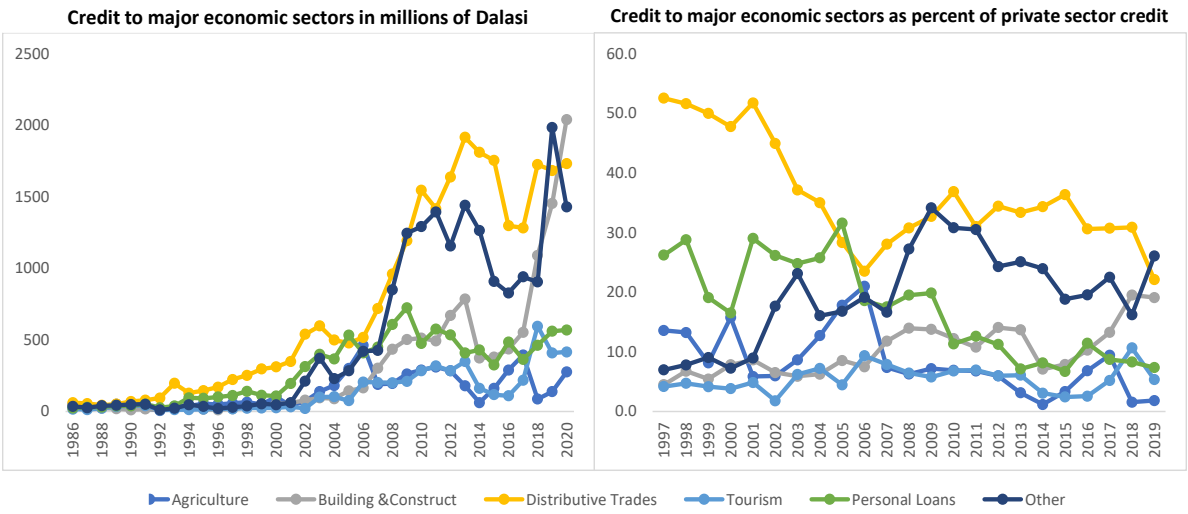


Source: Authors computations based on data from CBG data warehouse.

Figure 3.1. Indicators of Financial Sector Developments

On the other hand, innovation in the banking sector especially has gradually been moving the economy away from being a high cash-based economy as the ratio of currency with the public to broad money continues to decline.

As indicated earlier, bank credit supply to the real sector remained sluggish. This is shown in Figure 3.2 below where bank credit to major economic sectors trend upward somewhat but remains very volatile during the period reviewed. Credit to major economic sectors as a percent of total private sector credit average around 20 percent with credit to distributive trade accounting the most. However, bank credit to agriculture as a sector is not only volatile but the lowest as a share of private sector credit. This is alarming for a country whose foreign exchange earnings apart from tourism and foreign aid, depend mostly on agricultural exports receipts. Moreover, recent efforts in using demand management policies to induce private sector credit expansion have seen minimal impact pointing probably to the weak nature of policy transmission mechanism in the economy.



Source: Author's Computation based on data from CBG data warehouse

Figure 3.2. Bank Credit to Major Economic Sectors

3.3.2. Monetary Policy Framework

Like many other low-income countries particularly in Sub-Sahara Africa, The Gambia operated credit controls and fixed exchange rate regimes before 1985/6 (Hadjimichael et al, 1992). This was done by setting controls on interest rates for both bank deposits and lending as well as putting credit ceilings as a means of control on the rate of credit expansion in the economy. During this period, the Gambian dalasi was pegged to the British pound at 5 GMD to 1 pound. However, the unsustainable policies by the then government – ballooning public sector, creation of a number of state-owned enterprises which were not efficiently managed, high cost on subsidies and the over-valued domestic currency – triggered a comprehensive economic reform. The Economic Reform Programme (ERP) lead to the abandoning of the peg and credit controls as well as interest rate controls were removed. The central bank of The Gambia began to follow an indirect credit control where a ceiling on the Net Domestic Assets and Net Foreign Assets were introduced to control money supply growth and inflation.

In addition to the introduction of the interbank market and the auction of government treasury bills, in 1990 CBG introduced its bills (CBG Bills) for monetary policy purposes. While government bills were used for both deficit financing and monetary policy purposes, the introduction of the CBG Bill assumed the latter function allowing the central bank more policy independence. To strengthen this move, the CBG Act 1992, 2005 and 2018 mandates

the CBG to pursue price stability as its core objective. Subsequently, when the Monetary Policy Committee (MPC) was introduced in 2005, price stability as the core mandate of the CBG was included in their terms of reference giving the Bank the power and independence to achieve this objective. The CBG has other objectives as indicated in the amended act 2018 which include promoting and maintaining a stable exchange rate, directing and regulating the financial system, encouraging and promoting economic development and the efficient utilisation of the resources of The Gambia and supporting the general policy of the government.

To the objective of price stability, the CBG follows a monetary targeting framework with reserve money as its operating target and broad money as its intermediate target. The CBG sets targets for these variables and uses weekly open market operations to keep the targets within the desired level. In 2005, the monetary policy committee was constituted, and it became the apex body responsible for monetary policy. The Committee meets every quarter to review economic and financial sector developments and sets the monetary policy rate. CBG has other instruments like the deposit reserve requirement for banks and foreign exchange market interventions to manage liquidity and to smoothen large fluctuations in the exchange rate. In September 2019, an interest rate corridor system was launched with the introduction of standing lending and deposit facilities to improve short-term liquidity management as well as reduce interest rate volatility.

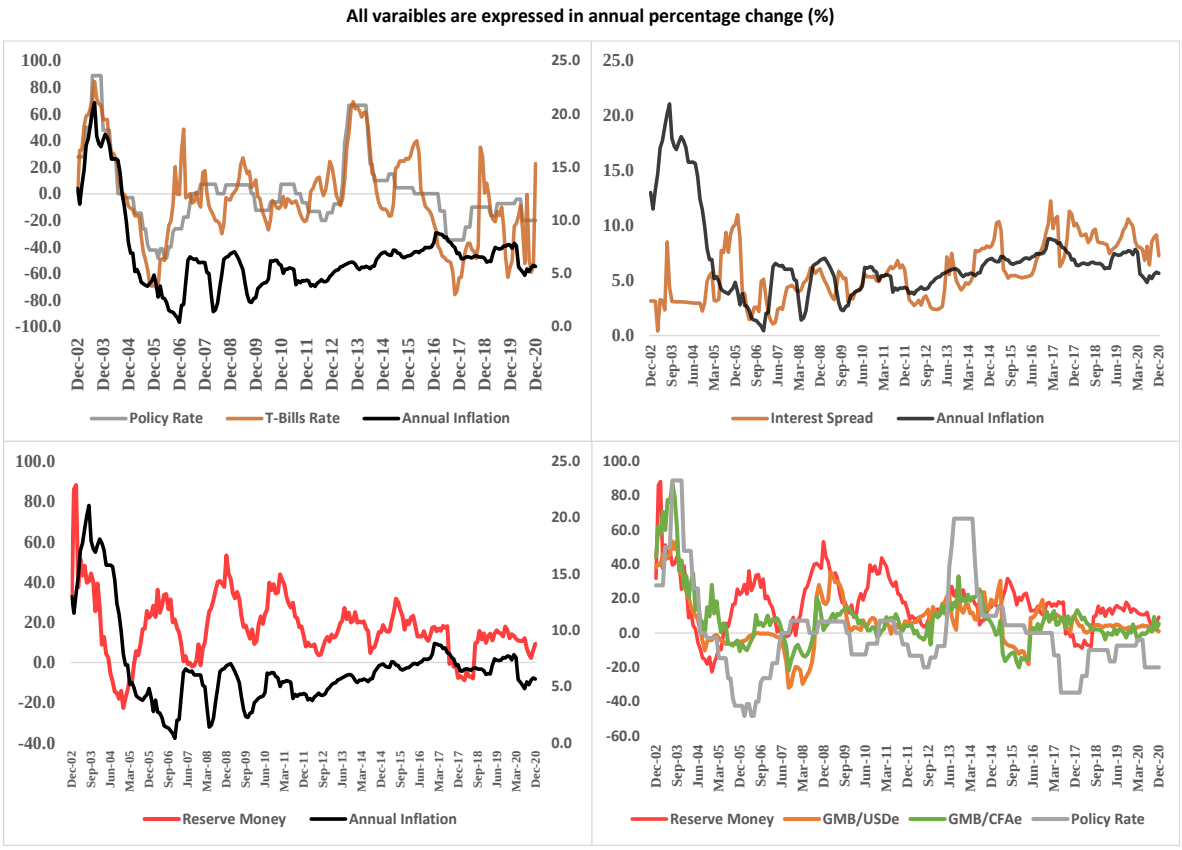
3.3.3. Monetary Policy Transmission: The Bank Lending Channel

As far as we know, there exists no empirical work on the monetary transmission in The Gambia. As a result, it is difficult to say which channel is functional and which one is not. However, the success in keeping inflation in single digits most times and the exchange rate stable suggests monetary policy actions may have real effect on the economy. To understand the effects of monetary policy actions on the economy, we look at the relationship between some indicators of monetary policy stance and price variables as shown in Figure 3.3 below. Since the CBG follows a monetary targeting framework, naturally we look at the growth in reserve money (its operating target) vis-à-vis output, inflation and exchange rate[17]. In addition, because the CBG uses its monetary policy rate (MPR) to signal its monetary policy

[17] As indicated in the CBG Act 2018, while inflation remains to be the core objective of monetary policy, the exchange rate also forms part of the broader objective of the Bank

stance, we included the MPR and the spread between the MPR and 91-day treasury bill rate[18].

The first graph on Figure 3.3 below plots the changes in the MPR, 91-day T-Bill rate and annual inflation and suggests a strong correlation between the MPR and 91-day treasury bill rate (80 percent) while the correlation between the MPR and inflation is moderate (60 percent).



Source: Author's Computation based on data from CBG data warehouse and International Financial Statistics (IFS) of the International Monetary Fund (IMF). Note, annual inflation is scaled from the right on both the first and third graphs.

Figure 3.3. Monetary Policy Indicators and Selected Macroeconomic Variables

The interest rate spread does not seem to have any correlation with inflation even though it hovers around the same average from the second half of 2005 onwards. While this is good news somewhat for monetary transmission, it does not tell the whole story.

[18] Bernanke and Blinder use a similar measure of the spread between 91-day T-Bills rate and commercial paper and found that it contains good information content in predicting economic activity.

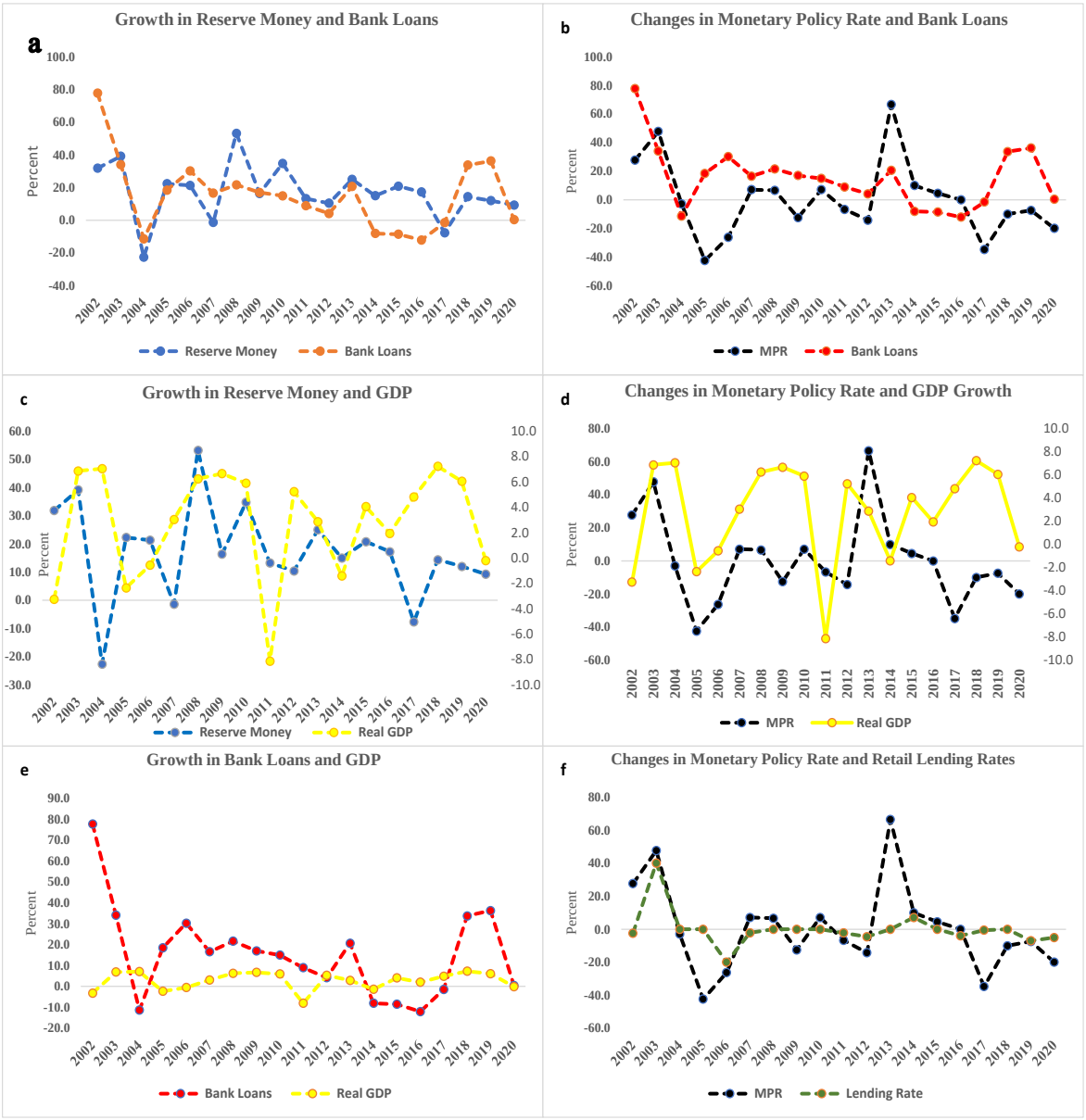
Our third and very fundamental indicator of monetary policy is the growth in reserve money which happens to be less correlated with inflation. This implies that reserve money is a weak operating target and a poor policy indicator in controlling inflation. The reason for this could be the instability of the demand for money in The Gambia (Sriram, 2009 and Nyong, 2014) and poor liquidity management framework which give rise to systemwide excess liquidity. Thus, the CBG may rely more on its MPR as an indicator of monetary policy stance. A similar conclusion is reached by looking at the last graph where growth in reserve money, MPR, the nominal exchange rate between the dalasi and US dollar and the nominal exchange rate between the dalasi and CFA franc[19]. It can be seen from Figure 3.3 that a tight monetary policy stance (an increase in the MPR) is accompanied by a strengthening dalasi and vice-visa while the same is not true for growth in reserve money.

As noted above, the transmission mechanism through the interest rate, reserve money and exchange rate channels does not show the full picture. As a result, and because our objective in this research is to investigate the existence of the bank lending channel of monetary transmission, we present next the relationship between the monetary policy indicators and bank balance sheet items and output. This will serve as preliminary synopsis of the correlation between monetary policy actions and bank loan supply as well as the correlation between bank loans and output. From Figure 3.4 below, panel (a) plots the growth rate in reserve money against the growth in bank credit to the private sector. In the beginning, the two tend to move together fairly well but later they became disjointed suggesting a weak relationship between the two. This implies that there is no strong connection between reserve money growth and bank credit. Similarly, no significant correlation between monetary policy rate and bank credit either as shown on panel (b) in Figure 3.4. In other words, even if there is some form of correlation, there appears to be a lagged response on bank credit supply following a change in monetary policy rate.

Panels (c) and (d) show the relationship of indicators of monetary policy stance and output growth. GDP growth is scaled from the right on both panels. Interestingly, there appears no systematic relations between monetary policy indicators and output. Even though this is a

[19] We included the Communatué financière d'Afrique (CFA) or African Financial Community Franc because all neighbouring countries of The Gambia are members of the common currency union whose economic activities have spillover effects on the Gambian economy.

simple visualisation of the data, it casts doubts on the potency of monetary policy in stimulating real economic activity, especially during recessions. Furthermore, the inclusion of support to economic development as part of CBG's broader objective could be questionable if there is no link between monetary policy and real activities. However, the effect of monetary policy could have been transmitted through the bank lending channel instead since monetary policy actions seem to somewhat impact bank credit supply. This relationship is shown on panels (e) and (f). Changes in bank credit supply appear to co-move with changes in output although with a lag. In other words, a change in monetary policy stance that changes the supply of bank loans will impact output after some period. Furthermore, panel (f) shows changes in monetary policy rates co-move with changes in retail lending rates of banks. Specifically, changes in the MPR filter down to the pricing of banks' financial products which is good news for the potency of monetary policy.



Source: Author's Computation based on Data from CBG Data warehouse

Figure 3.4. The Relationship Between Monetary Policy Indicators and Real Sector Variables

3.4. Methodology and Data

This chapter presents the analytical models as a foundation for the basis of the analysis conducted in this research. It highlights the different techniques used in addressing the three main objectives of the study. Lastly, the chapter concludes with the data used and its sources.

3.4.1. Methodology

In this study, we adopted and estimated three different versions of the vector autoregressive (VARs) models in response to the three main objectives of this research – a Structural VAR or SVAR, a Panel SVAR, or PSVAR and a BVAR for robustness check. Following the introduction of VAR models for policy analysis by Sims (1980a,1980b, 1986, 1992) it was established that VAR models are in fact appropriate for policy analysis contrary to their ad-hoc use for forecasting as emphasized by Sargent (1979,1984) and by Leamers (1985) among others. Though the premise of VAR models rests on their atheoretic nature, by performing some identification restrictions that are embedded with economic theory, VAR models were found to be very useful for macroeconomic analysis for policymaking. Against this background, several empirical pieces of research on monetary policy and monetary transmission, in particular, made use of VARs to account for the impact of exogenous monetary shocks on macroeconomic variables see (Bernanke & Blinder, 1998, 1992; Romer & Romer, 1989,1990; Ramey, 1993; Gertler & Gilchrist, 1993; Bernanke et al., 1994; Bernanke & Gertler, 1995; Bernanke & Mihov, 1998; Christiano et al., 1999). Cognizant of the success of this research in accounting for the impact of monetary innovations on macroeconomic variables, the use of VARs has become a practice for policymakers, academicians and other researchers. Therefore, we capitalise on this success story and adopt the VAR methodology for this study.

3.4.1.1. The Structural VAR or SVAR Model

Specifically, the SVAR methodology is employed to help address objectives **i, ii** (partly) and **iii** of this study – the detail of how we achieved this is delayed for section 3.5. Objective **i** is whether monetary policy actions have any real effect on the economy. In other words, whether exogenous monetary policy shocks have any impact on output and prices. Part of objective **ii** is to investigate whether exogenous monetary policy impacts bank credit and whether innovation in bank credit has any effect on real GDP. On the other hand, objective

iii seeks to know the distributional effect of exogenous monetary policy shocks on sector-specific credit supply. Therefore, the SVAR is employed to help answer these objectives.

i. Theoretical specification of the SVAR model

This study employs a five-variable VAR(p) model specified as below. All variables are treated as endogenous variables and each equation in the VAR regress each variable on its lag and lags of other endogenous variables (see Sims, 1986). A structural representation of such a system is given below.

$$\Lambda Y_t = B(L)Y_t + \varepsilon_t \qquad (1)$$

Where $Y_t = \begin{bmatrix} y_{1,t} \\ y_{2,t} \\ y_{3,t} \\ y_{4,t} \\ y_{5,t} \end{bmatrix}$ $Y = B_1 \begin{bmatrix} y_{1,t-1} \\ y_{2,t-1} \\ y_{3,t-1} \\ y_{4,t-1} \\ y_{5,t-1} \end{bmatrix} + B_2 \begin{bmatrix} y_{1,t-2} \\ y_{2,t-2} \\ y_{3,t-2} \\ y_{4,t-2} \\ y_{5,t-2} \end{bmatrix} + \ldots\ldots\ldots + B_p \begin{bmatrix} y_{1,t-p} \\ y_{2,t-p} \\ y_{3,t-p} \\ y_{4,t-p} \\ y_{5,t-p} \end{bmatrix} + \varepsilon_t$

$$\Lambda_1 = \begin{bmatrix} 1 & \gamma_{12} & \gamma_{13} & \gamma_{14} & \gamma_{15} \\ \gamma_{21} & 1 & \gamma_{23} & \gamma_{24} & \gamma_{25} \\ \gamma_{31} & \gamma_{32} & 1 & \gamma_{34} & \gamma_{35} \\ \gamma_{41} & \gamma_{42} & \gamma_{43} & 1 & \gamma_{45} \\ \gamma_{51} & \gamma_{52} & \gamma_{53} & \gamma_{54} & 1 \end{bmatrix}, \; B = \begin{bmatrix} b_{11} & b_{12} & b_{13} & b_{14} & b_{15} \\ b_{21} & b_{22} & b_{23} & b_{24} & b_{25} \\ b_{31} & b_{32} & b_{33} & b_{34} & b_{35} \\ b_{41} & b_{42} & b_{43} & b_{44} & b_{45} \\ b_{51} & b_{52} & b_{53} & b_{54} & b_{55} \end{bmatrix} \quad \textit{and} \quad \varepsilon_t = \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \\ \varepsilon_{4,t} \\ \varepsilon_{5,t} \end{bmatrix}$$

Λ is (m x m) invertible matrix capturing the contemporaneous relations among the endogenous variables, *B(L)* is (m x m) polynomial lag operator containing the lags of the endogenous variables describing the dynamics in the model, ε_t is a vector of (m x 1) matrix of structural innovations which is assumed to follow $E(\varepsilon_t) = 0$, and the variance-covariance matrix of the structural disturbances is given as $\Sigma_e = E(\varepsilon_t \varepsilon_t^{\mathrm{I}})$. As can be seen above, Y_t is (m x 1) matrix containing endogenous variables in the model. Pre-multiplying (1) by Λ^{-1} gives us the corresponding reduced form of (1) as in (2).

$$Y_t = \Lambda^{-1}B(L)Y_t + \Lambda^{-1}\varepsilon_t \qquad \text{or}$$

$$Y_t = B^*(L)Y_t + \mu_t \qquad (2)$$

Where $B^* = \Lambda^{-1}B$ and $\mu_t = \Lambda^{-1}\varepsilon_t$ as the reduced form innovations. As before, the variance-covariance matrix of the reduced form disturbances can be written as $\Sigma_\mu = \Lambda^{-1}\Sigma_e\Lambda^{-1'}$. The reduced form disturbances are assumed to be uncorrelated with the endogenous variables however, it is possible to have cross-correlations in the reduced form disturbances among equations. Thus, to be able to express Y_t as a function of the current and past shocks of the reduced form innovations, we re-write (2) in its moving average form.

$$Y_t - B^*(L)Y_t = \mu_t \quad ,$$

$$Y_t\left(I - B^*(L)\right) = \mu_t \quad ,$$

$$Y_t = \left(I - B^*(L)\right)^{-1}\mu_t$$

$$Y_t = C(L)\mu_t \qquad (3)$$

Where $C(L) = \left(I - B^*(L)\right)^{-1}$ assuming this polynomial is invertible. In matrix notation, equation 3 can be represented as follows.

$$Y_t = \begin{bmatrix} y_{1,t} \\ y_{2,t} \\ y_{3,t} \\ y_{4,t} \\ y_{5,t} \end{bmatrix} = \begin{bmatrix} \mu_{1,t} \\ \mu_{2,t} \\ \mu_{3,t} \\ \mu_{4,t} \\ \mu_{5,t} \end{bmatrix} + \begin{bmatrix} c_{11,1} & c_{12,1} & c_{13,1} & c_{14,1} & c_{15,1} \\ c_{21,1} & c_{22,1} & c_{23,1} & c_{24,1} & c_{25,1} \\ c_{31,1} & c_{32,1} & c_{33,1} & c_{34,1} & c_{35,1} \\ c_{41,1} & c_{42,1} & c_{43,1} & c_{44,1} & c_{45,1} \\ c_{51,1} & c_{52,1} & c_{53,1} & c_{54,1} & c_{55,1} \end{bmatrix} \begin{bmatrix} \mu_{1,t-1} \\ \mu_{2,t-1} \\ \mu_{3,t-1} \\ \mu_{4,t-1} \\ \mu_{5,t-1} \end{bmatrix} + \begin{bmatrix} c_{11,2} & c_{12,2} & c_{13,2} & c_{14,2} & c_{15,2} \\ c_{21,2} & c_{22,2} & c_{23,2} & c_{24,2} & c_{25,2} \\ c_{31,2} & c_{32,2} & c_{33,2} & c_{34,2} & c_{35,2} \\ c_{41,2} & c_{42,2} & c_{43,2} & c_{44,2} & c_{45,2} \\ c_{51,2} & c_{52,2} & c_{53,2} & c_{54,2} & c_{55,2} \end{bmatrix} \begin{bmatrix} \mu_{1,t-2} \\ \mu_{2,t-2} \\ \mu_{3,t-2} \\ \mu_{4,t-2} \\ \mu_{5,t-2} \end{bmatrix} + \ldots . \quad (4)$$

To demonstrate the interpretation of the matrix polynomial C(L), we know the coefficient $C_{11,2}$ can be expressed as $\frac{\partial y_{t+2}}{\partial \mu_{1,t}} = C_{11,2}$ thus, $C_{11,2}$ represents the response of $Y_{1,t}$ in period t+2 to a unit innovation in the shock term μ_1 occurring in period t holding all other shocks at all other dates constant. Therefore, the response of Y_i to a unit change in innovation μ_i is referred to as the Impulse Response. However, since the system in (3) is not yet identified, the impulse responses given by C do not have any economic meaning. In fact, it just represents a linear combination of the structural innovations ε_is given by $\mu_i = \Lambda^{-1}\varepsilon_i$. Therefore, for the interpretation of the impulse responses to be meaningful, we decompose 3 into the following:

$$Y_t = C(L)\Lambda^{-1}\Lambda\mu_t \qquad \text{or} \qquad Y_t = C^*(L)\varepsilon_t \tag{5}$$

Where $C^*(L) = C(L)\Lambda^{-1}$ and $\varepsilon_t = \Lambda\mu_t$. Now $C^*(L) = C(L)\Lambda^{-1}$ contains the impulse response of all the endogenous variables to the structural innovations captured in ε_t. Since the innovations in ε_t have an economic interpretation, we can say the impulse response given by C^* can also be interpreted in a meaningful way. However, identification will require imposing some restrictions on the matrix Λ which we discuss below.

ii. Identification in the SVAR

As noted above, identification will mean restricting elements in the Λ matrix as well as the variance-covariance matrix. This is important if we want to isolate pure exogenous shocks and the responses of endogenous variables to such shocks. Researchers in monetary transmission mechanisms often adopted the Cholesky factorisation approach which involves the restriction of the B matrix to be a diagonal matrix and matrix Λ is restricted to a lower triangular with a unit diagonal. The Cholesky factorisation is only one possible identification strategy in SVAR and should only be used when the implied recursive ordering is based on economic theory (Gottschalk, 2001). Because of this, alternative identification strategies which include non-recursive restrictions on matrix Λ as well as strategies that involve imposing long-run restrictions have been practiced by researchers in SVAR identification (see Bernanke and Mihov, 1986; Blanchard, 1989; Blanchard and Quah, 1989). This study employs both the recursive and non-recursive identification strategies for robustness check in results.

Before proceeding with the discussion of the two identification strategies, we re-write Equation 1 to contain exogenous variables – the model setup and analysis up to this point remain. As suggested by many studies, controlling for the effect of exogenous variables when modelling monetary policy transmission is crucial given that domestic policies in small open economies react to exogenous shocks. To this end, we capture the structure of The Gambian economy in the following VAR model.

$$\Lambda Y_t = B(L)X_t + \varepsilon_t \tag{6}$$

Where, as before, Λ and B(L) are (m x m) matrix polynomials in lag operators, Y_t is (m x 1) vector of domestic endogenous variables, X_t is (m x 1) vector of exogenous variables and ε_t is (m x 1) vector of structural shocks with $Var(\varepsilon_t) = \Sigma_e$. Again, the variance of the structural disturbances is assumed to be a diagonal matrix. The reduced form of 6 is given as in (7) corresponding with what we obtained in (2).

$$Y_t = A(L)Y_t + C(L)X_t + u_t \quad (7)$$

Where A(L) and C(L) are matrix polynomials and u_t is a vector of the reduced form innovations with $Var(u_t) = \Sigma_u$. The disturbances are related here as was in (2) and given by

$$\Sigma_u = \Lambda^{-1}\Sigma_e\Lambda^{-1'} \quad (8)$$

From (8), we know that there is *m x (m+1)* estimated parameters in Σ_e but *m x (m + 1) / 2* parameters in Σ_u. Therefore, normalisation of the diagonal elements of Λ will require *m x (m – 1) / 2* more restrictions to identify the model based on economic theory. This is presented next.

Cholesky Decomposition (Recursive) Approach

In this study, the exogenous variables included in the vector X_t are World Commodity Prices Index(WCPI), US Gross Domestic Product (GDP) and Federal Funds Rate (FR). The WCPI is included to account for shocks in global inflation which authorities in The Gambia pay close attention to during monetary policy decision making. We have alternated WCPI with World Food Price Index (WFPI) in some of the VARs estimated here because WFPI happens to be another very closely watched index by CBG in its policy-making process. The US GDP is included to control for external demand shocks while the Funds Rate is included to account for external financial conditions. Like many other small open economies, domestic policies cannot influence the external variables but the reserve is possible. Thus, the above-mentioned variables are exogenized in this study.

On the domestic front, Gross Domestic Product (GDP), Consumer Price Index (CPI), Bank Loans (BL), Monetary Policy Rate (MPR) and Nominal Effective Exchange Rate (NEER)

are included as endogenous variables. This will be the baseline model which corresponds to our objective **i**. During answering objective **iii**, sectoral credit supply will replace bank loans. Because of the difficulty of obtaining a measure of monetary policy stance, we will experiment with other policy instruments such as growth in reserve money, 91-day T-bill rate and Net Open Market Operation and the results will be available in the appendixes. In essence, we have the following vectors of exogenous and endogenous variables.

$$X'_t = [WCPI_t, WFPI_t, usGDP_t, usFR_t] \quad (9)$$

$$Y'_t = [GDP_t, CPI_t, BL_t, MPR_t, NEER_t] \quad (10)$$

Thus, the Cholesky decomposition imposes a recursive restriction with the ordering as in (10). This assumes that output, prices and bank loans do not respond contemporaneously (within the same period let's say a month, quarter, etc) to exogenous monetary policy shocks while the nominal effective exchange rate responds contemporaneously to monetary policy innovations. This kind of argument is widely used by researchers in monetary policy transmission (Bernanke and Blinder, 1992; Bernanke and Mihov, 1986; Gertler and Gilchrist, 1993; Bernanke and Gertler, 1995; Christiano et al,1999; Cheng, 2007). Thus, the ordering of the variables is very important for this identification strategy. Therefore, this strategy requires the estimation of the reduced form and computing the Cholesky factorisation relating the reduced form innovations and structural shocks of the model as shown below.

$$\begin{bmatrix} \varepsilon_t^{GDP} \\ \varepsilon_t^{CPI} \\ \varepsilon_t^{BL} \\ \varepsilon_t^{MPR} \\ \varepsilon_t^{NEER} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ \gamma_{21} & 1 & 0 & 0 & 0 \\ \gamma_{31} & \gamma_{32} & 1 & 0 & 0 \\ \gamma_{41} & \gamma_{42} & \gamma_{43} & 1 & 0 \\ \gamma_{51} & \gamma_{52} & \gamma_{53} & \gamma_{54} & 1 \end{bmatrix} \begin{bmatrix} u_t^{GDP} \\ u_t^{CPI} \\ u_t^{BL} \\ u_t^{MPR} \\ u_t^{NEER} \end{bmatrix} \quad (11)$$

Non-recursive Approach

As noted above, the non-recursive approach is widely used as an alternative approach of identification in SVAR. In this approach, the contemporaneous response between the monetary policy indicator and other endogenous variables is allowed based on economic

theory. This runs counter to the recursive approach. In essence, this study imposes the following restrictions.

$$\begin{bmatrix} \varepsilon_t^{GDP} \\ \varepsilon_t^{CPI} \\ \varepsilon_t^{BL} \\ \varepsilon_t^{MPR} \\ \varepsilon_t^{NEER} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ \gamma_{21} & 1 & 0 & 0 & 0 \\ \gamma_{31} & \gamma_{32} & 1 & \gamma_{34} & 0 \\ 0 & 0 & \gamma_{43} & 1 & \gamma_{45} \\ \gamma_{51} & \gamma_{52} & \gamma_{53} & \gamma_{54} & 1 \end{bmatrix} \begin{bmatrix} u_t^{GDP} \\ u_t^{CPI} \\ u_t^{BL} \\ u_t^{MPR} \\ u_t^{NEER} \end{bmatrix} \quad (12)$$

Equation one in (12) imposes that output response only with a lag to contemporaneous shocks to all other endogenous variables in the system. This argument is plausible, especially for officers at monetary authorities in developing and low-income countries who do not observe GDP series in the same period they make policy decisions. The same is true for equation two which implies a sluggish response of prices to bank loans, monetary policy rate and nominal effective exchange rate. Equation three responds contemporaneously to all endogenous variables except the exchange rate. In other words, monetary policy is assumed to affect bank loans contemporaneously suggesting the presence of an active bank lending channel. Equation four can be taken as the monetary policy reaction function where the central bank reacts to output and price with a lag. However, monetary policy response contemporaneously to bank loans and developments in the exchange rate market. The last equation imposes that the nominal effective exchange rate acts as the shock absorber of the economy in the short run by responding contemporaneously to all shocks in the economy.

In line with objective **i** and part of objective **ii** of this paper, an exogenous shock in the central bank policy rate (MPR) is expected to impact output and prices albeit with some lag. This is important because, in addition to inflation being the core objective of monetary policy in The Gambia, output forms part of a broader objective of CBG. Thus, a response of output and prices to monetary policy shocks indicate our choice of the monetary policy rate as an indicator of monetary policy stance is plausible. Following the literature on the credit and bank lending channels of monetary transmission, we expect an exogenous shock (a tight monetary stance corresponding to a rise in the MPR) on monetary policy to dampen bank loans to the private sector. This will serve as evidence of the bank lending channel in this study. Furthermore, an exogenous monetary policy shock is expected to impact the bank credit supply to major economic sectors in The Gambia. This is important for the

distributional effect of monetary policy actions on the sectoral credit supply which is in line with objective **iii** of this study. Finally, a positive exogenous shock of the monetary policy rate is expected to strengthen the Gambian dalasi (no exchange rate puzzle).

3.4.1.2. The Panel SVAR or PSVAR Model

Before presenting the PSVAR model and its discussion, it is important to lay the foundation that motivated this approach here. To be able to address part of objective **ii** of this research – which is to investigate the impact of bank-specific characteristics in the bank lending channel of monetary transmission – data on bank-specific characteristics such as size, liquidity, capitalisation among others are obtained for a panel of 12 commercial banks for the period spanning 2006 to 2020. The inclusion of bank-specific characteristics in studying the credit and 'bank lending channels of monetary transmission' have been widely employed and found to be significant determinants of bank credit/loan (Kashyap & Stein, 1994, 1995; Sorensen & Werner, 2006; Matousek & Sarantis, 2009; Kishan & Opiela, 2000, 2005; Amidu, 2014; Matousek & Solomon, 2018; Opolot & Nampewo, 2014; Chileshe, 2017; Simpasa et al., 2014). In addition, this sort of analysis is done to reveal the distributional effect of monetary policy actions on banks which is very fundamental for monetary policymaking, especially for The Gambia whose financial system is mainly composed of commercial banks (see chapter 3 above). Thus, this study also adopted this procedure with the view of broadening the investigation of the bank lending channel of monetary transmission.

A significant number of studies that included bank-specific characteristics in the study of monetary transmission through the bank lending channel made use of the Generalised Methods of Moments (GMM) proposed by Arellano and Bonds (1991) and its subsequent extensions (Arellano & Bover, 1995; Blundell & Bond, 1998). Among other things, the main idea of employing this procedure is to solve the endogeneity problem arising from the inclusion of the lagged dependent variable as a regressor[20]. However, the implementation of

[20] Many studies of 'the bank lending channel of monetary transmission' included the lagged value of bank credit/loan to account for the sluggish response of bank credit to monetary policy shock as well as to model the dynamic response of bank credit to bank-specific characteristics. Moreover, the inclusion of the lagged-dependent variables has been found to be always significant suggesting the current variation in bank credit is explained by its previous value. Failure to include it thus will result in misspecification problems.

the GMM or system GMM requires a large cross-section normally larger than the time dimension i.e., N > T where N is the number of cross-sections and T is the time dimension. Even though more recent work on modelling dynamic panel data has come up with alternative estimation procedures that work well with panel data of smaller cross-section (Allison et al., 2017), this remains to be a problem for our case. In other words, our panel data have both a small cross-section (12 banks) and a shorter time (15 years) thus the use of GMM (Arellano-Bond or AB approach) could lead to inefficient estimates even though the estimated parameters are consistent (Allison et al., 2017). Therefore, we opted for the panel SVAR model which permits both cross-section and time-series dimension in the data without penalising smaller samples. The details and suitability of the PSVAR model for such studies will be discussed below during the specification of the model.

i. The Structural Panel VAR (PSVAR) Model.

The use of panel vector autoregression in macroeconomics analysis shows a dramatic increase after the 2008-2009 great financial crises. Policymakers around the world realised that there are more interdependencies between world economies than was presumed in that a shock in one country is transmitted globally. Toward this end, panel VARs have been employed to study these interdependencies because of their ability to uncover the transmission of impulses between economies (using the impulse response functions of their VAR components) as well as accounting for the presence of dynamic heterogeneities among economies. Because of the availability and improved data quality across countries and the development of powerful econometric soft wares that allow for the estimation of such large models, macroeconomic research has taken a step in this area.

However, most studies that employed the panel VAR methodology either used the fixed effect estimation procedure or the instrumental variables with the Arellano-Bond GMM estimation approach. This is done to account for the time-invariant cross-sectional heterogeneities and the dynamic interdependencies among members of the panel. While the fixed effect OLS estimation can account for the time-invariant heterogeneities in the cross-sections, it does not solve the problem of endogeneity arising from the dynamic nature of the model. Moreover, the fixed effect estimation suffers from the Hurwicz-type bias as is the case in panel data to have large cross-sections with small-time series (Nickel, 1981). As noted in the previous section, to overcome the fixed effect OLS estimator bias, researchers

employ the Arellano-Bond and its extensions GMM estimation approach. However, the use of instrumental variables leads to less efficient estimates than those from the OLS estimators. Moreover, the GMM approach is biased in small samples which our current study falls within. For more on the application of panel VAR in macroeconomics and the use of fixed-effect OLS estimators and GMM instrumental variable approach in estimating panel VARs, see (Gilchrist & Himmelberg, 1998; Stanca & Gallegati, 1999; Canova et al., 2006, Canova & Cicalleri, 2013; Love & Zicchino, 2006; Goodhart & Hofmann, 2008; Katrin & Stefan, 2008; Mishra et al., 2014, Anarfo et al., 2019) among others.

This study, therefore, employs the novel structural panel VAR method developed by Pedroni (2013) which does not only account for the fixed effect in the panel but also is suitable for panel dataset of small sample size – fitting well for our study. According to Pedroni (2013), this approach is important for two reasons. Firstly, it addresses the heterogeneities – both the fixed effect features as well as the dynamic features – among the cross-sectional units of the panel. Secondly, it also accounts for the interdependence between members in the panel since each unit in the panel responds to both the member-specific idiosyncratic shocks as well as shocks common to all cross-sectional units. This fits well into our objective in this section of the study (part of objective **ii** of this paper). In that, even though banks share a common market, the possibility of them being heterogeneous exist stemming from managerial styles and level of influence of the parent bank among others. Furthermore, decomposing how banks respond to an exogenous monetary policy shock into bank-specific and common shocks will provide clarity to policymakers on how monetary policy actions are transmitted. More importantly, the inclusion of bank-specific characteristics such as size, liquidity and capitalisation will permit us to see if there exists any variation in response to monetary policy shocks based on bank characteristics.

Therefore, the representation of the panel SVAR as in Pedroni (2013) capturing our analysis of monetary policy innovation and bank lending (lending channel of monetary transmission) while accounting for bank-specific characteristics is presented next. We do this by applying the structural approach from the SVAR literature on the heterogenous unbalanced panel.

Let y_{it} be an unbalanced panel with *m x 1* vector of endogenous variables where i = 1,……,N and *m* is the number of endogenous variables (4, 5 or 6 in our case depending on the VAR being estimated) such that $y_{m,it}$, m = 1,……..M. Since we are dealing with an unbalanced

panel, t = 1,……T_i representing the time horizon. In line with Pedroni (2013), to account for bank-specific fixed effects into our representation, we demean the data by taking the average of $y_{m,it}$ overtime for each cross section and for each endogenous variable.

That is $\bar{y}_{m,it} = \sum_{t=0}^{T_i} y_{m,it} \Big/ T_i$ for all i and m such that $z_{it} = y_{m,it} - \bar{y}_{m,it}$. Therefore, let $z_{it} = [gdp_{it}, cpi_{it}, mpr_{it}, bl_{it}, neer_{it}]'$ be the demeaned data on gross domestic product *(gdp)*, consumer price index *(cpi)*, the central bank monetary policy rate (MPR), bank loans *(bl)* captured here as commercial banks private sector credit and the nominal effective exchange rate (neer)[21]. Following Mishra et al (2014) and Roch (2019) as in Pedroni (2013), the first step is to calculate the cross-sectional averages of the differenced demeaned data as $\Delta \bar{z}_{it} = \sum_{i=1}^{N_t} \Delta z_{it} \Big/ N_t$. Thus, the unobserved shocks which are taken to be orthogonal to each other as in standard SVAR literature, are the main driving force of the variations in these data. The technique forwarded by Pedroni (2013) is to decompose these unobserved shocks into common and idiosyncratic shocks such as $v_{it} = \pi_i \bar{v}_t + v_{it}$ where V_{it} are the composite shocks, $\bar{v}_t$ are the common shocks, v_{it} are the bank-specific idiosyncratic shocks and π_i is a diagonal matrix of bank-specific loadings that measures the relative importance of common shocks for a specific bank in the panel.

According to Pedroni (2013), these shocks are independent from each other overtime but could be cross-sectionally dependent. From the decomposition of these shocks as shown above, we can deduce that the moving average representation of the composite shocks to be $\Delta z_{it} = A_i(L) v_{it}$ where $A_i(L) = \sum_{t=0}^{K_i} A_{i,t} L^t$. Using the time effect and the moving average representation of the common shock $\Delta \bar{z}_{it}$, we can show bank-specific response to the common shock. To this end, since we know that $\Delta \bar{z}_{it} = \sum_{i=1}^{N_t} \Delta z_{it} \Big/ N_t$, substituting for Δz_{it}

[21] These endogenous variables are those that appear in the baseline VAR. Bank-specific characteristics will be added to these variables one at a time to explore the possible variation in bank responses to a monetary shock.

we have $\Delta \bar{z}_{it} = N_t^{-1} \sum_{t=0}^{N_t} A_i(L)\nu_{it}$. Since the structural shocks are given as $\nu_{it} = \pi_i \bar{\nu}_t + \nu_{it}$, then it follows that $\Delta \bar{z}_{it} = N_t^{-1} \sum_{t=0}^{N_t} A_i(L)\left[\pi_i \bar{\nu}_t + \nu_{it} \right]$ and

$\Delta \bar{z}_{it} = (N_t^{-1} \sum_{t=0}^{N_t} A_i(L)\pi_i)\bar{\nu}_t + N_t^{-1} \sum_{t=0}^{N_t} A_i(L)\nu_{it}$. As noted in Pedroni (2013), the second term on the RHS vanishes as $N_t \to \infty$ thus leaving us with the first term $A_i(L)\pi_i$ which represents bank-specific response to a common shock and this is captured as $\bar{A}_i = A_i(L)\pi_i$. The next strategy is to try and recover both the composite and common shocks from the time effect cross-sectional averages and then used these to estimate the idiosyncratic shocks and member-specific loadings. To this end, we estimate a reduced form VAR on the differenced data for the structural composite shocks as $D_i(L)\Delta z_{it} = u_{it}$ where $D_i(L) = I - \sum_{j=1}^{P_I} D_{ij}L^j$. In deciding the appropriate lag length, we adopted the general to specific lag selection criteria as suggested by Pedroni (2013). This is done for all cross-sectional units (banks) in the panel. Similarly, the same procedure is conducted to recover the structural common shocks and the MA reduced form is $\bar{D}(L)\Delta \bar{z}_t = \bar{u}_t$.

Relating the structural shocks and the reduced form innovations is based on the identification strategy employed as in standard SVAR literature. We begin by mapping the reduced form composite shocks to the structural form composite shocks and extending the same process for the common shocks. The MA of the reduced form of the composite shocks can be represented as $\Delta z_{it} = F_i(L)u_{it}$ where $F_i(L) = D_i(L)^{-1}$. Since the structural form of the composite shocks as noted above is represented as $\Delta z_{it} = A_i(L)\nu_{it}$, then the mapping of the reduced form and structural form of the composite shocks proceeds as $\Delta z_{it} = F_i(L)u_{it} = A_i(L)\nu_{it}$. Given that $F_i(0) = D_i(0)^{-1} = I$, evaluating $L = 0$ gives us $u_{it} = A_i(0)\nu_{it}$. This in turn gives us the responses of both the reduced form and structural form as $F_i(L)A_i(0) = A_i(L)$. Similarly, evaluating $L = 1$ gives us the steady-state responses of the reduced form and the structural form as $F_i(1)A_i(0) = A_i(1)$.

Applying the same procedure to relate the reduced form and structural form of the common shocks will lead to a similar outcome. Specifically, evaluating $L = 0$, the responses of the reduced form and the structural form to common shocks is given as $\overline{F}(L)\ \overline{A}(0) = \overline{A}(L)$. Similarly, for $L = 1$, the steady states' responses to common shocks is $\overline{F}(1)\ \overline{A}(0) = \overline{A}(1)$. To sum it up, according to Pedroni (2013), the orthogonality of the composite shocks relates the reduced form long-run covariance matrix and the steady-state responses as $\Omega_i(1) = A_i(1)A_i(1)'$ and $\overline{\Omega}(1) = \overline{A}(1)\overline{A}(1)'$ for the common shocks. The corresponding short-run equivalents for both the composite and common shocks are $\Omega_{u,i}(0) = A_i(0)A_i(0)'$ and $\overline{\Omega}_{\bar{u}}(0) = \overline{A}(0)\overline{A}(0)'$ respectively. If the restrictions on the impact matrix is recursive, then this is the same as the Cholesky orthogonalization.

Haven estimated the reduced form for both the composite and common shocks and using these estimates to obtain the structural shocks (v_{it} and $\bar{v}_t$) and structural responses $A(L)$ & $\overline{A}(L)$, we can now obtain the idiosyncratic shocks v_{it} and loading matrices π_i for each member of the cross-section in a straightforward way. According to Pedroni (2013), this could be achieved by running an OLS regression on the decomposed structural shocks ($v_{it} = \pi_i \bar{v}_t + v_{it}$) or equivalently calculating the sample correlates between v_{it} and $\bar{v}_t$.

Finally, we calculate the impulse response to the composite structural shocks as $A_i(L)v_{it} = A_i(L)\left[\pi_i \bar{v}_t + (I - \pi_i\pi_i')^{1/2} v_{it}\right] = A_i(L)\pi_i \bar{v}_t + A_i(L)(I - \pi_i\pi_i')^{1/2} v_{it}$ where $\overline{A}_i(L) = A_i(L)\pi_i$ denotes bank-specific responses to unit common structural shocks. Similarly, $A_i(L) = A_i(L)(I - \pi_i\pi_i')^{1/2}$ represents bank-specific responses to unit idiosyncratic bank-specific structural shocks. The idiosyncratic shocks are re-scaled as $v_{it}^{*} = (I - \pi_i\pi_i')^{1/2} v_{it}$ to ensure the impulse responses to both common and idiosyncratic shocks are identical.

In this study, we employed the estimation algorithm for panel SVAR developed by Pedroni (2013) and available as an add-in in EViews econometric software (EViews 12). To this end, the impulse response graphs under this section are generated using this algorithm in EViews.

3.4.2. Data

3.4.2.1. Data used for SVAR (Baseline and Extensions)

For the SVAR estimations, this study employs quarterly data on real GDP (RGDP), consumer price index (CPI), monetary policy rate (MPR) and nominal effective exchange rate (NEER) from 1998Q1 to 2020Q4. The sample choice is based on the availability of data and also it covers the period of increased financial intermediation (see section 3.3.1) in The Gambia. Furthermore, to explore 'the bank lending channel of monetary transmission', bank loans (BL) here measured as private sector credit, commercial banks average lending rate and commercial bank's loans to major economic sectors (loans to agriculture, building and construction, distributive trade, tourism and personal loans) were included in the SVAR extensions. Real GDP which is sourced from the World Bank Economic Indicators was only available in annual series therefore we employ the Denton method to interpolate the annual series into quarterly series. CPI, MPR and NEER are sourced from the International Financial Statistics (IFS) of the IMF while commercial banks loans to the private sector, average lending rates and sectoral loans were obtained from the CBG data warehouse. Apart from real GDP, the quarterly series of all the variables are the averages of the three months within the quarter.

We also included exogenous variables as a way of accounting for external economic and financial developments that could weigh on the Gambian economy. Toward this end, external demand is proxied by US real GDP while the US Federal Funds rate is employed to capture global financial conditions and all variables were obtained from the Federal Reserve Economic data of St Louis Federal Reserve. The world commodity price index which is a closely watched index by CBG was included to account for global commodity price shocks and was sourced from the World Indicators of the World Bank. A full description of the data and its source is presented in Table 6.2 in Appendix B. All the variables used were transformed into their natural logarithm except for the interest rates (MPR and federal funds rate) which were already in percentages. Since the quarterly series were generated using monthly averages, all variables were seasonally adjusted using the Census X-12 inbuilt in EViews.

3.4.2.2. Data used for Panel Structural VAR (PSVAR)

In order to estimate the PSVAR, we employ an unbalanced panel of 12 commercial banks from 2006Q1 to 2020Q4 giving us a cross-sectional unit of 12 (N=12) and a time horizon of 15 years (T=15) giving us 720 observations. Bank-specific characteristics such as size, liquidity and capitalisation were calculated as the ratios of bank total assets in relation to total assets of the banking industry, liquid assets – which is the sum of local and foreign currency holdings, reserves holdings with the central bank and government treasury bills holdings – is calculated as a ratio to total assets of the bank while capitalization – the sum of capital and reserves – is calculated as a ratio to total assets of the bank. As in many studies, all these ratios are normalised by the industry averages to avoid the ever-increasing in trend (Matousek and Solomon, 2017, Chileshe, 2017, Opolot and Nampewo, 2014 and Simpasa et al, 2014). Macroeconomic variables such as GDP and CPI included here as well as bank credit to the private sector are the same as explained above. Thus, the bank-specific variables are calculated in the following:

$size_{it} = \log A_{it} - \frac{\sum_i \log A_{it}}{N_t}$, where A_{it} is total bank assets and N_t is number of banks in the sample (12).

$Liq_{it} = \frac{LA_{it}}{A_{it}} - \frac{1}{T}\sum_i \left(\frac{1}{N_t} \sum_i \frac{LA_{it}}{A_{it}} \right)$, where Liq_{it} is bank total liquid assets and T is the time horizon.

$Cap_{it} = \frac{(C+R)_{it}}{A_{it}} - \frac{1}{T}\sum_i \left(\frac{1}{N_t} \sum_i \frac{(C+R)_{it}}{A_{it}} \right)$, where Cap_{it} is bank capitalization which is the sum of bank capital (C) and bank reserves (R).

3.5. Estimation Results

This chapter presents the estimation results and findings of this study. The results in the form of impulse responses from the SVAR and PSVAR are presented in sub-sections **3.5.1** and **3.5.2** below. For robustness check on results obtained in the baseline SVAR model, a BVAR model was estimated using the same data as in the baseline SVAR model and results are also presented at the end of sub-section **3.5.1.5**.

3.5.1. Results from the SVAR model and its extensions

The SVAR model as given in (11) and (12) is estimated using EViews 12 software. The results from the benchmark SVAR and its extensions in the form of impulse response functions (IRF) are presented in section 3.5.1.2. In addition, we calculated some variance decomposition to account for the percentage share of the variation in variables. However, to start with, the Augmented Dickey-Fuller (ADF) test for variables stationarity is presented in section 3.5.1.1 to gauge the integration of the series employed.

3.5.1.1. Unit Root Test (ADF Test)

The unit root test results are presented in Table 3.1. below using the ADF. The results shown here contain the endogenous variables used in the benchmark model while detailed results of all other variables used in this study is presented in Appendix B as Table 6.1. From Table 3.1, the results show all variables are integrated of order one I (1) using the reported p-values against the conventional 5 percent significance level. Similarly, results (not included here) were obtained using lag selection information criteria.

Table 3.1. Augmented Dickey-Fuller (ADF) Test Results

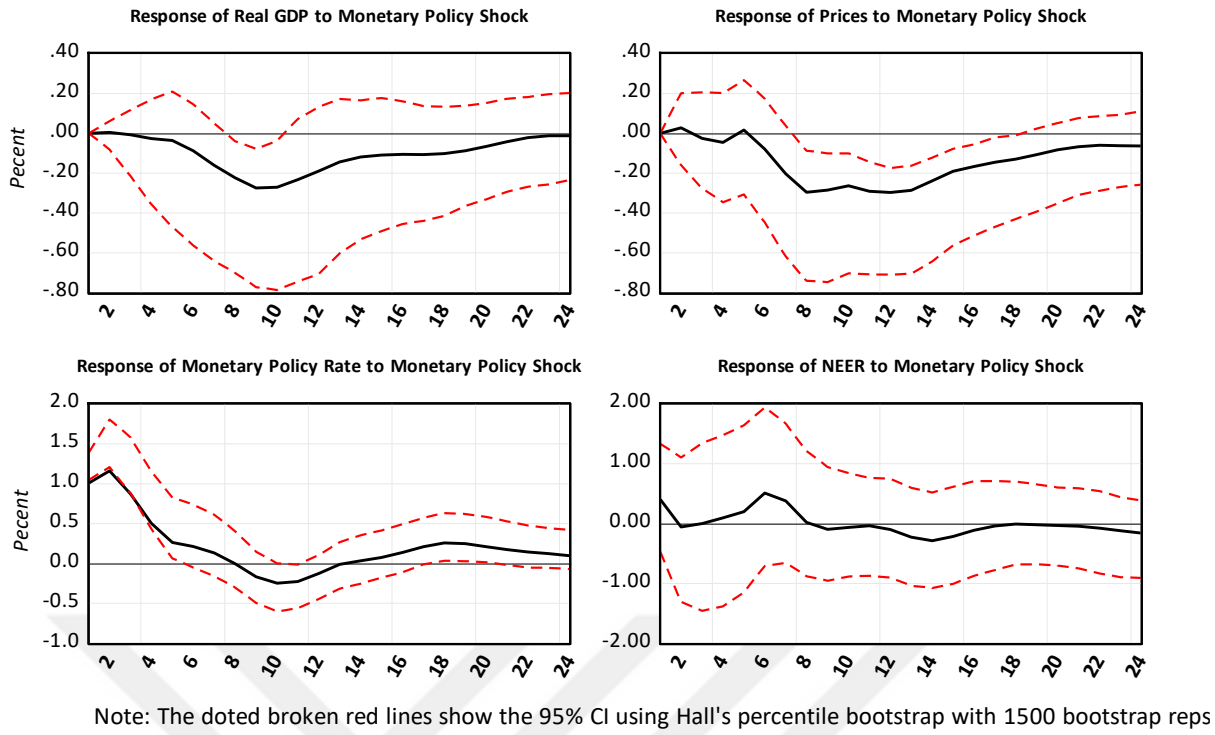
Variable	At Level		At First Difference	
	With Intercept	With Intercept and Trend	With Intercept	With Intercept and Trend
Log Real GDP	0.9556 (10)	0.5387 (10)	0.0010 (9)	0.0062 (9)
Log CPI	0.9577 (1)	0.0950 (5)	0.0000 (0)	0.0000 (0)
Log BL	0.3888 (6)	0.7156 (1)	0.0000 (0)	0.0011 (5)
MPR	0.1037 (1)	0.2224 (1)	0.0002 (0)	0.0016 (0)
Log NEER	0.2798 (1)	0.5075 (2)	0.0008 (1)	0.0000 (0)

Note: The numbers presented are the P-values while numbers in parenthesis are the lag length automatically chosen by the Akaike Information Criteria (AIC).

For our purpose, the results presented in this study are based on VARs estimated in level as suggested by many researchers (see Sims et al 1990, Bernanke and Mihov 1997). However, for robustness check, corresponding results based on VARs estimated in first difference are presented in Appendix B.

3.5.1.2. Impulse Response

To answer the question of whether unanticipated monetary policy shock has any real effect on the economy (in line with objective **i** of this study), a structural VAR (6) was estimated for the benchmark model and the impulse response functions are presented in Figure 3.5 and 3.6 below. The results are presented for both the recursive approach based on the Cholesky decomposition and the non-recursive structural VAR approach.

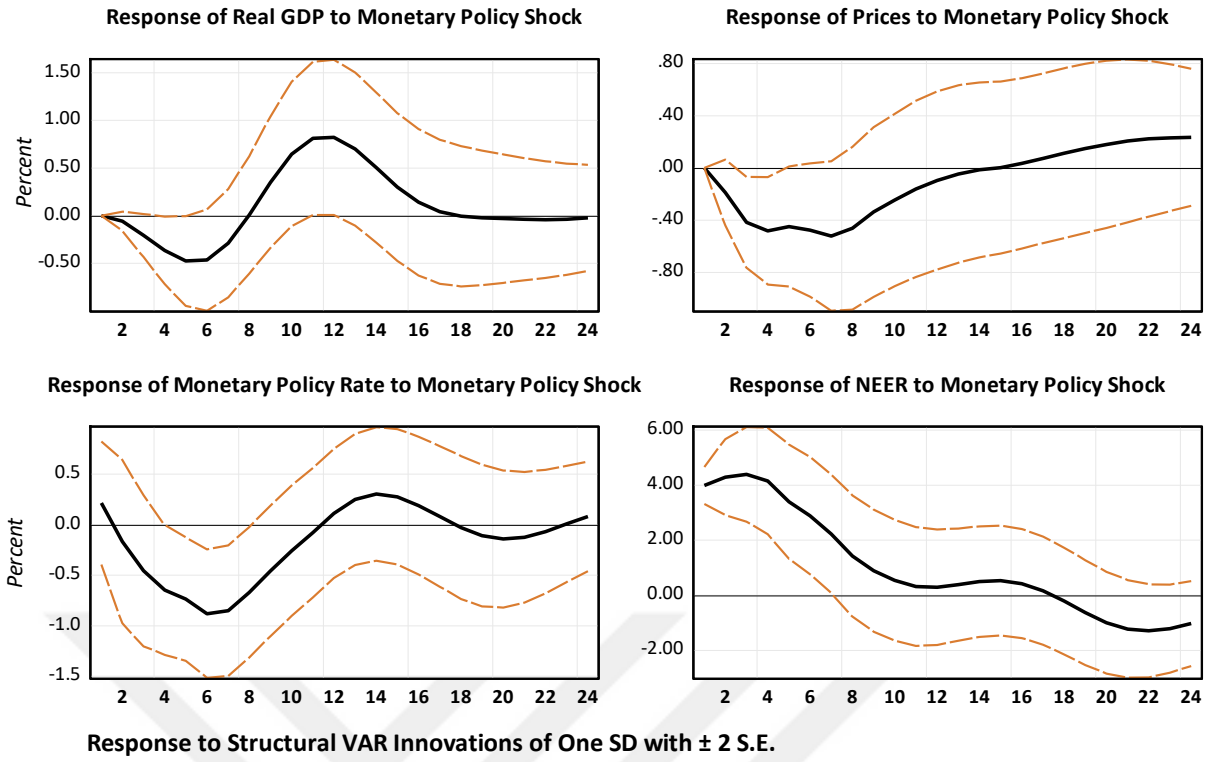


Note: The doted broken red lines show the 95% CI using Hall's percentile bootstrap with 1500 bootstrap reps

Source: Author's estimations using EViews 12 software package.

Figure 3.5. Impulse Response to an unanticipated positive monetary policy shock (***recursive***)

The results show an unanticipated structural innovation in monetary policy (one standard deviation shock on the monetary policy rate) leads to a decline in real GDP as expected. The decline in real GDP started around the fourth quarter after the shock and bottoms out (at -0.2 percent decline) after two years. However, the results appear to be significant only around the eighth to the tenth quarter which corresponds to the sharpest decline in real GDP. Similarly, a positive unanticipated structural shock in monetary policy leads to a fall in prices which started after the fifth quarter following the shock. The fall in prices bottoms out after two years (quarter 8) before returning to its long-run equilibrium. Unlike the decline in real GDP, the fall in prices following a monetary shock is fairly significant as the confidence intervals do not contain the baseline at least in the periods of the fall in prices. Moreover, a monetary policy shock is associated with a stronger Dalasi as the NEER appreciates following a monetary policy shock though the results are not significant across all horizons.



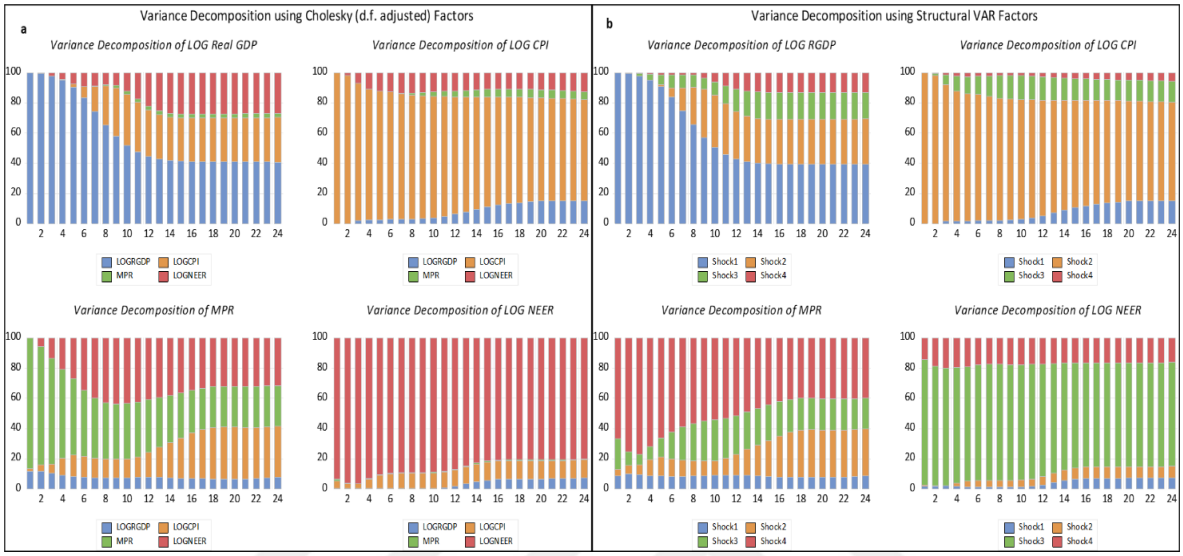
Source: Author's estimations using EViews 12 software package

Figure 3.6. Impulse Response to an unanticipated positive monetary policy shock (***non-recursive***)

Similar results are obtained from the non-recursive approach as shown in Figure 3.6 above. In this case, the fall in real GDP and prices occur almost immediately following an unanticipated monetary policy shock bottoming out (-0.5 percent) around quarters 5 and 7 respectively. Although the response of real GDP remains generally insignificant as was in the recursive approach, the response of prices is fairly significant from the third quarter to around the sixth quarter. Interestingly, an unanticipated monetary innovation leads to a sharp appreciation of the Dalasi (4 percent) at impact peaking (about 4.5 percent) around the third quarter after the shock. More importantly, the response of the nominal effective exchange rate is statistically significant as opposed to what we saw in the recursive approach. The responses of prices and the exchange rate suggest the results are free from both the price and exchange rate puzzles under the non-recursive while a partial price-puzzle, not exchange rate appears to be present under the recursive approach.

While the general results are not striking which maybe be due to data quality issues and/or a weak monetary policy indicator, we find that exogenous monetary policy shock has real

effect on the economy[22]. Therefore, this finding goes to answer the question raised in our objective **i** of whether exogenous monetary policy shock has any real effect on the Gambian economy. To gauge the relative importance of monetary policy shock in the fluctuation of variables, we estimated the forecast error decomposition and the results for both the recursive and non-recursive structural VAR are presented in Figure 3.7 below.



Source: Author's estimation

Figure 3.7. Contribution of structural shocks in forecast error variance

From Figure 3.7 above, Panels **a** and **b** contain forecast error variance decomposition from the recursive structural VAR and non-recursive structural VAR respectively. For the recursive SVAR, we can see that fluctuations in CPI and NEER are almost entirely due to their own shocks while monetary policy structural shocks account for only a small portion. On the other hand, structural shocks of CPI and NEER contribute about 50 percent of the fluctuation in real GDP in longer horizons (beginning around quarter 10) while at impact, all fluctuations in real GDP were due to its own structural shocks. Again, monetary structural innovation has a negligible contribution to real GDP variation. This goes to reinforce the impulse response results under the recursive SVAR. Panel **b** which is based on the non-

[22] Data on real GDP was subjected to some statistical interpolation to obtain quarterly series from annual series which could bring about loss of informative features of the data. Moreover, a simple correlation between CBG monetary policy rate (used here as an indicator of monetary policy) and real GDP growth rate and inflation shows a very low correlation value which points to the fact that the CBG MPR is a weak indicator of monetary policy stance. However, trying different indicators such as growth in reserve money (which is the operating target for CBG) and net open market operations performs worse than the MPR thus its choice.

recursive SVAR shows that structural monetary policy shocks contributed fairly to the fluctuations of real GDP (4% and 17% in the first year and sixth year) and CPI (10% in quarter four before peaking at 15.6% in quarter ten) respectively. More interestingly, monetary policy shocks accounted for about 83, 76 and 68 percent of the variation in the exchange rate at impact, after two years and by the end of the forecast horizon respectively. Similarly, exchange rate shocks account for more than 66 percent of the fluctuation in the monetary policy rate at impact and moderated around 50 percent over the forecast horizon. This is in line with our previous findings with the impulse response functions. Based on these results, there is evidence of monetary policy effects on real macroeconomic variables in The Gambia albeit partially.

3.5.1.3. Bank lending channel of monetary transmission in The Gambia

In order to investigate the existence of the BLC of monetary policy transmission in The Gambia, we included bank average lending rate and bank loans in the benchmark SVAR model. The addition of these two variables is done one at a time such that we allow innovation in monetary policy to run through the average lending rate which shows the efficacy of monetary policy on commercial banks' pricing decisions. After which bank loans substitute the lending rate in the SVAR and we trace the effect of structural monetary policy innovations to bank loans such that the bank lending channel is revealed. Following previous researchers and as captured by the identification in this study by (11) and (12), we estimated a VAR(6) model and the structural impulse response functions of the bank lending rate is presented in Figures 3.8 and 3.9 below. As before, impulse responses are presented for both the recursive and non-recursive SVAR.

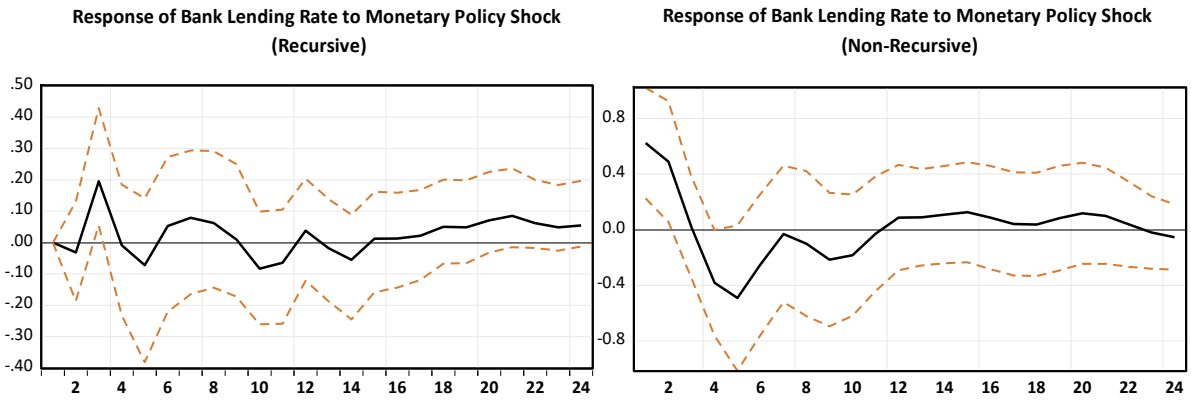
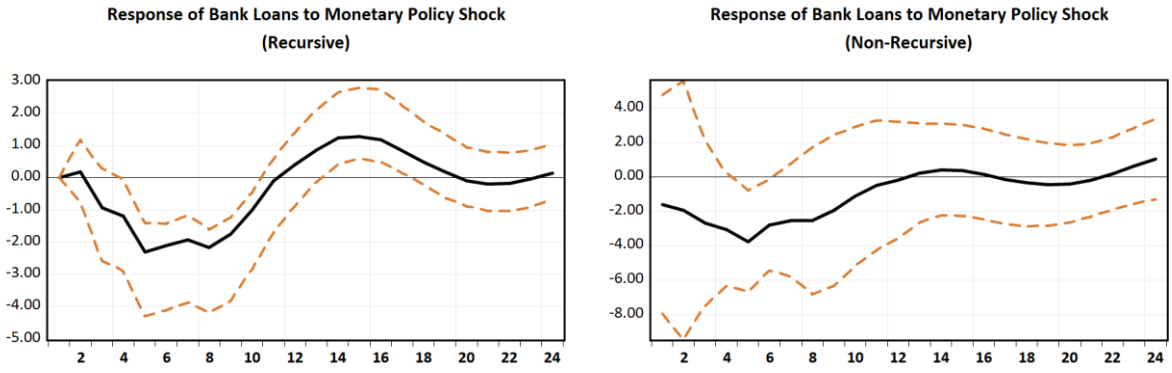


Figure 3.8. Response of bank lending rate to a structural monetary policy shock

Figure 3.8 shows the dynamic response of bank lending rate to a structural monetary policy shock (positive shock on MPR). For the recursive SVAR, the effect sets in after two quarters following the shock and peaking at 0.2 percent around the end of the third quarter. In other words, a positive shock in monetary policy leads to 0.2 percent increase in bank lending rate and this occurs after three quarters. However, the results are not significant as we can see the confidence intervals contain the baseline. On the other hand, under the non-recursive approach, a monetary shock is associated with an immediate increase in bank lending rate (0.6 percent) after which it begins to fall back to baseline precipitously. In this case, the results are statistically significant. The results suggest that monetary policy actions are transmitted through the bank lending channel as evident in the adjustment of lending rates by banks following a monetary innovation.

To further test for the existence of the BLC, bank loans to the private sector are included in the benchmark SVAR model. We examine the effect of a positive structural monetary policy shock on bank loans for both the recursive and the non-recursive as well as the corresponding response of real GDP to a structural shock on bank loans. The response of bank loans to monetary policy innovation serves as evidence of the existence of the bank lending channel. The impulse responses from the SVAR including bank loans are shown in Figure 3.9.

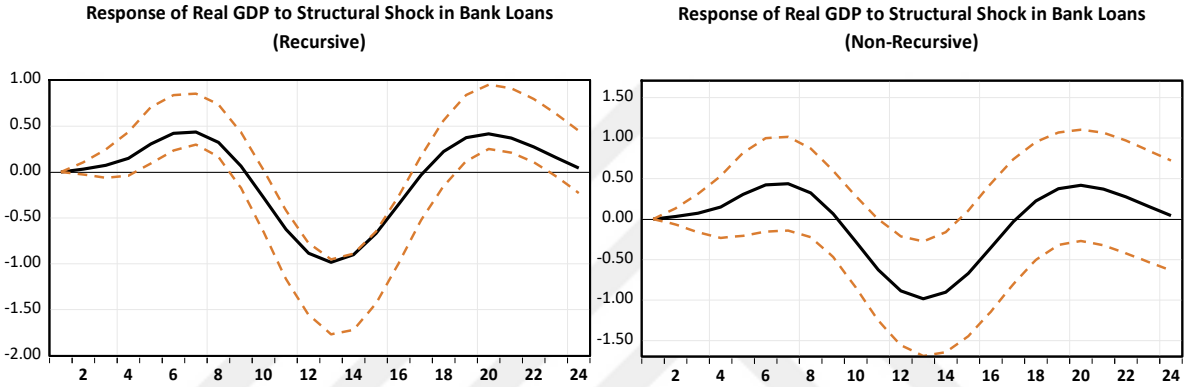


Source: Author's estimations using EViews 12 software package

Figure 3.9. Response of bank loans to a structural monetary policy shock

As shown in Figure 3.9, an unanticipated exogenous monetary policy innovation (tight monetary policy) is associated with a decline in bank loans to the private sector under both the recursive and the non-recursive approaches. In the case of the recursive approach, the decline in bank loans occurs towards the end of the second quarter after a monetary

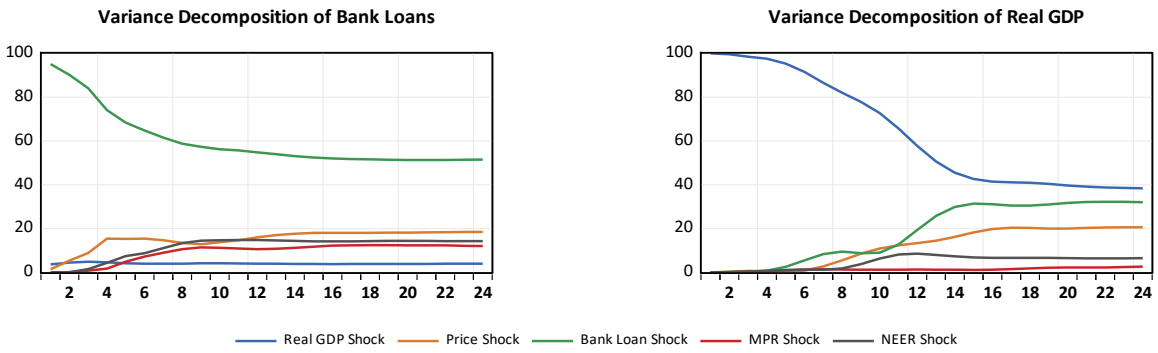
contraction. The fall in bank loan bottoms out in quarter five at (-2 percent) before gradually returning to its pre-shock baseline level. On the other hand, under the non-recursive approach, the fall in bank loans following an exogenous monetary shock is rather immediate (-2 percent at impact) bottoming out in quarter five at (-4 percent). The results for the recursive approach are statistically significant for the most part of the horizon while those for the non-recursive are partially significant in quarter five (the trough of the decline in bank loans). These results coupled with those shown in Figure 3.8 point to the existence of an active bank lending channel in The Gambia and that monetary policy actions are transmitted to the real sector through bank financial intermediation.



Source: Author's estimation using EViews 12 software package

Figure 3.10. Response of real GDP to a structural innovation in bank loans

Figure 3.10 plots the response of real GDP to innovation in bank loans to examine the responsiveness of output to changes in bank loans. This is important if we are interested in tracing out the ultimate impact of monetary policy on output through the bank lending channel. Toward this end, a positive shock in bank loans is associated with an increase in real GDP almost immediately following the shock and this is true for both the recursive and non-recursive approaches. In other words, a one standard deviation shock in bank loans corresponding to an increase of 0.06 percent in bank loans leads to a 0.5 percentage points increase in real GDP by the end of quarter 7 before declining back to its long-run equilibrium. This is true under both the recursive and the non-recursive SVAR. However, the results under the recursive approach are fairly significant while those under the non-recursive are not. Thus, our findings are in support of a partially active bank lending channel in The Gambia.

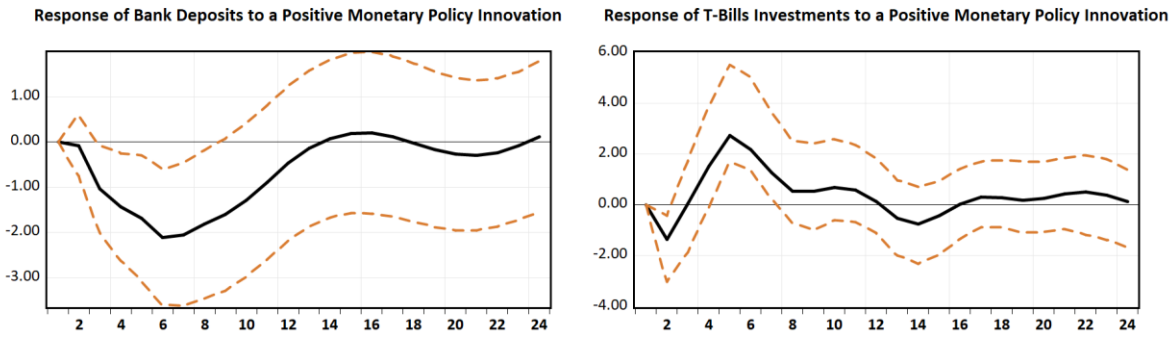


Source: Author's estimation using EViews 12 software package

Figure 3.11. Contribution of structural shocks to variation in bank loans and real GDP

In Figure 3.11 above, we show how important are structural shocks in explaining the fluctuations in bank loans and real GDP by presenting the forecast variance decomposition. Apart from variation due to its own shock, fluctuations in bank loans are mostly driven by variations in prices and exogenous monetary policy shocks both accounting for about 19 percent and 17 percent respectively at the end of the forecast horizon. More interestingly, bank loan structural shocks account close to 38 percent of the fluctuations in real GDP. This means if monetary policy could influence bank lending as noted in this study, then it could impact aggregate output through bank loans.

To understand further why an exogenous monetary policy shock is associated with a decline in bank loans, we look at what happens to bank deposits and investments in government treasury bills. Researchers noted that a tight monetary policy is accompanied by a decline in bank deposits as bank reserves dwindle and this limits banks' ability to extend credit. On the other hand, banks' investment in treasury bills is expected to decline at impact as banks discount their treasury bills holdings to finance the decline in deposits. However, this is expected to be temporal after which investment in treasury bills will rise again. To this end, we examine these facts by looking at the response of bank deposits and T-bills investments to an unanticipated monetary policy shock and the impulse response is presented in Figure 3.12.



Source: Author's estimation using EViews 12 software package

Figure 3.12. Response of bank deposits and T-Bills investment to a structural monetary shock

The results confirm these facts in the case of The Gambia even though the results are partially significant. As shown in Figure 3.12 above, an unanticipated exogenous monetary policy shock is associated with a decline in bank deposits occurring almost immediately and reaching its trough in quarter six (-2 percent) before rising slowly to its baseline. Similarly, bank investments in government T-bills decline at impact but only for two quarters after which it rises sharply to peak at 2 percent in quarter five before returning to its pre-shock baseline level. This is not surprising given that for the period being studied, monetary policy was a mirror image of fiscal activities as deficit financing became the order of the day. In an environment of high-interest rates (tight monetary stance in response to increased deficit financing), commercial banks would rather invest their funds in a risk-free asset (T-bills) than extend loans to the private sector.

3.5.1.4. The distributional effect of monetary policy shocks on sectoral credit supply

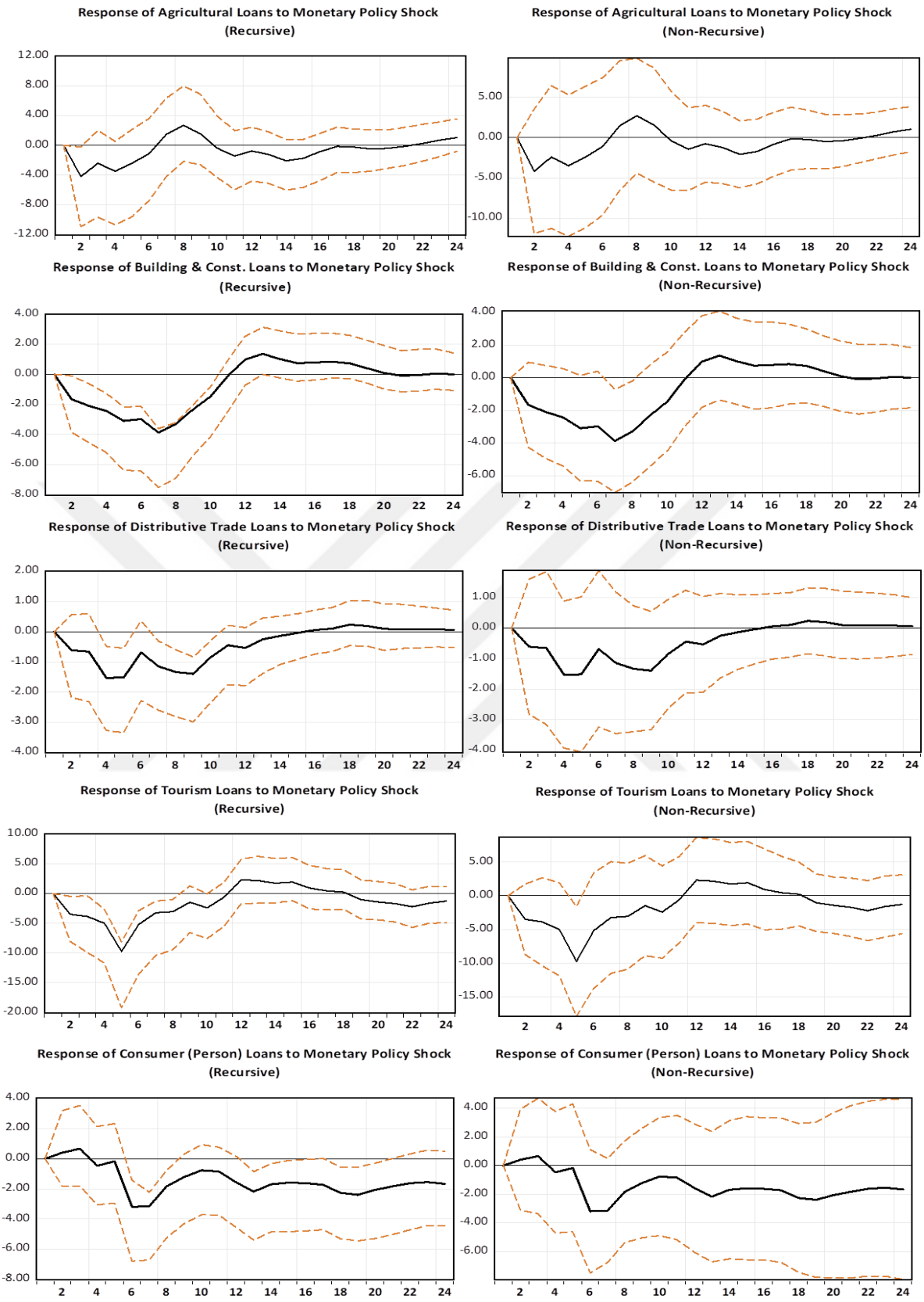
It is among the objectives of this study to investigate how an unanticipated exogenous monetary policy shock affects commercial banks' credit supply to major economic sectors in The Gambia. This is expected to help policymakers understand the distributional effect of monetary policy actions as it impacts different sectors differently. Moreover, given the recurrent use of monetary policy for stabilisation programmes in The Gambia in particular and Sub-Sahara Africa in general, understanding how monetary policy actions are transmitted to different sectors of the economy is vital. Toward this end, we arbitrarily chose five sectors based on data availability and the importance of the sector (gauge by the ratio of credit to the sector to the overall credit). We selected five sectors – credit to the agricultural sector, credit to the building and constructions sector, credit to the distributive trade sector,

credit to the tourism sector and consumer loans – who on average account for more than 70 percent of total bank credit to the private sector. This is a novel contribution by this paper to the existing literature on monetary transmission[23].

In order to examine the impact of a structural monetary policy shock on these sectoral loans, we included these variables one at a time in our benchmark SVAR model and trace the responses to a positive monetary shock. To this end, we estimated a VAR(6) model for the five variables and reports the impulse responses in Figure 3.13. As expected, the results show that a positive unanticipated exogenous monetary policy shock leads to a decline in all sectoral loans albeit differently. This is true under both the recursive and non-recursive approaches. For instance, an unanticipated exogenous monetary shock leads to an immediate decline in bank loans to the agricultural sector. The decline in bank loans to agriculture bottoms out at negative 4 percent after the second quarter before rising back to its long-run equilibrium. The results are not statistically significant under both the recursive SVAR and the non-recursive approach.

Similarly, a monetary tightening as in a positive exogenous monetary shock is associated with a decline in bank loans to building and construction sector. The decline is more prolonged than in the case of agricultural loans bottoming out at negative 4 percent in quarter seven before returning to its baseline level. The results are statistically significant only under the recursive approach as the confidence intervals do not contain the baseline at least in the periods corresponding to the decline in loans to the sector.

[23] Other studies that examined the effect of monetary policy on industrial loans, consumer loans among others can be found in Gertler & Gilchrist (1993) Bernanke & Gertler (1995) among others. However, these studies were based on US data and restricted to just the mentioned sectors therefore as far as SSA and The Gambia are concerned, to our knowledge this paper is the first to do such work in this area.



Source: Author's estimation using EViews 12 software package

Figure 3.13. Response of sectoral credit to a positive structural monetary policy shock

Furthermore, a similar outcome is observed for bank loans to the distributive trade sector. Though it appears the least impacted following a monetary contraction, a positive monetary shock is associated with a fall in bank loans for distributive trade occurring immediately after impact and bottoms out after one year (at -1.7 percent). Moreover, it takes 15 quarters to return to its long-run equilibrium making the distributive trade sector one of those sectors which endure a lasting effect following a monetary policy shock. The tourism sector which happens to be a very important sector for the Gambian economy as one of the major foreign currency earners has its fair share following a monetary tightening.

In effect, an unanticipated exogenous monetary innovation is associated with a decline in bank loans to the tourism sector and the effect occurs immediately following the shock bottoming out at quarter five (at -10 percent). In fact, the tourism sector is the most affected as evident in the largest decline in credit to the sector following a monetary policy shock and the effect lasts as long as three years before rebounding. This is true under both recursive and non-recursive SVARs however only the impulse response under the recursive approach is statistically significant.

Finally, consumer loans respond negatively to an unanticipated exogenous monetary policy shock but only after four quarters (after one). This could be as a result of the contractual nature of personal loans which are given for a fixed period of time and mostly on fixed interest rates as against bank loans to other sectors[24]. Thus, banks could only respond to a tight monetary policy by not making new loans while allowing old loans to expire without renewal. This way consumer loans will eventually decline in response to tight monetary policy after some time as could be seen above. Although the results under the recursive appear fairly significant, the decline in consumer loans following a monetary shock seems to never rebound.

In the above exercise, we found not only the distributional effect of an unanticipated monetary innovation on bank loan supply to major economic sectors but also the variation

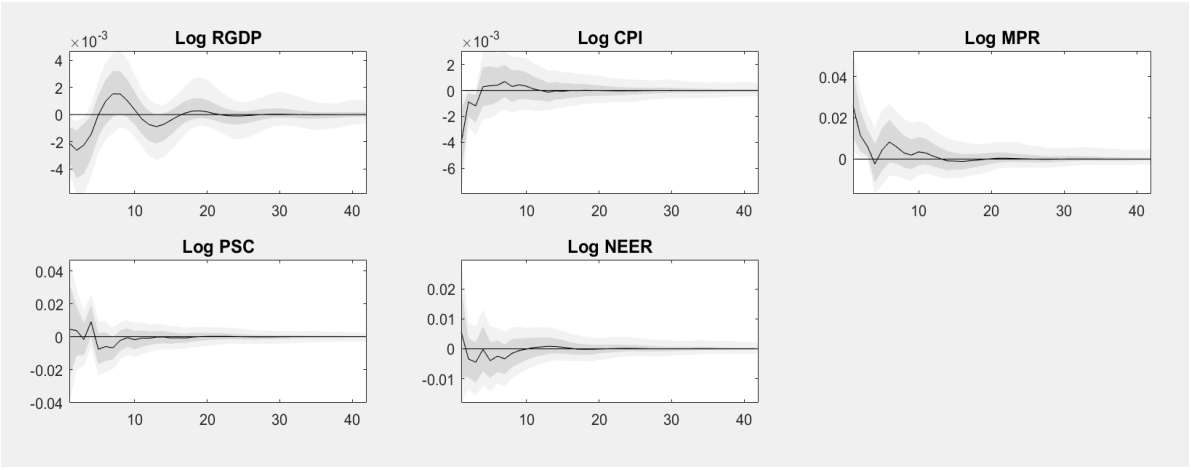
[24] For example, bank loans for distributive trade, tourism, building and construction and agriculture are mostly to finance the working capital of businesses/firms and are based on a revolving overdraft (OD) which is renewable every thirty days, sixty days and/or ninety days depending on the agreement between the bank and the borrower. It is worth noting that in The Gambia, bank loans to agriculture are mostly for processing and marketing thus are not long-term in nature.

in response of bank loans to monetary tightening. The decline in banks loans is sharper in the tourism, building and construction and agricultural sectors and have a lasting effect on all sectors except agriculture which rebounds to its baseline after six quarters. This further reinforces the fact that monetary policy is transmitted through the bank lending channel in The Gambia.

3.5.1.5. Robustness Check

For additional robustness check on the SVAR results, a BVAR (Bayesian VAR) with 4 lags was estimated using the same data and the results are presented in Figures 3.14 and 3.15. The BVAR was introduced by Litterman (1980) as an alternative to VAR with, among other things, the advantage of solving the problem of lost degrees of freedom which was prevalent in VAR models. The BVAR models also enable the possibilities of predictions concerning more efficient economic variables (Spulbar et al., 2011). For detailed coverage of BVAR and its application on monetary policy transmission in transitioning and low-income countries, see (Litterman, 1980; Borys et al., 2009; Spulbar et al., 2011; Maturu & Ndirangu, 2013; Osundina et al., 2018; Kabundi & Rapapali, 2019).

The BVAR was estimated with the Litterman/Minnesota prior type and the impulse response functions are presented below.



Source: Author's estimation using MATLAB software

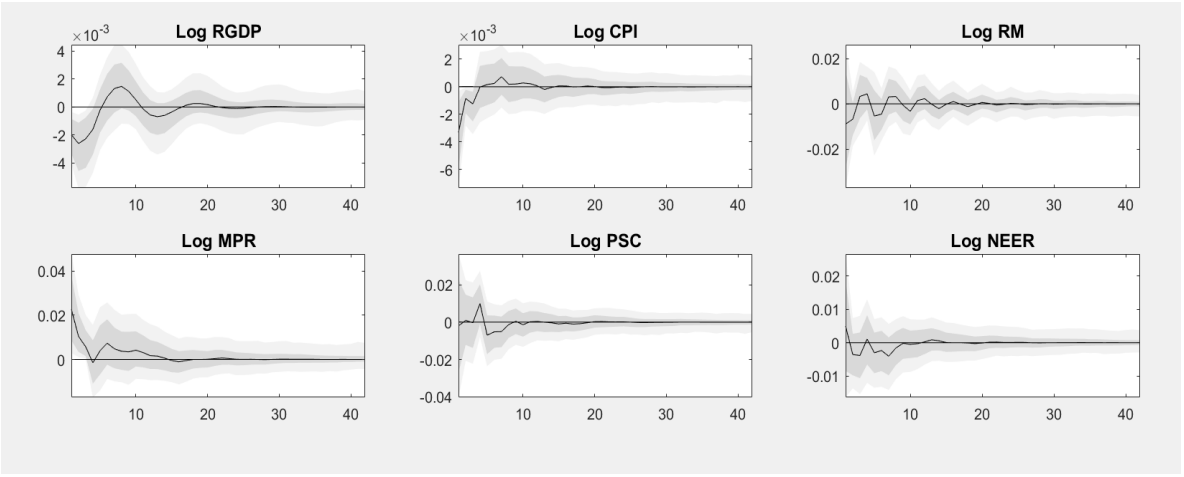
Figure 3.14. BVAR model (excluding reserve money) responses to a one standard deviation Cholesky orthogonalized shock in monetary policy. Light (dark) grey bands report 68 (90) % credible sets.

The results in Figure 3.14 are from a five variable BVAR (4) model with the ordering as 'log real GDP, log CPI, log PSC, log MPR and log NEER'. The response of each variable is

plotted with 68% (light) and 90% (dark) confidence bands. As expected, an exogenous shock in monetary policy corresponds with a decline in real GDP and prices and the decline occur immediately following the shock. However, as was the case with the SVARs, the results are only fairly significant over the horizon. Furthermore, commercial banks' credit to the private sector declined only after four quarters following a monetary policy shock and the result are not statistically significant. For the case of the nominal effective exchange rate, though the direction of response is in line with our a prior, they are not statistically different from zero.

Furthermore, we included reserve money in the BVAR model and the results are shown in Figure 3.15 below. The CBG follows a monetary targeting regime with reserve money as its operating target hence its addition is important. Generally, the results are not any different from what we saw in Figure 3.14. In other words, all variables respond as expected (right sign) to a monetary tightening but the results are only fairly significant for some variables while not significant for others. This lends credibility to the SVAR results obtained earlier and justifies the suitability of the model for purpose of which it is used here.

In sum, while we show that monetary policy affects real macroeconomic variables in The Gambia through its effect on real output, prices, bank credit/lending and the exchange rate, it is not the main cause of fluctuation in these macroeconomic variables thus authorities must account for this during policy decision making.



Source: Author's estimation using MATLAB software

Figure 3.15. BVAR model (including reserve money) responses to a one standard deviation Cholesky orthogonalized shock in monetary policy. Light (dark) grey bands report 68 (90) % credible sets.

3.5.2. Estimation Results from the PSVAR model

This section of the study presents the estimation results from the panel structural VAR following the model specification highlighted in section 3.4.1.2 above. Using the Pedroni (2013) algorithm, impulse response functions are generated to capture the dynamic effect of monetary policy shocks on bank credit supply to the private sector by individual banks within our sample.

Figure 3.16. Quantile Responses of bank credit to monetary policy shocks (median percentile)

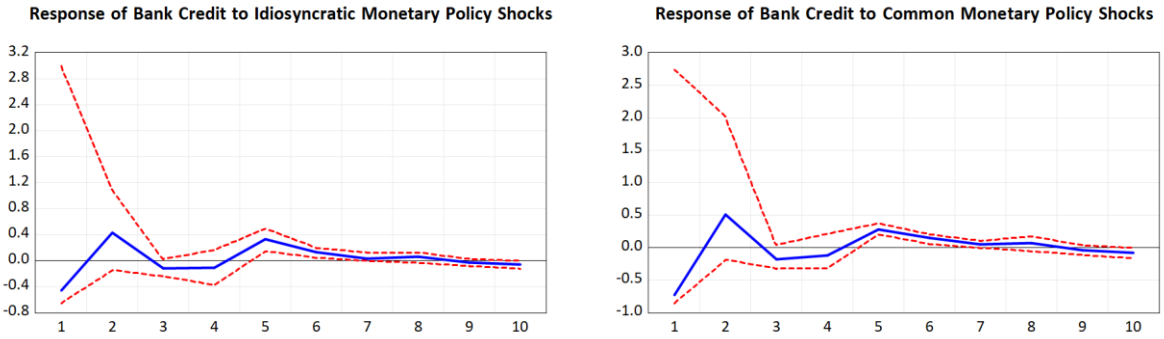
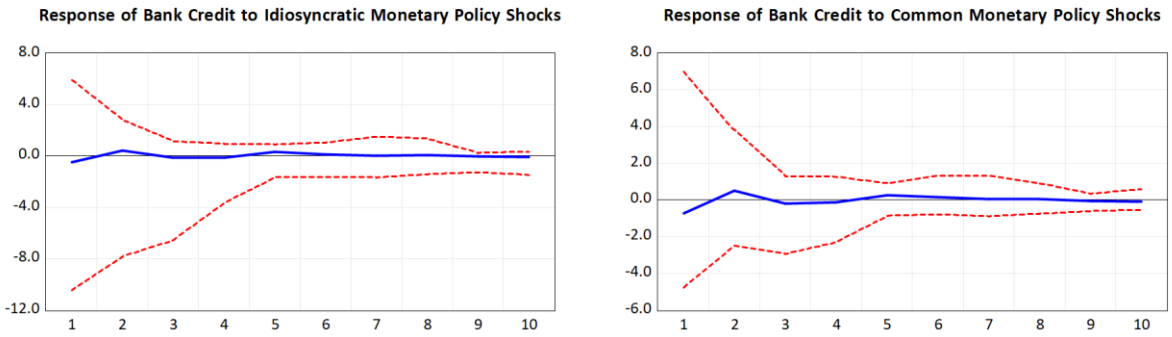


Figure 3.17. Quantile Responses of bank credit to monetary policy shocks (25th percentile)



Source: Author's estimation using EViews 12 software package. The impulse responses are in percentages, i.e., a percent response to one standard deviation shock on monetary policy.

Figure 3.18. Quantile Responses of bank credit to monetary policy shocks (75th percentile)

The quantiles responses of bank credit supply following a monetary policy innovation are presented in Figures 3.16 – 3.18. In addition, the forecast variance decomposition is also included to account for the variation in bank credit due to common and bank-specific monetary policy shocks (see Figures 3.19 – 3.21 below).

The main finding is that, as expected, all groups (banks) within our sample respond to exogenous monetary policy shock by reducing their credit supply to the private sector. The decline in bank credit occurs immediately following the shock and tappers off after the second quarter. However, the results are not statistically significant as the confidence bands contain the zero baselines. More importantly, the results suggest that banks respond in a similar way to both common and idiosyncratic monetary policy shocks. This is further confirmed by the similarities in response among groups within our sample – no significant variation across quantile responses; Figures 3.16 – 3.18. In fact, it appears that shocks common to all groups are more important than those that are specific to individual banks. This is illustrated below by the variance decomposition across quantiles (Figures 3.19 – 3.21).

The results show that about 20 percent of the variation in bank credit supply to the private sector at impact is due to common monetary policy shocks while about 4 percent is due to bank-specific monetary policy shocks. This is true across all quantiles (median, 25th and 75th). More importantly, these results are very significant across the forecast horizon.

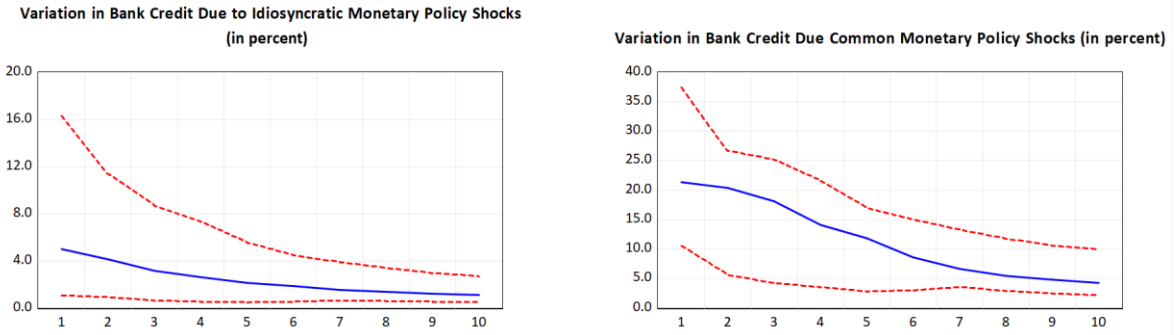


Figure 3.19. Quantile Variation in Bank Credit due to Monetary Policy Shocks (median percentile)

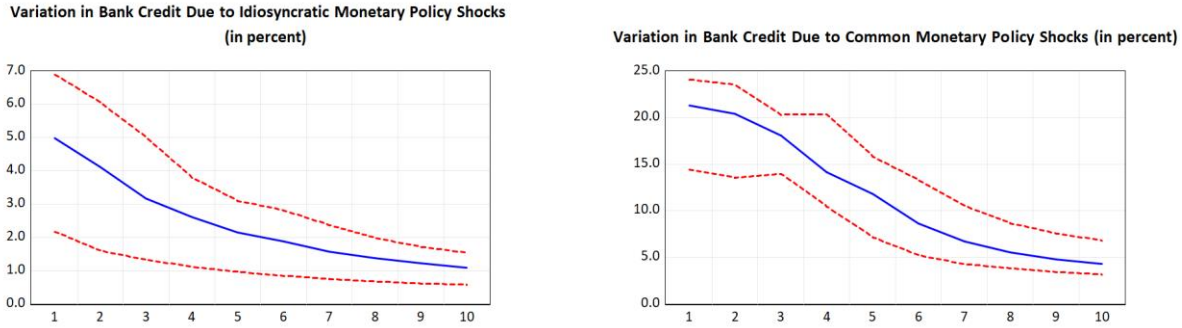
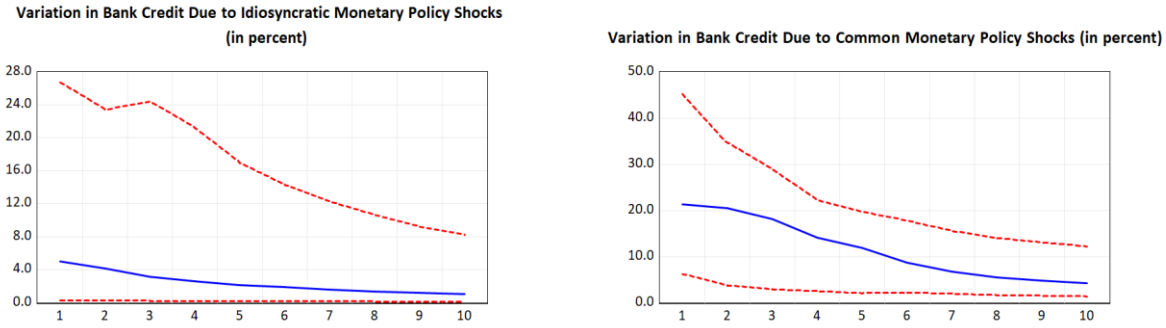


Figure 3.20. Quantile Variation in Bank Credit due to Monetary Policy Shocks (25th percentile)



Source: Author's estimation using EViews 12 software package

Figure 3.21. Quantile Variation in Bank Credit due to Monetary Policy Shocks (75th percentile)

The results point to three conclusions. Firstly, exogenous monetary policy shocks have no significant effect on bank credit supply to the private sector as it relates to individual banks or as a group. This corroborates to an extent (non-recursive IRF) the results obtained in section 3.5.1. Secondly, there is minimal or no heterogeneity in bank responses to monetary

policy shocks. Finally, most of the variation in bank credit supply is attributable to common monetary policy shocks. Thus, CBG should focus more on how the aggregate banking system responds to monetary policy actions than individual banks' responses.

Furthermore, even though the results above show no sign of heterogeneous response of bank credit to monetary policy innovation, it is important to check if bank-specific characteristics have any effect on how they respond to exogenous monetary policy shocks. This is important as it addresses part of objective **ii** of this paper as well as insuring us from falling prey to the consequences of not checking it out – many studies found bank-specific characteristics to be important in how banks respond to monetary policy (Matousek and Solomon, 2017, Chileshe, 2017, Opolot and Nampewo, 2014 and Simpasa et al, 2014). To this end, bank size, bank liquidity and bank capitalization were included in our PSVAR and the impulse responses are presented in Table 3.3 below.

As shown in Table 3.3, all bank-specific characteristic has the expected sign except bank size which on average carries a negative sign. However, none of these responses are statistically significant implying that, bank size, bank capitalization and bank liquidity do not have any significant influence over the supply of bank credit in The Gambia. This is in line with the conclusion we reached above that there appears to be no significant heterogeneity in banks' response to exogenous monetary policy shocks. The possible explanation for this is that banks in The Gambia allocate most of their credit portfolio to holding of government securities as government appetite for borrowing is mostly evident and the holding of government papers is a lot safer than issuing loans to the private sector. As a result, monetary policy is unable to significantly influence banks' lending decisions.

Table 3.2. Impulse Response of Bank Credit to Monetary Policy Shocks

	1st quarter	2nd quarter	3rd quarter	4th quarter	5th quarter	Average
Bank Size	-3.92	0.45	0.29	0.94	0.45	-0.36
Capitalization	2.72	0.61	-0.22	-0.88	-0.49	0.35
Liquidity	1.03	0.53	-0.65	0.00	0.23	0.23
Controlling for some Macroeconomic Variables:						
			Bank Size			
Real GDP	-0.0182	-0.0476	-0.0591	-0.0344	0.00251	-0.03
CPI	-0.0166	0.00565	0.0279	0.0391	-0.00451	0.01
NEER	0.2312	0.0945	-0.1022	0.1778	-0.0603	0.07
			Capitalization			
Real GDP	-0.0131	-0.0292	-0.0036	0.00839	0.0233	-0.003
CPI	0.0534	-0.00346	-0.00714	-0.00416	0.00566	0.009
NEER	0.1068	-0.1283	0.2636	-0.0165	0.0949	0.064
			Liquidity			
Real GDP	0.0372	0.0675	0.0648	0.00621	0.0483	0.044
CPI	-0.0223	0.00303	-0.00362	-0.0247	-0.00505	-0.011
NEER	0.00515	0.2542	0.1091	0.0472	0.11	0.105

Source: Author's calculations

This was the experience after the change of government in 2016/17 when CBG embarked on a series of policy easing culminating in the reduction of the policy rate from 23 percent to 10 percent, however, credit to the private sector grew on average by just 4 percent during the same period. Furthermore, we also included some macroeconomic variables to control for business cycle fluctuations and price movements for each bank-specific characteristic but as before, the results only show the right sign but the responses are not statistically different from zero see the lower part of Table 3.2 above.

This finding points to a significant drag on the effectiveness of the bank lending channel in The Gambia posing a lot of challenges to the CBG's conduct of monetary policy.

Admittedly, the problem is a complex one as it may have to do with the weak institutional environment that exists, the competitiveness of the banking industry as well as the disconnection of The Gambia financial sector from the international financial market (Mishra et al, 2014). Therefore, it calls for a comprehensive financial sector reform to enhance the effectiveness of the bank lending channel in particular and monetary policy transmission in general.

3.5.3. Discussion of Results

It is important to elaborate on the economic meaning of the results obtained in this study. To do that diligently, it will be prudent to contextualize the results with reference to earlier studies on the same subject and the realities in The Gambia. Toward this end, and in line with the main results corresponding to our objective **i**, we find that unanticipated exogenous monetary policy shock leads to a decline in real GDP and prices albeit partially. These results corroborate earlier studies that monetary policy has real effect on the economy (Bernanke and Blinder 1988, 1992, Bernanke and Gertler 1995 among others). The rather inert fall in real GDP reflects the economic restrictions imposed in our model mirroring the realities of the Gambian economy. In other words, we expect real GDP to respond with a lag to exogenous monetary shock since authorities at CBG do not observe GDP numbers at the same time monetary policy decisions are made. Similarly, inflation numbers are observed but with a shorter lag (one month). Therefore, even though the results are not generally significant, they somewhat point to the potency of monetary policy in The Gambia.

The second main finding in this study is the evidence of the bank lending channel of monetary transmission. As noted above, an unanticipated exogenous monetary shock is associated with an increase in bank lending rate and a fall in bank loans to the private sector. This is very fundament for this study as it suggests the existence of a partially active bank lending channel of monetary transmission in The Gambia. Similar results were obtained in previous studies especially for developing and low-income countries where the financial system is very rudimentary such that monetary policy could only impact the economy through the bank lending channel (see Cheng 2007, Lungu 2008, Aleem 2010, Matousek and Solomon 2018 among others). The Gambia being not an exception to this, a decline in bank loans to the private sector or an increase in commercial banks' lending rate following an exogenous monetary shock resonates well with domestic macro fundamentals. Because

government is the largest borrower in the domestic economy, a deficit-financed induced interest rates hikes will not only crowd out private lending but also encourage banks to hold more government papers. This is evident in the rise in commercial banks' investment in government treasury bills following a monetary tightening (Figure 3.12). Policymakers should be cognizant of this fact and make sure domestic policies are aligned to avoid missteps that could cost the economy (suffocating the private sector).

The third result in this study presents partial evidence of a distributional effect of monetary policy innovation on sectoral bank credit supply. We noted that an unanticipated exogenous monetary shock is associated with a decline in bank loans to all major sectors of the economy albeit differently. Except for consumer loans (personal loans), all other sectoral bank loans decline almost immediately after a monetary shock and the decline has a lasting effect. The reason for the sluggish response in consumer loans (which started to fall only around five quarters after impact), may be attributed to the contractual nature of this category of loans. Consumer loans are typically extended for a fixed period with a fixed interest rate agreed at the signing of the agreement thus may react to monetary policy changes only after some time. On the other hand, all other categories of bank loans in The Gambia are mostly for working capital purposes where businesses or firms acquire a short-term revolving overdraft to finance their working capital needs. Thus, these loans are susceptible to changes in monetary policy. While it is difficult to disentangle the decline in sectoral bank loans as supply or demand-driven, we strongly believe the decline in loans is attributable to supply constraints as banks redirect funds to invest in government papers. This finding is crucial for the use of monetary policy for stabilisation programmes.

Finally, the results from the PSVAR model show that in response to an exogenous monetary policy shock, banks in The Gambia respond in a homogenous way by reducing credit supply to the private. This is evidence in the parallel responses across the median, 25^{th}, and 75^{th} quantiles among banks in our sample. However, caution should be taken in interpreting this finding as the responses are not statistically different from zero. A possible explanation for the lacklustre effect of monetary policy on bank credit supply has to do with the composition of bank credit portfolios. In essence, banks prefer holding government securities – the presence of high government borrowing and it is a risk-free investment – than issue loans to the private sector. As noted earlier, this corresponds with the realities on the ground as the recent monetary easing by the central bank is unable to significantly translate into more

private sector lending. This is true even though rates on government securities fell on average from 15.8 percent at end of December 2016 to 5 percent in December 2020 – banks still prefer to lend to government than otherwise.

Furthermore, we noted that banks respond more to common monetary policy shocks than shocks specific to the individual bank. In other words, much of the variation in bank responses to exogenous monetary policy shock is attributable to common monetary policy shocks. This is explained by the significant results of the variance decomposition where about 20 percent of the variation in bank credit responses are attributed to common monetary policy shocks while only 4 percent could be attributed to idiosyncratic monetary shocks. The lesson from this finding is that even though banks could exhibit some heterogeneity in terms of managerial style, business model and market power, they respond in a homogenous manner to monetary policy innovations. In fact, the finding that bank-specific characteristics do not significantly influence banks' lending decisions lends support to the above conclusion.

3.6. Conclusion

This study was set out to address three main objectives: whether unanticipated exogenous monetary policy shock has any real effect in the economy; whether unanticipated exogenous monetary policy shock affects bank lending as well as to examine the distributional effect of monetary policy innovation on sectoral bank loans and lastly whether bank-specific characteristics such as size, capitalisation and liquidity are important in banks' lending decisions. In order to isolate purely exogenous monetary policy shock, we employ both the recursive and non-recursive identification strategies and estimated a structural VAR or SVAR model and report the impulse response functions therefrom. In addition, the PSVAR model incorporating bank-specific characteristics was estimated and the quantile impulse response functions were generated for further analysis.

The results from the SVAR show a positive exogenous monetary policy shock leads to a fall in real GDP and prices under both approaches (recursive and non-recursive). The decline in real GDP and prices exhibit some inertia under the recursive approach consistent with expectations while under the non-recursive approach, the fall is rather immediately following a positive shock in monetary policy. Though the results are only fairly significant in most cases, the presence of insignificant results suggests that caution should be taken in interpreting the results. That said, it is important to note that the results obtained in this study are robust to methodology. As noted earlier the rather insignificant results could be largely attributed to data issues and a weak institutional environment among others. Furthermore, we examined the impact of a positive monetary shock on bank loans to the private sector and find evidence of a decline in bank loans (or similarly an increase in bank lending rate) after a positive monetary innovation. In turn, we find that a positive shock in bank loans increases real GDP suggesting the partial existence of the bank lending channel of monetary transmission in The Gambia.

Furthermore, we show that monetary policy shocks affect bank credit supply to major economic sectors albeit in a varied way. Except for consumer credit, loans to all other sectors decline at impact after a monetary tightening and the decline has a lasting effect. In the case of loans to the tourism sector, the decline occurs around the fifth quarter reaching its trough at negative 10 percent – the sharpest decline among all other loan categories. Based on these findings, there is evidence of monetary policy shocks being transmitted to major economic

sectors through banks' sectoral credit supply in The Gambia. Furthermore, even though monetary policy actions are accompanied by a decline in sectoral credit, the magnitude and timing differ across sectors. These heterogeneous responses of economic sectors to monetary policy shocks signal to policymakers the danger of lumping all sectors together in evaluating the potential impact of monetary policy on the economy.

Further research could extend to include more relevant economic sectors such as fishing, manufacturing and services sectors as and when reliable data become available or by employing an alternative methodology that could allow the use of the available data on these sectors for similar analysis. This, if done, we believe will broaden the analysis and shed more light on the distributional effect of monetary policy shocks in the economy. Furthermore, as digitalisation of business activities increase, future research could explore the use of firm-level data to study the transmission of monetary policy shocks to firm-level activities. This is very important as it helps authorities to not only understand how major sectors are affected by monetary policy decisions but also pinpoints the impact on firms within those sectors. This gives a clearer picture as it shows the distributional effect of monetary policy shocks on sectors and firms at a more micro level.

Finally, we find that even though banks could exhibit some form of heterogeneities among themselves, they tend to respond to exogenous monetary policy shocks in a homogenous form. In fact, this study reveals that banks' credit supply to the private sector is more susceptible to common monetary policy shocks than bank-specific idiosyncratic monetary policy shocks. Specifically, this paper finds no significant effect of bank-specific characteristics such as bank size, bank capitalisation and bank liquidity on banks' lending decisions in The Gambia. This suggests that the central bank should rather focus more on the aggregate response of the banking system to monetary policy decisions during policy formulation and implementation.

4. CONCLUSION

This dissertation is composed of two independent studies on monetary policy. The studies are centred on economic characteristics found in low-income countries. The first study is on optimal monetary policy for aid-dependent low-income countries in the presence of fiscal indiscipline. The second study is on 'the bank lending channel of monetary policy transmission mechanism' in The Gambia.

Using a simplified DSGE model, the results from the first study reveal that increased foreign aid inflows cause some Dutch disease effects. This is evident in both the shrinking of the tradable sector and the appreciation of the exchange rate (real and nominal) as well as the expansion of the non-tradable sector following a positive shock in foreign aid inflows. These findings are in line with many studies, such as Elbadawi (1999), Bevan (2003), Fielding and Gibson (2012). However, the results in this study are contrary to those found by Nyoni (1997), Ogun (1998), Sackey (2001), Berg (2005) in that increase in aid inflows cause a real depreciation rather than an appreciation.

Furthermore, the study shows that monetary targeting outperformed both fixed exchange rate and price targeting regimes with reference to welfare (higher consumption) and growth. In order words, if the monetary authority follows a monetary targeting regime, the domestic economy will be less affected by external shocks and domestic consumption will be cushion leading to welfare gains following an increase in foreign aid. Note, this is consistent for the case of a permanent increase in foreign aid and when aid is volatile. Price targeting offers the second-best monetary policy response to a rise in aid while fixed exchange rate regime is the least favourable. The reason for this could be that aid-dependent LICs depend heavily on aid-related foreign currency as a source of foreign currency reserves thus are not in a better position to be able to defend a fixed exchange rate.

In terms of how macroeconomic policy should respond to increased foreign aid inflows, the model predicts that the 'fully spend and fully absorbed' option offered in the literature as the best response, leads to the Dutch disease effect in our case. Meanwhile, should authorities wish to pursue this option, monetary policy targeting remains to be the optimal policy regime for welfare cushioning as well as for growth. This will not only mitigate the Dutch disease effects on welfare but also cushion the domestic economy from external vulnerabilities relating to the stochastic nature of aid inflows.

Finally, this study was limited to the case of foreign aid as official development assistance to least developing countries. Future research could consider expanding this to include capital flows in general as financial globalisation increases and capital mobility is enhanced. This will give a border picture of how macroeconomic response to increased capital inflows should look like under different policy scenarios.

The second study employed a plethora of models to investigate the monetary policy transmission mechanism in general and the bank lending channel of monetary transmission in particular in The Gambia. In relation to objectives **i,** part of **ii** and **iii** of this study, a structural vector autoregressive (SVAR) model was used to investigate whether an exogenous monetary policy shock (monetary tightening) has any real effect on output, prices, bank credit and the exchange rate in The Gambia. The results show that real GDP and prices decline following a positive exogenous monetary policy shock under both the recursive and non-recursive identification strategies. However, the results are only partially significant. Furthermore, bank credit supply to the private sector declines in response to a tight monetary policy evident in the fall of bank loans as well as a rise in bank lending rate. In the same way, real GDP responds positively to a positive shock in bank loans suggesting the existence of the bank lending channel in The Gambia albeit partially. Given that the results are not overwhelmingly significant, we could only take it as there could be a passive bank lending channel present that is unable to transmit all monetary policy shocks to the real sector. It is worth noting that these results are robust as similar conclusions were reached using a BVAR technique.

In addition, in line with objective **iii,** results from the SVAR also reveal the distributional effect of monetary policy shocks on sectoral bank credit supply. In other words, a positive exogenous monetary policy shock is associated with a decline in all sectoral credit supply albeit differently. The heterogeneity in sectoral responses to monetary policy shocks points to the danger of treating all sectors as a homogenous unit when analysing the potential impact of monetary policy on the real sector of the economy.

Finally, results from the PSVAR suggest that banks in The Gambia respond in a homogenous way to exogenous monetary policy shocks. In other words, banks respond more pronouncedly to common monetary policy shocks than bank-specific monetary policy shocks. In fact, about 20 percent of the variation in bank credit supply to the private sector

is due to common monetary policy shocks. Moreover, the study shows that even though banks could exhibit some form of heterogeneities in managerial skills, business model, and/or market power, bank-specific characteristics have no significant influence on banks' lending decisions in The Gambia. This is important as it relates to part of objective **ii** of the study.

5. LIST OF REFERENCES

Ackim, M. E. (2016). The Impact of Monetary Policy on Bank Balance Sheet Variables in Sub-Saharan Africa: Evidence for a Bank Lending Channel.

Adam, C. S., & Bevan, D. L. (2003). Aid, public expenditure, and Dutch disease.

Aleem, A. (2010). Transmission mechanism of monetary policy in India. *Journal of Asian Economics, 21(2), 186-197.*

Aliyev, R. (2015). Essays on Monetary Policy.

Allison, P. D., Williams, R., & Moral-Benito, E. (2017). Maximum likelihood for cross-lagged panel models with fixed effects. *Socius, 3, 2378023117710578.*

Amidu, M. (2014). What influences banks' lending in sub-Saharan Africa? *Journal of Emerging Market Finance, 13(1), 1-42.*

Anarfo, E. B., Abor, J. Y., Osei, K. A., & Gyeke-Dako, A. (2019). Monetary policy and financial inclusion in sub-Sahara Africa: a panel VAR approach. *Journal of African Business, 20(4), 549-572.*

Arellano, C., Bulíř, A., Lane, T., & Lipschitz, L. (2009). The dynamic implications of foreign aid and its variability. Journal of Development Economics, 88(1), 87-102.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The review of economic studies, 58(2), 277-297.*

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of econometrics, 68(1), 29-51.*

Ashcraft, A. B. (2006). New evidence on the lending channel. *Journal of Money, Credit and Banking, 751-775.*

Assenmacher, K., & Gerlach, S. (2008). Monetary policy, asset prices and macroeconomic conditions: a panel-VAR study. *National Bank of Belgium Working Paper, (149).*

Bayale, N. (2020). Foreign aid and fiscal resources mobilization in WAEMU countries: ambiguous effects and new questions. African Journal of Economic Review, 8(2), 17-38.

Bean, C. R., Larsen, J. D., & Nikolov, K. (2002). Financial frictions and the monetary transmission mechanism: theory, evidence and policy implications. *Evidence and Policy Implications (January 2002).*

Berg, A. (2005, March). High aid inflows case study: Ghana. In *International Monetary Fund Seminar on Foreign Aid and Macroeconomic Management. Maputo, Mozambique, March* (pp. 14-15).

Bernanke, B. S. (1993, December). How important is the credit channel in the transmission of monetary policy?: A comment. In *Carnegie-Rochester Conference Series on Public Policy* (Vol. 39, pp. 47-52). North-Holland.

Bernanke, B. S., & Blinder, A. S. (1988). Credit, money, and aggregate demand. *The American Economic Review*, *78*(2), 435-439.

Bernanke, B. S., & Blinder, A. S. (1992). The federal funds rate and the channels of monetary transmission. *American economic review*, *82*(4), 901-21.

Bernanke, B. S., & Gertler, M. (1995). Inside the black box: the credit channel of monetary policy transmission. *Journal of Economic perspectives, 9(4), 27-48.*

Bernanke, B. S., & Mihov, I. (1998). Measuring monetary policy. *The quarterly journal of economics, 113(3), 869-902.*

Bernanke, B., Gertler, M. & Gilchrist, S. (1994). *The financial accelerator and the flight to quality*. National Bureau of Economic Research.

Blanchard, O. J. (1989). A traditional interpretation of macroeconomic fluctuations. *The American Economic Review, 1146-1164.*

Blanchard, O. J., & Quah, D. (1989). The dynamic effects of aggregate demand and supply disturbances. *The American Economic Review,* (Vol. 79, No. 4, pp. 655-673).

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics, 87(1), 115-143.*

Boone, P. (1996). Politics and the effectiveness of foreign aid. European economic review, 40(2), 289-329.

Bougheas, S., Mizen, P., & Yalcin, C. (2006). Access to external finance: Theory and evidence on the impact of monetary policy and firm-specific characteristics. *Journal of Banking & Finance, 30(1), 199-227.*

Canova, F., & Ciccarelli, M. (2013). Panel Vector Autoregressive Models: A Survey. *Emerald Group Publishing Limited.*

Canova, F., Ciccarelli, M., & Ortega, E. (2006, September). Do political events affect business cycles? The Maastricht treaty, the creation of the ECB and the euro economy. mimeo, presented at the Bundesbank spring conference.

Çatik, A. N., & Akdeniz, C. (2019). The evolution of the monetary transmission channels in Turkey: evidence from a TVP-VAR model. *Applied Economics Letters, 26(13), 1072-1079.*

Cheng, K. C. (2006). A VAR analysis of Kenya's monetary policy transmission mechanism: How does the central bank's REPO rate affect the economy (Working Paper No. 06/300). *International Monetary Fund.*

Chileshe, P. M. (2017). Banking structure and the bank lending channel of monetary policy transmission: Evidence from panel data methods.

Christiano, L. J., Eichenbaum, M., & Evans, C. L. (1999). Monetary policy shocks: What have we learned and to what end?. *Handbook of macroeconomics, 1, 65-148.*

Ciccarelli, M., Maddaloni, A., & Peydró, J. L. (2015). Trusting the bankers: A new look at the credit channel of monetary policy. *Review of Economic Dynamics, 18(4), 979-1002.*

Corden, W. M. (1982). Exchange rate policy and the resources boom. *Economic record*, *58*(1), 18-31.

Corden, W. M. (1984). Booming sector and Dutch disease economics: survey and consolidation. *oxford economic Papers*, *36*(3), 359-380.

Corden, W. M., & Neary, J. P. (1982). Booming sector and de-industrialisation in a small open economy. *The economic journal*, *92*(368), 825-848.

De Haan, L., & Sterken, E. (2006). The impact of monetary policy on the financing behaviour of firms in the Euro area and the UK. *European Journal of Finance, 12(5), 401-420.*

Easterly, W. (2003). Can foreign aid buy growth?. Journal of economic Perspectives, 17(3), 23-48.

Elbadawi, I. A. (1999). External aid: help or hindrance to export orientation in Africa?. *Journal of African Economies*, *8*(4), 578-616.

Fielding, D., & Gibson, F. (2013). Aid and Dutch disease in Sub-Saharan Africa. *Journal of African Economies*, *22*(1), 1-21.

Fischer, S. (1977). Long-term contracts, rational expectations, and the optimal money supply rule. *Journal of political economy, 85(1), 191-205.*

Franta, M., Horváth, R., & Rusnak, M. (2014). Evaluating changes in the monetary transmission mechanism in the Czech Republic. *Empirical Economics, 46(3), 827-842.*

Friedman, M., & Schwartz, A. J. (1963). *A monetary history of the United States. Princeton university press.*

Gali, J., & Monacelli, T. (2005). Monetary policy and exchange rate volatility in a small open economy. The Review of Economic Studies, 72(3), 707-734.

Gertler, M., & Gilchrist, S. (1993). The role of credit market imperfections in the monetary transmission mechanism: arguments and evidence. *The Scandinavian Journal of Economics*, 43-64.

Gertler, M., Gilchrist, S., & Monetary Policy, B. C. (1991).The Behaviour of Small Manufacturing Firms.

Gilchrist, S., & Himmelberg, C. (1998). Investment: fundamentals and finance. *NBER macroeconomics annual, 13, 223-262.*

Goodhart, C., & Hofmann, B. (2008). House prices, money, credit, and the macroeconomy. *Oxford review of economic policy, 24(1), 180-205.*

Gottschalk, J. (2001). An introduction into the SVAR methodology: identification, interpretation and limitations of SVAR models (No. 1072). Kiel working paper.

Hansen, H., & Headey, D. (2010). The short-run macroeconomic impact of foreign aid to small states: An agnostic time series analysis. *The Journal of Development Studies*, *46*(5), 877-896.

https://data.worldbank.org/share/widget?indicators=FS.AST.PRVT.GD.ZS&locations=GM-SL.

Hussain, M., Berg, A., & Aiyar, S. (2009). The macroeconomic management of increased aid: Policy lessons from recent experience. *Review of development economics*, *13*(3), 491-509.

Jiménez, G., Ongena, S., Peydró, J. L., & Saurina, J. (2012). Credit supply and monetary policy: Identifying the bank balance-sheet channel with loan applications. *American Economic Review, 102(5), 2301-26.*

Kashyap, A. K., Stein, J. C., & Wilcox, D. W. (1992). Monetary policy and credit conditions: Evidence from the composition of external finance.

Kashyap, A. K., Stein, J. C., & Wilcox, D. W. (1996). Monetary policy and credit conditions: Evidence from the composition of external finance: Reply. *The American Economic Review, 86(1), 310-314.*

Kashyap, A., & Stein, J. C. (1993). Monetary Policy and Bank Lending. *National Bureau of Economic Research.*

Kishan, R. P., & Opiela, T. P. (2000). Bank size, bank capital, and the bank lending channel. *Journal of Money, credit and banking, 121-141.*

Kishan, R. P., & Opiela, T. P. (2006). Bank capital and loan asymmetry in the transmission of monetary policy. *Journal of Banking & Finance, 30(1), 259-285.*

Kovanen, A. (2011). Monetary policy transmission in Ghana: Does the interest rate channel work? *International Monetary Fund Working Paper WP/11/275.*

Kucharcukova, O. B., Franta, M., Hájková, D., Král, P., Kubicová, I., Podpiera, A., & Saxa, B. (2013). *What we know about monetary policy transmission in the Czech Republic: Collection of empirical results (No. 2013/01)*. Czech National Bank.

Lartey, E. K. (2008). Capital inflows, Dutch Disease effects, and monetary policy in a small open economy. *Review of international economics*, *16*(5), 971-989.

Leamer, E. E. (1985, January). Vector autoregressions for causal inference?. *In Carnegie-rochester conference series on Public Policy (Vol. 22, pp. 255-304). North-Holland.*

Love, I., & Zicchino, L. (2006). Financial development and dynamic investment behaviour: Evidence from panel VAR. *The Quarterly Review of Economics and Finance, 46(2), 190-210.*

Lucas (1976). "Econometric policy evaluation: a critique." In the Phillips Curve and the Labour Market, eds. K. Brunner and A. Meltzer, Vol. 1 of the Carnegie-Rochester Conference in Public Policy, a supplemental series to the *Journal of Monetary Economics* . *Amsterdam: North-Holland.*

Lungu, M. (2007). Is there a bank lending channel in Southern African banking systems? *African Development Review, 19(3), 432-468.*

Mankiw, N. G., & Reis, R. (2018). Friedman's presidential address in the evolution of macroeconomic thought. *Journal of Economic Perspectives, 32(1), 81-96.*

Matousek, R., & Sarantis, N. (2009). The bank lending channel and monetary transmission in Central and Eastern European countries. *Journal of Comparative Economics, 37(2), 321-334.*

Matousek, R., & Solomon, H. (2018). Bank lending channel and monetary policy in Nigeria. *Research in International Business and Finance, 45, 467-474.*

Mishkin, F. S. (1995). Symposium on the monetary transmission mechanism. *Journal of Economic perspectives*, *9*(4), 3-10.

Mishkin, F. S. (2001). The transmission mechanism and the role of asset prices in monetary policy. *NBER Working Paper no. 8617.*

Mishra, P., Montiel, P. J., & Spilimbergo, A. (2011). How Effective Is Monetary Transmission in Developing Countries? A Survey of the Empirical Evidence.

Mishra, P., Montiel, P., Pedroni, P., & Spilimbergo, A. (2014). Monetary policy and bank lending rates in low-income countries: Heterogeneous panel estimates. *Journal of Development Economics*, *111*, *117-131*.

Moyo, D. (2012). Dead Aid: Why Aid is not Working and How There is a Better Way for Africa, Farrar, Straus and Giroux, 2010. *An African economist argues that African countries are worse off as a result of foreign aid*.

Muth, J. F. (1961). Rational expectations and the theory of price movements. *Econometrica: Journal of the Econometric Society, 315-335.*

Mwabutwa, C., Bittencourt, M., & Viegi, N. (2013). Evolution of monetary policy transmission mechanism in Malawi: A TVP-VAR Approach. *University of Pretoria, Department of Economics, Working Paper Series, (2013/27).*

Mwabutwa, C., Viegi, N., & Bittencourt, M. (2012). *Monetary Policy Response to Capital Inflows in Form of Foreign Aid in Malawi* (No. 201232).

Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica: Journal of the econometric society, 1417-1426.*

Nyong, M. (2014). The demand for money, structural breaks and monetary policy in the Gambia. *Developing Country Studies, 4(19).*

Nyoni, T. S. (1998). Foreign aid and economic performance in Tanzania. *World Development*, *26*(7), 1235-1240.

Nyumuah, F. S. (2018). An Empirical Analysis of the Monetary Transmission Mechanism of Developing Economies: Evidence from Ghana. *International Journal of Economics and Finance, 10(4), 72-83.*

Ogun, O. (1998). Real exchange rate movements and export growth: Nigeria, 1960-1990.

Oliner, S. D., & Rudebusch, G. D. (1995). Is there a bank lending channel for monetary policy? *Federal Reserve Bank of San Francisco Economic Review, 2(3), 20.*

Oliner, S. D., & Rudebusch, G. D. (1996). Monetary policy and credit conditions: evidence from the composition of external finance: comment. *The American Economic Review, 86(1), 300-309.*

Opolot, J., & Nampewo, D. (2014). Bank Lending Channel of the Monetary Policy Transmission Mechanism in Uganda: Evidence from Disaggregated Bank-level Data. *Journal of Applied Finance and Banking, 4(1), 47.*

Osei, R., Morrissey, O., & Lloyd, T. (2005). The fiscal effects of aid in Ghana. *Journal of International Development*, *17*(8), 1037-1053.

Ouattara, B., & Strobl, E. (2003). *Do Aid Inflows Cause Dutch Disease?: A Case Study of the CFA Franc Countries*. University of Manchester, School of Economic Studies.

Pedroni, P. (2013). Structural Panel VARs. *Econometrics, 1(2), 180-206.*

Prati, A., & Tressel, T. (2006). Aid volatility and Dutch disease: is there a role for macroeconomic policies?.

Prati, A., & Tressel, T. (2007). What is the Most Effective Monetary Policy. *Policy Matters: Economic and Social Policies to Sustain Equitable Development*, 254.

Pruteanu-Podpiera, A. M. (2007). The role of banks in the Czech monetary policy transmission mechanism. *Economics of Transition, 15(2), 393-428.*

Ramey, V. (1993, March). How Important is the Credit Channel in Monetary Transmission? In *Carnegie-Rochester Conference Series on Public Policy* (Vol. 39, pp. 1-45).

Roch, F. (2019). The adjustment to commodity price shocks. *Journal of Applied Economics, 22(1), 437-467.*

Romer, C. D., & Romer, D. H. (1989). Does monetary policy matter? A new test in the spirit of Friedman and Schwartz. *NBER macroeconomics annual*, *4*, 121-170.

Romer, C. D., Romer, D. H., Goldfeld, S. M., & Friedman, B. M. (1990). New evidence on the monetary transmission mechanism. *Brookings papers on economic activity*, *1990*(1), 149-213.

Sackey, H. A. (2001). External aid inflows and the real exchange rate in Ghana.

Samaké, I. (2010). A Macro Model of the Credit Channel in a Currency Union Member: The Case of Benin. *International Monetary Fund Working Paper WP/10/191*.

Sargent, T. (1979). Estimating vector autoregressions using methods not based on explicit economic theories. *Quarterly Review, 3(Sum).*

Sargent, T. J., & Wallace, N. (1975). " Rational" expectations, the optimal monetary instrument, and the optimal money supply rule. *Journal of political economy, 83(2), 241-254.*

Sargent, T., & Hansen, L. P. (1991). Two difficulties in interpreting vector autoregressions. *In Rational Expectations Econometrics. Westview Press.*

Simpasa, A. M., Nandwa, B., & Nabassaga, T. (2014). Bank Lending channel of monetary policy transmission in Zambia: Evidence from bank-level data. *African Development Bank Group.*

Sims, C. A. (1980a). Macroeconomics and reality. *Econometrica: journal of the Econometric Society, 1-48.*

Sims, C. A. (1980b). Comparison of interwar and postwar business cycles: Monetarism reconsidered. *American Economic Review*, 70(2), pp. 250 – 257.

Sims, C. A. (1986). Are forecasting models usable for policy analysis?. *Quarterly Review, 10(Win), 2-16.*

Sims, C. A. (1992). Interpreting the macroeconomic time series facts: The effects of monetary policy. *European economic review, 36(5), 975-1000.*

Snowdon, B., & Vane, H. R. (2005). *Modern macroeconomics: Its origin, development and current state*. Edward Elgar Cheltenham, UK • Northampton, MA, USA.

Sørensen, C. K., & Werner, T. (2006). Bank interest rate pass-through in the euro area: a cross country comparison (No. 580). *ECB working paper.*

Sriram, S. (2009). The Gambia: Demand for Broad Money and Implications for Monetary Policy Conduct. *International Monetary Fund Working Paper WP/09/192*.

Stanca, L., & Gallegati, M. (1999). The dynamic relation between financial positions and investment: evidence from company account data. *Industrial and Corporate Change, 8(3), 551-572*.

Temple, J., & Van de Sijpe, N. (2017). Foreign aid and domestic absorption. *Journal of International Economics*, *108*, 431-443.

The Central Bank of The Gambia. (1992). Central Bank of The Gambia Act, 1992.

The Central Bank of The Gambia. (2005). 2005 annual report.

The Central Bank of The Gambia. (2018). 2018 annual report. https://www.cbg.gm/annual-reports.

Thornton, J. (2014). Does foreign aid reduce tax revenue? Further evidence. *Applied Economics*, *46*(4), 359-373.

World Bank. (2021). World Bank Indicators 2020.

6. APPENDICES

6.1. Appendix A

6.1.1. Annex 1: Money Demand Function

The parameter for the coefficient on money in the household utility optimization problem is obtained by estimating a simple demand for money function for The Gambia using the Fully Modified Ordinary Least Squares (FMOLS) technique. The estimated model is as below and the parameter alpha (α_2) captures the semi-elasticity of the own rate of money (taken to proxy the elasticity of substitution of money in our model).

$$lnM_t = \alpha_0 + \alpha_1 lnY_t + \alpha_2 lni_t + \alpha_3 lnCPI_t + \alpha_4 lnEX_t + \upsilon_t \quad ,$$

Where M_t is real money balances (M2), Y_t is real GDP, i_t is 91-day treasury bill rate (which is also taken as the own rate of money in the literature), CPI_t is consumer price index to capture the rate inflation, EX_t is the nominal exchange rate which is included because of its importance in the conduct of monetary policy and υ_t is the error term which follows an iid process.

6.1.2. Annex 2: Total Factor Productivity in Tradable and Non-Tradable Sectors

There are no readily available estimates on sectoral total factor productivities for The Gambia such that we could use them in this study. To this end, we adopted the values of sectoral total factor productivities and country average total factor productivity by Koomson (2019) and scaled the values to the Gambia average. Koomson's study was on West Africa and country total factor productivities, as well as sectoral averages, was obtained as follows:

SECTORS	AVERAGE (1970 - 2011)
AGRICULTURE	6.9
SERVICE	6.1
MANUFACTURING	5.1
GAMBIA (COUNTRY AVERAGE)	3.7

To calculate the sectoral total factor productivity for The Gambia, we scaled the regional sectoral averages to the country average. It is important to note that these were the best proxies we could provide given the unavailability of readily available values.

TFP in Agriculture: [6.9/18.1] x 3.7 = 1.4
TFP in Service: [6.1/18.1] x 3.7 = 1.25

TFP in Manufacturing: [5.1/18.1] x 3.7 = 1.0

Since we are taking the agricultural sector as the tradable sector and the services sector as the non-tradable sector in this research, hence the above values are used for the calibration of Z and X where Z = 1.25 and X = 1.40.

6.1.3. Annex 3: Derivation of the Household Optimization Problem

From Equations (1) and (2), we rewrite consumption taking into account consumption on tradable and non-tradable goods. To obtain the first-order conditions of the problem, we form the Lagrange as follows:

$$L_t = \sum_{t=0}^{\infty} \beta^t \{ \left[\eta \ln \left(\left(\frac{C_t^T}{\theta} \right)^{\theta} \left(\frac{C_t^N}{1-\theta} \right)^{1-\theta} \right) + \varphi \ln \left(\frac{M_t}{P_t} \right) - \psi \ln \left(1 - L_t \right) \right] -$$

$$\lambda_t \left[M_t + P_t^T C_t^T + P_t^N C_t^N - M_{t-1} - e_t \tau_t A_t - W_t L_t - R_t K_t \right] \}.$$

First-order conditions:

FOC C_t^T:

$$\frac{\partial L}{\partial C_t^T} = \sum_{t=0}^{\infty} \beta^t \frac{\eta\theta}{C_t^T} - \sum_{t=0}^{\infty} \beta^t \lambda_t P_t^T = 0$$

$$\frac{\eta\theta}{C_t^T} = \lambda_t P_t^T \quad \rightarrow \quad \lambda_t = \frac{\eta\theta}{P_t^T C_t^T} \tag{4}$$

FOC C_t^N:

$$\frac{\partial L}{\partial C_t^N} = \sum_{t=0}^{\infty} \beta^t \frac{\eta(1-\theta)}{C_t^N} - \sum_{t=0}^{\infty} \beta^t \lambda_t P_t^N = 0$$

$$\frac{\eta(1-\theta)}{C_t^N} = \lambda_t P_t^N \quad \rightarrow \quad \lambda_t = \frac{\eta(1-\theta)}{P_t^N C_t^N} \tag{5}$$

FOC M_t:

$$\frac{\partial L}{\partial M_t} = \sum_{t=0}^{\infty} \beta^t \frac{\varphi}{M_t} - \sum_{t=0}^{\infty} \beta^t \lambda_t + \sum_{t=0}^{\infty} \beta^t \lambda_{t+1} = 0$$

$$\frac{\varphi}{M_t} + \beta\, \lambda_{t+1} = \lambda_t \tag{6}$$

Where Equation (6) can be rewritten using $P_t^T = e_t$ and λ_t in Equation (4) as:

$$\frac{\varphi}{M_t} = \frac{\eta\theta}{e_t C_t^{\ T}} - \beta \ \frac{\eta\theta}{e_{t+1} C_{t+1}^{\ T}} \qquad (7)$$

FOC L_t :

$$\frac{\partial L}{\partial L_t} = \sum_{t=0}^{\infty} \beta^t \frac{\psi}{(1-L_t)} - \sum_{t=0}^{\infty} \beta^t \lambda_t W_t = 0$$

$$\frac{\psi}{(1-L_t)} = \lambda_t W_t \qquad \rightarrow \qquad \lambda_t = \frac{\psi}{(1-L_t)W_t} \qquad (8)$$

Using the same condition $P_t^T = e_t$, we combine (4) & (5), (4) & (8) and using the results in Equation (7), we summarize the first-order conditions as follows:

$$\frac{1-\theta}{P_t^N C_t^{\ N}} = \frac{\theta}{e_t \ C_t^{\ T}} \qquad (9)$$

$$\frac{\varphi}{M_t} = \frac{\eta\theta}{e_t C_t^{\ T}} - \beta \ \frac{\eta\theta}{e_{t+1} C_{t+1}^{\ T}} \qquad (10)$$

$$\frac{(1-L_t)W_t}{e_t C_t^{\ T}} = \frac{\psi}{\eta\theta} \qquad (11)$$

Equation (9) represents the ratio of consumption of tradable goods and non-tradable goods which depends on the share and ratio of the two goods. While Equations (10) and (11) show the relationship between consumption, money supply and leisure. In effect, the trade-off between consumption and leisure depends on the elasticity of substation in consumption and the inverse of labour supply elasticity.

6.1.4. Annex 4: Derivation of the Firms Optimization Problem

Tradable Sector:

The representative firm maximizes the following problem:

$$Max\{K_t^{\ T}, L_t^{\ T}\}\left[P_t^T Y_t^T - W_t L_t^{\ T} - R_t K_t^{\ T}\right] \qquad (13)$$

$$\ell = P_t^T \left(X\left[K_t^{\ T}\right]^{\alpha}\left[L_t^{\ T}\right]^{1-\alpha}\right) - W_t L_t^{\ T} - R_t K_t^{\ T}$$

FOC. *wrt* $K_t^{\ T}$:

$$\frac{\partial \ell}{\partial K_t^{\ T}} = \alpha X P_t^T \left(K_t^{\ T}\right)^{\alpha-1}\left(L_t^{\ T}\right)^{1-\alpha} - R_t = 0$$

$$\alpha X P_t^T \left(K_t^{\ T}\right)^{\alpha-1}\left(L_t^{\ T}\right)^{1-\alpha} = R_t \qquad (13.1)$$

FOC. *wrt* $L_t^{\ T}$:

$$\frac{\partial \ell}{\partial L_t^{\ T}} = (1-\alpha) X P_t^T \left(K_t^{\ T}\right)^{\alpha}\left(L_t^{\ T}\right)^{-\alpha} - W_t = 0$$

$$(1-\alpha) X P_t^T \left(K_t^{\ T}\right)^{\alpha}\left(L_t^{\ T}\right)^{-\alpha} = W_t \qquad (13.2)$$

Non-Tradable Sector:

The representative firm maximizes the following problem:

$$Max\{K_t^N, L_t^N\}\left[P_t^N Y_t^N - W_t L_t^N - R_t K_t^N\right] \tag{14}$$

$$\ell = P_t^N\left(Z\left[K_t^N\right]^{\varepsilon}\left[L_t^N\right]^{1-\varepsilon}\right) - W_t L_t^N - R_t K_t^N$$

FOC. wrt K_t^N:

$$\frac{\partial \ell}{\partial K_t^N} = \varepsilon Z P_t^N\left(K_t^N\right)^{\varepsilon-1}\left(L_t^N\right)^{1-\varepsilon} - R_t = 0$$

$$\varepsilon Z P_t^N\left(K_t^N\right)^{\varepsilon-1}\left(L_t^N\right)^{1-\varepsilon} = R_t \tag{14.1}$$

FOC. wrt L_t^N:

$$\frac{\partial \ell}{\partial L_t^N} = (1-\varepsilon) Z P_t^N\left(K_t^N\right)^{\varepsilon}\left(L_t^N\right)^{-\varepsilon} - W_t = 0$$

$$(1-\varepsilon) Z P_t^N\left(K_t^N\right)^{\varepsilon}\left(L_t^N\right)^{-\varepsilon} = W_t \tag{14.2}$$

Combining (13.1) & (14.1) and (13.2) & (14.2), we obtain the following:

$$\alpha X P_t^T\left(K_t^T\right)^{\alpha-1}\left(L_t^T\right)^{1-\alpha} = \varepsilon Z P_t^N\left(K_t^N\right)^{\varepsilon-1}\left(L_t^N\right)^{1-\varepsilon} \tag{15}$$

$$(1-\alpha) X P_t^T\left(K_t^T\right)^{\alpha}\left(L_t^T\right)^{-\alpha} = (1-\varepsilon) Z P_t^N\left(K_t^N\right)^{\varepsilon}\left(L_t^N\right)^{-\varepsilon} \tag{16}$$

Dividing (15) over (16), we get the following:

$$\frac{\alpha}{(1-\alpha)}\frac{L_t^T}{K_t^T} = \frac{\varepsilon}{(1-\varepsilon)}\frac{L_t^N}{K_t^N} \quad \Rightarrow \quad \frac{K_t^T}{L_t^T} = \frac{\alpha(1-\varepsilon)}{\varepsilon(1-\alpha)}\left(\frac{K_t^N}{L_t^N}\right) \tag{17}$$

Now plugging (17) into (15) for $\frac{K_t^T}{L_t^T}$, we end up with:

$$\alpha X P_t^T\left[\frac{\alpha(1-\varepsilon)}{\varepsilon(1-\alpha)}\left(\frac{K_t^N}{L_t^N}\right)\right]^{\alpha-1} = \varepsilon Z P_t^N\left(K_t^N\right)^{\varepsilon-1}\left(L_t^N\right)^{1-\varepsilon}$$

$$\left(\frac{\alpha}{\varepsilon}\right)^{\alpha}\left(\frac{1-\varepsilon}{1-\alpha}\right)^{\alpha-1}\frac{X}{Z}\left(\frac{K_t^N}{L_t^N}\right)^{\alpha-\varepsilon} = \frac{P_t^N}{P_t^T} \tag{18}$$

6.1.5. Annex 5: Structural Form of the Model

- Endogenous Variables:

  $C_t, C_t^T, C_t^N, M_t, L_t, K_t^T, K_t^N, L_t^T, L_t^N, P_t, P_t^T, P_t^N, e_t, R_t, W_t, D_t, I_t^r, Y, Y^T, Y^N, g_t, g_t^T, g_t^N$

- Exogenous Variables: τ_t, μ_t, A_t.

- Parameters: $\beta, \eta, \varphi, \psi, \theta, \alpha, \varepsilon, Z, X, \Omega_g, \rho_d, \rho_A, K$.

1. $C_t = \left(\frac{C_t^T}{\theta}\right)^{\theta}\left(\frac{C_t^N}{1-\theta}\right)^{1-\theta}$

2. $\frac{1-\theta}{P_t^N C_t^N} = \frac{\theta}{e_t C_t^T}$

3. $\frac{\varphi}{M_t} = \frac{\eta}{P_t C_t^N} - \beta\frac{\eta}{P_{t+1}C_{t+1}}$

4. $\frac{(1-L_t)W_t}{P_t C_t} = \frac{\psi}{\eta}$

5. $P_t^T = e_t$

6. $P_t = \left(P_t^T\right)^{\theta}\left(P_t^N\right)^{1-\theta}$

7. $C_t^T = X(K_t^T)^{\alpha}(L_t^T)^{1-\alpha} + (\tau_t - \mu_t)e_t A_t$

8. $C_t^N = Z(K_t^N)^{\varepsilon}(L_t^N)^{1-\varepsilon}$

9. $\alpha X P_t^T (K_t^T)^{\alpha-1}(L_t^T)^{1-\alpha} = R_t$

10. $\varepsilon Z P_t^N (K_t^N)^{\varepsilon-1}(L_t^N)^{1-\varepsilon} = R_t$

11. $(1-\alpha)X P_t^T (K_t^T)^{\alpha}(L_t^T)^{-\alpha} = W_t$

12. $(1-\varepsilon)Z P_t^N (K_t^N)^{\varepsilon}(L_t^N)^{-\varepsilon} = W_t$

13. $D_t = \rho_d D_{t-1} + (1-\tau_t)e_t A_t$

14. $M_t = M_{t-1} + e_t \mu_t A_t$

15. $I_t^r = I^r{}_{t-1} + (1-\mu_t)A_t$

16. $\overline{K} = K_t^T + K_t^N$

17. $L_t = L_t^T + L_t^N$

18. $Y_t = Y_t^T + Y_t^N$

19. $Y_t^T = X(K_t^T)^{\alpha}(L_t^T)^{1-\alpha}$

20. $Y_t^N = \frac{P_t^N}{e} Z(K_t^N)^{\varepsilon}(L_t^N)^{1-\varepsilon}$

21. $g_t = \Omega_g g_t^N + (1-\Omega_g)g_t^T$

22. $g_t^N = \Omega_g g_t$

23. $g_t^T = (1-\Omega_g) g_t$

We now introduce the steady-state representation of the model. At the steady-state, A is fixed thus no action is required from the government $(\tau_t = 1)$ and the central bank $(\mu_t = 0)$. As a result, the steady-state equations are as follows where a bar above a variable shows its steady-state value:

1. $\overline{C} = \frac{(\overline{C}^T)^\theta (\overline{C}^N)^{1-\theta}}{\theta^\theta (1-\theta)^{1-\theta}}$

2. $\frac{\bar{e}\overline{C}^T}{\overline{P}^N \overline{C}^N} = \frac{\theta}{1-\theta}$

3. $\frac{\varphi}{\overline{M}} - (1-\beta)\frac{\eta}{\overline{P}\overline{C}} = 0$

4. $\frac{(1-\overline{L})\overline{W}}{\overline{P}\overline{C}} = \frac{\psi}{\eta}$

5. $\overline{P}^T = \bar{e}$

6. $\overline{P} = \left(\overline{P}^T\right)^\theta \left(\overline{P}^N\right)^{1-\theta}$

7. $\overline{C}^T = X(\overline{K}^T)^\alpha (\overline{L}^T)^{1-\alpha} + \overline{A}$

8. $\overline{C}^N = Z(\overline{K}^N)^\varepsilon (\overline{L}^N)^{1-\varepsilon}$

9. $\alpha X \overline{P}^T (\overline{K}^T)^{\alpha-1} (\overline{L}^T)^{1-\alpha} = \overline{R}$

10. $\varepsilon Z \overline{P}^N (\overline{K}^N)^{\varepsilon-1} (\overline{L}^N)^{1-\varepsilon} = \overline{R}$

11. $(1-\alpha) X \overline{P}^T (\overline{K}^T)^\alpha (\overline{L}^T)^{-\alpha} = \overline{W}$

12. $(1-\varepsilon) Z \overline{P}^N (\overline{K}^N)^\varepsilon (\overline{L}^N)^{-\varepsilon} = \overline{W}$

13. $\overline{Y} = \overline{Y}^T + \overline{Y}^N$

14. $\overline{Y}^T = X(\overline{K}^T)^\alpha (\overline{L}^T)^{1-\alpha}$

15. $\overline{Y}^N = \frac{\overline{P}^N}{\bar{e}} Z(\overline{K}^N)^\varepsilon (\overline{L}^N)^{1-\varepsilon}$

16. $\overline{\mu} = 0$

17. $\bar{\tau} = 1$

18. $\overline{K} = \overline{K}^T + \overline{K}^N$

19. $\overline{L} = \overline{L}^{T} + \overline{L}^{N}$

20. $\overline{g_t} = \Omega_g \overline{g_t^{N}} + (1-\Omega_g)\overline{g_t^{T}}$

21. $\overline{g_t^{N}} = \Omega_g \overline{g_t}$

22. $\overline{g_t^{T}} = (1-\Omega_g)\overline{g_t}$

6.2. Appendix B

Table 6.1. Augmented Dickey-Fuller (ADF) Test Results

Variable	At Level		At First Difference	
	With Intercept	With Intercept and Trend	With Intercept	With Intercept and Trend
Log Real GDP	0.9556 (10)	0.5387 (10)	0.0010 (9)	0.0062 (9)
Log CPI	0.9577 (1)	0.0950 (5)	0.0000 (0)	0.0000 (0)
Log BL	0.3888 (6)	0.7156 (1)	0.0000 (0)	0.0011 (5)
MPR	0.1037 (1)	0.2224 (1)	0.0002 (0)	0.0016 (0)
Log NEER	0.2798 (1)	0.5075 (2)	0.0008 (1)	0.0000 (0)
Log BLR	0.3927 (2)	0.5440 (2)	0.0000 (1)	0.0000 (1)
LogAgric.Loans	0.2653 (2)	0.4202 (2)	0.0000 (1)	0.0000 (1)
Log B&C Loans	0.6187 (0)	0.5803 (2)	0.0000 (1)	0.0001 (1)
Log DT Loans	0.5227 (0)	0.8349 (0)	0.0003 (2)	0.0000 (0)
Log TZM Loans	0.4520 (3)	0.3971 (3)	0.0005 (2)	0.0032 (2)
Log PL Loans	0.2649 (4)	0.5616 (0)	0.0000 (0)	0.0000 (0)

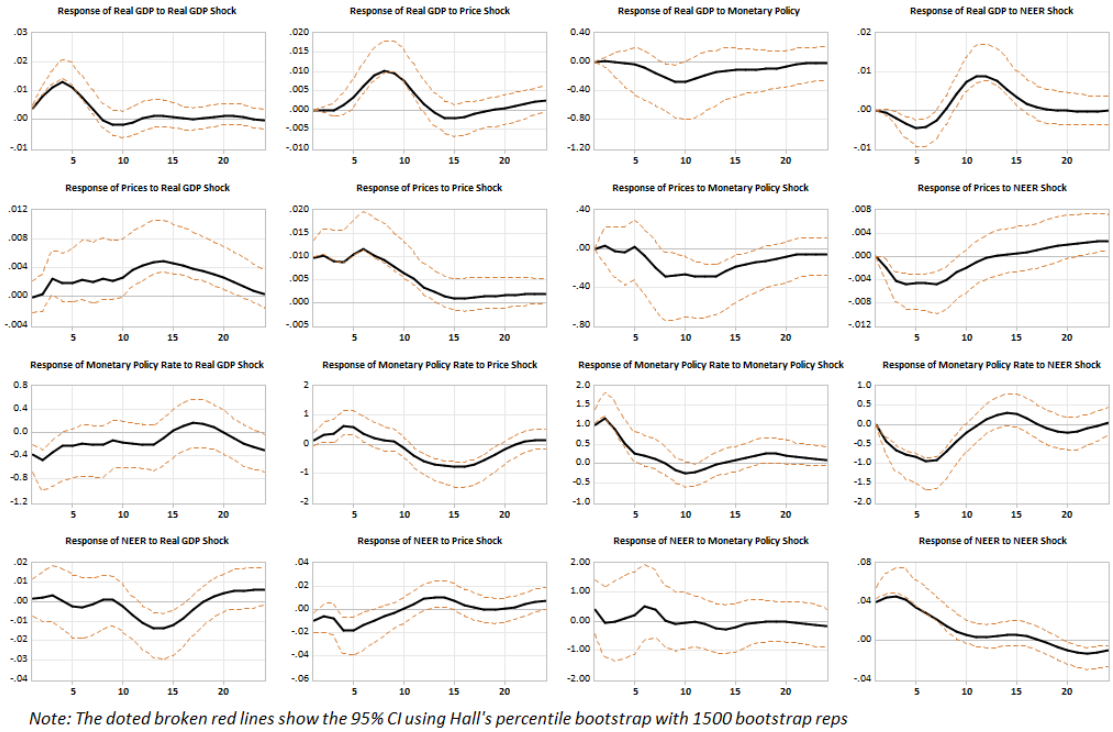
Source: Author's calculations

Table 6.2. Data Description and Source

	Real GDP	CPI	MPR	NEER	Bank loans	Lending rate
Mean	9.322708	4.541848	18.04167	4.687629	7.785900	22.67109
Median	9.338906	4.553610	15.75000	4.597528	8.153617	22.12500
Maximum	9.650914	5.233670	34.00000	5.676288	8.971662	34.50000
Minimum	8.958210	3.843853	10.00000	4.151712	6.041651	19.00000
Std. Dev.	0.185618	0.403404	5.803962	0.466874	0.872011	2.668651
Skewness	-0.024588	-0.114650	1.427810	0.961802	-0.619517	2.078180
Kurtosis	2.177608	1.967846	4.514667	2.683500	2.036492	7.318045
Jarque-Bera	2.601865	4.285359	40.05366	14.56829	9.443616	137.6966
Probability	0.272278	0.117340	0.000000	0.000686	0.008899	0.000000
Sum	857.6892	417.8500	1659.833	431.2619	716.3028	2085.740
Sum Sq. Dev.	3.135316	14.80886	3065.424	19.83537	69.19667	648.0747
Observations	92	92	92	92	92	92
Source	World Bank Indicator	IFS of IMF	IFS of IMF	IFS of IMF	CBG	CBG
Unit	Millions of GMD	Index	Percent	Index	Millions of GMD	Percent
Frequency	Annual	Monthly	Monthly	Monthly	Monthly	Monthly
Transformed	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly

Source: Author's calculations

6.2.1. Full Impulse Response of Recursive SVAR



Note: The doted broken red lines show the 95% CI using Hall's percentile bootstrap with 1500 bootstrap reps

Figure 6.1. Responses of endogenous variables to structural shocks (**Benchmark model**)

6.2.2. Full Impulse Response of Non-Recursive SVAR

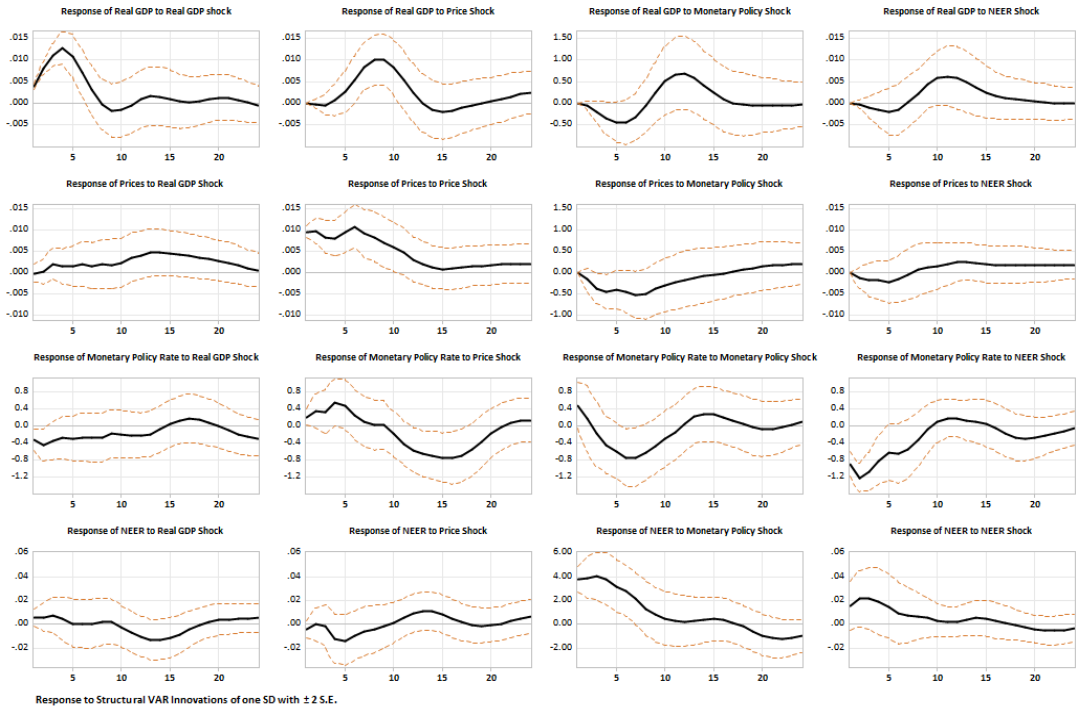


Figure 6.2. Responses of endogenous variables to structural shocks (**Benchmark model**)

6.2.3. Diagnostic Tests

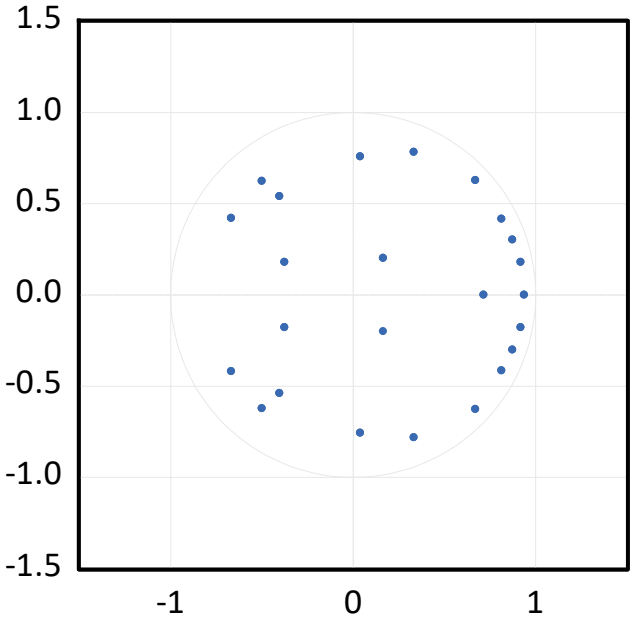


Figure 6.3. Inverse Roots of AR Characteristic Polynomial (Stability Test)

Table 6.3. VAR Residual Serial Correlation LM Tests

Sample: 1998Q1 2020Q4
Included observations: 86

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	29.03689	16	0.0237	1.900940	(16, 156.4)	0.0239
2	33.84351	16	0.0057	2.249491	(16, 156.4)	0.0058
3	27.83192	16	0.0331	1.815157	(16, 156.4)	0.0334
4	39.04124	16	0.0011	2.638119	(16, 156.4)	0.0011
5	10.79974	16	0.8217	0.667898	(16, 156.4)	0.8221
6	14.65481	16	0.5501	0.917203	(16, 156.4)	0.5508
7	23.09316	16	0.1113	1.483868	(16, 156.4)	0.1118

Null hypothesis: No serial correlation at lag h

Table 6.4. VAR Residual Normality Tests

Sample: 1998Q1 2020Q4
Included observations: 86

Component	Skewness	Chi-sq	df	Prob.*
1	0.052402	0.039358	1	0.8427
2	0.642414	5.915313	1	0.0150
3	0.193030	0.534070	1	0.4649
4	0.048064	0.033112	1	0.8556
Joint		6.521854	4	0.1634

Component	Kurtosis	Chi-sq	df	Prob.
1	3.127646	0.058385	1	0.8091
2	4.654983	9.814633	1	0.0017
3	3.899566	2.899699	1	0.0886
4	2.853652	0.076747	1	0.7818
Joint		12.84946	4	0.0120

Component	Jarque-Bera	df	Prob.
1	0.097743	2	0.9523
2	15.72995	2	0.0004
3	3.433769	2	0.1796
4	0.109859	2	0.9466
Joint	19.37132	8	0.0130

Null Hypothesis: Residuals are multivariate normal
*Approximate p-values do not account for coefficient estimation