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COPYCAT THEORY:
TESTING FOR FISCAL POLICIES HARMONIZATION IN THE SOUTHERN AFRICAN DEVELOPMENT COMMUNITY (SADC) AND SUB-SAHARAN AFRICA (SSA)

BY

CHRISTINE EGA MBAKILE-MOLOI

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree
of
Doctor of Philosophy
in the
Andrew Young School of Policy Studies
of
Georgia State University

GEORGIA STATE UNIVERSITY
2006

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2006

ACCEPTANCE

The dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics in the Andrew Young School of Policy Studies of Georgia State University.

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TABLE OF CONTENTS

Page

ACKNOWLEDGEMENTS vi

List of Tables xii

List of Figures xv

List of Appendices xvi

ABSTRACT xvii

CHAPTER 1: INTRODUCTION AND OVERVIEW 1

CHAPTER 2: MOTIVATION AND INSTITUTIONAL CONTEXT 10

What is Copy-Cat Behavior 10

Motivation 11

Why Do Jurisdictions Engage in Fiscal Mimicking 14

Some Background on SADC and SSA and its Economic Blocs 16

Southern African Development Community (SADC) 17

Other Regional Economic Blocs of Sub-Saharan Africa 29

The Economic Community of West African States (ECOWAS) 31

Common Market of Eastern and Southern Africa (COMESA) 31

The East African Community (EAC) 33

The Indian Ocean Commission (COI) 33

Economic Community of Central African States (ECCAS) 34

Intergovernmental Authority on Development (IGAD) 34

CHAPTER 3: REVIEW OF LITERATURE 37

Expenditure Mimicking 38

Tax Revenue Mimicking 40

Determining the Weights for the Weight Matrices 41

Previous Studies 42

CHAPTER 4: THEORETICAL FRAMEWORK 71

Some Background on the Expenditure and Tax Structures of the SADC Member Countries 71

Expenditures 71

Tax Structure 73

Theoretical Models 77

Theoretical Model I-Expenditures 77

Theoretical Model II–Tax Revenues 82

CHAPTER 5: THE EMPIRICAL SPECIFICATIONS 88

Econometric Model: Expenditure Side 88

Multiple Neighbors 89

Correlated Random Shocks 91

Empirical Estimation: Tax Revenue Side 92

Spatial Specification 93

Geographic Definition of Weight Matrices 96

Economic Definitions of Weight Matrices 98

Social Definitions of Weight Matrices 99

Methodologies 100

Generalized Method of Moments (GMM) 102

GMM Specification 102

Generalized Spatial Two Stage Least Squares (GS2SLS) Estimation 104

CHAPTER 6: DATA SET AND CHOICE OF VARIABLES 106
Dependent Variables 107
Government Expenditures 107
Government Tax Revenues 108
Descriptive Variables of Countries 108
Economic Variables 109
Socio-demographic Characteristics: 110
Political Variables: 111
CHAPTER 7: RESULTS 114
Government Tax Revenues 115
Sub-Saharan Africa 117
Southern African Development Community 120
Government Expenditures 122
Sub-Saharan Africa 122
Southern African Development Community 124
Explanatory Variables 125
Summary: Interpreting the Spatial Coefficients 129
Sub-Saharan Africa 129
Correlation between the Error Terms 136
GMM Vs GS2SLS Methodologies 139
Maximum Likelihood Estimations (MLE) 140
Spatial Analysis for Government Efficiency 141
Further Analyses of the Results 143

Some Simulations and Graphical Analyses of our Results 143

Spatial Dependency Tests 145

CHAPTER 8: SUMMARY AND CONCLUSIONS 147

CHAPTER 9: POLICY IMPLICATIONS AND FUTURE WORK 152

APPENDIX A: SUMMARY STATISTICS AND RESULTS 154

APPENDIX B: FIGURES 202

APPENDIX C: Total Differentiation-The Expenditure Theoretical Model.....208

REFERENCES 210

VITA 216

LIST OF TABLES

Table Page

1. The Evolution of SADC 22

2. GDP per Capita for SADC Members (constant 2000 US$) 24

3 SADC Countries' Adoption of VAT and Other Consumption Taxes 28

4. Sub-Saharan African Economic Regional Blocs 36

5. Summary of Previous Empirical Studies and Results 53

6. SADC Tax Structures as at December 2004 76

7. Summary Results and Interpretation (Using Contiguity Weight Matrix and Controlling for Fixed Effects) 133

8 Correlation between the Error Terms: Education for SADC 138

9 Correlation between the Error Terms: Health for SADC 138

10 Correlation between the Error Terms: International Trade for SADC 139

A1. Summary Statistics for SSA Expenditures 154

A2. Summary Statistics for SSA Tax Revenues 156

A3. Summary Statistics for SADC 158

A4. Africa's Multiple Regional Economic Groups 160

A5. Countries Included in Each Sample. 161

A6. Individual Tax Revenue-SSA 162

A7. Corporate Tax Revenue–SSA 163

A8. Value Added Tax–SSA 164

A9. Excise Tax–SSA 165

A10. International Trade Taxes–SSA 166

A11. General Public Services–SSA 167

A12. Defense–SSA 168

A13. Education–SSA 169

A14. Health–SSA.....170

A15. Transportation and Communication-SSA.....171

A16. Individual Tax Revenue–SADC 172

A17. Corporate Tax Revenue–SADC.....173

A18. Value Added Tax–SADC 174

A19. Excise Tax-SADC.....175

A20. International Trade Taxes–SADC.....176

A21. General Public Services–SADC 177

A22. Defense–SADC.....178

A23. Education–SADC.....179

A24. Health–SADC 180

A25. Transportation and Communication-SADC 181

A26. SSA Tax Revenues–Generalized Spatial Two Stage Least Squares (GS2SLS) Estimations.....182

A27. SSA Expenditures–GS2SLS 183

A28. SADC Tax Revenues–GS2SLS 184

A29. SADC Expenditures–GS2SLS.....185

A30. Tax Revenue/Expenditures Ratio–SSA 186

A31. Tax Revenue/Expenditures Ratio–SADC.....187

A32. Moran I and LM Spatial Error Tests-SSA 188

A33. Moran I and LM Spatial Error Tests-SADC.....189

A34. Results Summary Table-SSA 190

A35. Results Summary Table-SADC 192

A36. Tax Revenues–Generalized Spatial Two Stage Least Squares (GS2SLS) Estimations.....194

A37. Expenditures–GS2SLS 194

A38. Tax Revenue/Expenditures Ratio 195

A39. Spatial Coefficients Results: Selected Periods-SSA.....196

A40. Spatial Coefficients Results: Selected Periods-SADC 197

A41. SSA Tax Revenues–Maximum Likelihood (MLE) Estimations 198

A42. SSA Expenditures–Maximum Likelihood (MLE) Estimations.....199

A43. SADC Tax Revenues–Maximum Likelihood (MLE) Estimations.....200

A44. SADC Expenditures-Maximum Likelihood (MLE) Estimations 201

LIST OF FIGURES

Figure Page

1. Corporate Taxes-SADC 202

2. VAT-SADC 202

3. Excise Taxes-SADC 203

4. International Trade Taxes-SADC 203

5. General Public Services-SADC 204

6. Defense Expenditures-SADC 204

7. Individual Taxes-SSA 205

8. Corporate Taxes-SSA 205

9. VAT-SSA 206

10. Excise Taxes-SSA 206

11. International Trade-SSA 207

LIST OF APPENDICES

Page

Appendix A Summary Statistics and Results 154

Appendix B Figures 202

Appendix C Total Differentiation of Theoretical Model 208

ABSTRACT

COPYCAT THEORY:

TESTING FOR FISCAL POLICIES HARMONIZATION IN THE SOUTHERN AFRICAN COORDINATING COMMUNITY (SADC) AND SUB-SAHARAN AFRICA (SSA)

By

CHRISTINE EGA MOLOI

December 2006

Committee Chair: Dr. Sally Wallace

Major Department: Economics

The objective of this dissertation is to test empirically whether fiscal policy mimicking exists in developing countries and whether such mimicking leads to policy harmonization. This is done by studying the Southern African Development Community (SADC) Region and Sub-Saharan Africa (SSA). The dissertation uses panel data and applies the generalized method of moments (GMM) and the generalized spatial two-stage least squares (GS2SLS) methodologies to a spatial setting to test for the spatial interactions. The study also tests for evidence of spatial interaction in the assessment of government efficiency by voters in neighboring countries, where efficiency is measured using the price/quantity ratio of public goods provision. We find evidence of fiscal policy copycat behavior in both the SSA and SADC regions and mimicking is also

present in some tax revenues as well as in expenditure levels. This leads us to conclude that there is some form of fiscal harmonization taking place in these developing countries. We also find evidence of spatial interaction in the assessment of governments' efficiency in the provision of public goods. Overall, we conclude that there is evidence of some fiscal mimicking behavior as a developing world phenomenon.

CHAPTER 1: INTRODUCTION AND OVERVIEW

That a jurisdiction's policies may be influenced by other jurisdictions' policies has been explored by a number of authors of late. Empirical studies have found evidence that both tax and expenditure policies are copied among neighboring jurisdictions. However, most studies have been carried out at a local government or county level and in developed countries. A few studies that are related to this phenomenon have been carried out at the state level in the United States and these include, among others, Alm, McKee et al. (1993), Baicker (2001), Besley and Rosen (1998), Case, Hines et al. (1989), Case, Rosen et al. (1993) and Rork (2003). A study that was carried out by Goodspeed (2000) looked at thirteen OECD[1] countries but estimated the impact of horizontal and vertical externalities at the county local level.

According to Heyndels and Vuchelen (1998), mimicking can occur both on the expenditure and revenue sides of the budget. However, the existing literature tends to focus more on the revenue (tax) side, thus fitting into the fast growing positive literature aimed at explaining actual tax choices from a politico-economic perspective. The mimic models assume that politicians' tax setting behavior and expenditure decisions are dominated by electoral considerations.

There are a number of reasons why both voters and politicians will be particularly sensitive to fiscal policies in nearby jurisdictions. First, information on close-by jurisdictions' policies spreads more easily than information on far-away jurisdictions, even though with electronic commerce, it is now much easier for information to spread to

[1] Organization for Economic Cooperation and Development

distant jurisdictions very fast. Second, geographical neighbors are more likely to experience similar shocks, such as tax-base and business cycle shocks. Geographic ties could actually be more important in developing countries particularly where these countries tend to have strong cultural, historic and commercial ties. Thirdly, Besley and Case (1995) point out that in a world where voters make comparisons between states, incumbents may look to other states' taxing behavior before changing taxes at home. This in turn gives rise to a kind of (yardstick) competition between jurisdictions, each caring about what the other is doing. Tax-setting behavior is thus affected by electoral competition, whereby states would reduce tax rate increases that put them out of line with their neighbors. Case, Hines et al. (1989) point out that when states perceive that their spending levels are out of line with those of similarly situated states, they will often demand for change that will re-align their spending levels with these other states. Further, with globalization and regional economic integration sweeping across continents, objectives of these regional blocs such as harmonizing their various policies could lead to some mimicking or spatial interaction behavior as regions try to attain these objectives. Hence, mimicking could either be mandated or just voluntary, depending on how successful or how deep the integration process has gone.

With regard to tax burdens on people, the Tiebout model and its emphasis on voting with one's feet could be used to explain local official's concern with tax burdens in neighboring jurisdictions. However, the Tiebout mechanism need not lead to any mimicking behavior because the mechanism asserts that fiscally related movement among jurisdictions is motivated not by the burdens alone, but rather by the entire fiscal package which includes the level of public services relative to tax burdens. It is also the

case that some people could just " like" the tax package they have and will not move or vote with their feet. According to the Tiebout model, jurisdictions need not maintain similar tax burdens as long as they offset that with similar services. Ladd (1992) explains that some jurisdictions purposefully keep tax and spending burdens low relative to their neighbors specifically to differentiate their community fiscally from the others.

Empirical studies that have been undertaken in this area (and most are relatively recent) have mainly been on the U.S. states' and local government tax policies and they have shown that fiscal policies are copied among neighboring jurisdictions. Fewer studies have been undertaken on expenditure mimicking by jurisdictions and they have also found the presence of such mimicking. To indicate that tax mimicking is not atypical of the U.S. system but rather a general characteristic of decision making in a context of centralized government, some studies were carried out in Belgium (Heyndels and Vuchelen 1998) and England (Revelli 2001) and the general results were in line with the findings in the U.S., that such mimicking does exist elsewhere as well. More studies on fiscal policy mimicking outside the U.S. followed and these have been carried out in countries such as France, Spain, and Switzerland and even regionally in the OECD.

However, it would appear that little or no such study has been undertaken at a country level or for a group of countries, where some characteristics are quite heterogeneous. The majority of the studies were carried out at county and state levels, where characteristics tend to be relatively homogeneous. Nor has such a study been carried out for developing countries. A study at a country level was done by Redoano (2003) on European Union countries in which the author tested for evidence of interdependence among these countries when setting their public expenditures and taxes.

In fiscal policy, the behavior of governments is such that they either compete against one another for economic development or political strength, or they cooperate in their policies for the benefit of all jurisdictions involved, even across countries. Regional cooperation enhances, among other things, more equitable economic development especially where some areas or sub-regions are lagging behind in development or their access to markets and other resources is limited.

The purpose of this study is to develop and empirically test a model of fiscal policy mimicking and determine if there is evidence of fiscal policy harmonization in the SADC and Sub-Saharan African (SSA) regions by looking at both the expenditure and tax setting structures. The SSA region comprises of 47 countries of which the majority belong to one or more regional blocs which aim to promote, among other objectives, sustainable and equitable economic growth, socio-economic development and cooperation or integration among the member countries involved. Other objective issues covered by these blocs include the harmonization of macroeconomic policies, promotion of intra-regional trade and political considerations. While some of these blocs have been in place for quite a long time and even before some of the member countries attained independence, they did not make much stride with regard to attaining their objectives. However, the SSA countries have recently been inspired by the success of integration efforts in Europe and the Americas (Maruping 2005). Post-independence economic integration will also help these countries gain bargaining power and economic strength to be able to survive the threat of marginalization that comes with the globalization process.

Unlike the U.S., which has achieved full or deep integration of states whereby labor, capital and goods could cross borders virtually without any impediments, or the

European Union which is headed towards full integration, the SSA region is nowhere near achieving such a degree of integration, even within the different economic blocs. The objective of Africa's regional integration has been evolving over time and while most were initially focused mainly on political decolonization of Africa, this objective shifted to that of socio-economic integration in the post-independence period. Regional integration entails merging the economies involved and this requires harmonization of economic policies which pave the way for the merger.

It is against this background that we are motivated to focus on these countries which belong to one big bloc in the form of SSA as well as other relatively smaller regional economic blocs within SSA. That these countries are already on a quest to harmonize their macroeconomic policies, including fiscal policies, makes it even more interesting and worthwhile to test the copycat theory on their policies. Though it can be argued that the objectives of these regional blocs, which are discussed in detail below, could act as a catalyst in driving the mimicking behavior, it is still worth the while to undertake this study as it will help us make policy recommendations on the best way to proceed with integration objectives. This study thus attempts to determine if any fiscal policy harmonization is taking place in Africa, south of the Sahara, and we do this by way of testing for spatial interactions in government expenditures and revenues among these countries. All these regional integration blocs have as part of their main objectives, the harmonization of their macro-economic policies, including fiscal policies. It is possible that such efforts to harmonize policies could lead to mandated copycat behavior, but we also believe that voluntary copycat behavior could be playing a leading role

especially when we take into account that the economic integration process is usually a very slow and onerous process.

This research thus tests for fiscal policy harmonization in the SSA region at large but with more focus on SADC, to determine if such harmonization has already kicked in or not. Given the broad objectives of this integration, one would expect cooperation among the Member countries' fiscal policies. With these communities having been in existence for quite some time these countries have tended to look at their neighbors' or fellow members' policies when formulating their own, hence, our interest in studying if there has been any copycatting behavior with respect to fiscal policies. If copycat behavior exists, we would expect tax burdens and expenditure levels to be similar across governments, but given that these countries are prone to substantial external shocks to their systems, this may not be the case. Given that the SADC region and other regional economic blocs are currently looking into harmonizing tax policies, among other macroeconomic policies, the occurrence of copycat behavior or a lack thereof would help determine the need to strengthen institutional structures that have been put in place, aimed at fiscal harmonization.

However, while copycat behavior on taxes (and expenditures alike) could mean that we should expect to see some convergence in tax levels and tax structures, this may not be the case as there are some constraints to the extent of copycat. These include factors such as each country's economy or level of development where for instance, it could not be easy or practical for one country to fully mimic the income tax structure of its neighbor(s) because of greater tax enforcement problems especially in the poorer nations. The choice of tax policies in developing countries is also greatly affected by

their large informal economies which makes it difficult for these countries to fully coin their tax policies based on those of their neighbors. While we are not pre-empting our findings, we just want to bring to the attention of the reader that constraints faced by developing nations could impact on the extent to which these nations could mimic their neighbors' fiscal policies and we revisit these issues in the subsequent sections.

Further, the study adds something new to the study of joint determination by exploring the presence of spatial interaction in the joint determination of revenues and expenditures in the SSA countries and SADC. Previous studies on government expenditures and revenues have focused on the simultaneous determination of the two as well as on the direction of causality between them. With regard to the former, there are four possibilities that explain the nature of causality patterns (Hoover and Sheffrin 1992) existing between spending and taxation revenue. Causation could run from spending to taxation, i.e., where spending comes first or is determined exogenously with taxes adjusted to minimize distortions; taxes may cause spending; the two may be mutually determined, i.e., a bi-directional causality pattern; or taxes and spending may be causally independent. Understanding the relationship between government spending and taxation is important in evaluating the government's role in the distribution of resources.

In their study, Bahl, Martinez-Vazquez et al. (2002) use an empirical approach to hypothesize the simultaneous consideration of tax and expenditure policies by state and local government authorities. The authors hypothesize that the tax and expenditure share variables are simultaneously determined and they behave as complements in state and local budgets. Their findings indicate that revenue and expenditure distribution instruments are complements and they also conclude that states that use income taxes

more heavily than others are more likely to weigh social services more heavily when they make expenditure decisions. The reverse would apply for states that rely less on income taxes for revenues.

This study, though, does not focus on the direction of causality between government revenues and expenditures, nor does it conduct the simultaneous consideration of tax and expenditures policies by these countries. Rather, we use relative performance assessments[2] or government efficiency to determine if mimicry behavior is present in this measure of simultaneity. Whereas the first part of the study assesses the spatial effects of expenditures and taxes in isolation, this second part takes into account the fact that voters do assess the level of spending on or taxation for public goods provision simultaneously with the amount of public goods that they receive from the government (Geys 2005). They thus assess the "price/quantity" of government policy in relation to that of their neighbors and may want the two to be as close as possible. We thus apply the spatial interaction analysis to government efficiency by using the "price/quantity" ratio of government policy as a basis for assessing relative performance by illustrating that this ratio of government tax revenues to public goods provision in country *i* is dependent upon the same ratio in neighboring countries.

The rest of this study is outlined as follows. Chapter 2 gives a review of why jurisdictions would engage in mimicking behavior; the motivation of this study and the institutional context which entails a detailed background of SADC and a briefly outlines other SSA regional economic blocs and their objectives. In Chapter 3 we discuss the

[2] We use the ratio of tax revenues to public goods provision as the indicator for relative performance assessments. Geys, Benny (2005), employs a stochastic parametric reference technology to measure efficiency. High efficiency indicates that the government needs only few resources or taxes to generate high levels of public goods, while the opposite applies for low efficiency.

literature as it relates to mimicking behavior of jurisdictions and/or strategic interaction. Chapter 4 lays out the theoretical frameworks that help guide the empirical specifications which are discussed in Chapter 5. The data are discussed in Chapter 6 and these contain observations for 24 countries in SSA under government expenditures and 30 countries in SSA under government revenues. In addition, 11 SADC member countries are also analyzed. The results are presented in Chapter 7, while Chapter 8 covers the summary and conclusions. Chapter 9 covers policy recommendations/implications and as well as suggestions for future research.

CHAPTER 2: MOTIVATION AND INSTITUTIONAL CONTEXT

What is Copy-Cat Behavior

An interesting quote adopted from Meissner and Dickman (2000) goes: "Silicon Valley is the only place on Earth not trying to figure out how to become Silicon Valley." What this quote captures is that it is usually the jurisdiction that is performing well economically that is not trying to copy other jurisdictions, but itself. Our copycat theory is based on this behavior that jurisdictions will always try to improve their fiscal performance by copying their neighbors' policies which are making those neighbors successful and also which are conducive or adaptable to the copying countries' economies. Each jurisdiction or country in this case, wants to propel its economic structure to a level that is cherished by everyone and one way to achieve this is by way of adopting policies that are seen to be successful elsewhere. Let us take for instance the popularity of the Asian Tigers in the early to mid 1990s. The world at large was interested in knowing what they were doing in terms of tax, other fiscal and macroeconomic policies to achieve such growth and this interest extended to emulation where possible or feasible.

We look at copycat behavior as it applies to tax policies (competition or harmonization) and to government spending decisions. We focus on the presence of mimicking behavior of fiscal policies of these neighboring jurisdictions, barring factors arising from correlated random shocks that could produce correlation in neighbors' tax revenues and especially expenditures, when in fact such correlation is non-existent. Examples are issues like drought which would result in neighbors that are affected by the

calamity making provisions for it in their budgets and this does not connote copycat behavior, hence the need to control for that.

Motivation

The motivation behind this study thus stems from the realization that, at least to our knowledge no such study has been undertaken for developing countries. Most previous studies have focused in the U.S. and Europe, with these studies done mostly at a local level. Further, the few studies that have looked across countries have done so at the local level, with the exception of Redoano (2003) whose study focuses on fiscal interactions among European Union states at a national government level.

Most of the empirical literature on copy cat behavior in public finance and other areas has focused on local jurisdictions with very few focusing on central governments or across countries. Research in this area in developing countries is completely lacking, both at the central and local levels, hence our interest in extending it to this sample. Our motivation is also driven by the structural differences that exist between developing and developed countries and the will to establish if such differences do extend to policy choices and in particular, if some interdependence in fiscal policy choices exists among them as it does in developed economies. When we compare developing and developed countries, we find that a number of systematic differences exist between them in terms of economic structures and particularly fiscal structures in this case. For instance, the patterns of public expenditures in developing countries differ from those of developed countries because of the different requirements at different stages of development which make priorities in public spending different among the two. In developed countries the

bulk of government revenues that finance public expenditures are raised through taxes whereas in most developing countries the tax system is not well developed and they tend to rely on non-tax revenues as the major source of government financing. Further, the roles of different levels of government differ between the two with central governments in developing countries still assuming a large share of fiscal responsibility as marked by the high degree of fiscal centralization in developing countries (Oates 1999).

Further, reasons why past studies could have focused only on sub-national governments could be because country studies would be harder to undertake due to a number of factors. First, the way sub-national and national governments finance their budgets is different and this could make country studies harder to undertake. National governments can finance their budgets with deficit spending, which sub-national governments cannot do and this can have implications on spending decisions for these jurisdictions. Second, developing countries and particularly African countries' budgets are usually supported or propped up significantly by foreign capital inflows[3] and this in turn makes the tax price artificially low. This could definitely impact on the results as it is possible that the tax price that we are using could not be the "true" price but is largely discounted due to the impact of capital inflows.

However, despite these structural differences between the developing and industrialized countries and the difficulties they bring in studying developing countries, we believe that it would still be interesting and maybe quite a challenge to extend the fiscal interaction research to developing countries and to investigate whether they do mimic their neighbors' policies as it is the case in developed countries.

[3] Foreign capital inflows to developing countries and particularly Africa shot up during the 1980s and 1990s following the financial sector liberalizations (including exchange control liberalization) in many developing countries.

In our case, therefore, we will focus on some developing countries from Africa and our analysis will be done at the central government level. This dissertation focuses on the SADC region as well as the rest of Sub-Saharan Africa which comprises a number of regional economic blocs most of which are looking into harmonizing their macroeconomic policies, including fiscal policies. This study thus attempts to determine if fiscal policy harmonization is taking place in Africa, and we do this by way of testing for spatial interactions among these countries. The objectives of these regional integration blocs all point towards harmonizing their macro-economic policies which include fiscal policies. It is possible that such efforts to harmonize policies could lead to mandated copycat behavior, but we also believe that there could be some voluntary copycat behavior taking place, all the more so that the integration process is usually a very slow and onerous process.

Our study is further enhanced by applying the spatial interaction analysis to government efficiency, using the "price/quantity" ratio of government policy as a basis for assessing relative performance by illustrating that this ratio of government tax revenues to public goods provision in country *i* is dependent upon the same ratio in neighboring countries. This builds upon literature by Geys (2005), who points out that rational individuals consider taxation for public goods provision and the amount of public goods that they receive simultaneously and not in isolation as most studies tend to assume. In this case we assume that rational individuals can be expected to consider both the level of taxation for public goods provision and the level of public goods in assessing their governments' performance and we extend this to determine whether or not they do so in relation to policies of neighboring governments. The study will address the

efficiency issue at a central government level as opposed to previous studies that were carried at a local government level.

Why Do Jurisdictions Engage in Fiscal Mimicking

Policymakers often mention tax mimicking as a justification for particular decisions. According to Ladd (1992), local officials might defend a decision to raise the local sales tax rate based on the fact that the new rate will not be out of line with those in neighboring jurisdictions. On the other hand, they may oppose an increase in a certain tax rate, say the property tax rate, because the resulting tax burden will be excessive relative to those in nearby jurisdictions. Concern about the loss of business activity to neighboring jurisdictions could also lead to tax mimicking and this concern motivates much of the theoretical literature on tax competition that explores how competition among jurisdictions for a mobile tax base, such as industrial property, affects the nature of the equilibrium and the efficiency of public sector choices. However, Ladd (1992) shifts the attention away from business taxes and concentrates on individual tax burdens which can be used by resident voters through the political "voice" mechanism, as a benchmark with which to appraise the fiscal performance of their own government. They do so by comparing their tax burdens with those of neighboring jurisdictions and use the polls to punish their officials if they impose tax burdens that are out of line with those of their neighbors.

Further, tax mimicking could occur for political reasons. For instance, elected officials are well aware that their jobs may or usually depend on the decisions that they make with regard to tax rate changes. Changes to tax bases also, like exempting food

from sales tax, adopting the single weight sales under corporate tax,[4] among others, can impact on ones term in office. Governors have been unseated because of their tax policies and taxes appeared to be responsible for 30 percent of gubernatorial defeats in the 1960s and 20 percent in the 1970s in the U.S. according to evidence presented by Beyle (1983). Hence, it is not uncommon for tax changes to be foregone or not implemented especially if officials fear that they will not be able to convince the electorate that such changes are warranted and also if they understand that their jobs may be in jeopardy in case they try and fail. Tax competition can also be political with jurisdictions using tax to lure firms from other jurisdictions with the objective of creating, among others, more jobs and revenue.

With regard to expenditures, jurisdictions use them to compete with each other for businesses. Case, Hines et al.(1989) point out that jurisdictions' spending levels do affect each other in that when one jurisdiction perceives its spending levels to be out of line with those of its neighbors or similarly situated jurisdictions, it would often adjust its expenditures accordingly. For example, in the U.S. we could observe such expenditures mimicking in education such as funding for pre-school kids, Georgia's HOPE[5] scholarship program and others. Possible public expenditure interactions among countries could exist because of some form of yardstick competition rather than a form of tax competition due to low labor mobility across countries (Redoano 2003). Some positive externalities that exist among countries could make policy choices dependent and these could be in the form of public investments in infrastructure which tend to spillover in neighboring countries in the form of benefits. These neighboring countries will tend to

[4] This refers to the administering of corporate income tax when dealing with multi-state corporations and how you divide their income between states.
[5] HOPE is the acronym of Helping Outstanding Students Educationally.

compete or even complement those policy choices by undertaking similar investments in similar types of infrastructure.

However, the big question is whether the reasons give above apply to developing countries. With the structural differences that exist between developed and developing countries, especially with regard to sources of revenue, it is not clear if voters in developing countries are able to distinguish the role played by domestic politicians versus that played by external actors such as donors, the IMF and other funding organizations or shocks such as droughts, wars, and others. In most developing countries and Africa in particular, politicians do not feel accountable to voters and would not feel threatened by voters voting them out for failure to deliver to the people.

Most democratic countries have both a national government and a set of local governments and some have three levels of government, as follows: federal/central, state and local government. While most studies on tax and expenditure mimicking have concentrated on local and/or state governments, the study of central systems is also growing in importance, though little work has been done in this area. Further, with the evolving of new entities such as the European Union, the importance of elevating the study to the national level becomes more distinct.

Some Background on SADC and SSA and its Economic Blocs

Sub-Saharan Africa (SSA) or Africa south of the Sahara is made up of 47 countries, six of which are islands in the Indian and Atlantic Oceans. Africa has had many different regional organizations since independence that were aimed at cooperation and unity and most of these have failed. Currently, all countries in the SSA region belong

to at least one regional economic bloc. Most of the regional blocs aim to achieve one or more of the integrating cooperation arrangements which include the following, as outlined in the (SIPRI) document:

1. Preferential Trade Area (PTA) or Agreement which entails lower tariffs to imports from member countries
2. Free Trade Area (FTA)–no tariffs on member countries' goods
3. Customs Union (CU)–an FTA with same tariffs on goods from non-members
4. Common Market–a CU that allows free movement of the factors of production
5. Economic Community–a single currency or monetary union whereby fiscal and monetary policies are unified.

All of the above arrangements are found in the SSA region and the multiple economic blocs for regional integration in Africa tend to create problems in that some of them have the same or overlapping objectives and overlapping membership. The sub-section below briefly looks at each arrangement and gives its background, though with more emphasis on the SADC region which is the major focus of this research.

Southern African Development Community (SADC)

The Southern African Development Community (SADC) comprises of 14 countries[6] namely: Angola, Botswana, Democratic Republic of Congo (DRC), Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. One of the policies of SADC is to promote sustainable

[6] Seychelles opted out of SADC in July 2003 in order to strengthen its relationship with the Indian Ocean Organization, but for the period covered in this study, it was still a member of SADC.

and equitable economic growth and socio-economic development that will ensure poverty alleviation with the ultimate objective of its eradication, enhance the standard and quality of life of the people of Southern Africa and support the disadvantaged through regional integration. The main strategy being followed to reduce poverty through higher levels of export-led growth is macroeconomic liberalization (including liberalization of trade policy, harmonization of tax policy and more efficient and effective forms of economic management) as well as promotion of investment and supply-side measures to assist the region to increase production. The broad strategies of SADC thus include, among others, harmonizing political and socio-economic policies and plans of member states. Our study of tax mimicking will help us determine if these countries are attaining their objective of harmonizing tax policies.

Jurisdictions and regions often engage in harmonizing their policies for a number of reasons. Harmonization is often favored by economists because it reduces economic distortions that result from differential taxation. These distortions are particularly strong when the same good or activity has different tax rates applied to it according to the different principles. Therefore, in order to allow producers and consumers to carry the same tax burden for the same economic activities, welfare theory calls for the imposition of harmonized taxes. Unions and economic blocs whose objective is to have free trade would opt for harmonization. As pointed out by Frey and Eichenberger (1996), in such unions, the goods produced in any country should be burdened with the same tax rates in order to allow suppliers to produce the goods where the real resource costs are lowest.

Given that one of the reasons jurisdictions mimic one another is to prevent loss of business activity, if we do find the evidence of such behavior in the SSA and SADC

regions, then it will point towards the achievement of the objective of harmonizing taxes in the region to prevent business from being concentrated in one area or country with low taxes. Our findings could help the relevant authorities in these regions determine how much more work needs to be put in place in pursuing the goal of harmonizing policies and if they need to divert resources to the achievement of other objectives, if the harmonization is seen to be happening!

In today's globalized world, regional integration is viewed as a strategy for fostering economic development. It attempts to solve various bottlenecks, which impede countries from benefiting from global trade. With regional integration, countries are able to forge closer trading links between each other which help strengthen their capacity to participate in world trade than it is possible when they are on their own. Regional integration also enables many countries to overcome the obstacles represented by their relatively small domestic markets, by enabling producers to realize greater economies of scale and benefit from the establishment of regional infrastructures. Further, a regional approach in key structural areas enables participating countries to pool their resources and avail themselves of regional institutional and human resources, in order to attain a level of technical and administrative competence that would not be possible on an individual basis. Such key structural areas include among others, tariff reduction and harmonization, legal and regulatory reform, payment systems rationalization, financial sector reorganization, investment incentive and tax system harmonization, and labor market reform. Regional integration and coordination thus seek to promote regional trade and economic integration through liberalization procedures and harmonization of monetary and fiscal policies.

It is under this context that the Southern African Development Community (SADC) was formed. SADC currently has 14 member states and it was formed in 1992. However, it started off as the "Frontline States" which were formally constituted in 1975 and they initiated the formal establishment of structures to promote regional integration and cooperation.[7] The Frontline States were initially directed towards the political liberation of the region and they met regularly to coordinate efforts, resources and strategies with regard to the National Liberation Movements of Southern Africa that were fighting against colonialism, racism and white minority-rule. This initiative was later extended to address military attacks and the destabilization of majority-ruled states by apartheid South Africa.

Most of the countries of Southern Africa ultimately achieved political independence, but this was against a background of mass poverty and economic backwardness. These countries were also under threat of the powerful and hostile white minority ruled neighbors, viz., South Africa, South West Africa (now Namibia) and Rhodesia (now Zimbabwe). In light of this, the leaders of these countries saw the promotion of economic and social development through cooperation and integration as the next logical step after political independence. This led to the launching of the Southern African Development Coordinating Conference (SADCC)[8] in 1979 and its commitment was to pursue policies aimed at economic liberation on the basis of a sustainable integrated development of member countries' economies.

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[7] The original members of the Frontline States were Angola, Botswana, Mozambique, Tanzania and Zambia.

[8] SADDC comprised of the then majority ruled countries of Southern Africa; Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania and Zambia. Zimbabwe joined in 1980 when it attained independence.

When Zimbabwe and Namibia attained independence in 1980 and 1990 respectively, that formally ended the struggle against colonialism in the region, with the exception of South Africa where the process to end the inhumane system of apartheid was underway. In the meantime, countries in different regions of the globe were organizing themselves into closer economic and political entities. These economic blocs were aimed at benefiting firms from economies of scale provided by large markets and to become competitive both internally and internationally. For firms in Southern Africa not to lag behind, it became imperative for a large regional market to be established so they too could benefit from the economies of scale. Further, by the late 1980s and early 1990s, it became evident that SADCC needed additional strengthening. With these developments, the region was considered to have transformed from an era of conflict and confrontation to one of peace, security and stability.

By the late 1980s, it had become apparent to the SADCC policy makers, that the existing de facto international organization needed a treaty or some legally binding instruments. In 1989, the Summit of Heads of State or Government met and decided that the SADCC should be formalized to give it an appropriate legal status, taking into account the need to replace the Memorandum of Understanding with an Agreement, Charter or Treaty. For this reason, a Declaration and Treaty[9] was signed in 1992, which transformed SADCC from a coordinating conference into a development community,

[9] The Treaty formalized SADCC to give it an appropriate legal status, replacing the Memorandum of Understanding.

SADC.[10] SADC thus redefined the basis of cooperation among member states from a loose association into a legally binding arrangement.

Table 1: The Evolution of SADC

Year	Frontline States	SADCC	SADC
1975	1. Angola 2. Botswana 3. Mozambique 4. Tanzania 5. Zambia		
1979		1. Angola 2. Botswana 3. Lesotho 4. Malawi 5. Mozambique 6. Swaziland 7. Tanzania 8. Zambia	
1980		9. Zimbabwe	
1990		10. Namibia	
1992			1. Angola 2. Botswana 3. Lesotho 4. Malawi 5. Mozambique 6. Namibia 7. Swaziland 8. Tanzania 9. Zambia 10. Zimbabwe
1994			11. South Africa
1995			12. Mauritius
1997			13. DRC 14. Seychelles

Source: Various Reports

[10] At its inception, SADC had nine members and during the 1990s, its membership in increased to 14 with the accession of Namibia in 1990, South Africa in 1994, Mauritius in 1995 and Seychelles and the Democratic Republic of Congo in 1997.

The purpose of this transformation was to promote deeper economic cooperation and integration to help many of the factors that make it difficult to sustain economic growth and socio-economic development, such as continued dependence on the exports of a few primary products. The urgency to transform and restructure the SADC economies was mainly brought about by the small size of their individual markets, the inadequate socio-economic infrastructure and the high per capita cost of providing this infrastructure. Their low-income base also made it difficult for these economies to individually attract or maintain the necessary investments for their sustained development. SADC thus opted for a development integration approach which recognizes the political economic diversities of regional integrating countries including, among others, their diverse production structures, trade patterns, resource endowments, development priorities and resource allocation mechanisms. The approach allows member states to define the scope and sectors of cooperation and to identify appropriate strategies and mechanisms to overcome impediments to integration as well as address regional imbalances between member states.

Nonetheless, the Member States have a lot in common with regard to their economic and social polices. A common problem prevalent in all the Member States, even those with comparatively productive economies, is poverty. This means that SADC countries are also bound by a common determination to improve the quality of their people's lives through the benefits of regional economic integration. Though some countries in this region are classified as middle income, they still have a reasonable percentage of their citizens living below the poverty datum line. For instance 37.4

percent of citizens in Botswana,[11] a middle income country, lived below the national poverty line in 2002, while 65 percent of South Africans[12] lived below the poverty datum line in 2000.

Table 2: GDP per Capita for SADC Members (constant 2000 US$)

Country Name	1960	1965	1970	1975	1980	1985	1990	1995	2000	2003
Angola	..	..	..	..	928	843	878	597	715	814
Botswana	254	301	436	836	1247	1682	2487	2588	3135	3532
DRC	324	316	327	318	252	240	205	119	89	87
Lesotho	111	145	151	198	312	322	391	449	493	530
Malawi	97	107	119	147	158	150	143	153	166	157
Mauritius	..	..	..	..	1564	1838	2522	3050	3727	4161
Mozambique	..	..	..	..	175	121	151	159	208	255
Namibia	..	..	..	..	1967	1736	1606	1745	1802	1845
South Africa	2105	2565	3049	3401	3436	3145	3058	2872	2910	3026
Seychelles	2379	2485	2646	3341	4531	4485	5644	6036	7619	6881
Swaziland	..	..	727	995	986	960	1336	1318	1336	1358
Tanzania	..	..	..	..	..	..	267	251	269	309
Zambia	528	613	569	554	476	417	389	318	328	354
Zimbabwe	430	435	570	610	562	572	602	570	570	..

Source: *World Development Indicators (World Bank 2005)*

Table 2 above gives the GDP per capita for all the SADC member countries and shows how they compare to one another. While some countries have improved over time between 1960 and 2003, most have stalled or even worsened. The statistics indicate that the member countries are at different stages of development, with the majority poor and generally under-developed. A number of factors have contributed to these disparate growth patterns in this region, and these range from civil wars which have ravaged countries like DRC, shrinking its GDP per capita by almost four fold over four decades;

[11] *Mmegi,* October 22, 2004.
[12] *Africa Recovery,* Vol.14, #4 (January 2001), page 12.

to the discovery of precious minerals like diamonds in Botswana, which helped bolster its growth and hence the GDP per capita. In some countries the discovery of precious minerals has resulted in illegal mining of these minerals and civil wars, which adversely affected the growth of the economies due to political instability and badly designed economic policies as resources are diverted to the wars.

According to the Regional Strategy Paper (RSP) and Regional Indicative Programme (RIP), the main strategy being followed by SADC to achieve poverty reduction through higher levels of export-led economic growth is macro-economic liberalization (including liberalization of trade policy, harmonization of tax policy and more efficient and effective forms of economic management) as well as promotion of investment and supply-side measures to assist the region to increase production. The SADC Protocol on Trade (Southern African Development Community [SADC] 1993) aims to achieve full implementation of the SADC Free Trade Area by 2008. According to this Protocol, Member States are expected to liberalize tariffs on trade according to the following three product groups:

a) *Immediate Liberalization or Category "A"*–products under this group are to be reduced to "zero" or become "free" in the first year of implementation;

b) *Gradual Liberalization or Category "B"*–tariff reductions on some products will start in the first year, others in year three, four or five. Tariffs on all products falling under this category will be reduced to "zero" or become "free" of import duty in year eight; and

c) *Sensitive Products or Category "C"*–this group was split into two. However, almost all products in this Category are in group (i) and tariff reductions will start in year

eight and end in year twelve. This means that they will be "free" in year twelve. Group (ii) is an exclusion list and goods under the exclusion list will not be touched or reduced to "zero."

The objectives of the Free Trade Area are to further liberalize intra-regional trade in goods and services; ensure efficient production; contribute towards the improvement of the climate for domestic, cross-border and foreign investment; ensure efficient production; and enhance economic development, diversification and industrialization of the region. Overall, the objective is to have 85 percent of all intra-SADC trade at zero tariffs by 2008 and the remaining 15 percent to be liberalized by 2012. The main instrument of trade liberalization is therefore the elimination of customs tariffs and non-tariff measures on substantial intra-SADC trade. The SADC region has adopted the following specific strategies in order to achieve the above objectives, viz:

1. The gradual elimination of tariffs;
2. Adoption of common rules of origin;
3. Harmonization of customs rules and procedures;
4. Attainment of internationally acceptable standards, quality, accreditation and metrology;
5. Harmonization of sanitary and phyto-sanitary measures;
6. Elimination of non-tariff barriers; and
7. Liberalization of trade in services.

In addition to participating in regional trade agreements, SADC countries are also members of the World Trade Organization (WTO) and therefore have an interest in multilateral tariff negotiations. For instance, South Africa signed a free trade agreement

with the EU in 1999. The road to regional integration is usually slow and full of bends and bumps. Progress towards accelerated integration in SADC has been quite modest. In spite of the slow progress, however, there is still popular and widespread support attached to economic integration by many governments. The fact that the SADC region is founded on economic structures that were based on the import substitution model is seen as a key factor to the slow implementation of regional integration initiatives. Most member countries were economically dependent on protected industries for both employment creation and the fiscal revenues obtained from the protective tariffs. With this background, it was difficult to implement protocols that called for opening up their markets to outside competitors. Most countries were concerned that this would lead to significant losses in fiscal revenues as well as employment. Implementation has thus slowed down as governments tried to find alternative sources of revenue and most governments did so by introducing alternative non-discriminatory taxes, such as the Value Added Tax (VAT). VAT is relatively new in the region and it has not been adopted by all the member countries yet. Table 3 gives a summary of consumption taxes in SADC and when VAT was adopted.

Table 3: SADC Countries' Adoption of VAT and Other Consumption Taxes

Country	Adoption Date	Rate (percent)	Base	Exemptions
VAT				
Botswana	1st July 2002	10	G+S	Standard
Lesotho	1st July 2003	5-15: 14 Std	G+S	Standard, Other
Malawi		12	G+ST	
Mauritius	1st July 2002	15	G+S	Standard, Other
Mozambique	1st June 1999	17	G+S	Standard, Other
Namibia	2000	15	G+S	Standard
South Africa	1991	0-14	G+S	Standard
Tanzania	1998	20	G+S	
Zambia	July 1995	17.5		Standard, Zero rate, Other
Zimbabwe	1st January 2004	15	G+S	
Other General Consumption Taxes				
Angola		10	G	
DRC		13	G+S	
Swaziland		14 (VAT in 2006/07)	G+ST	
Seychelles				

Source: Various countries' Revenue System Reports and Cnossen (2003).
Notes: G = Goods; S = Services; ST = Services taxed selectively

As alluded to earlier, harmonization of tax policies is one of the strategies being followed by SADC to achieve poverty reduction, hence this study will determine if this liberalization move needs to be enhanced or it is happening naturally. Considering the fact that these countries joined SADCC/SADC at different points of time, the empirical study will incorporate time-specific dummy variables that will capture the various agreements dates.

Normally, countries, especially those in the same region, would compete to attract business in various ways or to improve the welfare of their citizens. The presence of tax competition in the region need not be harmful to the integration process. According to Edwards and de Rugy (2002), a country with low tax rates could be receiving " too much" investment and the citizens and policy experts of neighboring countries may demand the same from their government, hence the mimicking. Tax competition leads to

what is commonly known as a " race towards the bottom" whereby it creates pressure to reduce tax rates globally[13] and all countries gain from increased growth and higher incomes as investment is re-aligned from jurisdictions that had always had low tax rates to those that that reduce their rates. As alluded to earlier, mimicking is done with the objective to achieve positive outcomes, such as improving one's investment climate in the case of taxes by expanding the opportunities and increasing incentives for investment. This in turn translates into higher GDP as well as an improved standard of living for citizens and hence reduced poverty.

Edwards and de Rugy (2002) point out that opposition to international tax competition, though wrapped in the language of economics, stems mainly from political concerns whereby it is considered to reduce the ability of governments to redistribute income. As such, rising tax competition has caused governments to adopt defensive rules which include, among others, proposals to harmonize taxes across countries and restricting countries from offering tax climates that are too hospitable to foreign investment inflows.

Other Regional Economic Blocs of Sub-Saharan Africa

A number of regional integration blocs exist in Africa and especially in SSA, most of which tend to overlap in terms of member states as well as in terms of objectives they want to attain. Our focus is on the objective of harmonizing macroeconomic policies and specifically fiscal harmonization, which is also a necessary condition for a smooth

[13] Edwards, C and V de Rugy (2002) point out that the average top personal income tax rate in the major industrial countries of the Organization fro Economic Cooperation and Development has fallen 20 basis percentage points since 1980 while the average top corporate income tax fell by 6 percentage points over a six year period.

implementation of economic integration, in addition to trade policies and monetary policies. Most of the economic blocs in SSA have, as one of their major objectives, the harmonization of macroeconomic policies, which include fiscal harmonization. Geda (2001) opines that most countries in Africa that have adopted the Structural Adjustment Programs (SAPs) could already be undergoing a *de facto* macro policy harmonization, at least at the level of intent, because of the identical nature of policy instruments prescribed by these International Financial Institutions (IFIs). We do take this point into consideration when we do our empirical estimations by including a dummy to capture the SAPs.

Our focus on fiscal policy harmonization is embedded in the crucial role it plays in the process towards attaining regional integration. Its key role comes from the link between fiscal deficit, exchange rate and the external sector with the last two being the channels that link a country with the rest of the world. This makes fiscal policy harmonization crucial for regional integration. In the next sub-sections we provide a summary of some of the major economic blocs of SSA that aim to harmonize their macro-economic policies. We provide this review to show how much effort these regional blocs are making at harmonizing their macroeconomic policies which is actually mandated copycat behavior. While it will be difficult to separate the mandate copycat behavior from the voluntary copycat behavior, from the review we can deduce that most of these blocs still have a long way to go to achieve their objectives because of failure to have the needed structural frameworks in place.

The Economic Community of West African States (ECOWAS)[14]

The Economic Community of West African States (ECOWAS) is a regional group initially made up of 16 West African countries and it was created on May 28, 1975 in Lagos, Nigeria. ECOWAS was established with the objective to promote cooperation and integration in order to create an economic and monetary union for promoting economic growth and development in West Africa. Its scope has now been extended to include socio-political interactions. However, the process towards achieving the aim of collective self-sufficiency was very slow hence the treaty was revised in Cotonou on July 24, 1993 towards a looser collaboration. One of the major objectives of ECOWAS is the harmonization and coordination of the economic, scientific, technical, cultural and social policies of Member States;

ECOWAS has encountered many problems some of which include political instability, poor governance in many member states, little or no diversification of member states' economies, poor infrastructure and many regional integration blocs with the same objectives.

Common Market of Eastern and Southern Africa (COMESA)

COMESA was established on November 5, 1993 in Kampala, Uganda. Its members are Angola, Burundi, Comoros, Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Namibia, Rwanda, Seychelles, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. COMESA replaced the former

[14] ECOWAS members include Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. Mauritania withdrew its membership in 2000.

Preferential Trade Area (PTA) which came into existence in 1981 but its origins can be traced as far back as the mid-1960s. In October 1965, the United Nations Economic Commissioner for Africa (ECA) set up a meeting for states of eastern and southern Africa which were politically independent to consider proposals for the establishment of a mechanism for the promotion of sub-regional economic integration. The meeting recommended the creation of an Economic Community of Eastern and Southern African states. Following a number of developments during the 1970s in the region which include the collapse of the federations in eastern and central Africa, the destabilization of the southern states by apartheid South Africa and the urgency to reduce economic dependence on the industrialized countries of the north, the region finally signed a Treaty establishing the PTA in December 1981 in Lusaka, Zambia. The PTA Treaty envisaged its transformation into a Common Market and this was realized in 1993 when the Treaty establishing COMESA was signed in Kampala, Uganda.

Members of COMESA agreed to cooperate in exploiting the natural and human resources for the good of all their people. Its objectives include, among others, attaining sustainable growth and development of the member states through the promotion of a more balanced and harmonious development of its production and structures; promoting joint development in all fields of economic activity and the joint adoption of macro-economic policies and programs to raise the standards of living of the member states' citizens; as well as inter-state cooperation, harmonization of macroeconomic policies and integration of programs among the member states.

The East African Community (EAC)

The Treaty establishing the East African Community (EAC) was signed on November 30, 1999 in Arusha, Tanzania and came into force in 2001. The EAC member countries are the Republics of Kenya, Uganda and Tanzania and its broad goal is to enhance cooperation in all areas for the mutual benefit of the member states by establishing a customs union as the entry point of the Community, to be followed by a Common Market and subsequently a Monetary Union. Ultimately, the Community envisages a political federation of the East African States. As with the other regional economic blocs, the EAC's objectives include among others: promotion of a sustainable growth and equitable development of member states; rational utilization of the region's natural resources and protection of the environment; and strengthening and consolidating the long standing political, economic, social, cultural and traditional ties by member states and associations between the people of the region.

The Indian Ocean Commission (COI)

The Indian Ocean Commission (COI), commonly known as the *Commission de l'Océan Indien*, is an intergovernmental organization whose members are the Indian Ocean islands of Comoros, Madagascar, Mauritius, Mayotte, Reunion Island and the Seychelles. These islands formed this commission in order to encourage cooperation. It was started in January 1984 under the General Victoria Agreement and its objectives include:

1. diplomatic cooperation;
2. economic and commercial cooperation;

3. cooperation in the field of agriculture, maritime fishing, and the conservation of resources and ecosystems;
4. cooperation in cultural, scientific, technical, educational and judicial fields; and
5. Preparing the region and its economic actors to face the challenge of globalization.

Economic Community of Central African States (ECCAS)

The Economic Community of Central African States (ECCAS) was established on October 18, 1983 as the major economic community in Central Africa. Its members are Angola, Burundi, Cameroon, Central African Republic, Chad, Republic of Congo, DRC, Equatorial Guinea, Gabon, Rwanda and Sao Tomé and Principe. Though ECCAS began functioning in 1985, it was inactive for several years because of financial difficulties with some members failing to pay membership fees and conflicts in the region. Its objectives include among others: to develop capacities to maintain peace, security and stability, which are essential prerequisites for economic and social development; and to develop physical, economic and monetary integration.

Intergovernmental Authority on Development (IGAD)

The Intergovernmental Authority on Development (IGAD)[15] is the Horn of Africa regional grouping which came into being following recurring and severe droughts and other natural disasters between 1974 and 1984 which caused widespread famine, ecological degradation and economic hardship in the region. While individual countries

[15] Members of IGAD include Djibouti, Ethiopia, Eritrea, Kenya, Somalia, Sudan and Uganda.

took substantial measures to cope with the problems and also received support from outside, they decided to go for a regional approach that will supplement national efforts. Hence, the six countries of the region, through the United Nations, established an intergovernmental body for development and drought control in their region.

This would create a fully-fledged regional political, economic, development, trade, and security entity similar to the Southern African Development Community (SADC) and the Common Market for Eastern and Southern Africa (COMESA). However, cooperation in this region is currently on hold because of the various political problems which are dogging it. For instance, there is no functioning government in Somalia while Ethiopia and Eritrea have not yet resolved their border issues; Sudan has internal problems and for those member countries that are not fighting, they are concentrating on other regional blocs to which they are members.

Sub-Saharan Africa has got quite a number of regional blocs as indicated in Table 4 below and some of these are smaller blocs inside or within a bigger bloc, focusing on a different mandate, like the Southern African Customs Union (SACU) within SADC, an economic bloc. This study will not focus on all the economic blocs separately, except for SADC, but it incorporates only three large ones in the empirical study due to data limitations as well as the problem of multiple memberships of countries to these blocs. Table 4 summarizes these regional blocs in terms of area size, population, GDP and GDP per capita.

Table 4: Sub-Saharan African Economic Regional Blocs

African Economic Community (2004, 2005)					
Pillars regional blocs (REC)	**Area** (km²)	**Population**	**GDP (PPP)** ($US)		**Member states**
			in millions	per capita	
AEC	29,910,442	853,520,010	2,053,706	2,406	53
ECOWAS	5,112,903	251,646,263	342,519	1,361	15
ECCAS	6,667,421	121,245,958	175,928	1,451	11
SADC	9,882,959	233,944,179	737,335	3,152	14
EAC	1,763,777	97,865,428	104,239	1,065	3
COMESA	12,873,957	406,102,471	735,599	1,811	20
IGAD	5,233,604	187,969,775	225,049	1,197	7
Other African blocs	**Area** (km²)	**Population**	**GDP (PPP)** ($US)		**Member states**
			in millions	per capita	
CEMAC [1]	3,020,142	34,970,529	85,136	2,435	6
SACU [1]	2,693,418	51,055,878	541,433	10,605	5
UEMOA [1]	3,505,375	80,865,222	101,640	1,257	8
UMA	5,782,140	84,185,073	491,276	5,836	5

Source: Table adapted from
http://en.wikipedia.org/wiki/Economic_Community_of_Central_African_States

Notes: [1] Economic bloc inside a pillar REC
AEC–African Economic Community
ECOWAS–Economic Community of West African States
ECCAS-Economic Community of Central African States (in French, *Communauté Économique des États d'Afrique Centrale* (CEEAC))
SADC–Southern African Development Community
EAC–East African Community
COMESA–Common Market for Eastern and Southern Africa
IGAD–Intergovernmental Authority on Development
CEMAC–Economic and Monetary Authority of Central Africa
SACU–Southern African Customs Union
UEMOA–Western African Economic and Monetary Union
UMA–Arab Magreb Union

CHAPTER 3: REVIEW OF LITERATURE

This section gives a detailed overview of the mimicking literature by reviewing previous studies on fiscal policy mimicking and related areas. It will focus on, among other issues, how these studies estimated the copycat marginal effect, the control variables they used and their homogeneity, the choice of weight matrices as well as the methodologies they applied.

As indicated above, empirical studies in public finance have started applying spatial models to capture mimicking behavior or strategic interactions that occur between governments of all levels in terms of spending and tax revenue decisions. The mimicking or spatial interaction behavior is captured by way of using weight matrices which help capture the potential spatial correlation either in the dependent variables (by way of the spatial autoregressive model) or in the error terms (using the spatial error model) or testing for spatial correlation in both the dependent variable and the errors (using the general spatial model). A detailed discussion of the models is given in Chapter 5.

A large amount of empirical and some theoretical research has explained the copycat behavior using different underlying theoretical frameworks such as spillover effects as in Case, Rosen et al.(1993), strategic interaction (Brueckner 1998), tax competition (Wildason 1989) or yardstick competition (Besley and Case 1995 and Ladd 1992). However, Case, Hines et al.(1989) point out that estimating the parameters of these models is the same, regardless of the underlying theoretical framework. Spillover effects refer to a situation where public expenditures in one state benefit residents of neighboring states and these could exist as externalities (Redoano 2003) in one jurisdiction which spillover into another jurisdiction and determine the level of

investment in the jurisdiction benefiting from the externalities. Strategic interaction occurs when conditions in which policy decisions are made in one jurisdiction are affected by the actions of neighboring jurisdictions. With regard to tax competition in mimicking behavior, jurisdictions choose tax rates (corporate, property, etc.) taking into account the migration of mobile capital in response to tax differentials with the neighboring jurisdictions while mimicking based on yardstick competition involves a situation where citizens can evaluate the performances of their policy makers by using policy choice taken by neighboring countries as their benchmark.

Expenditure Mimicking

While our study uses the explanation based on the tax competition literature on the revenue side, with regard to expenditures, it follows the strategic interaction of Case, Rosen et al. (1993) by applying this to developing countries. With regard to independent variables, studies that focus on the expenditure side to test for mimicking add to the generic estimating equation, the expenditures of neighboring jurisdictions. (A detailed explanation is given in Chapter 5.) For instance, Case, Hines et al. (1989) and Case, Rosen et al. (1993) test the notion that state governments' expenditures depend on the spending of similarly situated states. This was one of the first papers to include the expenditures of neighboring states in the generic expenditure estimation equation, i.e., in addition to income, the jurisdiction's grants from other levels of government, its demographic and/or political considerations. The expenditures of neighboring countries are the independent variables that are used to pick up mimicking or spatial interaction. This variable is interacted with the weight matrix of choice and the estimated coefficient

gives the mimicking behavior or spatial interaction. Other studies that focus on testing for mimicking behavior in expenditures have been carried out by Redoano (2003), Revelli (2002) and Revelli (2003).

Mimicking behavior has been found to exist with regard to government spending decisions and Case et al. (1989), and Case, Rosen et al. (1993) observed that U.S. jurisdictions' spending levels affected each other in that when one state perceived that its spending levels were out of line with those of its neighbors,[16] this would often result in demands for change. Similar findings were made by Revelli (2003) who, using both the spatial lag and spatial error models, found that spatial auto-correlation is an important feature of local governments' expenditure decisions. At a country level, Redoano (2003) found the presence of spatial interaction in terms of government expenditures in the European Union.

Studies focusing on expenditures have used different ways to define or capture the dependent (expenditure) variable. For instance, Case, Rosen et al. (1993) use per capita dollar figures deflated using the personal consumption expenditure deflator and they focus on direct expenditures of state and local governments while Revelli (2003) adopts the same measure for English non-metropolitan districts but excludes capital expenditures and he also uses the logarithms of per capita current expenditure in Revelli (2003) for English countries and districts. Similarly, Redoano (2003) also uses per capita public expenditures at constant prices for both aggregate and disaggregated expenditures. Our study veers from those measures by using the ratio of disaggregated expenditures to total expenditures.

[16] Neighborliness does not necessarily mean geographic proximity because states may regard as neighbors other states that are similar to them economically or demographically, i.e., without taking into consideration the geographical proximity.

Tax Revenue Mimicking

The same method of capturing expenditure mimicking behavior is used when dealing with tax revenues. Using the spatial lag method, mimicking behavior is captured using neighboring jurisdictions' or countries' tax revenues and a much wider set of literature exists for tax revenues than expenditures. As with expenditures, we could test for tax revenue mimicking in the error terms as well using the spatial error model or the general spatial model which captures spatial interaction in both the dependent variable and the residuals. Empirical studies conducted in this area have shown that tax policies are copied among jurisdictions and to capture tax mimicking, these studies have concentrated on either tax rates or tax burdens as variables of interest. Studies that use tax rates use either the average tax rate (e.g., Hernandez-Murillo 2003) or the top rate especially with regard to personal income tax (Redoano 2003). Studies that have used the tax burden or the effective average income tax rate, calculated as a ratio of income tax revenue to personal income include Esteller-Moore and Sole Olle (2001), Sole Olle (2003) and Ladd (1992). Other taxes like excise taxes when analyzed separately or individually have been captured in terms of cents per gallon of gasoline or cents per package of cigarettes (Rork 2003). In our study we adopt the ratio method capturing the disaggregated tax revenues as ratios of total revenues similar to Rork (2003) who divides corporate income tax revenues by adjusted state gross state product (GSP) and in the case of personal income he divides all revenues collected from personal income by personal income in the state.

As with the model for expenditure mimicking, the independent variables adopted in tax mimicking include, among others, the jurisdiction's per capita income,

unemployment rate, demographic variables, political variables and other economic variables. In our study we did not include the unemployment rate due to data limitations on this variable in developing countries. Empirical studies on tax mimicking have found that it exists at local government as in Heyndels and Vuchelen (1998) and Ladd (1992); state level in Rork (2003) and Hernandez-Murillo (2003); federal or central government level in Redoano (2003) and Ruiz (2006); and and inter-governmental or between different levels of government in Esteller-Moore and Sole Olle (2001).

Determining the Weights for the Weight Matrices

Spatial interaction studies use spatial weights to compute the effect of the tax rates or revenues and expenditures of the relevant competitors or neighbors on the home jurisdiction. The spatial weight matrix, *W*, captures the notion of proximity among jurisdictions by aggregating the dependent variables (tax rates/revenues or expenditures) of neighboring jurisdictions hence its specification imposes a certain pattern of interaction. As discussed in detail in Chapter 5, neighbors in this context do not necessarily imply geographical proximity or contiguity only since geography might not be the most relevant factor in determining neighbors. Factors like distance, demographics, social and economic variables could exert the most powerful mutual influences because of similarities amongst jurisdictions, near or far. Hence, studies tend to use different measures to construct the weight matrix, though the most standard is the border contiguity measure as in Case, Hines et al. (1989), Case, Rosen et al. (1993), Ruiz (2006), Redoano (2003), Hernandez-Murillo (2003), Hernandez-Murillo (2002), and Brueckner and Saavedra (2001), to include but a few. Other measures used to construct

the weight matrix include economic characteristics like GDP and GDP per capita as in Redoano (2003), Case, Hines et al. (1989), and Case, Rosen et al. (1993), demographic characteristics such as population size and race (Hernandez-Murillo 2003, Case, Hines et al. 1989 and Case, Rosen et al. 1993), and distance decay (Redoano 2003, Brueckner and Saavedra 2001 and Garrett, Wagner et al. 2005).

In this study we adopt the two geographic measures of contiguity and distance, given that our sample is largely contiguous and we also include the GDP per capita and the poverty measure using the human development index as the poverty proxy. A detailed discussion of how we determined these weight matrices is covered in Chapter 5. The rest of this chapter gives a review of some of the studies referred to above on how they dealt with the issues that are pertinent to mimicking literature and the results they obtained. We also include a detailed summary table of literature at the end of this chapter.

Previous Studies

Case, Hines et al. (1989) and Case, Rosen et al. (1993) test the notion that state governments' expenditures depend on the spending of similarly situated states. This was one of the first papers to include the expenditures of neighboring states in the generic expenditure estimation equation, in addition to income, the jurisdiction's grants from other levels of government, its demographic and/or political considerations. The authors observed that jurisdictions' spending levels affected each other in that when one state perceived that its spending levels were out of line with those of its neighbors,[17] it would

[17] Neighborliness does not necessarily mean geographic proximity because states may regard as neighbors other states that are similar to them economically or demographically, i.e., without taking into consideration the geographical proximity.

often result in demands for change. They constructed a simple model in which the optimizing level of expenditure by a state decision-maker is affected by the expenditure levels of that state's neighbors. To determine which states are neighbors they explored several criteria for specifying the weight matrix. A weighting matrix is generated to measure the extent to which a state is neighbor to another state by assigning a value to each pair of states and this value will depend on the method used to determine neighbors. This is not an easy task considering that states with similar demographics may exert greater mutual influences because their populations are most likely to compete in national markets or, those similar to them economically. The authors constructed weight matrices based on geography, per capita income and percentage of population that is black, as these turned out to be the ones most consistent with the data.

The study used annual data for the continental United States during the period 1970-1985. Using OLS estimation they regressed real per capita income, income squared, real per capita total federal grants to state and local governments, population density, proportion of the population at least 65 years old, proportion of the population between 5 and 17 years old, and proportion of the population that is black, as well as state and year indicator variables on the sum of direct expenditures of state and local governments, exclusive of expenditures for interest, state-run liquor and utility concerns, and insurance. They also applied different weight matrix measures to capture the spatial impact of neighbors' expenditures. Their results confirmed that indeed states' expenditures are significantly influenced by their neighbors and these results were consistent with well established theoretical models of benefit spillovers among jurisdictions. They found that the impact of a dollar of increased spending by a state's neighbors increases its own

spending by about 70 cents. The authors noted that spillovers need not be confined to sub-federal jurisdictions, but that for national governments, there is some anecdotal evidence indicating that fiscal policies in one country are affected by changes in other countries, even without considerations of macroeconomic coordination.

Case (1993) presents evidence to the effect that, when making a decision to reelect a governor, voters may look at the tax increases in neighboring states to obtain information on whether a tax increase is appropriate and if so how much it should be. Collecting direct information on whether tax changes are necessary can be quite expensive for voters to undertake, hence, they may look at the tax changes made in neighboring states. The author modeled the patterns of reelection and defeat of governors from 1977 to 1988 as a function of changes in state income tax liabilities[18] and allowing for the possibility that neighboring states' changes in tax liability during the same period may have an impact on the reelection odds of a given state's governor. Using two-stage least squares estimation, they estimated two equations for each income category. To determine if the TRA86 changes would influence the results, the first estimation did not allow for TRA86 to affect the sensitivity of a state's tax change to its neighbors' tax changes while the second estimation did allow for the impact of TRA86. The paper concluded that comparisons with neighbors influence gubernatorial behavior: Governors are more likely to raise taxes when their neighbors are doing the same.

One of the early studies that contributed to the literature on the determination of local taxes by testing the hypothesis about tax mimicking was carried out by Ladd (1992). She looked specifically into whether local governments consider the tax burdens

[18] They looked specifically at the difference between the income tax liability in the governor's reelection year and the tax liability in effect at the end of the governor's first year in office.

in other jurisdictions when making their own tax decisions, if that was the case, there would be less observed variation in the tax burdens of neighboring jurisdictions than in comparable non-neighboring jurisdictions. Unlike the previous studies such as Case, Hines et al. (1989) and Case (1993), that tested for fiscal copycatting at the state level, Ladd focused on tax mimicking at the local level.

Following a number of studies on tax and expenditure mimicking in states and local governments in the United States, similar studies were carried out in Europe. One of these was by Heyndels and Vuchelen (1998) who present evidence of tax mimicking among Belgian municipalities. By applying tax mimicking theory to a different institutional setting, they were able to establish the extent to which mimicking is not typical to the U.S. system only but rather a general characteristic of decision making in a context of decentralized government. The authors focused on the choice of tax rates for the local income tax and the local property tax, which are the major sources of revenue. They looked at 589 municipalities for the 1991 budgetary year and given that Belgian municipalities are very small and thus institutionally homogeneous, they used geographic neighbors as a choice of reference. This is unlike in the U.S. where responsibilities among types of local governments differ considerably. The authors were also able to use tax rates instead of tax burdens because of the uniform definition of the tax bases in Belgian municipalities.

Using 3SLS estimation to take account of mutual dependence on tax rates between municipalities and also to avoid potential spatial autocorrelation in the error terms that occur when using OLS, they modeled both local property tax and local income tax as dependent variables per capita income, percentage of people under 20 years,

percentage of people over 60 years, the municipality's area and tax rates in jurisdictions of reference. To capture the mimicry behavior, they used a geographical measure that allows for some unequal weighting by excluding central cities (with population over 50 000) from the set of counties neighbors. Their general results were in line with the findings obtained in the U.S. that tax policies are copied among states and local governments, thus suggesting that mimicking behavior is not exclusive to the U.S. system only. They found evidence of interdependence of different tax rates and also that mimicking among Belgian municipalities had a geographical dimension extending beyond immediate neighbors.

A study similar to that of Case (1993) was carried out by Ashworth and Heyndels (1997) in Belgium, whereby they investigated politicians' opinions about the level of local tax rates. Their analysis was aimed at the two most important taxes in Belgium, viz., local income tax and local property tax, which account for over 80 percent of all tax revenues and they analyzed politicians' opinions on these. They formulated a number of hypotheses which they tested by introducing questions on tax opinions in a large scale survey conducted among politicians who were active at the municipal level in Flanders. Questionnaires asked respondents to rate the taxes as to whether they felt they were (rather) low, average or (rather) high. The survey was conducted in 1994 and questionnaires were sent to all local spokesmen of the six national parties in the 308 Flemish municipalities. Thus using a sample of 683 Flemish local politicians, the study undertook an ordered probit analysis of opinions on the level of local income and local property tax rates. The results revealed common influences on the perceptions of how high or low local tax rates are. There was evidence that tax policy in neighboring

jurisdictions affects the perceived political cost of one's own tax rates and that mimicking behavior was the expected outcome. These results are similar to those of Case (1993) whereby Governors were found to consider taxes of neighboring states when setting theirs.

Fewer studies on expenditure mimicry behavior have been carried out compared to taxes. One such study was done by Revelli (2002) who looked at spatial interactions among English local governments in tax setting and public spending decisions. He estimated both the spatial lag model, which tests for spatial interaction in the dependent variable and the spatial error model which tests for spatial interaction in the error terms. Using the border contiguity weight matrix to capture the spatial interaction, his results revealed that spatial effects really matter in the specification of the local public expenditure determination and also that local property tax mimicry brings about spatial auto-correlation in the residuals.

Another study that focused on expenditures and revenues was conducted by Redoano (2003) on European Union (EU) countries in which he tested whether these countries set their public expenditures and taxes interdependently. He bases his investigations on two theoretical explanations, one that there exist externalities among jurisdictions and hence their policies are not independent and also that countries compete with their neighbors in order to attract tax base. Using three weight matrix measures based on distance, GDP and GDP per capita to capture the spatial effects, the paper found evidence that tax competition occurs in Europe mainly between geographically close countries and also found evidence of interdependence in income taxes' setting and public expenditures' decisions.

Alm, McKee et al. (1993) explored the mimicry behavior of states from a different angle, by examining the factors that affect the probability that a state will enact a lottery and mimicking behavior being one of these factors. While lotteries have played a major role in revenue collection in most American states, the objective of their study was to identify those factors that determine whether a state would introduce a lottery or not. Theirs was a divergence from previous research on state lotteries which had focused on issues like incidence of the lottery tax, the revenue potential of lotteries and their administrative costs. Of particular interest in this study was the role played by fiscal pressure in the introduction of lotteries. The authors used discrete-time hazard function (duration model) estimation methods to estimate the factors that have led a state to introduce a lottery using data collected on all states for the period from the initial enactment of a lottery in 1964 to 1988. The factors they estimated include economic, fiscal, demographic and political features of the states. The results suggested that there is a variety of factors influencing the timing of lottery enactment and that fiscal pressures played an important role during the early lotteries but that their role has declined over the years. Instead, political features and attempts to mimic the behavior of neighboring states seem to have become the dominant factors in lotteries introduced recently.

Mimicry behavior does not apply to fiscal issues only but has been found to apply in many areas where individual decision making is involved. Individuals' attitudes about a range of activities may develop through contact with others, be it charitable giving or cheating on income taxes, as put by Case (1991). In a study on farmers' attitudes toward new technologies in Indonesia, Case (1991) developed an estimation scheme that allows individuals to be influenced by neighbors when making discrete choices. Using a random

sample of rural Javanese farm households from the 1980 survey of SUSENAS,[19] the author selected a sub-sample comprising of 1,664 wet rice producing farms from 84 districts in four rural provinces of Java. In this study, " neighbors" refers to farmers who live in the same district in rural Java and geographic proximity was used because farmers are more likely to have the most contact with farmers that are close by. Using both standard probit estimation and probits that allow for neighbors' influence, they found strong evidence for neighborhood effects.

McGarvey and Walker (2004) revisit the Case, Rosen et al. (1993) study using new data and a new methodology to estimate three fiscal behavioral issues. These issues are: that states' budgetary decisions are influenced by their neighbors' tax and expenditure policies; that demographic variations have an impact on spending patterns; and that federal grants have a larger than expected impact on state spending. They specified a fully parametric conditional mean function by displaying first-order spatial dependence and combine that with semi-parametric estimation of the moment conditions' covariance. By so doing they allowed for more general cross-sectional dependence in the model's unobservables. Using panel data on 48 states from 1977 to 1999, they found evidence that the copycat effect was small but statistically significant. Their results also suggested that the copy-cat effect was very sensitive to whether a proxy for tax price was included in the model and when such a proxy was included, the copy-cat effect fell by more than half.

Most literature on spatial effects in government tends to focus on taxation and expenditure levels and Geys (2005) argues that this deems such studies incomplete. He points out that rational individuals are likely to consider the level of spending on (or

[19] This is the 1980 Indonesian socio-economic survey.

taxation for) public goods provision simultaneously with how much public goods they actually receive. He argues that they assess the "price/quantity" of government policy in relation to that of neighboring jurisdictions rather than concentrating on spending or taxation levels alone. Focusing on the ratio of tax revenues to public goods provision as a proxy for relative performance assessments, the author uses data on Flemish municipalities to demonstrate whether a spatial pattern exists among them. The dependent variable indicates how efficiently tax revenues are employed to generate public goods and this is interpreted as an indicator for the "price/quantity" of local governments' policies. Their analysis reveals a significant spatial pattern in Flemish local government's efficiency ratings, implying that efficiency at one local government is associated with efficiency at its neighbors.

Overall, literature relating to mimicking behavior or spatial patterns in government's spending and taxation decision-making suggest that such behavior exists in most scenarios where comparison of policies by neighboring jurisdictions, or jurisdiction that share similar economic or other characteristics, is possible. Most studies have found that spatial auto-correlation exists and it is an important feature in decision-making of local and state governments. While some studies use the spatial lag model which tests for spatial interaction in the dependent variable and some use the spatial error model which focuses on the unobservables, both models have been able to show if such interaction exists. A third general model that tests for both spatial lag and spatial error simultaneously is now being widely used and this study will follow the same approach.

On issues regarding spatial factors, much as the definition of neighborliness is not restricted to contiguity or close neighbors, determining the best measure of the weight

matrix to capture the spatial factor is still a problem. There is no test yet that can be used to help researchers choose the best weight matrix measure that applies to their particular case, hence determining the weight matrix is still an ambiguous exercise. This study will thus use different weight matrix measures, with the primary one being the geographic or contiguity measure.

Most of the literature on copy cat behavior in public finance and other areas has focused on local jurisdictions in the empirical studies with very few focusing on central governments or across countries. Research in this area in developing countries is completely lacking, both at the central and local levels. This could probably be attributed to data limitations. When we compare developing and developed countries, we find that a number of systematic differences exist between them in terms of economic structures and particularly fiscal structures in this case. For instance, the patterns of public expenditures in developing countries differ from those of developed countries because of the different requirements at different stages of development which will make one role of public expenditures more important that the other. In developed countries the bulk of government revenues that finance public expenditures are raised through taxes whereas in most developing countries the tax system is not well developed and they tend to rely on non-tax revenues as the major source of government financing. Further, the roles of different levels of government differ between the two with central governments in developing countries still assuming a large share of fiscal responsibility as marked by the high degree of fiscal centralization in developing countries (Oates 1999). Given these structural differences between the developing and industrialized countries, it would be

interesting to extend the fiscal interaction research to developing countries and to investigate whether they do mimic their neighbors' policies.

Furthermore, the focus on revenue or taxation and spending levels by most studies has been done separately or in isolation. As explained above, studies either focus on taxes only or expenditures only, though a few have studied the two functions of government jointly. Even then, those that have looked at both taxes and expenditures at the same time have still considered the revenue and expenditures levels separately when determining the presence of spatial interactions. Hence, it has been pointed out that such focus on government taxation and expenditure levels in isolation is incomplete (Geys 2005) and it needs to be enhanced by looking at both taxation and spending simultaneously. While our study looks at the levels of revenues and spending separately, we enhance it by focusing on the efficiency of public provision of goods and testing for spatial effects in this behavior.

Table 5: Summary of Previous Empirical Studies and Results

Author and Objective	Model, Data and Methodology	Findings
Alm J., et al. (1993): Examine the factors that affect the probability that a state will enact a lottery, where the probability is assumed to depend upon economic, fiscal, demographic and political factors.	**Model:** **Conditional Probability** $P_{it} = \Pr(y_{it} = 1 \mid y_{i,1} = ... = y_{i,t-1} = 0, x_{it})$ $= 1 - F(-\beta' x_{it})$ where: y_{it} = discrete dependent variable which denotes the lottery status of state *i* in period *t* *F(.)* = cumulative normal density function x_{it} = is a vector of factor affecting the probability of lottery enactment β = is a vector of coefficients $\hat{Q}_{is} = \hat{P}_{is} \prod_{t=1}^{s-1} (1 - \hat{P}_{it})$ where: $\hat{P}_{it}$ = the single-year predicted probability of lottery enactment $\hat{Q}_{is}$ = the probability that state *i* will enact a lottery in some period *s* after *s*-1 periods without a lottery. **Data:** **Methodology**: Discrete-time hazard function (or duration model) estimation method.	The results suggest fiscal pressures have played an important role in the early lotteries; also, an element of tax competition exists, where states decisions are affected by the actions of other states, near and far; and political considerations as well as demographic features of a state also affect lottery introduction.

Author and Objective	Model, Data and Methodology	Findings
Ashworth and Heyndels (1997) They investigate politicians' opinions about the level of local tax rates by presenting a test aimed at identifying relevant determinants of both politicians' beliefs and attitudes. They also test indirectly some central hypotheses of tax choice models from an analysis of politicians' opinions.	**Model:** $O = \beta_0 + \beta_1 IDEO + \beta_2 MAJOR + \beta_3 ELECT$ $+ \beta_4 TAXCH + \beta_5 TAX + \beta_6 RENT$ $+ \beta_7 NUMCH + \beta_8 NEIGH + \beta_9 PRESS$ $+ \beta_{10} POP + \beta_{11} RICH$ Where: O = the respondent's opinion on the taxation opinion scale IDEO = a measure for the ideological position of the respondent Major = a dummy variable which reflects the political position of the respondent ELECT = a summary measure of the electorate's ideological position TAXCH = the change in the tax rat since 1988 TAX = the actual tax rate set by the local authority RENT = the share of renters as a percentage of the local population and applies only to the local property tax estimation equation. NUMCH = the number of changes in the tax rate since 1988 NEIGH = the average tax rate in neighboring municipalities. PRESS = the number of organized interest groups which (tried to) influence the respondent's party. POP = the size of the local population RICH = the richness of the local tax bases **Methodology:** Ordered Probit Analysis **Data:**	The study finds evidence that tax policy in neighboring jurisdictions affects the perceived local political cost of one's own property tax rate. For opinions on the level of local income tax rates, the ideological position of the electorate and interest group activity are relevant determinants.

Author and Objective	Model, Data and Methodology	Findings
	From a survey among 683 Flemish politicians and aimed at the local income tax (LIT) and the local property tax (LPT).	
Baicker (2001): The paper estimates the degree to which state spending is influenced by the spending of neighboring states.	**Model:** $E_{it} = \phi w_i \overline{E}_t + X_{it}\beta + \varepsilon_{it}$ where: E_{it} = state per capita general expenditures $\overline{E}_t$ = vector of each state's spending in year *t* w_i = vector assigning a " neighborliness" weight X_{it} = matrix of covariates including state and year dummies **Data:** Expenditure data from the Census of Government Finances; demographic data from the Bureau of the Census Current Population Reports; covers 48 contiguous states in the years 1983–1994. Interstate mobility from PUMS one percent sample. **Methodology:** OLS and IV	State spending is significantly influenced by the spending of neighboring states. States raise their spending by something between 37 and 88 cents for every dollar increase in their neighbors' spending.
Besley and Rosen (1998): They analyze the phenomenon that state and federal tax setting decisions are interdependent, and they estimate the magnitude of	**Model**: $t_{jst} = \alpha_s + \beta T_{jt} + \gamma X_t + \delta Z_{jst} + \in_{jst}$ where: t_{jst} = the specific rate of sales taxation on commodity *j* in each state in each year	States do respond when the federal government encroaches on their tax bases. Specifically, a 10-cent increase in the real federal unit tax on cigarettes lads to a

Author and Objective	Model, Data and Methodology	Findings
the responses using gasoline and cigarette tax rates.	α_s = state fixed effect T_{jt} = the federal sales tax rate in year *t*, X_t = vector of time-varying regressors common to all states Z_{jst} = vector of time- and state-varying regressors $\in_{jst}$ = random error term **Data**: Annual data on the continental states for the years 1975 to 1989 **Methodology**: robust standard error procedure (OLS leads to downward bias in the standard errors)	2.8-cent increase in the real state cigarette unit tax, while a 10-cent increase in the real federal tax rate on gasoline induces a 4.1-cent increase in the real state gasoline tax rate.
Brueckner (2003): He provides an overview of empirical models of strategic interaction among governments and clarifies the theoretical roots of such studies by showing how the empirical frameworks fit into two broad categories, *viz*; spillover model and resource-flow models.	**Model:** $z_i = \beta \sum_{j \neq 1} \omega_{ij} z_j + X_i \theta + \varepsilon_i$ where: z_i = the level of a decision variable chosen by jurisdiction *i* z_j = the vector of z 's for other jurisdictions ω_{ij} = nonnegative weights X_i = is a vector of characteristics of jurisdiction *i*. β and θ are unknown parameters and the latter is a vector	Both types of models generate jurisdictional reaction functions and the estimated reaction function[20] slope is non-zero, which confirms the presence of strategic interaction.

[20] The spillover and resource-flow models ultimately lead to the same empirical specification, despite their differences.

Author and Objective	Model, Data and Methodology	Findings
	ε_i = an error term **Methodology:** The author suggests maximum likelihood (ML) methods and instrumental variables (IV) approach.	
Case (1991): presents an estimation scheme that allows individuals to be influenced by neighbors when making discrete choice decisions by testing for interdependence in farmers attitudes towards the adoption of new technologies in Indonesia.	**Model:** $Y^* = X\beta + u$ *(1)* $Y^* = X\beta + \overline{X}\delta + u$ *(2)* $Y^* = (1/\theta_1)X\beta + n\theta_2/(\theta_1(\theta_1 - n\theta_2))\overline{X}\beta + (I - \phi W)^{-1}u$ *(3)* $Y^* = X\beta + \overline{X}\delta + (I - \rho W)^{-1}\varepsilon$ *(4)* where: Y^* = expected profits X = farm household characteristics $\overline{X}$ = matrix of mean household characteristics in the relevant district W = matrix that assigns to each household its neighbors **Data:** Random sample of rural Javanese farm households from 1980 survey of SUSENAS[21] **Methodology:** Eq. (1) is a standard probit framework which constrains the coefficients on neighbors'	Results indicate the strong presence of neighborhood effects and appear to be robust to changes in specification. Failure to control for neighbors' influence may bias estimation of parameters of interest. It appears that neighbors are important influences in farmers' decisions to adopt new technologies.

[21] The Indonesian Socio-Economic Survey

Author and Objective	Model, Data and Methodology	Findings
	variables to zero; Eq. (2) allows neighbors' right-hand side variables to enter; Eq. (3) constrains the neighbors' variables in a manner implied in the equation; and Eq. (4) allows for spatial correlation in errors	
Case (1993): The paper presents evidence that voters may look at the tax increase in neighboring states to obtain information on whether a tax increase is appropriate and use this information to decide whether to reelect their governor.	**Model:** $t = \phi_1 \hat{t} + \phi_2 CAP^* \hat{t} + \phi_3 POST86^* \hat{t} + X\beta + \varepsilon$ where: t = [NT x 1] vector of N states' tax changes observed for T years X = [NT x *k*] matrix of year indicator variables and observable state economic and political characteristics thought to affect the tax change chosen $\hat{t}$ = [NT x 1] vector representing values of states' geographic neighbors' average tax changes for the period. ϕ_1 = parameter that measures the extent to which states are influenced by the taxing decisions of their neighbors CAP = indicator variable that takes the value 1 if the incumbent cannot, by law, run for reelection. POST86 = indicator variable that takes the value of 1 if the year is 1987 or 1988. ε = error term assumed to be normally distributed with mean zero and constant variance.	The results suggest that comparisons with neighbors influence gubernatorial behavior in that Governors are more likely to raise taxes when neighbors are doing the same.

Author and Objective	Model, Data and Methodology	Findings
	Data: Generated by the TAXSIM program at the National Bureau of Economic Research. **Methodology:** Two-stage least squares estimation.	
Case et al. (1989) and Case et al. (1993): Formalize and test the notion that states' expenditures depend on the spending of similarly situated states.	**Model:** $E_{it} = X_{it}\beta + \phi E_{jt} + f_i + h_t + u_{it}$ where: E_{it} = state *i*'s per capita expenditure in year *t* X_{it} = its own characteristics E_{jt} = the expenditures of its neighbors f_t and h_t = the individual and year effects, respectively. β and ϕ are parameters. For multiple neighbors, E_{it} is replaced with $\sum_{j=1}^{n} w_{ij} E_{jt}$ where: $\sum_j w_{ij} = 1$, and $w_{ij} = 0$ if state j is not a neighbor of state *i*. System of expenditure equations: U_{it} is a random error $E_t = \phi W E_t + X_t \beta + u_t$	They find that their neighbors indeed significantly influence states' expenditures, which is consistent with well-established theoretical models of benefit spillovers among jurisdictions

Author and Objective	Model, Data and Methodology	Findings
	where: E_t = (48 x 1) vector of state expenditures X_t = (48 x k) matrix of explanatory variables W = (48 x 48) weighting matrix **Data:** Pooled cross–section time series data X_{it} comprises *real per capita income, income squared, real per capita total federal grants to state and local governments, population density, proportion of the population at least 65 years old, proportion of population 5–17 years old*, and *proportion of the population that is black.* **Methodology***: OLS,*	
Besley and Case (1995): The authors develop a model of political economy of tax-setting which determines the voters' choices and incumbent behavior simultaneously in a multi-jurisdictional world. The model assumes that voters compare jurisdictions in order to overcome political agency problems, which in turn forces incumbents into a yardstick competition.[22]	**Model:** $\Delta\tau_{it} = \beta^* x_{it} + \alpha^* z_{it} + \varphi\Delta\tau_{-it} + \psi Y + v_{it}$ where: $\Delta\tau_{it}$ = tax changes in state i at time t x_{it} = a vector of characteristics considered to influence the representative voter z_{it} = the incumbent-specific characteristics τ_{-it} = changes in state i's neighbors at time t Y = year effects $\beta^* = \beta / \gamma_1$ $\alpha^* = \alpha / \gamma_1$	The results show that vote-seeking and tax-setting are tied together through the nexus of yardstick competition. Tax changes appear to be a significant determinant of who is elected, thus reducing effort put into curbing tax increases that are out of line with neighbors.

[22] Yardstick competition refers to a situation where each jurisdiction cares about what the other is doing.

Author and Objective	Model, Data and Methodology	Findings
	$\varphi = \gamma_2 / \gamma_1$ and is the spatial correlation coefficient λ = the probability that an elected official is good v_{it} = the error term. **Methodology**: IV estimate and 2SLS **Data:** Reelection bids of governors in the continental United States from 1960 through 1988.	
Feld et al. (2003): The paper provides a test of tax-mimicking in 22 French regions from 1984 to 1995. The regions tested had non-negligible tax setting power since the decentralization in 1986.	**Model:** $t_T * = \beta_1 \hat{t}_T + \beta_2' X_T + \varepsilon$ and $t_T = (1-\lambda) t_{T-1} + \lambda \beta_1 \hat{t}_T + \lambda \beta_2' X_T + \lambda \varepsilon$ where: $t_T *$ = optimal tax rate in a region for year T β_1 = a scalar that measures the influence of the tax policies of neighboring regions. $\hat{t}_T$ = the average of the neighboring regions' tax rates. X_T = vector that describes *k* economic and demographic variables of the region. β_2 = the associated vector that measures their influence on its tax policy λ = the coefficient of adjustment ε = an error term assumed to be normally distributed. **Data:** Panel data	The results indicate that tax rates at the French regional level are positively influenced by the tax policy in neighboring regions. The evidence is compatible with traditional tax competition models as well as with yardstick competition models.

Author and Objective	Model, Data and Methodology	Findings
Feld and Reulier (2005): The paper tests for the existence of strategic tax setting/competition at the Swiss cantonal level.	**Model:** $t^g = \beta_1 \hat{t}^g_{t-1} + \beta_2 X_{t-1} + \varepsilon$ where: $\hat{t}^g_{t-1}$ = an [NTx1] vector of the average of cantons geographic neighbors or weighted average of all other competing cantons' taxes of the previous period for *T* years in income class *g* X_{t-1} = an [NK x k] matrix of k observable cantons' economic and demographic characteristics of the preceding period ε = error term, normally distributed with mean zero and constant variance. β_1 = indicates to what extent a canton's tax policy is influenced by the tax policy in neighboring or all other competing cantons. **Data:** Yearly panel data set of the 26 cantons from 1984 to 1999. **Methodology**: Instrumental Variable method and Generalized Methods of Moments (GMM)	The results lend support for the hypothesis that strategic interactions between sub–federal jurisdictions in Switzerland exist. Income tax rates in the cantons depend –*ceteris paribus*–on neighbors' tax rates of the previous period or on other competing cantons' tax rates.
Goodspeed (2000): Estimates the impact of horizontal and vertical externalities on the choice of tax rates by local governments operating in a federation.	**Model**: $t^L_{1ct} = b_0 + b_1 t^n_{1ct} + b_2 H_{ct} + b_3 G^L_{ct} + b_4 D_c + \in_{ct}$ where: *ct* = country *c* in year *t* t^L_{1ct} = local income tax rate in country *c* in year *t* t^n_{1ct} = national income tax rate in country *c* in	Local governments decrease their use of income taxes in reaction to a higher national income tax rate and a lower poverty rate. A one percentage point increase in

Author and Objective	Model, Data and Methodology	Findings
	year t and reflects vertical externality H = measures the horizontal externality G_{ct}^{L} = total local revenue per capita in country c in year t D_c = are country–specific dummy variables $\in_{ct}$ = random error term **Methodology:** Tobit estimation **Data:** 13 OECD countries for the period 1975–1984.	the national government income tax leads to a fall of about 0.17 of a percentage point in the local government income tax rate.
Heyndels and Vuchelen (1998): The paper presents empirical evidence on tax mimicking among Belgian municipalities by looking at local income tax and local property tax..	$t = \alpha_1.Z + \alpha_2.t^{REF} + \varepsilon$ where: t = a $[589 \times 1]$ vector of local tax rates for the municipal budgetary year 1991 Z = a$[589 \times 5]$ matrix of the internal determinants of the local tax rates, which are: ε = the error term t^{REF} = a vector of average tax rates in neighboring municipalities. **Methodology:** 3-Stage Least Squares (3SLS) technique **Data:** Tax rates on 589 municipalities	The general results were in line with previous findings, that tax rates are indeed copied among neighboring municipalities. They also found evidence of interdependency of different tax rates and that mimicking among Belgian municipalities has a geographical dimension which extends beyond immediate neighbors. However, the intensity of influence diminishes with geographical distance.

Author and Objective	Model, Data and Methodology	Findings
Ladd (1992): The paper tests the hypothesis about whether local officials consider the tax burdens of neighboring counties when making their own decision about taxes on their own residents.	**Model:** $TB_i = a + \sum_h b_h X_{hi} + \sum_k c_k SD_{ki} + d \sum_j w_j TB_{ji} + u_i$ Where: TB_i = tax burden in the *i*th county X_h = county characteristics that affect tax burdens SD_k = an indicator for each state in which one or more of the sample counties are located $\sum_j w_j TB_{jt}$ = a weighted average of tax burdens in neighboring counties where w_j is the weight: u_i = a random error d = the coefficient that measures the degree of tax mimicking. **Methodology*:*** Instrumental Variables **Data:** Data on 248 large U.S. counties for 1978 and 1985	The study provides support for the view that local tax decisions in one jurisdiction are influenced by the tax burdens in neighboring jurisdictions. Regression equations confirm the presence of tax mimicking for total local tax burdens and for property tax burdens but does not find any evidence for sales tax burdens. Evidence of tax mimicking was more significant within metropolitan areas than within states: the average standard deviation of the total tax burden was only 0.0021 in MSAs, which is significantly smaller than that of states which was 0.0037.
Sole-Ollé (2003): The paper investigates the relation between tax mimicking and electoral accountability in	**Model:** $t_{i,t} = \alpha_1 t_{j,t} + \sum_k \alpha_{2,k} x^k_{i,t-1} + \sum_l \alpha_{3,l} z^l_{i,t-l} + \sum_m \alpha_{4,m} w^m_{i,t-1} + \alpha_{0,i} + \alpha_{0,t} + \varepsilon_{i,t}$	The results confirmed mimicking behavior in the choice of property and vehicle tax rates, where an increase in each of

Author and Objective	Model, Data and Methodology	Findings
Spain by looking at property taxes, motor vehicle tax and local business tax.	where: $t_{i,t}$ = the tax rate of either the property tax, motor vehicle tax or local business tax in the *i* municipality $t_{j,t}$ = the tax rate of each of these taxes in the set of neighbors or reference municipalities, *j* $x^k_{i,t-1}$ = the variables that measure the availability of exogenous revenues $z^n_{i,t-1}$ = the variables that measure the demand for services in a municipality $w^m_{i,t-1}$ = variables that proxy for political factors $\alpha_{0,i}$ and $\alpha_{0,t}$ = municipal fixed and time effects, respectively $\varepsilon_{i,t}$ = well-behaved error term. **Data:** Panel data for a set of Spanish municipalities (surrounding the city of Barcelona) during the 1990s).	these tax rates prompts a positive response in the tax rates of its neighbors. Results regarding the business tax were les robust. Local elections were found to play a role in disciplining the Leviathan and that relative evaluation of fiscal policies by voters increase the effectiveness of the accountability process.
Revelli (2001): The paper tested for mimicry in local tax setting in English non-metropolitan districts. It looked at The United Kingdom's two-tier system of local government	**Model:** $r_{it} = \rho r_{it-1} + \tau M_i r_t + \theta W_i R_{kt} + z'_{it}\beta + d_i + q_i + v_{it}$ where: index *i* = the shire district (*i* = 1,….,296) index *k* = the county (*k* = 1,….,39)	The results confirmed the presence of large and significant horizontal interaction between UK districts even after allowing for district-specific and time effects: a

Author and Objective	Model, Data and Methodology	Findings
comprising county authorities and district authorities.	index t = the financial year r_{it} = the property tax rate set by district i in period t R_{kt} = the property tax rate set by county k in the same year. z_{it} = a vector of explanatory variables specific of district i in period t. d_i = a fixed effect, i.e., an unobservable characteristic of the district that influences the local tax rate and is constant over time q_t = a time effect τ and θ = measure the horizontal interactions between districts and the vertical interactions between districts and counties respectively. Matrix M attributes neighbors to each district Matrix W assigns a county to each district **Data:** Used data collected by the Chartered Institute of Public Finance and Accountancy (CIPFA) for the years 1983-1990, i.e., before the reform of local government finance that introduced the Poll Tax/Council Tax. Data is for 296 shire districts and 39 counties.	10 percent increase in the local property tax rate of a district's neighbor led to an increase of 4-5% in its own property tax. There was no evidence of positive correlation between district and county property tax rates, supporting the thesis that the spatial autocorrelation in local taxes is not simply being driven by spatially auto-correlated shocks, but is rather compatible with tax mimicking at local level.
Rork (2003): The paper models state competition tax by estimating the degree of interdependence	**Model**: $T_{it} = X_{it}\beta + \theta T_{jt} + \xi_i + \lambda_t + u_{it}$ where:	Results indicate that taxes with relatively mobile bases respond positively to rates set in neighboring states and these

Author and Objective	Model, Data and Methodology	Findings
among five of the major tax instruments used by state governments.	T_{it} = tax measure in state *i* at time *t* X_{it} = state characteristics T_{jt} = neighbor's tax rate ξ_i and λ_t are state and year fixed effects, respectively u_{it} = mean zero, normally distributed random error To account for multiple neighborhood: T_{jt} is replaced by $\sum_j w_{ij} T_{jt}$ $T_{it} = \theta W T_{it} + X_t \beta + \xi_i + \lambda_t + u_t$ **Data**: State financial data for the years 1967-1996. Focuses on categories: personal income tax, corporate income tax, general sales tax, motor fuel tax and tobacco tax **Methodology**: Instrumental Variable Estimation. They use two types of weights; contiguity weights and population weights.	are: *Cigarette taxation*: an increase of 10 cents in neighboring states' cigarette taxes would induce a home increase between 4 and 6 cents; *Gasoline taxation*: the coefficient ranged from 0.463 for population weights and 0.600 with the contiguity weights; *Corporate income tax*: the estimated coefficient was 0.16 for both weights. Taxes with relatively immobile tax bases are found to respond negatively to neighboring states' taxes: *Personal income tax*: the coefficient ranged from –0.048 to –0.097; *General sales tax*: the coefficients ranged from –0.237 to –0.164.
Redoano (2003): Investigated	**Model:**	*Corporate tax:* Regression results

Author and Objective	Model, Data and Methodology	Findings
whether there is empirical evidence that EU Countries set their public expenditure and taxes interdependently.	$E_{it} = \alpha + \theta E_{it-1} + \beta A_{it} + \gamma X_{it} + D_i + \eta_{it} + u_{it}$ Where: E_{it} = state $i's$ fiscal choices in year t E_{it-1} = dependent variable lagged of one year X_{it} = a vector representing state $i's$ own characteristics D_i = year dummy η_{it} = individual linear time trend $\alpha, \beta, \gamma, and \theta$ are unknown parameters u_{it} = random error term $A_{it} = \sum_{j=1}^{n} w_{ijt} E_{jt}$ Where: $\sum_{j=1}^{n} w_{ijt} = 1$, and $w_{ijt} = 0$ if state j is not a neighbor. **Data:** Annual data on the EU States over the period 1980-1995.	suggest that tax competition occurs in Europe mainly between geographically close countries. *Income taxes and public expenditures*: Found similar results–confirm existence of yardstick competition with respect to countries with similar characteristics and " leader" countries. GDP and GDP distance weights performed better.
McGarvey and Walker (2004): They provide new empirical estimates in the literature on state and local government	**Model:** $y_t = X_t \beta + tp_t \alpha + W_n y_t \rho + f_t + h_t + u_t$ $u_t = D_t \varepsilon_t$	Regarding the copy-cat effect, they found that a hundred dollar per capita increase in a state's neighbors' expenditures

Author and Objective	Model, Data and Methodology	Findings
expenditures by focusing on the effects of preference variables, the copycat effect and the fly-paper effect.	Where: y_t = per capita expenditures X = observations of k variables. tp_t = the tax price f_t = fixed effects h_t = year effect W_n = Weight matrix **Data:** Annual data for states and local governments over the period 1977-1999. **Methodology:** An efficient GMM method.	would lead to an increase in per capita state spending of $13.66 in the early period (1977-1988) and about $31.04 in the latter period (1989-1999).
Geys (2005): He assesses the " price/quantity" of government policy in relation to that of neighboring jurisdictions, rather than focusing on spending or taxation levels alone.	**Model:** $SF - Mean = \alpha + \rho WSF - Mean + \beta X + \varepsilon$ where: $SF - Mean = E(u \mid u + e)$ is the government efficiency rating X = vector of control variables W = Weight Matrix α, ρ and β are parameters. Data: Used 301 Flemish municipalities in the year 2000. **Methodology:**	The analysis reveals a significant spatial pattern in Flemish local government's efficiency ratings.

Author and Objective	Model, Data and Methodology	Findings
	Both Maximum Likelihood estimation (ML) and Instrumental Variables estimation (IV)	

Source: Summary compiled by author from various papers.

CHAPTER 4: THEORETICAL FRAMEWORK

Some Background on the Expenditure and Tax Structures of the SADC Member Countries

To set the stage for the theoretical model, it is important to understand the main motivations in both public expenditure determination and the determinants of tax structure and particularly in the context of developing countries.

Expenditures

Public expenditures play a major role in the functioning of an economy and at all levels of income. This role does, however, change in the course of development and as the budgetary function adapts to changing needs of an economy. Government expenditure decisions are an outcome of a political process and while the views of political leaders and policymakers are influential, they are subject to various pressures and constraints, as well as international concerns.

As pointed out by Goode (1993), expenditure demands and responses to them are affected by the structure of the economy and by demographic, sociological, geographic, and technological factors. The direction of influence is, however, not always obvious. For instance, a demographic factor that could be expected to influence the demand for spending on education is the proportion of the population under 18 years; or expenditure on social security is often associated with the proportion of population that is over 65 years. Geographic factors include such issues as expenditures for irrigation and

transportation while technological factors that influence government expenditures include the spread of motorcars and trucks, as well as changes in military technology.

There is, therefore, no single formula that can be applied by developing countries in the determination of total government expenditures because of these complexities that result from such factors as fiscal conditions, political, economic and other factors. For most developing countries, their total expenditures usually depend on how much revenue they make as well as how much they can borrow or they can get in the form of aid or grants. However, government spending decisions in most developing countries and especially in Africa have of late been also heavily influenced by macroeconomic structural adjustment programs that have become synonymous with budget deficits and high external debts. In their study, Fan and Rao (2003) found that structural adjustment programs had an adverse impact on government spending on infrastructure in most regions where they had been implemented.

The factors that affect government expenditures outlined above do not include the role played by copycat behavior when it comes to determining expenditures. As indicated in the earlier sections, this theory has only gained momentum recently, though in earlier literature, attention was called to an international demonstration effect that causes people in poor countries to emulate the consumption standards of rich countries. This effect compels poor countries to consume more and save less than they otherwise would. When applied to government expenditures, the international demonstration effect may make political leaders of poor countries today to have different attitudes towards spending on education, health, and other economic services than existed in the industrialized countries when they were at comparable stages of development. These

countries did not have more developed or much richer countries to emulate but mostly their neighbors who were at more or less the same development stage as they were.

Tax Structure

The principal reason that governments levy taxes is to raise revenue to provide resources for the provision of various public services, in turn presumably motivated by the wish to promote outcomes such as reduced poverty, maintenance of law and order and higher living standards. The other reasons for levying taxes include stabilization of the economy and also in the case of externalities where specific taxes are used to address such externalities. Taxation is currently the only practical way of raising the revenue to finance government spending. With tax mimicking, countries would look at their neighbors' tax structures with the intent to copy if deemed to be favorable or attractive. Musgrave (1969) points out that economic factors bear on tax structure development in two ways. First, as the economy's structure changes with economic development, so does the nature of the tax base. Second, the economic objectives of tax policy tend to vary with the stages of economic development, as well as the economic criteria by which a good tax structure is to be judged. For low income countries, their economic structures impose severe limitations on the structure of the tax system. As pointed out by Tanzi and Zee (2000), it is difficult for developing countries to set up an efficient and fair tax system, more especially if they want to be integrated in the international economy. For these countries, an ideal tax system would be one that does not entail a lot of government borrowing when raising essential revenue. The tax system must not discourage economic activity and it must not diverge from the tax systems in other countries.

Challenges that developing countries face concerning the establishment of efficient tax systems include, among others, the following: (i) a hard to establish tax base given that most workers in these countries are employed in informal structures that pay in cash and do not maintain good accounting books–the hard to tax; (ii) manpower constraints, especially shortage of educated and well-trained personnel make it difficult to create an efficient tax system; and (iii) the formal structure of the economy in developing countries coupled with financial constraints make it difficult to generate reliable statistics, thus making it difficult for policy makers to make informed decisions regarding potential impact of major changes to the tax system.

Hinrichs (1966) underscores the issue of tax structure by pointing out that there is no single tax system that can be deemed best for all countries or even for one country at all times. The process of economic development as well as social mobilization necessarily means a change in economic tax bases during development and this necessitates parallel changes in the tax structure whose objective is mainly to narrow down the expenditure-revenue gap. However, setting up an efficient and fair tax system is an onerous task, particularly for developing countries that want to be integrated in the international economy. The ideal tax system in these countries should raise essential revenue without excessive borrowing by the government. Hinrichs (1966) made the following empirical generalizations, that tax structures have diversity within broad patterns that tend to shift during the process of economic development and social mobilization and such structural diversity is more pronounced at higher levels of income where either direct or indirect taxes are stressed depending on the cultural-political preference for either type of taxes. At lower levels of income, preference patterns are less

important. With the constraints given above, to an efficient tax system in developing countries, even if the governments were able to discern the preferences of taxpayers, it would be difficult to assign taxes to them as such choices may not be available or costly to administer and enforce.

At an early stage of development, most countries tend to emphasize indirect taxation in view of the fact that the taxes are easy to collect as compared to direct levies, and they are also easy to enforce. These countries tends to move towards direct taxation as their economies develop, as shown in Table 6 where most SADC countries now use practically both direct and indirect taxes, though they are still lacking in the likes of social security taxes.

Table 6: SADC Tax Structures as at December 2004

Country	Individual		Corporate	Property	Turnover	Social Security	Taxes on Goods and Services			Taxes on International Transactions		Other Taxes
		Payroll					Sales	Excise	VAT	M duties	X duties	
Angola*	√		√			√		√		√	√	√
Botswana	√		√	√				√	√	√	√	
DRC	√		√	√	√			√		√	√	
Lesotho	√		√	√				√	√	√	√	
Malawi	√	√	√					√		√		√
Mauritius	√		√	√				√	√	√		
Mozambique	√		√	√				√	√	√	√	√
Namibia	√		√	√				√	√	√		√
Seychelles			√	√		√	√					
South Africa	√	√	√	√	√	√		√	√	√		√
Swaziland	√		√	√				√		√	√	√
Tanzania	√	√	√	√				√	√	√		√
Zambia	√		√	√		√		√	√	√		
Zimbabwe	√		√	√		√		√	√	√		√

Source: *IMF Country Reports*-Various
Notes: * no municipal taxes

Theoretical Models

Our study tests for mimicking in both government expenditures and tax revenues hence we look at two theoretical models that apply to each specifically. We will then test these models empirically using data for both the SADC and SSA regions.

Theoretical Model I-Expenditures

In this section, we will look at the theoretical model that will guide us in our empirical estimation on the expenditure side. The model discussed here looks at policy interaction as it relates to fiscal expenditures and it is borrowed from Case, Hines et al. (1989) and Case, Rosen et al. (1993). The authors point out that there are several ways in which expenditures of one state can affect the fiscal policies of other states. The theoretical framework in their study builds on the foundation that governments are concerned with the welfare of their citizens and hence choose expenditure levels that will equate the sum of the individual marginal benefits from public services to the marginal costs of providing those services. In addition, these governments also take into consideration expenditure levels of neighboring governments when determining their own expenditure levels. Other studies, like Revelli (2003), have modeled public expenditure determination in a two-tier system of government which accounts for both vertical and horizontal fiscal interactions, i.e., they look at interactions among governments at the same level, like local government versus local government and interactions at different levels of government, like state government versus local government.

Given that this study is conducted at a country level and looks at one level of government, i.e., central or federal government, it will only consider the horizontal fiscal interaction for both expenditures and tax revenues. The model discussed here illustrates how expenditure levels of one country's neighbors impinge on that country's optimal level of expenditure–the tax revenue side is modeled theoretically in the next sub-section. In modeling this connection, all consumers in a country are assumed to be identical; the government is assumed to provide only one type of public good; and lump-sum taxes are considered. The representative consumer's utility in state *i* is expressed as a regularly smooth and convex utility index:[23]

$$V^i = V^i(Y^i - T^i, G^i; \psi^i) \tag{4.1}$$

where Y^i is per capita income in country *i*, T^i is each consumer's lump-sum tax burden in country *i*, G^i gives the level of public services provided by country *i*'s government, and Ψ^i is a vector of exogenous conditions affecting the utilities of country *i*'s residents which include political and other economic constraints. The price of private goods is the *numeraire*. Using per-consumer units to measure public services implies the following budget balance[24] requirements:

$$T^i \geq G^i \tag{4.2}$$

If the government acts in the interests of its citizens, it chooses G^i and T^i to maximize Equation (4.1) subject to Equation (4.2). Equation (4.2) will hold with equality if preferences exhibit non-satiation.

[23] See Samuelson, L.A. (1954).
[24] Equation (4.2) applies only when the budget is balanced or there is a surplus, which is what most jurisdictions strive for but is hardly ever achieved practically, especially in developing countries.

The Lagrangian is given by:

$$L = V^i(Y^i - T^i, G^i; \psi^i) + \lambda(G^i - T^i)$$

(4.3)

and the first-order conditions imply that:

$$\partial V^i(.)/\partial G^i = \partial V^i(.)/\partial(Y^i - T^i)$$

(4.4)

From Equation (4.4), we can define p_g^i as the consumer's marginal willingness to pay for public goods, i.e. $p_g^i = \dfrac{\partial V^i(.)/\partial G^i}{\partial V^i(.)/\partial(Y^i - T^i)}$. Normalizing the price of the public good to one, i.e., $p_g^i = 1$, gives Equation (4.4) which implies that the marginal utility of an additional dollar of expenditure on public goods equals the marginal utility of an additional dollar of after-tax private income.

The model illustrated above does not incorporate the direct response of a country's expenditure level to changes in the expenditures of its neighbors. The model shows that the expenditures of a country are determined entirely by variables that relate to that country. However, since the purpose of this study is to demonstrate the presence of fiscal interdependence between countries, we need to incorporate the neighbors' variable that captures that interdependence.

Let us suppose that consumers compare the utilities they derive from the goods provided by their governments to utility levels they would obtain if they resided in

neighboring countries. This comparison could be direct or indirect via the politicians and if individuals are not happy, the politicians may eventually feel the heat and leave or change their policies in favor of what the voters prefer. This would imply that there is performance comparison across jurisdictions or yardstick competition. Further, let us suppose that legislators worry about the consequences of unpleasant or hostile political voice if they offer their citizens a fiscal package that is inferior to the one they would have obtained had they resided in the neighboring country. The following is a possible objective function for a government decision-maker faced with such a situation.

$$V^i = V^i(G^i, Y^i - T^i, G^j; \psi^i), \tag{4.5}$$

where G^j represents the average level of government expenditures in other countries and ψ^i gives the remaining exogenous characteristics that influence utilities in country *i*. Equation (4.4) still characterizes the efficient choice of expenditure by country *i* but with utilities as given in Equation (4.5) and G^j is an argument of the functions on both sides of Equation 4.4. We obtain the influence of other countries' expenditures on country *i*'s expenditures by totally differentiating (4.4) colleting terms and imposing from Equation (4.2) that $dT^i = dG^i$ and this yields the following function (see Appendix C for the detailed differentiation):

$$\frac{dG^i}{dG^j} = \frac{\dfrac{\partial^2 V^i}{\partial G^i \partial G^j} - \dfrac{\partial^2 V^i}{\partial G^j \partial C^i}}{2\dfrac{\partial^2 V^i}{\partial G^i \partial C^i} - \dfrac{\partial^2 V^i}{\partial (G^i)^2} - \dfrac{\partial^2 V^i}{\partial (C^i)^2}} = \phi \tag{4.6}$$

where $C^i = Y^i - T^i$ is private consumption. From Equation (4.6) the denominator of the right-hand side must be positive because of the second-order condition characterizing the optimal choice of G^i. Therefore, the impact of a change in G^j on the

level of G^i must have the same sign as the difference of the two second partial derivatives in the numerator of the right hand side of Equation (4.6). The sign of the difference of the two second partial derivatives in the numerator will depend on the extent to which G^j is complementary with G^i and C^i; If G^j is more complementary with G^i than it is with C^i, then G^i will increase with G^j and the numerator will be positive. It is not possible to predict the patterns of complementarity beforehand, hence the sign of ϕ can only be determined empirically.

Even though the sign of ϕ, is indeterminate, it is reasonable to expect the expenditures of neighboring countries to move in the same direction. In the above theoretical model we assume that labor is immobile or that voters can not freely move from one country to one that offers them higher utility at free will. The assumption of perfect labor mobility would only be feasible in situations where there are no legal barriers between jurisdictions like border/passport controls and permits for work and residency that make mobility difficult. This assumption would thus be considered only applicable in counties, districts, states, as well as in countries in a union or region where there is free mobility of labor to some degree. However, it does not apply to the Sub-Sahara Africa and SADC regions. Regarding labor mobility inter-regionally, the European Union has been advocating for the free movement of labor within the Union, but mobility is still restricted. The European Commission has in the past taken steps to foster labor mobility between the member states, the aim of which is to remove any remaining impediments to cross-border labor mobility. For the SADC region, there is currently no free mobility of labor. One of the broad strategies of the SADC region (as well as the other regional economic blocs of SSA) as contained in its Treaty is to develop

policies aimed at the progressive elimination of obstacles to the free movement of capital and labor, goods and services, and of the peoples of the region generally, among member states.

When it comes to how rational voters are in developing countries when compared to the developed world, we expect them to exercise some form of rational behavior as well. While it can be argued that in developing countries lack of access to voting information is a major stumbling bloc, the politicians usually make it their interest to get such information to the voters during their campaigning period. Further, voters themselves are usually aware of their social and infrastructural needs and they can use their judgment to determine if such services are being delivered timely or not and where they have an opportunity to use their voice by voting out the incumbent who is not delivering, they can do so. Edlin et al. (2005) point out that a rational voter will decide which candidate or option to vote for based on the voter's judgment of the expected social consequences of the election outcome as distinct from the direct consequences to that voter.

However, it is important to point out that the theoretical model that we use above is predicated on the voter or individual, which is more applicable to developed countries and hence, it may not be the best model for developing countries. Further, our study does not set up a model that tests explicitly the median voter over a tax competition or harmonization model. Future studies could focus on developing a theoretical model that is more applicable to developing countries.

Theoretical Model II–Tax Revenues

In this section we present the theory that applies to the mimicking behavior of jurisdictions when determining their tax revenues. The theoretical model discussed below

draws from the tax competition literature and it is borrowed from Brueckner and Saavedra (2001) and Brueckner (2003). Considering that this study is looking at strategic behavior as opposed to tax competition, it is important to distinguish between the two concepts. The basic tax competition model considers a country with many identical regions each playing host to competitive firms that produce a single output. The firms employ a fixed stock of mobile capital and an immobile factor fixed in supply to produce the output. The fixed factor could be interpreted as land or labor, and may give rise to pure profits. It is assumed that each region uses a tax imposed on capital that is employed within its borders to finance the public good that it supplies. Tax policy affects the distribution of the world capital stock. An important insight is that a rise in the capital tax rate of one region benefits other regions by increasing their capital supplies and, hence, their revenues, which is a positive externality. However, the government in each region neglects these externalities since it is only concerned with the welfare of its own residents, leading to taxes being set too low. This results in under-provision of public goods, that is, an increase in all tax rates at the same time by a small amount would increase public goods supplies and hence welfare in all regions.

With strategic behavior, other jurisdictions tax rates must be taken into account when a given jurisdiction makes its tax decisions. Strategic behavior also leads to under provision of public goods. For our model, let us assume that we have 2 or more jurisdictions which produce a private good using mobile capital and immobile labor. For simplicity, capital is assumed to be fixed regionally but mobile between jurisdictions. Let K_i denote the capital invested in the jurisdiction $i, i = 1,2,....N$, and $\overline{L}_i$ denote labor supply in jurisdiction *i*. The production function is given by $F(K_i, \overline{L}_i)$ and its intensive

form is written as $f(k_i)$, denoting output produced per worker where k_i is the capital per unit of labor in jurisdiction *i*.

Brueckner and Saavedra (2001) point out that fixed factor labor is often viewed as supplied by local workers and assuming that each community in a metropolitan area constitutes a separate labor market could be unrealistic. However, in the case of this study where we are dealing with countries that are supposed to constitute immobile labor, the assumption that each jurisdiction supplies its own labor is largely valid except in the case where neighboring countries were supplying labor to South African mines, albeit under special arrangements. For simplicity, we assume the jurisdictions to have identical population sizes and to impose a tax on the capital invested locally, with t_i denoting the tax per unit in jurisdiction *i*. Given that capital is mobile across jurisdictions, to equalize the net-of-tax returns, its distribution must satisfy the following:

$$f'(k_1) - t_1 = f'(k_2 - t_2) = ... = f'(k_n - t_n) = \rho \tag{4.7}$$

or $$f'(k_i - t_i) = \rho \tag{4.7'}$$

where ρ is the uniform net-of-tax return. Further, it is assumed that the capital stock is fixed regionally[25] and this gives the additional condition:

$$\sum_{i=1}^{n} k_i = n\bar{k} \tag{4.8}$$

where $\bar{k}$ is the economy-wide level of capital per unit of labor. Equations (4.7) and (4.7') determine both $k_i, i = 1,2,....,n$ and ρ as functions of taxes t_i. The capital per worker in jurisdiction *i* and the uniform net return are presented as follows:

$$k_i = H(t_i, t_j) \tag{4.9}$$

[25] Capital is assumed to be mobile among jurisdictions within the region.

$$\rho = G(t) \tag{4.10}$$

Where t_j denotes the tax per unit in jurisdiction *j* or neighboring jurisdictions, *t* represents the entire vector of taxes. Differentiation of Equations (4.7) and (4.7') shows that $\partial k_i / \partial t_i < 0$ or $H_{t_i} < 0$, indicating that increasing taxes in jurisdiction *i* would shrink its tax base as capital flees to other jurisdictions with lower taxes, to equalize net returns. Further, $\partial \rho / \partial t < 0$, an indication that capital's net return declines as taxes increase.

The revenue from taxes is used to provide a public good q_i. The public good has private characteristics and it is produced at unit cost, with its level given by $t_i k_i$, which is equivalent to tax revenue per worker. Individual consumption of the private good is given as c_i and it is equal to the wage, $w(k_i)$ which depends positively on k_i, and on income from ownership of capital, which equals $\rho\bar{k}$. Combining all the above information, the common utility function for residents of jurisdiction $i, U(c_i, q_i; \widetilde{X}_i, Y_i)$, can be written as

$$U[w(k_i) + \rho\bar{k}, t_i k_i; \widetilde{X}_i, Y_i] = U\{w[H(t_i, t_j)] + G(t)\bar{k}, t_i H[t_i, t_j]; \widetilde{X}_i, Y_i\}$$

$$\equiv V(t_i, t_j; \widetilde{X}_i, Y_i) \tag{4.11}$$

Where $\widetilde{X}_i$ represents jurisdiction characteristics, other than income, which help determine preferences and Y_i represents the political variables. The objective function thus ultimately depends on jurisdiction *i*'s tax rates and tax rates elsewhere. Therefore, in choosing its tax rates, jurisdiction *i* takes into account the capital flight caused by an increase in its tax rate as well as the impact of the tax increase on capital's net return. Given that the impact of the higher t_i depends on tax rates elsewhere, the optimal value will also depend on these rates.

Jurisdiction *i* maximizes (4.11) with respect to t_i by setting

$$\partial V / \partial t_i \equiv V_{t_i} = 0 \tag{4.12}$$

Given the above derivative, the solution to this maximization problem will depend both on tax choices elsewhere, t_j, as well as on X_i, the characteristics of jurisdiction *i* and Y_i, the political variables. The solution is written as,

$$t_i = R(t_j; X_i, Y_i) \tag{4.13}$$

Equation (4.13) is a demand function for decision variable t_i and function *R* denotes a reaction function. This reaction function presents jurisdiction *i*'s best response to choices made by other jurisdictions on their taxes (t_j) and the position of the reaction function depends on jurisdiction *i*'s characteristics and not those of its neighbors. If, for instance, the slope of the reaction function for country *i* is negative, then it implies that jurisdiction *i* would lower its tax rate in response to an increase in the tax rate in jurisdiction *j* when the marginal utility of the public good is small. In theory, nothing is said regarding the sign of the slope of the reaction function however, differentiating (4.13) indicates the following:

$$\partial t_i / \partial t_j = -V_{t_i t_i i} / V_{t_i t_i} \tag{4.14}$$

Where the expressions are the second partial derivatives of *V* of which, $V_{t_i t i i}$ represents a vector of derivatives and depending on the properties of preferences, it can take either sign, while $V_{t_i t_i}$ must be negative so as to satisfy the second-order condition. The slope of the reaction function R_{t_i} can thus be positive or negative; it can also be zero. However, a reaction function slope of zero would indicate a case where

interaction is absent. Consequently, a test of the null hypothesis that the reaction function has a slope of zero is effectively a test for the existence of interaction. The slope of the reaction function gives by how much a jurisdiction would react to a 1 percent or unit change in the respective tax rates of neighboring jurisdictions.

While tax policies in developing countries differ in terms of structure from those of the developed world we would still expect them to behave in a similar way when it comes to tax competition as they try to get as much revenue as they can from taxes and especially corporate taxes. Developing countries collect much less tax revenue as a fraction of GDP, compared to developed economies, owing to a number of problems which include, among others, greater tax enforcement problems and a huge underground or informal sector. These countries do rely a lot on corporate tax revenue, obtaining as much as 19.3 percent of revenue from corporate taxes as compared to 9.7 percent for developed countries (Gordon and Li 2005). This indicates that developing countries are just as likely to compete for business as would the developed countries.

CHAPTER 5: THE EMPIRICAL SPECIFICATIONS

Econometric Model: Expenditure Side

In this section we empirically test the theoretical model for government expenditure determination that we presented in the previous section. Emanating from the theoretical model which implies that country *i*'s per capita expenditures in year t, E_{it}, depend on the country's own characteristics (X_{it}) and its neighbors' expenditures, we assume at the initial stage that each country has only one neighbor whose per capita expenditure is denoted E_{jt}. From Equation (4.6) in the theoretical model, we estimate the impact of neighboring countries expenditures on country *i*'s expenditures and in linear specification we write:

$$E_{it} = X_{it}\beta + \rho E_{jt} + u_{it} \tag{5.1}$$

where β and ρ are parameters and u_{it} is a random error. In Equation (5.1) we assume that the neighbor effects are transmitted concurrently, i.e., without any lags; a reasonable supposition given that the data are annual. Normally, it would be expected that a jurisdiction would copy its neighbor's policies that are already in place, thus resulting in a lag between the two tax or expenditure variables. However, Case, Hines et al. (1989) who were one of the first researchers to apply spatial analysis to expenditures, analyzed a model in which they included the lagged variable for expenditures $E_{j,t-1}$, as an exogenous variable and found that the model did not perform as well as it did without it; the value of the log likelihood was lower than with E_{jt}.

A country's public expenditure is characterized by individual effects[26] or unobserved characteristics that influence its fiscal decisions and do not change over time. Institutional differences are likely across countries and to control for these, Equation (5.1) is enhanced with an individual effect. The model also allows for time effects, i.e., including a series of year specific intercepts, which are intended to control for variables that might have a common effect on the countries in a given year like business cycle conditions.[27] With the country and time effects, the model takes the following form:

$$E_{it} = X_{it}\beta + \rho E_{jt} + f_i + h_t + u_{it} \tag{5.2}$$

where f_i and h_t are the country fixed and time effects, respectively. In the above two equations, we are looking at a scenario which takes into consideration only one neighbor. However, it is often the case that a country has more than one neighbor whose expenditures have an impact on its own expenditure.

Multiple Neighbors

As explained in Chapter 3 (Literature Review), the term neighbor as used in this context does not necessarily mean sharing a border "geographic neighbor", it can be generalized to any network structure. Defining neighbors has always proved to be a problem and as pointed out by Sole Olle (2003), Anselin (2002) and others; a common procedure for specifying these interactions uses geographic proximity criteria, but that, there is no reason not to use other distance metrics such as socio-economic similarity. A detailed discussion of how neighbors are selected in this study follows in the next

[26] Examples of such fixed effects include climate, political make-up, etc.
[27] Time effects are also crucial in that they prevent attribution of behavioral significance to any cross-country correlations in spending that are in actual fact due to common nation influences.

sub-section. The fact that expenditures of neighboring countries have an impact on the expenditures of country *i* does not imply that all neighbors have equal influence. Country *j*'s impact on country *i*'s spending depends on the complementarity of the countries' spending in generating utility for residents of country *i*, where complementarity is based on the extent to which the countries' populations are similar. Case et al. (1989) assume that the impact of other countries' expenditures on country *i* depend on a weighted average of all other countries' expenditures and the weights depend on the " degree of neighborliness." With multiple neighbors, E_{it} in Equation (5.2) is replaced with

$$\sum_{j=1}^{n} w_{ij} E_{jt} \tag{5.3}$$

where $w_{ij} = 1$ if country *j* is neighbors with country *i* and $w_{ij} = 0$ if country *j* is not a neighbor of country *i*. Vector w_{ij} indicates the relative importance of each country to country *i*. The system of expenditure equations for all countries is written in the following matrix form:

$$E_t = \alpha + \rho W E_t + X_t \beta + u_t \tag{5.4}$$

where E_t is an (N x 1) vector of country expenditures in year *t*; WE_t is the spatial lag term, X_t is an (N x *k*) matrix of explanatory variables that includes time and fixed effects; and *W* is an (N x N) weight matrix that assigns neighbors to every country. The parameter ρ reflects the strength of interaction among countries.

The expenditure equations that we estimate finally are in the form:

$$E_{it} = \alpha + \rho W E_{jt} + X_{it} \beta + u_{it} \tag{5.6}$$

Correlated Random Shocks

The inclusion of time effects in the model is meant to control for systematic influences that are common to all countries in a given year or period. However, neighbors could still be subject to correlated random shocks and the presence of such shocks produces a correlation between neighbors' levels of spending that could result in the presence of causal influences that are actually not there. Hence to correct for this, potential correlation among the errors of neighbors is allowed in the following way:

$$u_t = \lambda W u_t + \varepsilon_t = (I_N - \lambda W)^{-1} \varepsilon_t \tag{5.7}$$

where ε is an idiosyncratic error that is uncorrelated between countries: $E(\varepsilon_{it}\varepsilon_{jt} = 0)$ for $i \neq j$. In this study there is potential for dependence on neighbors through expenditure (E), as well as through errors (u), to mimic each other. If spatial correlation in the error terms is not corrected for, it would not affect the consistency of the β parameters, but it would reduce its efficiency. However, ignoring the spatial lag term when ρ is non-zero would be more serious as it will yield inconsistent estimates of the β parameters.

With the errors in Equation (5.4) correlated with the right-hand-side variables, this equation cannot be estimated consistently using ordinary least squares. To remove the dependent variable from the right hand side, we can invert it to the following reduced form:

$$E_t = (I_N - \rho W)^{-1} X_t \beta + (I_N - \lambda W)^{-1} u_t \tag{5.8}$$

where I_N is the identity matrix of size N and it gives the solution of the Nash equilibrium of the game. Given that the error term is $u_t = \lambda W u_t + \varepsilon_t$, Equation (5.8) now

incorporates the potential correlation between errors of neighbors and expenditure and is now written as a non-linear function of exogenous variables *X*. With this correlation, it means that estimating using ordinary least squares (OLS) will lead to inconsistent parameters. Most studies, as indicated in the summary of literature above have used either maximum likelihood (ML) such as Brueckner (2003) or instrumental variables (IV) as in Baicker (2001), Brueckner (2003), Besley and Case (1995), Ladd (1992), and Rork (2003) in their estimations. Other types of methodologies have also been used in spatial analysis such as ordered probit and 2SLS. However, in the presence of correlation between the jurisdictions characteristics *X*s and the error term, using ML estimates for spatial analysis will be inconsistent and this needs to be corrected for.

Empirical Estimation: Tax Revenue Side

This section gives the empirical specification for tax revenues. The reaction function generated in Section 4.3 above relates each jurisdiction's chosen tax rate to the choices of other jurisdictions and to its own characteristics. The empirical estimation thus follows from Equation (4.13) and it can be written as:

$$Tax_{it} = \alpha + \rho Tax_{jt} + X_{it}\beta + u_{it} \tag{5.9}$$

Where Tax_{it} represents tax revenues as shares of total revenue for country *i* at time *t*, Tax_{jt} are tax revenue shares for neighboring countries, β and ρ are parameters, and u_{it} is an error term. Variable X_{it} is a vector representing the socio-economic characteristics of community *i*, and these represent preferences as well as other factors that affect the determination of tax revenues. The key coefficient in Equation (5.9) is the

reaction of country *i* to the tax rates of other countries *j*, and this is reflected by ρ. Jurisdictions often keep their tax rates low in view of the idea that a tax increase would result in positive fiscal externalities for neighboring jurisdictions with lower tax rates as they experience inflow of capital and a widening of their tax base. Other jurisdictions will not usually follow suit when there is an increase in tax rates in one jurisdiction. Hence, the coefficient ρ is expected to be positive in the presence of tax mimicking.

The rest of the estimation procedure follows the one outlined under expenditures above. Hence, for both tax revenues and spending levels, we test the hypothesis that the slope of the reaction function is zero, i.e., $\rho = 0$ which is a test for the existence of interaction or mimicking behavior. This hypothesis tests for spatial interaction among the dependent variables and since spatial dependencies could also be due to spatially associated omitted variables, we test for the hypothesis that there is no spatial interaction in the error terms, i.e., $\lambda = 0$. We estimate the following revenue equations:

$$Tax_{it} = \alpha + \rho WTax_{it} + X_{it}\beta + u_{it} \tag{5.10}$$

With

$$u_{it} = \lambda Wu + \varepsilon \tag{5.10a}$$

Spatial Specification

This section gives an overview of how weight matrices that are used to determine spatial interaction are constructed and we also include the choice of matrices that are used for this study. Determining the weighting matrix can be quite an onerous task as coming up with the best measure or criterion can involve a lot of trial and error. Revelli (2002)

points out that in general, the definition of the weighting criterion should be driven by the following: (a) the theoretical model; (b) the size and number of jurisdictions (local) in the sample; and (c) parsimony-as opposed to arbitrariness. As a result of the uncertainty regarding the proper specification of the spatial weight matrix, Ruiz (2006) points out that this could lead to a potential problem of drawing inappropriate conclusions as the specified weight matrix may not be the true weight matrix.

For most spatial models in applied local public economics, the use of geographic criterion seems reasonable enough, and this draws from the conclusion that close-by jurisdictions are more likely to affect each other than those that are far away. It is on this notion that most studies assume a limited geographical dimension of information externalities and this only considers jurisdictions that share boundaries. Brueckner (2003) underscores this by pointing out that this effect applies in both " spillover" and " resource-flow" models.[28] Most empirical works have thus used a straightforward contiguity criterion which defines neighborliness as border-sharing and all contiguous jurisdictions are given equal weight. For instance, Case (1992) used geographic proximity to test for interdependence in farmers' attitudes toward the adoption of new technologies. Heyndels and Vuchelen (1998) pointed out that for large-scale jurisdictions like the U.S. states, this approach seems reasonable but that it is far less so in the context of many small municipalities as is the case with their study on Belgium. They extend the

[28] The *spillover model* is where agents or jurisdictions are directly affected by the decision variables chosen elsewhere and a *resource-flow model* is where the availability of a resource at a location is affected by the decision variables at all other locations.

jurisdiction's reference space beyond its immediate borders by introducing a second-order lag.[29]

When constructing a weight matrix, it is important to consider both the spatial extent of the influence and the power of the influence (Bucholtz 2004). Not every member of a neighborhood would exert the same influence even if they all share a border with that jurisdiction. In the case of countries that are spread over a vast region, various ways could be used to determine the weight matrix and these include the contiguity or border criteria, geographic distance, economic characteristics, social characteristics and demographic characteristics. One way to overcome this uncertainty is to construct the weights using several of these methods and taking into consideration variables or characteristics that are common to all jurisdictions in the sample. The estimation results could then be used to determine which measures are better by looking at the ones with higher and more significant coefficients. This is the method preferred by most studies as demonstrated by among others, Case, Hines et al. (1989) who used three criteria (geography, per capita income, and percentage of the population that is black) to construct the weighting matrices, and Redoano (2003) who used four criteria: geographical distance weighted, GDP weighted, GDP distance weighted and GDP per capita weighted. In this study, we consider the geographic, economic and social definitions of the weight matrix.

[29] They define two separate "reference spaces" for each Belgian municipality *i*. The first one consists of the municipalities' immediate neighbors (First-Order Neighbors) and the second one are municipalities that have a common boundary (Second-Order Neighbors) with FON municipalities but excludes municipality *i* itself and the FON municipalities of *i*.

Geographic Definition of Weight Matrices

The first weight matrix measures we consider are based on the geographical definition. We use the contiguity criterion to determine the weight matrix given the clustering of SADC countries and that most of them share a border with at least one neighbor and this also extends to the SSA countries of which most share a border with at least one other country. However, in these two regions, we have countries that are islands and hence do not share a border with any country, and this criterion would exclude them from the analysis. This problem is also encountered where some countries in the region are omitted from the sample due to lack of data, thus leaving some countries without neighbors. However, we overcome this constraint of unconnected observations by considering the nearest neighbor in terms of distance or shortest distance to mainland in the case of islands.

The first geographic measure we use is the contiguity measure where the individual elements of the weighting matrix, W, which is an *n x n* positive matrix, are computed based on whether countries share a common border or not. We set weights such that: $\omega_{ij} = 1$ if countries *i* and *j* share a common border and $\omega_{ij} = 0$ for non contiguous countries. Further, by convention, a country cannot be its own neighbor hence the diagonal elements will be zero ($w_{ii} = 0$ and $w_{jj} = 0$). In order to eliminate discontinuity points in the solutions, the weight matrix is usually row-standardized such that each element in the standardized matrix falls between 0 and 1 and each row sums to one, whereby $w_{ij}^{s} = \omega_{ij} / k$, where $k = \sum_{j} \omega_{ij}$. Row standardizing suggests that a spatial lag operation, whereby a vector of observations is multiplied by *W*, corresponds to an

averaging of the neighboring values and it also makes interpretation easy. However, given that $\sum_j w_{ij} \neq \sum_i w_{ji}$, the row standardized weight matrix is no longer symmetric.

When using contiguity to determine the weight matrix, different weight structures may result from the same spatial layout (Anselin 2002). Contiguity can be determined using only common boundaries and this is referred to as the *rook* case or it can be determined using only common vertices,[30] a case known as the *bishop*. The third case is whereby both boundaries and vertices are used to determine neighbors and this is referred to as the *queen* case and this is what we apply in this study. The queen case normally yields more neighbors.

Geographic proximity could also be viewed as a continuous variable hence, the second geographical weight matrix criterion that we use is based on the distance between capital cities of the countries that are in the sample. When using distance to capture spatial interactions, we expect countries that are close to one another to display some mimicking behavior as opposed to distant neighbors. The distance measure was computed using the latitudes and longitudes of the capital cities. We define d_{ij} as the distance between capitals of countries *i* and *j* and set $\omega_{ij} = 1/d_{ij}$, and construct w_{ij} from ω_{ij}. The distance weight matrix is then normalized using $w_{ij}^d = \frac{1}{d_{ij}} \Big/ \sum_j \frac{1}{d_{ij}}$. Case, Hines et al. (1989) and Case, Rosen et al. (1993) also suggest using $\omega_{ij} = 1/d_{ij}^2$ or $\omega_{ij} = 1/d_{ij}^4$, however, they point out that in practice the various measures of distance tend to yield similar results.

[30] This is where countries do not share a common border but just a point or what is referred to as a node in geographic information system (GIS).

Economic Definitions of Weight Matrices

We build our second type of weight matrices by considering two countries neighbors if they have similar economic characteristics. We considered the GDP and GDP per capita variables for the weighting matrices and their construction is similar for both variables. For GDP we use:

$$w_{ij}^{g} = \frac{1}{\left|GDP_i - GDP_j\right|} / \sum_j \frac{1}{\left|GDP_i - GDP_j\right|}$$

Where g is GDP and $GDP_i - GDP_j$ is the difference in the GDP levels between countries i and j. In our study we use time invariant GDP, which is the average GDP for the period 1980-2001.

Similarly, the GDP per capita weight matrix is calculated in the following way:

$$w_{ij}^{gdppc} = \frac{1}{\left|GDP_i^{gdppc} - GDP_j^{gdppc}\right|} / \sum_j \frac{1}{\left|GDP_i^{gdppc} - GDP_j^{gdppc}\right|}$$

where *gdppc* is GDP per capita. When applying the economic and social weight matrices to our case, we encountered a problem of spatial coefficients that were out of the stipulated boundaries. We corrected this problem by assigning zeros to cases where the absolute difference for each variable was very high and 1 to those with smaller absolute differences. The smaller the difference, the closer the countries are in terms of each economic measure. For GDP per capita our cut off point was US$200,[31] however we ended up dropping the GDP measure from our estimations as it failed to produce

[31] The absolute differences, $\left|GDP_i^{gdppc} - GDP_j^{gdppc}\right|$ range from a low of 1.64 to a high of 5,507, with the majority of the countries clustered in the lower tail. We chose 200 as our cut off point because this is where our weight matrix performed well without being too singular.

acceptable results, yielding spatial coefficients that were outside the acceptable range of -1 to 1. We attributed the problem to large variations in economic variables between the countries as some of the middle-income countries in the sample have very high GDP levels, like South Africa, while some low-income countries' GDP levels are relatively very low.

It is also possible to test if there is a leader among the jurisdictions under analysis by using a weight matrix that assigns a higher weight to countries with higher values of the variable that is used to determine such leadership. Generally in fiscal studies, GDP is used to determine which country or countries are leaders. In this study, the way in which we reconditioned our GDP per capita weight matrix could be used to interpret the results in terms of " leader(s)" as we made a distinction between the countries with low and high GDP per capita by assigning them different values.

Social Definitions of Weight Matrices

For the social indicator measure we used the Human Development Index (HDI) measure to construct the weight matrix. As with GDP and GDP per capita, we used the average[32] over the period under review and it was calculated as follows:

$$w_{ij} = \frac{1}{\left|HDI_i - HDI_j\right|} / \sum_j \frac{1}{\left|HDI_i - HDI_j\right|}$$

Where $HDI_i - HDI_j$ is the difference in the indices between country *i* and country j. We encountered the same problems with our HDI matrix as we did with the GDP per capita weight matrix and we had to redefine it to get it to perform well. We attributed this problem to the big inequalities in the social and economic variables among these

[32] The HDI Index is given for every five years.

developing countries where some are classified as low-low income and some are high-middle income, hence their HDI and GDP per capita values vary a great deal between the poorer countries and the richer ones. The HDI index takes values between 0 and 1 where values close to one indicate that a country is relatively rich and values close to zero indicate a great deal of inequality or poverty. We redefined this weight matrix by first taking the absolute differences between all the countries and then coding those that were above 0.2 as zero and those below or equal to 0.2 were coded as 1. A higher absolute difference in the indices implies that the two countries were not close in terms of HDI rank and the reverse applies for those with small absolute differences. We chose 0.2 because that was our median point where the maximum difference was around 0.6. The reconditioned weight matrix performed well. This reconditioning of the weight matrix takes us back to the issue of arbitrariness associated with the determination of weight matrices, where there is no prescribed or specific way of determining them.

Methodologies

For the empirical analysis part, we tried to apply methodologies that would give us a better estimation given the objective of this study. As pointed out above, ordinary least squares (OLS) will yield inconsistent estimates because the spatial lag term, WE_t is correlated with the error term u_t. However, we can estimate our models using alternative methods. The maximum likelihood approach has been the most common method of estimation and specification testing while the instrumental variables (IV) have been used mainly for the estimation of the spatial lag. These two methods of estimation have been rarely used in the estimation of the general or full spatial model, which involves

estimation of a spatial lag model with a spatial autoregressive disturbance Saavedra (2000). When dealing with panel data that involves a large number of countries over a short period of time, or where $N>T$, maximum likelihood estimators (MLE) may yield estimates that are not consistent. This is the case with our SSA data where the number of countries exceeds the number of years. Further, McGarvey and Walker (2004) point out that they could not estimate the $n \times n$ disturbance covariance matrix using a fully efficient estimator such as maximum likelihood or a best IV estimator since n is greater than T in their sample.

Kelejian and Prucha (1999) pointed out that the (quasi) maximum likelihood estimator may not be computationally feasible in many cases that involve moderate- or large-sized samples and they suggested a generalized moments estimator that is computationally simple regardless of the sample size. Further, while the MLE assumes normally distributed errors, the GMM estimation does not rely on distributional assumptions and the estimators are easy to calculate. While GMM estimation has the advantage of consistency in the presence of arbitrary heteroscedasticity, this comes at a cost of possibly poor finite sample performance.

When comparing MLE-based and GMM-based tests against spatially autocorrelated errors in spatial models, Egger, Larch et al. (2005) found that contrary to previous research, GMM-based Wald-tests tend to perform extremely well irrespective of the underlying error distribution and outperformed the MLE-based LM-test in terms of both size and power in small to moderately-sized samples and error distributions. In the case of normally distributed errors, a Wald-test based on the variance of the spatially

autoregressive residuals (SAR) parameters, the GMM performed as well as the MLE-based tests.

This study uses two methodologies: the generalized method of moments (GMM) and the generalized spatial two stage least squares (GS2SLS).

Generalized Method of Moments (GMM)

We use the GMM estimator that can be applied to spatial models and was developed by Kelejian and Prucha (1999) and Kelejian and Prucha (2006). Their generalized moments estimator uses moment conditions to form a system of equations to be estimated, depending on the model. While this method requires some matrix multiplication and the calculation of the trace of $W'W$, it does not require the calculation of the determinant of W or the eigenvalues of W, which is a problem that affects the MLE procedure.

GMM Specification

Following Kelejian and Prucha (2006) we specify a general spatial model and its underlying assumptions. The model with *n* spatial units can be described as follows:

$$Y_n = X_n\beta_n + \rho_n W_n Y_n + u_n \tag{5.11}$$

$$u_n = \lambda_n M_n u_n + \varepsilon_n \tag{5.12}$$

The variables are as defined above under the econometric models above. The matrices W_n and M_n are the spatial weights matrices which can be the same, and ρ_n and λ_n are the typical autoregressive parameters. The vectors $\overline{Y}_n = W_n Y_n$ and $\overline{u}_n = M_n u_n$ are the spatial lags of Y_n and u_n, respectively. With all quantities allowed to depend on the

sample size *n*, the model is fairly general and allows for spatial spillovers in the variables and in the error terms. We make the assumptions that all the diagonal elements of W_n and M_n are zero, that the matrices $I_n - \rho_n W_n$ and $I_n - \lambda_n M_n$ are nonsingular for all ρ and λ, and we uniquely define the following:

$$Y_n = (I_n - \rho_n W_n)^{-1} X_n \beta_n + ((I_n - \rho_n W_n)^{-1} u \ , \tag{5.13}$$

$$u_n = (I_n - \lambda_n M_n)^{-1} \varepsilon_n \tag{5.14}$$

The spatial lag model can be formulated as a linear model with an endogenous variable (Wy) and exogenous variables (X) and we have:

$$y = Z\gamma + u \tag{5.15}$$

where $Z = [Wy, X]$ and $\gamma = [\rho, \beta]$. The endogeneity problem for the spatially lagged dependent variable is solved by using instrumental variables and these are obtained using a matrix Q (N x q) of additional variables:

$$Wy = Q(Q'Q)^{-1} Q'Wy \tag{5.16}$$

such that $\hat{Z} = [Wy, X]$, and this results in the spatial two stage least squares estimator (S2SLS):

$$\hat{\gamma}_{S2SLS} = [\hat{Z}'\hat{Z}]^{-1} \hat{Z}'y \tag{5.17}$$

Inference on the γ_{S2SLS} is based on the asymptotic variance matrix:

$$AsyVar[\hat{\gamma}_{S2SLS}] = \hat{\sigma}^2 [Z'Q(Q'Q)^{-1} Q'Z]^{-1} \tag{5.18}$$

with $$\hat{\sigma}^2 = (y - Z\hat{\gamma}_{S2SLS})'(y - Z\hat{\gamma}_{S2SLS}) / N \tag{5.19}$$

On the other hand, the moment conditions related to λ are

$$E[\frac{1}{n} \varepsilon'\varepsilon] = \sigma^2 \tag{5.20}$$

$$E[\frac{1}{n}\bar{\varepsilon}'\bar{\varepsilon}] = \sigma^2 \frac{1}{n} tr(MM') \tag{5.21}$$

$$E[\frac{1}{n}\bar{\varepsilon}'\varepsilon] = 0 \tag{5.22}$$

From Equation (4), assuming $\tilde{u}$ is a predictor of u, using the notation $\bar{u} = Mu$ and $\bar{\bar{u}} = MMu$, and after substituting Equation (5) into Equation (6), we get the following moment conditions for λ:

$$E\left[\frac{1}{n}(\bar{u} - \lambda\bar{\bar{u}})'(\bar{u} - \lambda\bar{\bar{u}}\right] = E\left[\frac{1}{n}(u - \lambda\bar{u})'(u - \lambda\bar{u})\right]\frac{tr(M'M)}{n} \tag{5.23}$$

$$E\left[\frac{1}{n}(\bar{u} - \lambda\bar{\bar{u}})'(u - \lambda\bar{u}\right] = 0 \tag{5.24}$$

OLS is used to estimate and obtain a consistent estimate of the residuals which are then plugged into the above moments to obtain a consistent estimate of λ.

Generalized Spatial Two Stage Least Squares (GS2SLS) Estimation

We also used an instrumental variable estimator that builds on the generalized spatial two-stage least squares (GS2SLS) model by Kelejian and Prucha (1998) which is an estimation procedure for models that contain spatially lagged dependent variables as well as spatially autocorrelated error terms. However, their estimation is based on a cross-sectional setting (where T = 1) and we apply it to panel data (where T >1) as in McGarvey and Walker (2004) and Hernandez-Murillo (2003). This is basically a three-step procedure which estimates the autoregressive spatial model with autoregressive errors (Equations 5.11 and 5.12) by two-stage least squares (2SLS) using a set of instruments, H_t, which is a nT x p matrix. The instrument matrices are composed of a

subset of the linearly independent columns of

$(X_t, W_t X_t, W_t^2 X_t, ..., M_t, X_t, M_t W_t X_t, M_t W_t^2 X_t, ...)$.

In the second step the parameter λ is estimated using residuals obtained in the first step and the GMM procedure. In the third and final step, the regression model in (Equation 5.11) is then re-estimated using 2SLS but after the model has been transformed via a GLS type of transformation to account for the spatial correlation.

CHAPTER 6: DATA SET AND CHOICE OF VARIABLES

In this study, we estimate the models specified in Equations (5.6) and (5.9) using yearly panel data on government expenditures, tax revenues , economic, geographic, political and demographic conditions. The use of panel data is advantageous over the conventional cross-sectional or time series data sets for various reasons. Panel data tends to give a large number of data points which increases the degrees of freedom and reduces the collinearity among explanatory variables. This improves the efficiency of econometric estimates. The other advantage of panel data is that it allows for the availability of multiple observations for a given variable or individual at a given time, allowing one to identify an otherwise unidentified model, thus overcoming the problem of unidentification of a model that results from measurement errors (Hsiao 2003).

The data used to test both tax and expenditure mimicking covers overall thirty Sub-Saharan African countries at the central government level for the period 1980-2001. The data on tax revenues and expenditures were obtained from the International Monetary Fund *Yearbook of Government Finance Statistics, IMF Staff Country Reports and c*entral bank and government reports for individual countries. For some countries data on defense were obtained from (SIPRI). Data on the economic and demographic control variables: aid per capita, GDP per capita, openness (GDP, imports and exports), land area, literacy rate, proportion of population aged 0–14 years and proportion of population above 65 years were obtained from the World Bank's *World Development Indicators and the World Economic Outlook* (WEO) Databases. The political right and civil liberty data were obtained from the *Freedomhouse*. Data on structural adjustment programs (SAPs) were obtained from the IMF and World Bank country reports while the

regional economic blocs information came from *Africa Recovery*, United Nations. The electoral system data were obtained from *Global Coalition for Africa* Reports.

Dependent Variables

In this study we looked at five categories of government tax revenues and five categories of government spending as our dependent variables. These are presented in detail below.

Government Expenditures

Under the public expenditure specifications, we consider selected categories of spending, and these are government expenditures in general public services, defense, education, health and transport and communication. The expenditure categories are presented as shares of the total expenditures. This is done mainly to avoid large fluctuations in data over the years in some countries as a result of, for example, declaring a new unit of currency during periods of very high inflation or hyperinflation. The categories chosen here include expenditures on social services such as education and health which most developing countries tend to give higher priority given that they are the cornerstones of human development. It is our view that these would most likely be more copied than others. Table A1 in the Appendix presents the summary statistics for these variables as well as the control variables.

Government Tax Revenues

The taxes analyzed are consumption taxes, individual income taxes, corporate income taxes, excise taxes and international trade taxes. Consumption taxes comprise general sales tax, turnover tax or value added tax (VAT) and are presented here as VAT. The general sales tax comprises of the manufacturers sales tax and the retail sales tax. By 2003, eight SADC countries had introduced a VAT,[33] which extends through the retail stage, while in the whole of Sub-Saharan Africa, 33 countries had adopted VAT by May 2005, IMF (2005). Property taxes[34] are miniscule in most countries and are levied by local authorities, hence, they will not be considered here. Table A2 presents the summary statistics of these variables and those for the SADC countries are presented in Table A3.

Descriptive Variables of Countries

For each of the equations that we are estimating under expenditures and tax revenues, we propose a set of explanatory variables that could affect how the above fiscal choices are determined. These variables are divided into the following characteristics: economic variables (aid per capita, per capita income, trade openness and IMF/World Bank structural adjustment programs [SAPs]); socio-demographic characteristics (percentage of population over 65 years, percentage of population under 14 years, land area, literacy rate and poverty or human development index (HDI); and political variables (political rights and civil liberties, dummies representing each country's colonizing

[33] VAT has replaced GST and turnover taxes in most SADC countries. The SADC countries with VAT as at 2003 were Botswana, Lesotho, Mauritius, Mozambique, Namibia, South Africa, Tanzania and Zambia.
[34] The overall property tax revenue includes items like property transfer tax, estate duty, donations tax or marketable securities tax and these taxes are levied by central government authorities.

regime, dummies representing regional economic bloc membership and dummy for SADC membership). These independent variables are explained in detail below.

Economic Variables

Aid per capita: Most of the countries under review at one point relied heavily on international aid and grants as a source of revenue and most still depend on aid as their economies continue to perform poorly for a number of reasons which include, famine, wars, lack of natural resources, over reliant on minerals and failure to diversify their economies when minerals get depleted.

Per capita income: This is included because it measures the general well-being of the residents of a country (and it also controls for potential income effects in consumption) and generally accounts for local economic conditions.

IMF/World Bank SAPs/ESAPs: This dummy variable represents the IMF and World Bank structural adjustment programs (SAPs) or enhanced structural adjustment programs (ESAPs) that were imposed by these Bretton Woods institutions on countries that were borrowing from them. SAPs have been imposed by these institutions on countries seeking financial assistance, to ensure that these countries repay their debts and restructure their economies. Such restructuring has required that the borrowers reduce spending on areas like health, education and development, while prioritizing debt repayment. These constraints have had an impact on countries' decisions to spend in these progressive sectors and hence the inclusion of SAPs in our estimation. They could also impact on tax revenue decisions as governments adjust their tax rates and/or bases to increase revenues so as to be able to service their debt. We include this variable as a

dummy where it takes the value of 1 for the period that the country was under the structural adjustment policy and zero when it was not.

Openness: We included the openness measure as a proxy for trade intensity in each of our observations. To measure trade openness, we used the ratio of exports plus imports to GDP and the data for all the variables used in calculating the ratio was obtained from the *World Development Indicators*.

Socio-demographic Characteristics:

The percentage of the *population that is over the age of 65* is included because of its high impact on government expenditures, particularly health expenditures in developing countries where most elderly people do not have health insurance. However, unlike in developed countries where the aged have a strong political voice, this may not be the case in developing countries because of limited access to relevant information.

Percentage of population under 14: Most expenditure on education is directed towards the young. It is also the case that countries with different age structures may have different demands for publicly provided goods. Some studies like Case, Rosen et al. (1993) and Revelli (2003) have included racial structures like proportion of population that is black or proportion of the minority, but we did not include that variable given that the population structures of the countries in SSA are totally different from those of developing countries.

Land area: This variable captures the size of the countries and they differ considerably in terms of size and this also accounts for some expenditures. Using land

area to account for size of countries also helps to identify the choice of tax structures by different countries.

Latitudes/Longitudes: We use the latitudes and longitudes of the cities of the countries in the sample to calculate the distance in miles between these cities. The physical distance between the cities was used to compute one of our geographic weight matrices.

Literacy Rate: This is included to account for the countries' expenditures and economic conditions in general. It could also capture how vocal voters are in terms of their ability to access and analyze election information based on their ability to read.

Poverty/HDI Index: With a relatively large population of developing countries still living in poverty, most expenditure could be geared towards improving living standards of voters. However, this variable is used to determine one of the weight matrices.

Political Variables:

Democracy/Electoral system: Although there are many variations of electoral systems, such systems fall into three main groups: plurality-majority (where voters vote for candidates); proportional representation (where voters vote for a party); and semi-proportional representation which is a combination of the other two. These were assigned values of 3 for plurality-majority; 2 for proportional representation; and 1 for semi-proportional representation. All the three groups are found in the SSA region.

Political rights and civil liberties: This is meant to capture such factors as freedom of speech or expression, assembly, association, religion, free and fair elections,

and hence the extent to which citizens will be able to use elections to air their voice. Further, experience has shown that civil strives and political instabilities have had a serious impact on countries' abilities to develop their individual economies as well as take full advantage of regional integration arrangements. The political rights and civil liberties are rated separately on a seven-category scale with 1 representing the most free and 7 the least free.

Dummy on colonies: Almost all of the countries in SSA were at one point colonized by European countries. Countries that colonized SSA include Belgium, Britain, France, Germany, and Portugal and most colonies adopted their colonizers' language as the official language. This dummy variable therefore captures the possibility that countries with the same colonizer would tend to adopt similar policies.

Dummy on economic bloc membership: This captures the various economic blocs that are in Sub-Saharan Africa. However, in view of the fact that most countries are members of at least one economic group and to avoid the dummy variable trap problem, we only included the three major economic blocs represented in our sample and left out the rest. The economic blocs included are SADC, COMESA and ECOWAS. Table A4 in the Appendix gives the detailed economic bloc membership of the countries included in the sample.

*Time trend: w*e included the trend variable in our analysis to help capture variables that are highly correlated with time and affect the dependent variable but are not directly observable. However, when running our regression, this variable caused the weight matrix not to perform well or to be close to singular. We had to drop this variable, but this did not affect the results much. Dropping this variable had no impact on

the fixed effects part of the model which would have automatically dropped it anyway as fixed effects computation renders all fixed variables zero and drops them.

The descriptive statistics of all the variables given in Tables A1 to A3 of the Appendix have been separated between SSA expenditures, SSA revenues and SADC expenditures and revenues because of the different number of countries and observations used in each sample. Data limitations led to our including 24 countries under SSA expenditures, 30 countries under SSA revenues and 11 countries for SADC.

CHAPTER 7: RESULTS

The empirical results presented here provide evidence on the presence of copycat behavior pertaining to expenditure and taxation policies and can indicate whether such behavior points towards any harmonization of these policies in these regions. Further, the study allows the spatial interaction analysis to extend to the simultaneous determination of government expenditures and tax revenues by determining if, when these two policies are determined simultaneously by governments of these countries, such behavior is also mimicked among neighbors. We perform this by using the " price/quantity" ratio of government policy as a basis for assessing relative performance by illustrating that this ratio of government tax revenues to public goods provision in country *i* is dependent upon the same ratio in neighboring countries. By so doing, we assume that jurisdictions simultaneously consider the level of taxation for public goods and how much public goods they receive and compare this with those of neighboring jurisdictions.

In our estimations, we applied both the GMM and the GS2SLS methodologies to the general spatial model for each of the categories of government tax revenues and spending that we looked at and the results are presented in the Appendix. We used the general spatial model, which includes both the spatial lagged term and the spatially correlated error structure. This model is in the form:

$$\begin{aligned} y &= \rho W_1 y + X\beta + \mu \\ \mu &= \lambda W_2 \mu + \varepsilon \\ \varepsilon &\approx N(0, \sigma_\varepsilon^2 I_n) \end{aligned} \tag{7.1}$$

where y is a n x 1 vector of dependent variables and in our model it represents the various categories government tax revenues and expenditures, ρ is the coefficient of the

spatially lagged dependent variable which captures the spatial relationship in the variables, β is a k x 1 vector of parameters that are associated with exogenous variables, X is an n x k matrix of exogenous variables, ε is an n x 1 vector of disturbances, λ is the coefficient of the spatial autoregressive structure for the error term ε, and μ is a n x 1 vector of disturbances. W_1 and W_2 are weight matrices that can be equal and in our estimations we treat the weight matrices as equal, except for the case where we use both the distance and contiguity matrices in the same model. According to LeSage (1999), this kind of configuration of the spatial weight matrices would indicate a belief that contiguity alone does not suffice to capture the spatial effects at work, but that the distance from the central city might also represent an important factor in what we are modeling. Further, we also test for spatial interaction using different weight matrices based on economic and social variables.

The interpretation of the results is presented below. However, we first present the general or overall analysis and then summarize the interpretation for the spatial coefficients in Section 7.4. However, given the large output of our results, we will focus our interpretation on the contiguity and GDP per capita weight matrices. The results for the other two weight matrices, distance and HDI, are also presented in the results tables.

Government Tax Revenues

In the first part, we focus on government revenues and estimate the reaction function of one country's taxation choices to those of other countries. We did estimations for the SSA region which included thirty countries as well as for the SADC region which covered 11 countries (see Table A5 in the Appendix for the list of countries). For our

estimations we used the generalized moments (GMM) estimating technique of Kelejian and Prucha (1999), with and without fixed effects and applied it to the general spatial model which gives the spatial coefficients for both the variables and the error terms. As indicated above, the general spatial model tests for spatial interaction in the dependent variable as well as in the disturbances. In our estimations, the spatial interaction in the model is given by the parameter ρ, which gives the impact of a unit increase in the weighted averages of neighboring countries' tax revenues or expenditures on a country's own tax revenues or expenditures. In our estimations, if countries that are included in the sample do not make tax revenue or expenditure decisions in isolation, but consider taking into consideration their neighbors' fiscal policy choices, then we should expect to see some evidence of correlation in the variables of interest. We also apply the generalized spatial two-stage least squares (GS2SLS) technique to test for spatial interaction and compare the results between the two techniques to see if they yield similar results

Our results are divided into the two regions; we tested for spatial interaction in the whole of SSA and then we focused on the SADC sub-region. The reason we looked at the two regions was because we wanted to determine if mimicking can occur over a wide region comprising many developing countries but of diverse economic conditions as in SSA that are spread over a wide geographic area and are also quite heterogeneous in terms of area or size, language (official), political administration, among other things, and we also checked for the same under a smaller region, SADC, where all the countries have stronger ties because of the regional integration process.

Sub-Saharan Africa

We begin by analyzing the results for the SSA sample using the GMM methodology. The GMM regression results for this region for the five government tax revenue categories are given in Tables A6 to A10. The five categories of tax revenues we examined are individual income taxes, corporate income taxes, VAT, excise taxes and international trade taxes. On the results tables, the second and third columns use geographic proximity in terms of border sharing to define neighborliness; the fourth and fifth columns use both distance and contiguity; the fifth and sixth columns use the human development index (HDI) weight matrix while the last two columns use the GDP per capita weight matrix. As indicated above, we will limit our interpretation to the contiguity and GDP per capita weight matrices. In all of these specifications, there is evidence that neighborliness does matter when making decisions pertaining to tax revenues. The results for the GS2SLS estimations are presented in Table A26 in the Appendix and these only use the contiguity weight matrix. The results are also summarized in Tables A34 to A37 where we present only the spatial interaction coefficients, i.e., the spatial correlation in the model (ρ) and the spatial correlation in the errors (λ). The next sub-sections discuss the overall results as well as the marginal effects of the spatial coefficients.

For the GMM methodology under the contiguity weight matrix, the spatial autoregressive parameter or the copy-cat parameter (McGarvey and Walker 2004)), ρ, for individual income tax revenues for SSA is positive at 0.31 without controlling for fixed effects and improves to 0.51 with fixed effects and both are statistically significant at 5 percent and 1 percent levels, respectively. These results attest to the presence of

spatial interaction in the determination of individual income taxes in the region. Further, this implies that a 1 unit increase in the neighboring countries' ratio of individual income tax to total revenues would induce a 0.5 unit increase in this ratio in the home country. The spatial coefficient under the GDP per capita weight matrix is -0.49. The coefficient that allows for spatial autocorrelation in the disturbances, λ, is negative under the contiguity but positive under the GDP per capita weight matrix measure when we control for fixed effects.

The negative and highly significant degree of correlation between neighbors' errors and the relatively large, positive and very precise measure of correlation in the spatial terms could suggest that spatial interaction comes from the correlation in the countries' tax revenues. Hence, the ultimate effect of an individual income tax increase by country *i*'s neighbors is to increase country *i*'s individual income tax revenues by 0.5 (when using the contiguity measure). The GS2SLS method yields similar results. Other studies have found negative coefficients on the personal income tax of neighboring jurisdictions, for instance, Rork (2003) found estimates ranging between -0.048 to -0.097 for neighboring states. He attributed this negative interaction to possible lack of mobility in the tax base. A change in a neighboring state's personal income tax rates is unlikely to cause big relocations to that state with most individuals preferring to remain in their home state of residence. While this would be a plausible explanation for developing countries, our positive spatial coefficient could be attributed to the need to harmonize taxes by these countries.

For corporate income tax revenues, the spatial autocorrelation coefficient is positive under the contiguity but under the GDP per capita weight matrix it is not

significant. The spatial coefficient under the contiguity measure is 0.57 without fixed effects and it is statistically significant at 1 percent. Conversely when using the GDP per capita measure, the coefficient is not significant. The significant size of the coefficient could signify the presence of corporate tax mimicking that is leading to harmonization. This is possible given that the SSA countries have of late been moving towards harmonizing regional corporate taxes to attract businesses to the region. The results also indicate strong mimicking behavior among countries that are geographically closer as indicated by the relatively larger spatial interaction coefficient under the contiguity measure and the non-significant one under the distance measure.

Estimations for the value added tax (see Table A8) reveal positive spatial correlation under both the contiguity and GDP per capita measures of the weight matrix when we do not control for fixed effects. The spatial coefficients under the contiguity matrix are 0.12 and -0.69, estimated without and with fixed effects respectively and both statistically significant. The corresponding coefficients under the GDP per capita matrix are 0.13 and 0.19. These results indicate the presence of spatial interactions with regard to VAT in the region, where most countries have now adopted VAT to replace the general sales tax and other related taxes. Mimicking behavior here could be in terms of countries adopting VAT as neighbors adopt it, as well as setting their rates close to or similar to those of their neighbors, leading to harmonization of the VAT. The high and negative spatial coefficient for VAT revenues could imply that countries are moving towards harmonizing their VAT rates by lowering them, hence the negative coefficient, and this is reflected in the revenue ratio we use here as our dependent variable. Future

analysis could control for the general movement in VAT and other taxes by including an average world-wide tax rate.

The results for the excise tax revenues presented in Table A9 indicate a relatively strong presence of spatial interaction in SSA when using the geographic measure and only when we do not control for fixed effects. The spatial lag coefficients when not controlling for fixed effects is -0.77 under the contiguity measure and statistically significant at 1 percent. Similarly under the GDP per capita weight matrix, the spatial coefficient is -0.58.

For international trade taxes (Table A10), the spatial correlation coefficient in the dependent variable is negative for the contiguity measure but positive under the economic characteristic measure. The negative coefficient for spatial correlation could be attributed to the fact that these countries have got diverse imports and exports, especially in exports where most developing countries export natural resources and agricultural products that are usually unique to each country and hence it may be difficult to harmonize taxes or tariffs in such cases. Contiguous countries do not necessarily export the same minerals or even agricultural products mainly due to different climates and vegetation.

Southern African Development Community

We carried out similar estimations for the SADC region using both the GMM and GS2SLS methods. Tables A16-A20 present the summary of our GMM estimation results for the SADC region using the contiguity, distance, HDI and GDP per capita weight matrices. Our dependent variables are the same tax revenue categories (as shares of total revenue) as in the SSA sample above. For individual tax revenues, the contiguity weight

matrix performs better when we did not control for fixed effects with a spatial lag coefficient of -0.57 and it is highly significant. However, the GDP per capita measure gives a spatial coefficient of 0.60 that is also highly significant, implying the presence of mimicking behavior among countries with similar incomes. Overall, the results suggest that there is some mimicking behavior in neighboring countries when determining individual income taxes and also that there are some unobserved factors that contribute to mimicking as reflected in the high spatial error coefficients.

For corporate income tax revenues, only the GDP per capita weight matrix shows the presence of spatial interaction in the variables. The spatial lag correlation coefficient is 0.36 under this weight matrix and this implies that the slope of the tax revenue reaction function is positive, signaling the presence of copycat behavior as SADC countries work towards achieving their objective of harmonizing taxes.

With regard to VAT, the spatial autocorrelation coefficient is -0.46 and significant under the contiguity measure and without fixed effects, -0.05 with fixed effects and under GDP per capita it is 0.41 with fixed effects. The evidence of VAT mimicking is not that strong among SADC countries when we control for fixed effects and this could be explained by the fact that most of these countries introduced VAT in the later part of our review period and even then, it is not all of them that had adopted VAT during this period.

Excise taxes show the presence of spatial interaction in the variables only under the GDP per capita weight matrix with a coefficient of 0.31 that is statistically significant, but the contiguity matrix was not significant. International trade taxes yield negative coefficients in the spatial interaction among the dependent variables under the contiguity

weight matrix, but positive under the GDP per capita weight matrix and these results are similar to the ones we obtained for SSA countries. The spatial error coefficient is positive under contiguity but negative under the GDP per capita weight matrix, signaling that spatial interactions are present and explained by some unobserved variables in the error terms, such as some shocks affecting these countries such as drought, wars, changes in world prices of their mineral and agricultural goods, among others.

Government Expenditures

On the expenditure side, we included as dependent variables five categories of government expenditure, viz; general government services, defense, education, health and transport and communication, each as a ratio of total expenditures. Our samples comprised of 24 countries from SSA and 11 countries from SADC.

Sub-Saharan Africa

Tables A11-A15 present the GMM results of the expenditure categories for the SSA region and we analyze the results for the contiguity and GDP per capita weight matrices. Under general public expenditures, the geographical weight matrix measure exhibits the presence of both spatial lag dependence and spatial error correlation. The spatial lag coefficient under the contiguity weight matrix is 0.40 when we do not control for fixed effects and -0.28 when we include fixed effects and both are statistically significant. The GDP per capita weight matrix spatial lag coefficients is 0.32 without controlling for fixed effects and 0.20 with fixed effects. The coefficient of spatial

correlation in the error term is positive (λ=0.09) and significant under the contiguity weight matrix but negative under the GDP per capita weight matrix (λ=-0.3).

Expenditures in defense also display the presence of spatial interaction. The spatial lag coefficient is -0.64 and significant at 10 percent under the contiguity weight matrix and it is 0.26 and significant at 1 percent under the GDP per capita weight matrix. Political tensions in the region would result in increased expenditures in defense and the SSA region has been having civil wars and inter-country wars in one area or the other throughout the review period. Further, as shown in our summary statistics tables in the Appendix, the share of defense expenditure to total revenue is relatively high in the region.

With regard to education expenditures, there is evidence of spatial lag interaction, with neighboring countries' expenditures having a positive effect on the expenditures of country *i*. The spatial lag coefficient is significantly high at 0.98 under the contiguity but relatively smaller at 0.32 under the GDP per capita weight matrix. This reflects the need for these countries to educate their population and they do so by mimicking their neighbors and investing more in education.

Health is one of the sectors where government expenditure is high in most developing countries where in most cases health services are offered for free or at highly subsidized fees. In our estimations, we find a relatively high and positive spatial lag coefficient of 0.65 when we do not control for fixed effects and -0.34 when we take fixed effects into account, under the contiguity matrix. This coefficient is not significant under the GDP per capita weight matrix. The transportation and communications expenditures

exhibit correlation in the dependent variables between the countries and the coefficient is 0.677 for the contiguity weight measure and not significant for the GDP per capita one.

Southern African Development Community

On the expenditures side, the spatial correlation coefficient for general public services is 0.29 and significant under the contiguity weight matrix and 0.6 under the GDP per capita weight matrix. The spatial error coefficient is negative and significant under all the weight matrices. Under government expenditures in defense, the spatial lag correlation is not significant under the contiguity weight matrices and it is -0.48 under the GDP per capita weight matrix.

Expenditures in education in neighboring countries show a negative sign under the contiguity weight matrix in both estimation methods and this is not the expected sign as normally, developing countries tend to increase their expenditures in education as most still need to invest in their citizens' education to reduce reliance on foreign manpower or expatriates. The spatial lag coefficient under the contiguity matrix is relatively high at -0.40 while under the GDP per capita weight matrix measure it is positive at 0.31.

Expenditures in health display the presence of spatial interaction in the dependent variableonly under the GDP per capita matrix and without fixed effects. Redoano (2003) found that public expenditures on health for European Union countries did not seem to be affected by neighbors but mainly by their previous year expenditures. Expenditures in transport and communication display negative and large spatial lag coefficients for the geographic weight matrix (-0.93 with fixed effects) and GDP per capita weight matrix (-0.62 with fixed effects). The negative spatial lag in transport and communication

expenditures could be attributed to the fact that most of these projects are capital projects that tend to have large start-up costs and whose lives span over several years, if not decades. The high interaction displayed by the spatial error could be that developing countries could actually copy their neighbors in such expenditures as most of them still lack good infrastructures and failure to keep up with their neighbors could affect investment in their countries.

Explanatory Variables

In this study we included quite a number of control variables as explained in Section 6.3, to explain the tax revenues and expenditures dependent variables. Aid per capita (AID_PC), which was rescaled downwards by 100 in our estimations, is expected to be positive under both revenues and expenditures as it boosts governments' revenues and in turn their spending levels. In our estimations, this variable performed well though it was negative in some cases. Developing countries tend to rely a lot on foreign aid (grants) to the extent that in their earlier years of independence, for most of these countries, at least half of their revenue budgets were based on foreign aid. The amount of foreign aid, however, has been going down as these countries become more reliant on different types of taxes and exports for their revenues, and also as some graduate from low income to middle income status.

GDP per capita (GDP_PC), which was expected to be positive, performed well under corporate income tax revenues, VAT (with fixed effects), and education and it was mostly negative or mixed under the other variables. The largely negative coefficient for GDP_PC could be attributed to the fact that most of the countries under review had

experienced a decline in GDP_PC as their economic conditions worsened in them because of a number of factors. These factors include, among others, civil wars, droughts and mismanaged economies by corrupt leaders and political dictators. The land area (LAND_AREA) variable was included to capture the size of each country and also as a proxy for bigger governments, that is, if we assume that bigger countries will have bigger governments. This was rescaled by a factor of 10,000 and it was expected to be positive but we got some negative coefficients mostly under spending categories.

The literacy rate (LITERACY) variable turned out to be negative mostly under tax revenues for the SSA sample while the SADC sample did yield some positive coefficients under some of the revenue categories and this could be explained by the relatively high literacy rates in the SADC sample compared with the SSA samples. The minimum literacy rate for SSA in both samples is 10.8 percent and that is for Burkina Faso whose literacy rates are astonishingly low but improving, (see Tables A1 and A2) while the minimum for the SADC sample is 44.5 percent.

Demographic variables in terms of different age (and more often race) structures are often included in these models to capture the different demands that jurisdictions have for publicly provided goods. In our study, we included the percentage of population aged between 0-14 years (POP_0-14) and we expected its coefficient to be positive especially in terms of education and health. For both samples under education, this coefficient is positive and highly significant when we do not control for fixed effects. With regard to the health expenditures, we only get a positive and significant relationship when we use the HDI weight matrix. The other demographic variable that we included is the proportion of population that is above 65 years (POP_65+) and this was expected to be

positive because the higher it is, the greater the spending on health and other related areas. This variable behaves well in both SADC and SSA samples, even though the proportion of the elderly in developing countries tends to be lower than in developed countries because of lower life expectancy rates, most of which have been declining owing to, among others, the HIV/AIDS pandemic.

The openness (OPENNESS) explanatory variable was almost always negative but behaved relatively well with international trade taxes as expected. Based on our measure of openness (ratio of imports plus exports to GDP), one would expect a higher ratio to mean higher revenues from international trade taxes. The negative coefficients could be attributed to the decline in tariff revenue as most countries adopt the WTO low tariff agreements and also as among themselves regionally, they adopt low tariffs within the region. This loss in government revenue from trade through tariffs reform is however, considered to be counteracted by the gain in welfare because reducing tariffs in considered to bring welfare gains.

We also included a dummy variable for the IMF and World Bank Structural Adjustment Programs (SAPs) or Enhanced Structural Adjustment Programs (ESAPs) to capture the impact of these programs on the policies of countries that implemented them. As explained in Section 6.3, these are economic policies that have to be adopted by countries in order to qualify for new World Bank and IMF loans and they are supposed to help these countries make debt repayments on the older loans from commercial banks, foreign governments and the World Bank. Though the SAPs are designed for individual countries, they have common guiding principles and features such as, among others, promoting export-led growth, privatizing government owned enterprises otherwise known as parastatals and liberalization. These conditions impact on fiscal policy (and

other macro-economic decisions) as countries are also required to balance their budgets by cutting down on government spending while raising revenues. Participating countries are also required to remove price controls and state subsidies and this, coupled with the requirement to reduce spending, impacts directly on spending programs related to sectors such as health, education and social care because services provided by these sectors tend to be highly subsidized in developing countries. The SAPs dummy (IMF/WB_SAPs) was negative and significant under general public services and defense categories and it was also quite significant but positive for the transport and communication category. Remarkably, it was positive but non significant for the education and health sectors in the SSA sample but for the SADC sample, it was negative and significant under education.

For our political variables, we included political right (POL_RIGHT) and electoral system (ELECT_SYSTEM) where the former measures the degree to which elections are fair and free and also captures freedom of speech while the latter captures the variations of electoral systems that exist in our samples. We obtained a general positive and significant POL_RIGHT for all our samples and in terms of expenditures, it could signal the willingness of governments to provide services to please their electorates so that they can keep them in power in subsequent elections, notwithstanding cases of dictators. The ELECT_SYSTEM is positive for revenues and negative for expenditures. Almost all of the countries included in our samples were at one point colonized by one western country or another. We thus included a colonizer dummy and we divided these colonizers into BRITISH, FRENCH and GERMAN.[35] These give mixed results across the samples and the categories. We also included regional economic dummies and

[35] Under countries colonized by Germany, we also included those that were colonies of Belgium, Portugal and those that were never colonized.

included the three major ones COMESA, SADC, and ECOWAS and these were included only under the SSA samples. The problem we encountered here was that of dual or multiple memberships to these blocs by most SSA countries and we had to leave out the smaller ones and focus on the big blocs that cover the whole region. These dummies were positive in all categories under revenues except for international trade taxes and mixed for expenditures. For the SADC sample, we included a dummy for SADC membership to capture when each country joined SADC and it is negative for corporate and international trade tax revenues and virtually non-significant for the other categories of revenues and spending.

Summary: Interpreting the Spatial Coefficients

In this sub-section we present a summary interpretation of the spatial coefficients in terms of the marginal effects. In Tables A34 and A35 we present a summary of these coefficients under all the four weight matrices that we used. However, in view of the large number of our results, we will not examine every estimation in detail but we will focus on the coefficients of the contiguity weight matrix as it is the standard or traditional weight matrix used in most spatial studies.

Sub-Saharan Africa

For the individual income tax revenues for the SSA region, the correlation in countries' revenues suggests that an increase in the ratio of individual income tax revenues to total revenues by one unit in the neighboring countries will result in an

increase in the home country's ratio by 0.52 units. The other three weight matrices yield similar results. With corporate income tax revenues, the spatial coefficient of 0.57 indicates that a 1 unit increase in the neighboring countries' corporate revenues will lead to a 0.57 unit increase in the corporate revenues of the home country. Comparably, a similar study conducted by Rork (2003) for U.S. states found that a 10 percent increase in the average corporate income tax rate of one's neighbors resulted in an increase of 1.6 percent at the home state while Redoano (2003) obtained a corporate tax spatial coefficient of 0.89 for European countries.

The VAT revenues yield a spatial coefficient of -0.69 which implies that a 1 unit increase in the ratio of VAT revenues by neighboring countries would yield an increase of 0.69 units in the home country's ratio of VAT revenues to total revenues. Excise taxes yield a similar reaction, with the home country increasing its excise tax revenue to total revenues ratio by 0.03 units in response to a 1 point increase in the neighboring countries' ratio. Developing countries derive a larger portion of their revenue from consumption taxes[36] and given the general lack of mobility in consumption taxes in these countries, the coefficient could go either way. The positive coefficient observed here could indicate the quest for these countries to raise as much revenues as they can by raising their rates when their neighbors do, or it could indicate the move towards tax harmonization, as per the objectives of these regional integrations. The international trade taxes give a negative spatial coefficient which denotes that a 1 unit increase in the ratio of international taxes for neighboring countries would induce a 0.5 unit decrease in the home country's ratio. Most countries have been implementing trade liberalization so as to enhance their

[36] A study by Gordon, Roger and Wei Li (2005) found that consumption taxes comprise 51.2 percent of the poorer countries revenues.

economic growth and this entails cutting tariffs and other trade taxes which results in loss of tax revenue. Many developing countries get a sizeable portion of their income from international trade taxes but have been reducing their tariffs in order to comply with WTO and regional trade agreements (Ebrill, Stotsky et al. 1999). This could explain the negative spatial coefficient in tariffs and hence lower revenue from trade taxes.

With regard to expenditures, general public services had a negative spatial coefficient which implies that a 1 unit increase in the neighboring countries' share of general public expenditures would lead to the home country reducing its share by 0.28 units. It should be noted though that while the contiguity matrix with fixed effects gave a negative spatial coefficient, this was not the case when we did not control for fixed effects and also with the other three matrices, viz., distance, GDP per capita and HDI, which all yielded positive but much smaller coefficients. The spatial interaction coefficient for the defense category was positive, indicating that such expenditures in the home country are influenced by neighboring countries decisions with the home country reducing its defense expenditures share by 0.65 units in response to a 1 unit increase in the neighboring countries. The spatial coefficient for education was also positive, confirming the presence of mimicking behavior with the home country adjusting its share of education expenditures by 0.98 units in response to a 1 unit increase in the shares of neighboring countries.

For the health expenditure category, we obtained a negative spatial coefficient which implies an reduction in the home country's ratio by 0.34 units in response to a 1 unit increase in the neighboring countries' health expenditure ratios, holding everything else constant. We also found that a 1 unit increase in the transport and communications

expenditure ratio on a country's neighbors leads to a 0.67 unit increase in the country's own ratio. We present the rest of the copycat coefficients in a summary table below.

Table 7: Summary Results and Interpretation (Using Contiguity Weight Matrix and Controlling for Fixed Effects)

Dependent Variable	Copycat Result (in the Variables)		Copycat Result (in the Error Terms)		Comments and interpretation of the spatial coefficients.
	SSA	SADC	SSA	SADC	
Individual Taxes	0.516***	0.194	-0.306***	-0.183***	The spatial coefficients for the SSA region is positive, implying that 1 unit increase in the neighboring countries ratio of individual taxes to total tax revenues would result in a 0.51 unit increase in the home country's ratio. The spatial coefficient for SADC was not statistically significant.
Corporate Taxes	0.024	0.173	-0.027	-0.169***	The spatial coefficients are not significant in both regions when we control for fixed effects except for the spatial error coefficient in SADC, which implies the presence of omitted variables that could be spatially autocorrelated. However, the SSA spatial coefficient is 0.57 and significant when we do not control for fixed effects, signaling a move towards harmonizing taxes.
VAT	-0.686***	-0.051	0.393***	-0.027	The VAT spatial coefficient is negative for the SSA region and this could imply that countries in the region are reducing their taxes, moving towards the harmonization of such.
Excise Taxes	0.025***	0.207	-0.588***	-0.153***	Countries in the SSA region will increase their share of excise taxes marginally in response to increases in neighboring countries' shares.
Int'l Trade Taxes	-0.503***	-0.774***	0.210***	0.390***	Countries in both regions will reduce their share of international taxes in response to an increase in neighboring countries. This could reflect the reduction in tariffs that is taking place all over the world so as to improve trade relations. For instance in COMESA, in 2000 most countries had reached the 80 percent tariff reduction agreed upon. The negative

Dependent Variable	Copycat Result (in the Variables)		Copycat Result (in the Error Terms)		
					coefficient could also reflect the changes (decline) in world prices of natural resources and agricultural goods that these countries are exporting.
General Public Services	-0.283**	0.101	0.089***	-0.062	A 1 unit increase in the share of general public services expenditures in neighboring countries would result in a 0.3 unit decrease in the home country's share in SSA.
Defense	-0.648***	-0.214	0.364***	0.284***	Countries will respond to an increase in their neighbors' share of defense expenditures by reducing their own shares in the SSA region while in the SADC region the coefficient was not statistically significant but the spatial error coefficient was significant indicating the presence of shocks in neighboring countries that are felt in the home country.
Education	0.979***	-0.404	-0.560**	0.285***	A 1 unit increase in the share of education expenditure in the neighboring countries will trigger a 0.9 unit increase in similar expenditures in the home country for the SSA region. This reflects the need to invest in education for these countries as most of them still lack educated manpower.
Health	-0.338**	0.294	0.212**	-0.229	Countries in the SSA region will reduce their expenditures in health in response to increases by their neighbors. This could reflect a reduction in health expenditures in the region as a whole as reflected in the structural adjustment policies of the IMF that affect most of these countries. The positive spatial error coefficient could reflect the increased spending in health to combat the AIDS pandemic which has impacted most SADC countries greatly.
Trans. &	0.667***	-0.930***	-0.333***	0.550***	An increase in the share of transport and

Dependent Variable	Copycat Result (in the Variables)		Copycat Result (in the Error Terms)		
Communication					communications expenditures would trigger a reduction in the share of the home country in SADC but an increase in SSA. This could reflect the need for increased expenditures in such infrastructures as roads and communications in this region. The significant spatial error terms could reflect shocks such as oil prices that impact heavily on transportation.

Correlation between the Error Terms

Our spatial estimation results revealed the presence of spatial correlation in the error terms as indicated by the spatial error coefficient, lambda, which is non-zero. The non-zero and significant spatial error coefficients indicate the presence of omitted variables that are correlated with the dependent variable and are in themselves spatially autocorrelated. These variables could be in the form of shocks such as regional wars, droughts and changes in world prices of these countries' major exports as well as imports. To test for the extent of these shocks between countries, we computed the correlation coefficient matrix for the residuals ($Correl(\varepsilon_{t_i}\varepsilon_{t_j})$ of selected dependent variables whose spatial error coefficients were relatively high. We chose the education expenditures ($\lambda = -0.28$), health expenditures ($\lambda = -0.23$) and transport and communication expenditures ($\lambda = 0.55$) for our analysis. These results are for the SADC region using the contiguity weight matrix. We believe that there could be some strong unexplained factors which contribute to the high spatial error coefficients such as shocks that affect neighboring countries or omitted variables that are in themselves spatially correlated.

Table 8 below gives the correlation between the residuals results for education expenditures in SADC. The coefficients that are relatively high are those that are between neighbors. For instance, between Botswana and Namibia the correlation coefficient is 0.2 and so is that between Botswana and Zimbabwe. Similarly for South Africa and Swaziland the correlation between the error terms is 0.3 and these are border neighbors. This could imply the occurrence of a similar among these countries that is not reflected in our model.

The spatial error coefficient for health expenditures is negative and calculating the correlation between the error terms for this variable gives both positive and negative coefficients (Table 9) implying the presence of a shock or shocks that impact these countries differently. This could be the AIDS pandemic which has led to some countries increasing their health expenditures extensively while some countries have been made to reduce their spending in adherence to the structural adjustment programs.

Table 10 presents results for the coefficients between the error terms for international trade tax revenues. These are positive and relatively high for countries that are neighbors. For instance, between Botswana and Zimbabwe the coefficient is 0.51 and between Botswana and South Africa it is 0.41 and these are big trading partners. For instance, Botswana imports at least 60 percent of its goods and services from South Africa. Between South Africa and Swaziland, the coefficient is 0.63 and these are trading partners.

Overall we conclude that indeed there are some variables and shocks not captured in the model but contribute to spatial interaction among these countries.

Table 8: Correlation between the Error Terms: Education for SADC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	1										
(2)	0.047	1									
(3)	0.050	0.003	1								
(4)	0.030	0.073	0.003	1							
(5)	0.031	0.012	0.062	0.053	1						
(6)	0.202	0.055	0.052	0.035	0.034	1					
(7)	0.159	0.009	0.330	0.010	0.195	0.165	1				
(8)	0.050	0.003	0.107	0.003	0.062	0.052	0.330	1			
(9)	0.026	0.058	0.009	0.264	0.238	0.030	0.029	0.009	1		
(10)	0.150	0.336	0.009	0.229	0.037	0.173	0.031	0.009	0.183	1	
(11)	0.237	0.009	0.069	0.007	0.040	0.065	0.217	0.069	0.009	0.031	1

(1)	Botswana	(5)	Mauritius	(9)	Tanzania
(2)	DRC	(6)	Namibia	(10)	Zambia
(3)	Lesotho	(7)	South Africa	(11)	Zimbabwe
(4)	Malawi	(8)	Swaziland		

Table 9: Correlation between the Error Terms: Health for SADC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	1										
(2)	0.024	1									
(3)	0.019	0.001	1								
(4)	0.012	0.037	0.001	1							
(5)	0.009	-0.003	0.039	0.028	1						
(6)	-0.115	0.029	0.027	0.015	0.014	1					
(7)	-0.075	-0.003	-0.265	-0.004	-0.154	-0.108	1				
(8)	0.019	0.001	0.069	0.001	0.039	0.027	-0.265	1			
(9)	0.008	0.027	-0.004	-0.173	-0.190	0.009	0.015	-0.004	1		
(10)	-0.094	-0.271	-0.003	-0.144	0.014	-0.113	0.012	-0.003	-0.106	1	
(11)	-0.159	-0.003	0.037	-0.001	0.021	0.032	-0.142	0.037	-0.003	0.012	1

(1)	Botswana	(5)	Mauritius	(9)	Tanzania
(2)	DRC	(6)	Namibia	(10)	Zambia
(3)	Lesotho	(7)	South Africa	(11)	Zimbabwe
(4)	Malawi	(8)	Swaziland		

Table 10: Correlation between the Error Terms: International Trade for SADC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	1										
(2)	0.211	1									
(3)	0.244	0.055	1								
(4)	0.164	0.303	0.057	1							
(5)	0.187	0.116	0.254	0.234	1						
(6)	0.476	0.238	0.241	0.186	0.193	1					
(7)	0.408	0.095	0.628	0.097	0.415	0.400	1				
(8)	0.244	0.055	0.389	0.057	0.254	0.241	0.628	1			
(9)	0.157	0.257	0.089	0.553	0.474	0.176	0.150	0.089	1		
(10)	0.358	0.628	0.097	0.502	0.199	0.401	0.165	0.097	0.431	1	
(11)	0.513	0.097	0.298	0.082	0.201	0.290	0.490	0.298	0.097	0.167	1

(1)	Botswana	(5)	Mauritius	(9)	Tanzania
(2)	DRC	(6)	Namibia	(10)	Zambia
(3)	Lesotho	(7)	South Africa	(11)	Zimbabwe
(4)	Malawi	(8)	Swaziland		

GMM Vs GS2SLS Methodologies

Using the GS2SLS methodology for comparison (see Tables A36 and A37) and applying it to the contiguity weight matrix, we obtained results that either replicated those obtained under the GMM methodology or were very close.

Overall, we expect countries to copy their neighbors' tax and expenditure policies but we do not expect the degree of mimicking to be the same for all the different categories. Theoretically, we would expect to observe higher coefficients or stronger mimicking in mobile taxes like corporate income tax than individual income tax especially in developing countries where labor is immobile and by extension, the individual income tax. However, our results indicate that mimicking is more pronounced in individual income taxes than in corporate taxes. One reason behind this could be that, in their quest to lure investors to their countries, developing countries have a tendency to

introduce many tax concessions, tax holidays and tax exemptions which eventually lead to very little taxation of capital and thus impact negatively on the ultimate corporate tax revenue. It could also be possible that as a way to encourage capital inflow, developing countries will try to keep their tax rates as low as possible in comparison with their neighbors' tax rates.

The presence of mimicking behavior with regard to VAT is stronger in SSA than in SADC where the spatial coefficient is negative. VAT is fairly new in most developing countries but it is fast becoming popular as its collection has proved to be more successful than the income taxes. Further, it has come to replace revenue lost from tariffs as tariff levels decline due to trade liberalization. As such, we would expect the VAT spatial coefficient to be more robust, but this could happen in later years as a longer time series covering the adoption of VAT by a larger sample becomes available for analysis.

On the expenditures side, we expected to observe more mimicking behavior in the education and health sectors in both regions, however this was not the case with the SADC region where the education spatial coefficient is negative.

Maximum Likelihood Estimations (MLE)

We also used the maximum likelihood estimation for our estimations and the results reveal that the MLE spatial coefficients are smaller than the GMM estimator, but the signs of the coefficients are the same. The results are presented in Tables A41-A44.

Spatial Analysis for Government Efficiency

In this sub-section, we enhance our study by extending our spatial analysis to encompass the government efficiency in the provision of public goods, i.e., determine if voters use their neighbor's ratings when assessing their government's efficiency rating. We apply Geys (2005) notion that voters' use the " price/quantity" of public provisions to assess relative performance by illustrating the interdependence between the ratio of tax revenues to public goods provisions of country *i* to that of neighboring jurisdictions. In our study, we use the ratio of government revenues to government expenditures as a proxy for the "price/quantity" of public goods provision and test for spatial patterns in the SSA and SADC regions. For the SSA sample we have 30 countries and 660 observations (as in our tax revenues sample) and for SADC we have 11 countries and 242 observations.

Using the same control variables as in our estimations above, we test for both spatial lag (ρ) and spatial error (λ) coefficients using the general spatial model. The results for the SSA sample in Table A28 show that in the three estimations using different weight matrices, the spatial lag parameter is statistically significantly different from zero and it is negative for the geographical weight matrices and positive but small for the HDI matrix. The parameter for the contiguity matrix is -0.4 and for the distance measure it is -0.2. Negative spatial autocorrelation is said to occur when units or countries that are close together have different aspatial attributes than objects that are farther apart or are identified as spatial outliers as opposed to spatial clusters (Anselin 2002). These results indicate that, holding other factors constant, a 1 unit higher efficiency rating in neighboring countries is associated with a decrease in one's own efficiency rating by 0.2

units (or we could say efficiency is only copied among distant neighbors with similar aspatial attributes, as per the negative coefficient). The spatial error parameter is positive and significant under all the three matrices and it is virtually the same under the contiguity and HDI matrices at 0.19 and 0.17, respectively.

The SADC sample yields similar results, with the spatial lag coefficients in the dependent variable negative and statistically different from zero under all the weight matrices. The spatial error coefficient is positive and significant, with the distance weight matrix giving us a $\lambda = 0.4$ when we don't specifically account for fixed effects while the HDI weight matrix gives us $\lambda = 0.25$. While the spatial error coefficient accounts for unobserved spatial heterogeneity, it also reflects the effect of the omitted spatial lagged dependent variable, ρ and comparing the magnitude of the two coefficients provides a rough idea of how much the effect of the spatial error parameter is due to unobserved spatial heterogeneity and not due to the omitted spatially weighted dependent variable (Coughlin, Garrett et al. 2006). If the two coefficients are close, then the bulk of the spatial error effect would be due to the omitted spatially weighted dependent variable. In our case, these two coefficients are not really close, considering that they have opposite signs hence we could attribute the spatial error effect to unobserved spatial heterogeneity.

Overall, our results indicate the presence of spatial interaction among these countries when they make joint or simultaneous decisions regarding the tax revenues and spending.

Further Analyses of the Results

In addition to our analyses above, we tried to establish the trend of the spatial coefficients over time to determine if we could discern any outstanding behavior in the coefficients of each category over time. We did this by dividing the data into four 5-year periods (the last term though comprised 7 years) and doing estimations for each period using the contiguity weight matrix.

Our results which are presented in Tables A39 and A40 reveal that for individual tax revenues, the spatial coefficient starts off being negative and then turns positive for both the SSA and SADC regions. The reverse applies for the corporate tax revenues spatial coefficient which moves from positive to negative, implying stronger mimicking in earlier years than recently. The VAT spatial coefficient starts off being negative for both samples but it turns positive during the second phase (1986-1990) for SSA while for SADC it becomes positive only in the last phase. The coefficients for excise taxes and international trade taxes display a somewhat similar behavior between the two regions.

On the expenditures side, with the exception of the defense category whose coefficients are all negative, the rest of the expenditure categories for SADC display a similar trend, with the spatial coefficients negative during the earlier years and then becoming positive. For the SSA region while the spatial coefficients for most variables are positive, they all trend somewhat downwards.

Some Simulations and Graphical Analyses of our Results

We conducted further simulations whereby we calculated the predicted values for each region for some of the dependent variables and compared that to two countries

chosen based on their economic performance. For each region we chose one country whose economy is doing particularly well as based on its GDP per capita and one whose economy is relatively smaller. For the SADC region, we chose Botswana and Malawi and our predicted values are depicted on Figures 1 to 6. For the corporate tax revenues, both countries displayed a similar trend with the regional average and this was the case with all the dependent variables that we selected. However, in this case, Botswana's graph was almost identical to or sort of converged with that of SADC while Malawi's was much higher and parallel to these two series. We observed similar behavior with VAT with Botswana's graph converging with that of the region's average while Malawi's graph is much higher but moving it the same direction with the others. The main distinction between the two tax revenues is that the corporate tax revenues graphs are upward sloping while the VAT ones are downward sloping.

With excise tax revenues, we observe Botswana's curve converging towards that of Malawi which is parallel to the SADC curve. Botswana maintains a closer track of the SADC curve under international trade taxes while Malawi's is still parallel and further below that of SADC. We also looked at the general publics services and defense expenditure categories and in both cases we observe Botswana maintaining a closer trend with the regional average while Malawi's curves are either far above or below with a sizeable gap, albeit all three moving in the same direction.

With the SSA region (see Figures 7-11), we analyzed all the tax variables and chose Lesotho and Nigeria for comparison. For the individual taxes, we observe a generally downward trend for all the three series with Nigeria much closer to the regional average while Lesotho is much lower but converges towards the three during the last

years under review. We observe a similar trend under corporate taxes, with the major notable difference being the downward trending of the SSA series as opposed to the SADC series which move upwards. For the remaining three tax revenues, viz., VAT, excise taxes and international trade taxes, Nigeria's curve is much closer to that of SSA while Lesotho's maintains quite a reasonable gap. All in all though, we discern a slow convergence in the three curves, especially in the case of Lesotho.

Overall, we can conclude that countries whose economies are more advanced in the region, display closer or even full convergence with the regional averages while the smaller economies maintain a sizeable gap which in most cases is below the regional average. However, these poorer countries seem to be slowly closing on, on this gap especially during the last two years of the period under review. These countries therefore, do not appear to start off being closer or the same in terms of revenue and tax structure but appear to be moving towards similar structures as they develop. An extension of our time series could reveal some interesting trends.

Spatial Dependency Tests

Spatial autocorrelation tests measure the degree of dependence among observations in a given geographic space. There are a number of tests than are used for this purpose and in this study we tested for the presence of spatial correlation using two of the approaches; the Moran I test and the Lagrange Multiplier statistics. Both tests use regression residuals to test for spatial autocorrelation. The Moran I statistic is considered to be global in the sense that it estimates the overall degree of spatial autocorrelation for a dataset. The Moran I statistic is formally given as:

$$I = \frac{N(e'We)}{S(e'e)} \tag{7.1}$$

Where e is a vector of OLS regression residuals, W is a spatial weight matrix, N is the number of observations, and S is a standardization factor which is equal to all the summation of all the elements in the weight matrix. For a normalized weight matrix, the expression (7.1) becomes:

$$I = \frac{e'We}{e'e}$$

The null hypothesis for the Moran I test is the absence of spatial dependence and the spatial weight matrix is included to represent the pattern of potential spatial interaction that causes dependence.

We also conducted spatial diagnostic tests using the Lagrange Multiplier statistic Anselin (1988) which is also derived from OLS residuals and weight matrix traces and is in the form:

$$LM = (1/T).[e'We/\sigma^2]^2 \sim \chi^2 \tag{7.2}$$

where $T = tr\{(W + W')W\}$. The LM statistic is based on estimation under the null hypothesis only and it has an asymptotic $\chi^2(1)$ distribution. It corresponds to the square of the Moran I statistic.

Results for the two diagnostic statistics are presented in Tables A32 and A33 of the Appendix for all the four weight matrices that we used. The overall results display the presence of spatial autocorrelation as we reject the null hypothesis of no spatial interaction under one matrix or more for all the dependent variables, short of defense and education for the SADC sample, where the tests are not significant.

CHAPTER 8: SUMMARY AND CONCLUSIONS

Studies in public finance and related fields that incorporate spatial effects have gained popularity in economic literature. Previous studies have found the presence of spatial interaction among jurisdictions when making policy decisions, in other words, governments at all levels make their decisions by taking into account what their neighbors are doing. The aim of our study was three-fold: first, we tried to determine the presence of such policy mimicking in governments expenditures; then we did the same for government revenues; and finally, we tested for spatial interaction in government efficiency to determine if it is also influenced by neighboring countries. Most importantly, we applied the fiscal copycat theory to developing countries, and to the best our knowledge, all existing studies pertaining to this theory have been confined to developed countries only.

We have thus contributed to the empirical literature of fiscal policy mimicking by applying this technique to developing countries and used the results to try and determine the presence of fiscal harmonization. We also extended our analysis by going beyond the exclusive analysis of revenues or expenditures in isolation, and analyzed their spatial interaction in the context of government efficiency. We did this at a national level as opposed to previous studies that have focused on local government level efficiency. In our dissertation, we employed panel data on central government tax revenue and spending in Sub-Saharan Africa and the regional economic bloc of Southern African Coordinating Community, which basically is a sub-set of the SSA sample.

We used spatial econometric techniques to test for fiscal policy mimicking in our sample countries. We test whether fiscal interactions exist in government tax revenues because countries try to attract businesses so they could expand their tax bases or as it is the case with most regional blocs, whether they do so as a way of harmonizing their regional policies. On the expenditure side, we test whether governments try to please their voters so they could vote them back in power (since we do not expect any significant " voting with one's feet" to occur at a country level).

Even though our estimations gave us mixed results in as far as the signs of the coefficients, overall we found the presence of fiscal policy mimicking in these developing countries. We also observe that our estimates are in some cases smaller in magnitude compared to those obtained in previous studies. When we compare our estimates to the only other study that tested for spatial interaction across countries at a central government level (Redoano 2003), we find that some of our estimates are not that far off from their results. Small spatial coefficients are not unexpected as we are looking at countries that cover a vast area and differ in more ways than one, as compared to most previous studies that have focused on local jurisdictions that tend to have a lot in common or at a state level which are more homogeneous than a set of developing countries.

From our study we find evidence, and some of it relatively strong, that spatial interaction is present in our samples as we reject the null hypotheses that $\rho = 0$ and $\lambda = 0$. For example, our results reveal that if neighboring countries increase their share of individual income tax revenues to total revenues by 1, then country *i* would increase its own ratio by 0.3 and this applies to both the SSA and SADC samples. We

found strong evidence of spatial interaction in VAT (ρ =0.3) and excise tax revenues (ρ =0.4) for the SSA sample. Expenditures in education and health also display strong mimicking behavior for the SSA sample and somewhat in SADC. Overall, the contiguity weight matrix performed quite well compared to the distance and HDI weight matrices. We encountered problems with our HDI and GDP per capita weight matrices and we had to redefine them to get them to perform well. We attributed this problem to the big inequalities in the social and economic variables among these developing countries where some are classified as low-low income and some are high-middle income. This would not be a problem for studies that focus on jurisdictions that have similar socio-economic characteristics.

We also tested for government efficiency by relating total taxes to the level of spending as a measure for the " price/quantity" of government and determining spatial patterns among the governments of these developing countries. While we did find some evidence that when governments simultaneously determine the revenue and spending levels they do consider their neighbors' policies, our results also showed mostly positive and relatively high correlation in the error terms, which could suggest that we need to improve the estimation of this simultaneity by introducing other control variables.

We conclude that mimicking is not a developed country only phenomenon! We have found evidence of fiscal policy mimicking behavior in the SSA and SADC regions, some of which point to policy harmonization. This is a crucial finding for the African countries as they have been involved in sub-regional economic and political groupings or blocs, most of which share the same objectives which include, among others, harmonizing their macroeconomic policies. For instance, SADC states in its Regional

Strategy Paper that one of the macro-economic liberalization policies it tends to implement is the harmonization of tax policies. We did find mimicking in individual tax revenues, which are usually not the primary focus of regional integration objectives as tariffs are, thus pointing us to some evidence of voluntary mimicking behavior. For instance, in its Memorandum of Understanding (MoU) in tax cooperation, SADC envisages to harmonize both indirect taxes and VAT as well as to avoid tax competition in the region. However, it should be noted that this MoU was drawn in 2003, which is outside our review period and while these objectives had been initiated some time back, their implementation takes time and this could mean that some voluntary mimicking in these tax revenue categories that started before the formal agreement took place.

Donor funds and the spending constraints attached to these funds, which are similar for most countries, have played a great role in determining how developing countries allocate their budgets and with all of the countries in the sample having relied on donor funds at some point in time, these funds have contributed to some mandated mimicking behavior. The same can be said for conditions imposed by International Financial Institutions (IFIs) through the SAPs and the ESAPs as well as the regional cooperation agreements which also played a role in mandated copycat behavior. While we have included aid to capture donor funds and dummies to capture the impact of SAPs and ESAPs, future studies could enhance this analysis by controlling for these constraints in a more detailed way. Therefore, while our spatial coefficients reflect the presence of mimicking behavior, it is possible that due to all the above-mentioned factors, this may not be copycat behavior per se and we need to control more for these and other world trends such as the downward movement of VAT rates as countries harmonize these.

We also find evidence of spatial interaction in the error terms in both regions which reflects the presence of omitted variables that are spatially correlated. These could be shocks in the neighboring countries that are felt in the home country. For developing countries and particularly for Sub-Saharan Africa as a whole, such shocks include, among others, prolonged droughts, regional wars, the AIDS pandemic impact on health expenditures, oil prices, prices of other major imports and prices of the major exports of these countries. These factors need to be controlled for in the model.

From our analysis we conclude that as a result of the above factors, there is some evidence that mandated policy convergence is taking effect in Africa and that in addition, some voluntary mimicking is also present in some taxes and expenditures.

CHAPTER 9: POLICY IMPLICATIONS AND FUTURE WORK

As indicated above, we find evidence which points towards the presence of fiscal policy mimicking behavior in these developing countries. This is crucial for those regions which are trying to harmonize their policies like our case study SADC as well as the other SSA regional economic blocs. When implementing the different macro-economic policies, countries or regions put in place structures aimed at making such policies work. Our study reveals that with mimicking behavior present, this could enhance the implementation of these policies and thus make it easy for these regions to implement their policies without fully committing resources towards the building up of such structures.

Future research could take the analysis of spatial interaction in developing countries one government level down by focusing on local governments. The main challenge here would be data availability since most developing countries lack sufficient time series data at the local government level and this would tend to limit the sample size. Further, most local governments in these countries are not entitled to raise their own taxes. The study could focus on two or more adjacent countries or even just look at one country like South Africa, though here one could encounter the problem of the introduction of homelands (and abolition thereafter) as well as the reclassification of provinces that took place after independence. However, these could be easily controlled for. Future work could also focus on testing for fiscal policy mimicking in all the regional economic blocs that are in SSA individually as we did for SADC. Again, data

availability would still be a major challenge as evidenced by our inability to include all countries that are in SADC in our analysis as some lacked considerable data.

Empirically, we have found that though the determining of weight matrices is considered *ad hoc*, careful consideration has to be put in place when dealing with developing countries, especially when we want to use measures that reflect their economic diversity to construct such matrices. Future studies could try to overcome this problem by using spatial clusters which group regions by similar economic or social ranges. This could also be done by introducing flexibility into the spatial weight matrix whereby it is built with bands that are based on distance with jurisdictions falling within each band given the equal weights.

APPENDIX A: SUMMARY STATISTICS AND RESULTS

Table A1. Summary Statistics for SSA Expenditures

Variable	Data Source	Obs	Mean	Std. Dev.	Min	Max
General Public Services[37] (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	528	0.1920	0.0999	0.0005	0.5907
Defense (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries Facts On International Relations and Security Trends (FIRST) SIPRI Military Expenditure Database from http://projects.sipri.se[38]	528	0.1045	0.0799	0.0003	0.4593
Education (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	528	0.1499	0.0577	0.0000	0.3458
Health (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	528	0.0658	0.0385	0.0000	0.3279
Transportation (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	528	0.0668	0.0476	0.0000	0.2630
Aid_ pc	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	528	45.0648	46.3453	0.0004	395.4898
GDP_ pc	World Development Indicators World Economic Outlook (WEO)	528	732.26	872.10	44.64	3,933.55
Land_area[39]	World Development Indicators World Economic Outlook (WEO)	528	526,228	534,112	2,030	2,267,050
	World Development Indicators	528	56.855	20.337	10.796	89.342

[37] The expenditure categories are given as shares of total expenditures.
[38] Accessed August 2005.
[39] Land area has been rescaled by 10 000.

Variable	Data Source	Obs	Mean	Std. Dev.	Min	Max
Literacy	World Economic Outlook (WEO)					
Pop_0-14	World Development Indicators World Economic Outlook (WEO)	528	44.2979	4.2083	25.4217	50.1054
Pop_65+	World Development Indicators World Economic Outlook (WEO)	528	3.0684	0.7230	1.9020	6.2249
IMF/WB_SAPs	IMF and World Bank Country Reports	528	1.3580	0.4799	1.0000	2.0000
Pol_right	Freedom House	519	4.8131	1.7863	1.0000	7.0000
Civil_Lib	Freedom House	519	4.7803	1.3901	2.0000	7.0000
Ttrend		528	11.5000	6.3503	1.0000	22.0000
Latitude	Latitude and Longitude of World Cities from www.mapsofworld.com[40]	528	-6.6021	13.6262	-29.1800	12.3400
Longitude	Latitude and Longitude of World Cities from www.mapsofworld.com[40]	528	23.5038	17.0817	-10.4700	57.3000
British	http://en.wikipedia.org[41]	528	0.5417	0.4987	0	1
French	http://en.wikipedia.org[41]	528	0.2500	0.4334	0	1
German[42]	http://en.wikipedia.org[41]	528	0.2083	0.4065	0	1
COMESA	Africa Recovery, United Nations	528	0.5833	0.4935	0	1
ECOWAS	Africa Recovery, United Nations	528	0.2083	0.4065	0	1
SADC	Africa Recovery, United Nations	528	0.4583	0.4987	0	1
Elect_system	Global Coalition for Africa	528	1.2917	0.0234	1	3
Openness	World Development Indicators	528	0.695	0.017	0.121	2.087

[40] Accessed September 2005
[41] Accessed Septmeber 2005.
[42] Includes Belgian and Portuguese colonies as well as independent countries that were never colonized.

Table A2. Summary Statistics for SSA Tax Revenues

Variable	Data Source	Obs	Mean	Std. Dev.	Min	Max
Individual Income Tax[43] (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	660	0.102	0.077	0.001	0.443
Corporate Income Tax (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	660	0.126	0.090	0.007	0.659
GST/VAT (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	660	0.141	0.103	0.004	0.560
Excises (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	660	0.106	0.099	0.000	0.519
International Trade (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	660	0.298	0.176	0.017	0.813
Aid_ pc	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	660	48.979	45.778	0.000	395.490
GDP_ pc	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	660	780.81	1,020.86	44.63	4,796.26
Land_area[44]	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	660	468,386	20,534	2,030	2,267,050
Literacy	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	660	52.916	19.830	10.796	89.342
Pop_0-14	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	660	44.110	4.101	25.422	51.523

[43] The tax revenue categories are given as shares of total revenues
[44] Land area has been rescaled by 1000.

Variable	Data Source	Obs	Mean	Std. Dev.	Min	Max
Pop_65+	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	660	3.178	0.867	1.902	6.353
IMF/WB_SAPs	IMF and World Bank Country Reports	660	1.3848	0.4869	1	2
Pol_right	Freedom House	660	4.917	1.716	1	7
Civil_Lib	Freedom House	660	4.815	1.325	2	7
Latitude	Latitude and Longitude of World Cities from www.mapsofworld.com[40]	660	-4.120	13.655	-29.180	13.280
Longitude	Latitude and Longitude of World Cities from www.mapsofworld.com[40]	660	19.610	19.386	-16.400	57.300
Ttrend		660	11.500	6.349	1	22
British	http://en.wikipedia.org[41]	660	0.467	0.499	0	1
French	http://en.wikipedia.org[41]	660	0.333	0.472	0	1
German[45]	http://en.wikipedia.org[41]	660	0.200	0.400	0	1
COMESA	Africa Recovery, United Nations	660	0.433	0.496	0	1
ECOWAS	Africa Recovery, United Nations	660	0.300	0.459	0	1
SADC	Africa Recovery, United Nations	660	0.367	0.482	0	1
Elect_system	Global Coalition for Africa	660	1.3	0.0205	1	3
Openness	World Development Indicators	660	0.682	0.014	0.121	2.087

[45] Includes Belgian and Portuguese colonies as well as independent countries that were never colonized.

Table A3. Summary Statistics for SADC

Variable	Data Source	Obs.	Mean	Std. Dev.	Min	Max
Individual Income Tax (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	242	0.1444	0.0950	0.0284	0.4427
Corporate Income Tax (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	242	0.1564	0.0944	0.0233	0.6589
GST/VAT (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	242	0.1681	0.1128	0.0059	0.5597
Excises (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	242	0.1262	0.1461	0.0010	0.7138
International Trade (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	242	0.2671	0.1789	0.0171	0.8000
General Public Services (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	242	0.1950	0.1060	0.0005	0.4749
Defense (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	242	0.0883	0.0682	0.0003	0.3989

[46] Accessed June 2005.

Variable	Data Source	Obs.	Mean	Std. Dev.	Min	Max
	Facts On International Relations and Security Trends (FIRST) SIPRI Military Expenditure Database from http://projects.sipri.se[46]					
Education (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	242	0.1647	0.0608	0.0000	0.3458
Health (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	242	0.0792	0.0374	0.0000	0.3279
Transportation (dependent variable)	IMF-Government Finance Statistics Yearbook IMF Staff Country Reports Central Bank Annual Reports and Bulletins for Individual Countries Government Reports for Various Countries	242	0.0744	0.0463	0.0000	0.2630
Aid_ pc	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	242	44.68	33.6278	0.0004	229.0282
GDP_ pc	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	242	1,167.84	1,073.41	84.27	3,933.54
Land_area	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	242	639,002	649,062	2,030	2,267,050
Literacy	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	242	71.61	10.00	44.54	89.34
Pop_0-14	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	242	43.04	5.55	25.42	49.58
Pop_65+	World Bank Development Indicators (WDI) World Economic Outlook (WEO)	242	3.20	0.97	1.98	6.23
IMF/WB_SAPs	IMF and World Bank Country Reports	242	1.32	0.47	1	2
Pol_right	Freedom House	242	4.25	1.84	1	7
Ttrend		242	11.50	6.36	1	22
British	http://en.wikipedia.org[41]	242	0.7273	0.4463	0	1
French	http://en.wikipedia.org	242	0.0909	0.2881	0	1
sadc_membership		242	0.7686	0.4226	0	1
Elect_system|	Global Coalition for Africa	242	1.1818	0.3865	1	2
openness	World Development Indicators	242	0.890	0.401	0.253	1.954

Table A4. Africa's Multiple Regional Economic Groups

CEEAC	CEMAC	CEPLG	COMESA	EAC	ECOWAS	IGAD	IOC	MRU	SACU	SADC	UEMOA
Burundi	Cameroon	Burundi	Burundi	Tanzania	Gabon	Djibouti	Comoros	Liberia	Botswana	Botswana	Burkina Faso
Cameroon	Gabon	Congo, DR	Comoros	Kenya	Cote d'Ivoire	Ethiopia	Madagascar	Sierra Leone	Lesotho	Congo, Dr	Cote d'Ivoire
Gabon	Chad		Congo, DR	Uganda	Ghana	Kenya	Mauritius		Namibia	Lesotho	Guinea Bissa
TCH			Djibouti		Gambia	Uganda	Swaziland		Swaziland	Mauritius	Mali
Congo, DR			Ethiopia		Guinea Bissau				South Africa	Malawi	Togo
			Kenya		Liberia					Namibia	
			Madagascar		Mali					Swaziland	
			Mauritius		Nigeria					Seychelles	
			Malawi		Sierra Leone					Tanzania	
			Namibia		Togo					South Africa	
			Swaziland							Zambia	
			Seychelles							Zimbabwe	
			Tanzania								
			Uganda								
			Zambia								
			Zimbabwe								

Source: Africa Recovery, September 2002

Notes: CEEAC: *Communauté Economique des Etats de l'Afrique Centrale*
CEMAC: *Communauté Economique et Monétaire d'Afrique Centrale*
CEPLG: *Communauté Economique des Pays des Grands Lacs*
COMESA: *Common Market for Eastern and Southern Africa*
EAC : *East African Cooperation*
ECOWAS : *Economic Community of West African States*
IGAD : *Intergovernmental Authority for Development*
IOC : *Indian Ocean Commission*
MRU : *Man River Union*
SACU : *Southern African Customs Union*
SADC : *Southern African Development Community*
UEMOA : *Union Economique et Monétaire Ouest-Africaine*

Table A5. Countries Included in Each Sample.

SSA–Revenues (30)	SSA-Expenditures (24)	SADC (11)
Botswana	Botswana	Botswana
Burkina Faso	Burkina Faso	Congo Dem. Rep
Burundi	Burundi	Lesotho
Cameroon	Cameroon	Malawi
Chad	Congo Dem. Rep	Mauritius
Comoros	Djibouti	Namibia
Congo Dem. Rep	Ethiopia	South Africa
Cote d'Ivoire	Gambia	Swaziland
Djibouti	Ghana	Tanzania
Ethiopia	Kenya	Zambia
Gabon	Lesotho	Zimbabwe
Gambia	Liberia	
Ghana	Madagascar	
Guinea Bissau	Malawi	
Lesotho	Mali	
Liberia	Mauritius	
Madagascar	Namibia	
Malawi	Nigeria	
Mali	South Africa	
Mauritius	Swaziland	
Namibia	Tanzania	
Nigeria	Uganda	
Sierra Leone	Zambia	
South Africa	Zimbabwe	
Swaziland		
Tanzania		
Togo		
Uganda		
Zambia		
Zimbabwe		

Table A6. Individual Tax Revenue-SSA

Variable	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	GMM	GMM FE	GMM	GMM FE	GMM	GMM FE	GMM	GMM FE
	0.465***		0.357***		0.300***		-0.074***	
constant	(5.344)		(4.547)		(3.186)		(-7.452)	
	0.006	0.010*	0.010	0.012*	0.013*	0.013**	0.008	0.012**
aid_pc	(0.938)	(1.857)	(1.3740	(1.906)	(1.887)	(2.108)	(1.201)	(2.046)
	0.002	-0.026***	0.000	-0.034***	-0.002	-0.026***	0.026***	-0.057***
gdp_pc	(0.467)	(-3.883)	(0.000)	(-4.507)	(-0.543)	(-3.689)	(3.668)	(-6.964)
	0.042***		0.044***		0.043***		0.027***	
land_area	(6.278)		(6.597)		(6.641)		(4.350)	
	0.019	-0.015	0.031	-0.026	0.015	-0.023	0.067***	-0.064**
literacy	(0.999)	(-0.693)	(1.635)	(-0.953)	(0.874)	(-0.641)	(3.868)	(-2.312)
	-0.865***	-0.108	-0.804***	-0.131	-0.616***	-0.218*	0.276***	-0.097
pop_0-14	(-5.905)	(-0.869)	(-5.326)	(-0.953)	(-4.597)	(-1.665)	(3.735)	(-0.717)
	-0.229***	0.251***	-0.183***	0.231***	-0.126**	0.258***	0.051	0.176**
pop_65+	(-3.846)	(3.644)	(-3.026)	(3.367)	(-2.242)	(3.885)	(1.263)	(2.566)
	0.008	0.003	0.007	0.006	0.005	0.004	0.004	0.006
IMF/WB_SAPs	(1.332)	(0.858)	(1.209)	(1.484)	(0.937)	(1.083)	(0.743)	(1.371)
	0.003*	-0.001	0.003*	-0.002	0.004**	-0.001	0.003	-0.001
pol_right	(1.645)	(-0.451)	(1.782)	(-1.096)	(2.143)	(-0.633)	(1.561)	(-0.477)
	0.043***		0.044***		0.053***		0.042***	
british	(4.636)		(4.736)		(5.827)		(4.738)	
	-0.002		-0.003		-0.008		0.007	
french	(-0.187)		(-0.391)		(-1.002)		(0.840)	
	0.024*		0.029**		0.012		-0.036***	
COMESA	(1.933)		(2.389)		(1.031)		(-2.772)	
	0.008		0.005		-0.018		-0.047***	
ECOWAS	(0.604)		(0.384)		(-1.463)		(-3.508)	
	0.042***		0.042***		0.048***		0.044***	
Elect_system	(7.069)		(7.138)		(8.288)		(8.377)	
	-0.033***	-0.015	-0.023**	-0.017	-0.020**	-0.024**	-0.008	-0.022**
Openness	(-3.511)	(-1.471)	(-2.443)	(-1.467)	(-2.188)	(-2.202)	(-0.989)	(-1.997)
	0.307***	0.516***	0.158***	0.319***	0.527***	-0.710***	-0.485***	0.091
ρ	(5.302)	(7.544)	(2.634)	(4.262)	(6.174)	(-4.116)	(-9.038)	(1.237)
	-0.159***	-0.306***	-0.019	-0.059	-0.276***	0.385***	0.405***	0.459***
λ	(-2.994)	(-3.351)	(-0.197)	(-0.479)	(-21.10)	(7.000)	(149.1)	(22.91)
R^2	0.280	0.777	0.247	0.777	0.304	0.778	0.254	0.765

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A7. Corporate Tax Revenue–SSA

Variable	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	GMM	GMM FE	GMM	GMM	GMM FE	GMM FE	GMM	GMM FE
constant	0.005		-0.044		0.880***		0.016	
	(0.047)		(-0.506)		(6.588)		(1.616)	
aid_pc	-0.033***	-0.047***	-0.037***	-0.047***	0.063***	-0.039***	-0.032***	-0.042***
	(-4.639)	(-4.818)	(-4.852)	(-4.795)	(7.686)	(-4.267)	(-4.329)	(-4.523)
gdp_pc	0.043***	0.046***	0.045***	0.045***	-0.023***	0.057***	0.040***	0.072***
	(9.187)	(3.805)	(9.487)	(3.780)	(-4.610)	(4.418)	(4.971)	(6.508)
land_area	0.012*		0.018***		0.021**		0.024***	
	()		(2.633)		(2.518)		(3.700)	
literacy	-0.091***	-0.370***	-0.086***	-0.382***	-0.097***	-0.167***	-0.078***	-0.270***
	(-4.521)	(-5.711)	(-4.154)	(-5.877)	(-4.376)	(-3.033)	(-4.001)	(-4.609)
pop_0-14	0.122	0.240	0.236	0.237	-1.251***	0.044	0.096	-0.124
	(0.758)	(1.109)	(1.451)	(1.090)	(-7.580)	(0.220)	(1.436)	(-0.577)
pop_65+	-0.068	0.074	-0.068	0.069	-0.177**	0.100	-0.029	0.446***
	(-1.043)	(0.660)	(-1.011)	(0.610)	(-2.542)	(1.030)	(-0.609)	(4.102)
IMF/WB_SAPs	0.007	0.020***	0.005	0.020***	0.014**	0.019***	-0.003	0.009
	(1.103)	(2.933)	(0.787)	(2.885)	(2.119)	(2.880)	(-0.406)	(1.329)
pol_right	-0.003	0.004*	-0.002	0.004	-0.011***	0.001	0.000	0.002
	(-1.638)	(1.670)	(-0.760)	(1.605)	(-5.382)	(0.583)	(-0.195)	(1.052)
british	0.012		0.017		0.100***		0.049***	
	(1.139)		(1.594)		(8.578)		(4.674)	
french	-0.030***		-0.031***		-0.002		-0.023**	
	(-3.535)		(-3.419)		(-0.213)		(-2.509)	
COMESA	0.056***		0.046***		0.093***		0.082***	
	(4.745)		(3.692)		(6.362)		(5.889)	
ECOWAS	0.038***		0.025*		-0.004		0.038**	
	(2.858)		(1.875)		(-0.225)		(2.541)	
Elect_system	0.006		0.013**		0.031***		0.022***	
	(0.880)		(2.086)		(3.669)		(3.725)	
Openness	0.012	-0.024	0.017*	-0.025	-0.065***	-0.025	0.025***	-0.015
	(1.251)	(-1.265)	(1.817)	(-1.304)	(-5.785)	(-1.527)	(2.658)	(-0.845)
ρ	0.567***	0.170	0.414***	0.147	0.845***	0.979***	0.006	0.000
	(7.884)	(1.345)	(5.154)	(1.129)	(7.465)	(6.174)	(0.155)	(-0.002)
λ	-0.234**	-0.027	0.031	0.042	-0.429***	-0.442***	0.432***	0.412***
	(-2.412)	(-0.747)	(1.564)	(1.256)	(-6.518)	(-4.279)	(10.74)	(10.57)
R^2	0.415	0.514	0.353	0.514	0.373	0.475	0.281	0.471

Figures in parentheses are asymptotic t-statistics.

significant at 10%; **significant at 5%; *** significant at 1%

Table A8. Value Added Tax–SSA

Variable	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	GMM	GMM FE	GMM	GMM	GMM FE	GMM FE	GMM	GMM_FE
	0.836***		0.678***		0.206***		-0.033**	
constant	(8.223)		(8.129)		(3.864)		(-2.136)	
	0.068***	0.019**	0.074***	0.024**	0.008	0.024***	0.062***	0.021**
aid_pc	(7.890)	(2.178)	(8.593)	(2.500)	(0.922)	(3.057)	(6.902)	(2.275)
	-0.027***	0.014	-0.026***	0.015	-0.001	0.000	0.021**	0.044***
gdp_pc	(-4.987)	(1.441)	(-4.907)	(1.2340	(-0.177)	(-0.008)	(2.053)	(4.036)
	0.031***		0.028***		-0.034***		0.038***	
land_area	(3.708)		(3.378)		(-4.560)		(4.460)	
	-0.044*	0.036	-0.037	0.024	0.105***	-0.051*	0.019	-0.036
literacy	(-1.862)	(0.662)	(-1.570)	(0.517)	(3.838)	(-1.833)	(0.771)	(-1.066)
	-1.501***	-0.229	-1.255***	-0.338	-0.389**	-0.292*	-0.302***	-0.236
pop_0-14	(-8.458)	(-1.228)	(-8.022)	(-1.577)	(-2.155)	(-1.867)	(-2.812)	(-1.055)
	-0.287***	-0.117	-0.208***	-0.157	-0.378***	-0.133*	0.049	-0.267**
pop_65+	(-3.836)	(-1.379)	(-3.001)	(-1.429)	(-4.841)	(-1.736)	(0.828)	(-2.490)
	0.014*	-0.003	0.011	-0.001	-0.020**	-0.001	0.003	0.002
IMF/WB_SAPs	(1.913)	(-0.555)	(1.453)	(-0.133)	(-2.492)	(-0.095)	(0.362)	(0.413)
	-0.011***	-0.006***	-0.010***	-0.009***	0.008***	-0.006***	-0.012***	-0.008***
pol_right	(-4.814)	(-2.980)	(-4.417)	(-4.139)	(3.372)	(-3.502)	(-4.465)	(-3.820)
	0.104***		0.100***		-0.003		0.114***	
british	(8.241)		(7.817)		(-0.274)		(8.836)	
	0.018		0.010		-0.024**		0.013	
french	(1.513)		(0.853)		(-2.194)		(1.095)	
	0.125***		0.116***		0.079***		0.098***	
COMESA	(8.635)		(7.999)		(5.490)		(5.339)	
	0.041**		0.028*		0.037**		0.029	
ECOWAS	(2.471)		(1.675)		(2.526)		(1.514)	
	0.022***		0.019**		-0.006		0.044***	
Elect_system	(2.619)		(2.249)		(-0.836)		(5.846)	
	-0.045***	-0.004	-0.047***	-0.005	0.014	-0.006	-0.046***	0.013
Openness	(-4.228)	(-0.285)	(-4.409)	(-0.244)	(1.378)	(-0.400)	(-3.746)	(0.726)
	0.116**	-0.686***	-0.005	-0.367***	-0.846***	0.323***	0.126**	0.193***
ρ	(1.979)	(-9.414)	(-0.091)	(-4.400)	(-19.45)	(9.121)	(2.070)	(5.040)
	-0.063	0.393***	0.095	0.112	0.447***	-0.953***	0.499***	0.750***
λ	(-1.057)	(7.075)	(1.595)	(1.2480	(20.98)	(-4.599)	(16.521)	(23.854)
R^2	0.346	0.661	0.337	0.664	0.459		0.062	0.661

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A9. Excise Tax–SSA

Variable	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	GMM	GMM FE	GMM	GMM	GMM FE	GMM FE	GMM	GMM_FE
	0.347***		0.382***		0.206***		-0.108***	
constant	(3.544)		(3.038)		(3.864)		(-7.188)	
	0.006	-0.007	-0.006	-0.026***	0.008	-0.017*	-0.001	-0.020**
aid_pc	(0.599)	(-0.884)	(-0.602)	(-2.714)	(0.922)	(-1.874)	(-0.142)	(-2.402)
	0.015**	0.000	0.013**	-0.024**	-0.001	-0.010	0.019*	-0.003
gdp_pc	(2.374)	(0.042)	(2.050)	(-1.999)	(-0.177)	(-0.993)	(1.930)	(-0.252)
	-0.031***		-0.047***		-0.034***		-0.038***	
land_area	(-3.444)		(-5.029)		(-4.560)		(-4.616)	
	0.011	0.002	0.048*	0.006	0.105***	0.066	0.105***	0.025
literacy	(0.391)	(0.076)	(1.682)	(0.1380	(3.838)	(1.106)	(4.065)	(0.833)
	-0.410*	0.406**	-0.370*	0.482**	-0.38988	0.466**	0.510***	0.423**
pop_0-14	(-1.934)	(2.306)	(-1.733)	(2.259)	(-2.155)	(2.280)	(6.436)	(2.131)
	-0.521***	0.064	-0.520***	0.217**	-0.378***	0.156	-0.195***	0.210**
pop_65+	(-5.469)	(0.653)	(-5.298)	(2.001)	(-2.155)	(1.502)	(-3.348)	(2.241)
	-0.022**	0.005	-0.024***	0.001	-0.020**	-0.006	-0.034***	0.001
IMF/WB_SAPs	(-2.467)	(0.796)	(-2.658)	(0.122)	(-2.492)	(-1.023)	(-4.047)	(0.184)
	0.009***	-0.001	0.010***	0.002	0.008***	0.002	0.004	0.004*
pol_right	(3.495)	(-0.259)	(3.607)	(0.724)	(3.372)	(1.161)	(1.185)	(1.940)
	-0.028**		-0.033**		-0.003		-0.006	
british	(-2.093)		(-2.352)		(-0.274)		(-0.482)	
	-0.074***		-0.064***		-0.024**		-0.023*	
french	(-5.280)		(-4.474)		(-2.194)		(-1.869)	
	0.084***		0.081***		0.079***		0.059***	
COMESA	(5.271)		(4.846)		(5.490)		(3.356)	
	0.015		0.020		0.037**		0.029	
ECOWAS	(0.862)		(1.086)		(2.526)		(1.495)	
	-0.003		-0.004		-0.006		0.029***	
Elect_system	(-0.402)		(-0.435)		(-0.836)		(3.595)	
	0.039***	-0.007	0.042***	0.001	0.014	0.022	0.040***	0.003
Openness	(3.376)	(-0.436)	(3.358)	(0.052)	(1.378)	(1.328)	(3.345)	(0.151)
	-0.774***	1.025***	-0.324**	0.300*	-0.846***	-0.257***	-0.580***	0.207***
ρ	(-5.990)	(5.900)	(-2.474)	(1.675)	(-19.45)	(-9.664)	(-9.885)	(5.670)
	0.234	-0.588***	-0.021	-0.120**	0.447***	0.509***	0.396***	-0.317***
λ	(1.413)	(-3.153)	(-0.692)	(-2.451)	(20.98)	(5.624)	(55.412)	(-11.06)
R^2	0.270	0.712	0.231	0.718	0.459	0.717	0.246	0.717

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A10. International Trade Taxes–SSA

Variable	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	GMM	GMM FE	GMM	GMM	GMM FE	GMM FE	GMM	GMM_FE
	0.454***		0.114		0.180		0.023	
constant	(2.905)		(0.956)		(1.254)		(0.661)	
	-0.023	-0.004	-0.016	-0.002	-0.016	0.003	-0.006	0.027*
aid_pc	(-1.534)	(-0.274)	(-1.105)	(-0.100)	(-1.095)	(0.180)	(-0.373)	(1.751)
	-0.099***	-0.094***	-0.096***	-0.096***	-0.100***	-0.106***	-0.129***	-0.154***
gdp_pc	(-10.777)	(-4.769)	(-10.47)	(-4.616)	(-10.85)	(-5.230)	(-7.697)	(-8.060)
	-0.065***		-0.078***		-0.075***		-0.064***	
land_area	(-4.935)		(-5.666)		(-5.594)		(-4.720)	
	0.006	-0.343***	0.058	-0.371***	0.039	-0.334***	0.062	-0.245***
literacy	(0.155)	(-4.252)	(1.399)	(-4.936)	(0.917)	(-4.430)	(1.528)	(-3.730)
	0.026	0.022	0.720***	0.288	0.698**	0.287	0.798***	-0.030
pop_0-14	(0.081)	(0.062)	(3.152)	(0.773)	(2.248)	(0.807)	(5.196)	(-0.076)
	0.405***	0.119	0.630***	0.012	0.574***	-0.031	0.703***	0.207
pop_65+	(3.137)	(0.731)	(5.787)	(0.062)	(4.383)	(-0.169)	(7.454)	(1.044)
	0.015	0.030***	0.008	0.038***	0.005	0.031***	0.008	0.035***
IMF/WB_SAPs	(1.143)	(2.795)	(0.576)	(3.283)	(0.384)	(2.672)	(0.587)	(3.180)
	-0.019***	-0.013***	-0.017***	-0.015***	-0.015***	-0.015***	-0.014***	-0.014***
pol_right	(-4.673)	(-3.726)	(-4.289)	(-3.991)	(-3.776)	(-4.058)	(-3.073)	(-4.014)
	-0.086***		-0.089***		-0.064***		-0.069***	
british	(-4.275)		(-4.432)		(-3.122)		(-3.196)	
	0.042**		0.023		0.028		0.021	
french	(2.218)		(1.235)		(1.507)		(1.094)	
	-0.095***		-0.110***		-0.101***		-0.063**	
COMESA	(-3.913)		(-4.511)		(-4.120)		(-2.164)	
	-0.005		-0.017		-0.039		0.002	
ECOWAS	(-0.175)		(-0.598)		(-1.492)		(0.065)	
	-0.048***		-0.048***		-0.050***		-0.047***	
Elect_system	(-3.919)		(-3.778)		(-4.019)		(-3.476)	
	0.084***	-0.026	0.084***	-0.031	0.090***	-0.043	0.114***	-0.054*
Openness	(4.096)	(-0.879)	(3.947)	(-1.004)	(4.521)	(-1.363)	(5.904)	(-1.697)
	-0.337***	-0.503***	-0.263***	-0.158	-0.433***	0.099	-0.039	0.229***
ρ	(-4.734)	(-4.670)	(-3.738)	(-1.391)	(-4.626)	(0.798)	(-0.726)	(5.838)
	0.153***	0.210***	0.177***	-0.125***	0.133***	-0.134***	0.409***	0.677***
λ	(137.08)	(11.161)	(8.979)	(-13.39)	(6.394)	(-8.953)	(51.51)	(22.46)
R^2	0.372	0.672	0.358	0.675	0.377	0.675		0.668

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A11. General Public Services–SSA

Variable	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	GMM	GMM FE	GMM	GMM FE	GMM	GMM FE	GMM	GMM FE
constant	0.659***		0.007		0.801***		0.260***	
	(3.650)		(0.095)		(3.051)		(3.297)	
aid_pc	0.031***	-0.065***	0.037***	-0.064***	0.032***	-0.050***	0.046***	-0.045***
	(2.780)	(-4.862)	(3.295)	(-4.547)	(3.051)	(-3.571)	(3.959)	(-3.431)
gdp_pc	-0.044***	-0.016	-0.017**	-0.025*	-0.030***	-0.029*	0.011	-0.029*
	(-4.534)	(-1.105)	(-2.030)	(-1.693)	(-3.323)	(-1.937)	(1.283)	(-1.904)
land_area	-0.018*		-0.018*		-0.015		-0.016	
	(-1.680)		(-1.719)		(-1.399)		(-1.547)	
literacy	0.016	-0.279***	0.063*	-0.260***	0.022	-0.119**	0.069**	-0.081
	(0.484)	(-4.026)	(1.774)	(-3.608)	(0.738)	(-2.062)	(2.359)	(-1.526)
pop_0-14	-0.538**	-0.888**	0.268*	-1.012***	-0.616***	-0.942***	-0.300**	-0.674**
	(-2.190)	(-2.474)	(1.873)	(-2.868)	(-2.617)	(-2.961)	(-2.352)	(-2.166)
pop_65+	-0.468***	-0.275**	-0.219**	-0.262**	-0.532***	-0.225*	-0.532***	-0.202*
	(-3.958)	(-2.197)	(-2.405)	(-2.019)	(-5.018)	(-1.792)	(-6.122)	(-1.675)
IMF/WB_SAPs	-0.029***	-0.020**	-0.023**	-0.021**	-0.013	-0.019**	-0.007	-0.013
	(-3.158)	(-2.119)	(-2.382)	(-2.219)	(-1.413)	(-2.089)	(-0.870)	(-1.492)
pol_right	0.003	-0.001	0.008***	-0.001	0.005*	0.001	0.007**	-0.001
	(1.038)	(-0.192)	(2.644)	(-0.295)	(1.779)	(0.355)	(2.492)	(-0.325)
british	-0.016		-0.011		-0.022		-0.023	
	(-1.079)		(-0.718)		(-1.511)		(-1.541)	
french	0.011		0.032**		-0.004		0.010	
	(0.733)		(2.054)		(-0.252)		(0.737)	
COMESA	-0.023		-0.021		-0.008		0.006	
	(-1.297)		(-1.187)		(-0.470)		(0.353)	
ECOWAS	-0.058***		-0.032*		-0.044**		-0.035*	
	(-3.011)		(-1.731)		(-2.306)		(-1.851)	
Elect_system	-0.003		-0.003		-0.001		0.018	
	(-0.326)		(-0.309)		(-0.153)		(1.629)	
Openness	0.072***	0.053**	0.067***	0.055**	0.055***	0.046**	0.070***	0.024
	(5.661)	(-0.192)	(5.176)	(2.381)	(4.529)	(2.038)	(5.470)	(1.077)
ρ	0.400***	-0.283**	0.320***	-0.086	0.942***	0.596***	0.317***	0.199***
	(4.177)	(-2.218)	(3.427)	(-0.652)	(7.873)	(4.709)	(9.527)	(5.596)
λ	-0.238***	0.089***	-0.242**	-0.218	-0.854***	-0.786***	-0.216***	-0.302***
	(-185.43)	(15.828)	(-2.095)	(-1.420)	(-19.63)	(-5.229)	-7.274)	(-5.060)
R^2	0.225	0.480	0.155	0.481		0.475	0.27	0.446

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A12. Defense–SSA

Variable	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	GMM	GMM FE	GMM	GMM	GMM FE	GMM FE	GMM	GMM FE
	0.321***		0.418***		0.590***		0.000	
constant	(4.478)		(4.371)		(4.015)		(0.017)	
	0.021**	0.005	0.012	0.015	-0.006	0.001	-0.004	0.005
aid_pc	(2.579)	(0.490)	(1.424)	(1.381)	(-0.857)	(0.059)	(-0.478)	(0.588)
	-0.008	0.006	-0.013*	-0.013	-0.017***	0.001	0.024**	0.007
gdp_pc	(-1.195)	(0.522)	(-1.925)	(-0.963)	(-2.620)	(0.126)	(2.417)	(0.647)
	0.005		0.005		0.007		0.004	
land_area	(0.770)		(0.654)		(0.931)		(0.620)	
	-0.125***	-0.189***	-0.112***	-0.168***	-0.062***	0.157**	-0.092***	0.121**
literacy	(-5.931)	(-3.186)	(-5.086)	(-2.898)	(-2.661)	(2.500)	(-3.269)	(2.172)
	-0.057	0.415*	-0.069	0.739***	-0.212	0.272	0.542***	0.635***
pop_0-14	(-0.371)	(1.763)	(-0.429)	(2.638)	(-1.196)	(1.096)	(8.368)	(2.838)
	0.052	0.159*	-0.002	0.233**	-0.136	0.258***	0.045	0.182**
pop_65+	(0.711)	(1.867)	(-0.026)	(2.162)	(-1.608)	(2.681)	(0.724)	(1.996)
	-0.038***	-0.022***	-0.042***	-0.024***	-0.029***	-0.023***	-0.023***	-0.016***
IMF/WB_SAPs	(-5.788)	(-3.453)	(-6.172)	(-3.284)	(-4.366)	(-3.447)	(-3.505)	(-2.806)
	0.008***	0.007***	0.008***	0.010***	0.004*	0.005**	0.005**	0.005**
pol_right	(4.043)	(3.396)	(3.690)	(4.510)	(1.957)	(2.113)	(2.048)	(2.384)
	-0.025**		-0.029***		-0.037***		-0.053***	
british	(-2.470)		(-2.791)		(-3.504)		(-4.478)	
	-0.036***		-0.031***		-0.022**		-0.045***	
french	(-3.941)		(-3.297)		(-2.349)		(-4.568)	
	-0.008		-0.020*		-0.035***		-0.036***	
COMESA	(-0.709)		(-1.708)		(-3.051)		(-2.944)	
	-0.100***		-0.109***		-0.109***		-0.073***	
ECOWAS	(-7.950)		(-8.411)		(-8.207)		(-5.688)	
	-0.044***		-0.041***		-0.029***		-0.036***	
Elect_system	(-6.415)		(-5.757)		(-4.088)		(-4.321)	
	-0.070***	0.040**	-0.066***	0.035*	-0.052***	0.058***	-0.048***	0.050***
Openness	(-8.516)	(2.175)	(-7.411)	(1.703)	(-6.158)	(3.401)	(-5.248)	(3.061)
	-0.521***	-0.648***	-0.329***	-0.417***	0.491***	1.076***	0.139***	0.257***
ρ	(-8.958)	(-6.238)	(-4.938)	(-3.191)	(3.754)	(6.063)	(4.818)	(7.751)
	0.205***	0.364***	-0.039	0.020	-0.472***	-0.669***	0.892***	-0.333***
λ	(11.405)	(29.54)	(-0.529)	(0.332)	(-17.75)	(-7.925)	(6.075)	(-9.263)
R^2	0.445	0.528	0.391	0.515	0.403	0.486	0.289	

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A13. Education–SSA

Variable	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	GMM	GMM FE	GMM	GMM	GMM FE	GMM FE	GMM	GMM_FE
	-0.230**		-0.175**		-0.021		0.000	
constant	(-2.176)		(-2.242)		(-0.257)		(-0.058)	
	-0.014**	-0.005	-0.014**	-0.002	-0.019***	-0.003	-0.027***	-0.001
aid_pc	(-2.518)	(-0.902)	(-2.413)	(-0.233)	(-3.158)	(-0.3590	(-4.195)	(-0.094)
	0.018***	0.005	0.019***	0.008	0.022***	0.005	-0.008	0.012
gdp_pc	(3.813)	(0.681)	(3.777)	(0.985)	(4.142)	(0.704)	(-1.045)	(1.515)
	-0.039***		-0.034***		-0.034***		-0.034***	
land_area	(-7.284)		(-6.327)		(-6.241)		(-6.422)	
	0.005	-0.037	0.023	-0.063*	0.042**	-0.038	0.009	-0.027
literacy	(0.335)	(-1.554)	(1.3900	(-1.8250	(2.404)	(-0.865)	(0.461)	(-1.069)
	0.357***	-0.192	0.433***	-0.509**	0.381***	-0.660***	0.159**	-0.440***
pop_0-14	(2.921)	(-1.0460	(3.4380	(-2.581)	(2.838)	(-3.423)	(2.515)	(-2.807)
	0.102*	-0.053	0.118*	-0.123*	0.087	-0.148**	0.069	-0.126**
pop_65+	(1.780)	(-0.754)	(1.955)	(-1.700)	(1.428)	(-2.141)	(1.553)	(-2.075)
	-0.001	0.002	0.003	0.003	0.000	0.001	-0.001	0.004
IMF/WB_SAPs	(-0.140)	(0.445)	(0.637)	(0.613)	(0.077)	(0.262)	(-0.142)	(1.046)
	-0.001	0.001	-0.001	-0.001	-0.002	-0.002	0.000	0.000
pol_right	(-0.500)	(0.612)	(-0.756)	(-0.815)	(-1.204)	(-1.135)	(0.155)	(-0.232)
	0.012*		0.017**		0.014		0.035***	
british	(1.683)		(2.078)		(1.621)		(4.171)	
	-0.008		-0.002		-0.008		0.001	
french	(-1.221)		(-0.300)		(-1.134)		(0.142)	
	0.009		-0.003		-0.015		-0.007	
COMESA	(0.986)		(-0.322)		(-1.586)		(-0.797)	
	0.007		-0.009		-0.022**		-0.007	
ECOWAS	(0.665)		(-0.862)		(-2.239)		(-0.750)	
	0.009*		0.013**		0.006		0.008	
Elect_system	(1.864)		(2.446)		(1.120)		(1.295)	
	0.003	-0.028**	0.016**	-0.007	0.017**	-0.009	0.003	-0.004
Openness	(0.397)	(-2.524)	(2.430)	(-0.593)	(2.590)	(-0.734)	(0.410)	(-0.387)
	0.789***	0.979***	0.417***	0.241*	-0.250	-0.845*	0.095**	0.313***
ρ	(10.563)	(8.945)	(4.863)	(1.730)	(-0.836)	(-1.710)	(2.156)	(7.241)
	-0.372***	-0.560**	-0.001	-0.040	0.109	0.461*	0.725***	-0.421***
λ	(-2.997)	(-2.109)	(-0.015)	(-0.421)	(0.916)	(1.935)	(4.502)	(-14.28)
R^2	0.448	0.542	0.327	0.553	0.328	0.553	0.062	

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A14. Health–SSA

Variable	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	GMM	GMM FE	GMM	GMM	GMM FE	GMM FE	GMM	GMM_FE
	-0.035		0.017		0.082***		-0.150***	
constant	(-0.464)		(0.840)		(3.413)		(-4.607)	
	0.012***	0.008	0.003	0.010*	-0.001	0.005	0.019***	0.006
aid_pc	(2.781)	(1.529)	(0.721)	(1.919)	(-0.197)	(0.888)	(4.309)	(1.024)
	0.000	0.003	-0.002	-0.016**	0.008**	-0.002	0.011***	-0.002
gdp_pc	(-0.026)	(0.415)	(-0.523)	(-2.304)	(2.165)	(-0.436)	(3.640)	(-0.313)
	0.013***		0.002		0.000		0.007*	
land_area	(2.854)		(0.4780		(0.099)		(1.759)	
	0.004	0.013	0.032***	0.019	0.059***	-0.025	0.035***	0.037
literacy	(0.315)	(0.488)	(2.625)	(0.720)	(4.946)	(-0.747)	(3.427)	(1.496)
	-0.088	0.127	-0.008	0.134	0.095	0.060	0.024	-0.099
pop_0-14	(-0.949)	(0.998)	(-0.176)	(0.992)	(1.085)	(0.473)	(0.517)	(-0.605)
	0.113***	0.203***	0.124***	0.108*	0.125***	0.270***	0.135***	0.312***
pop_65+	(2.622)	(3.755)	(4.103)	(1.7610	(3.016)	(5.699)	(3.855)	(5.902)
	0.002	0.002	0.003	0.002	0.003	0.001	-0.004	-0.003
IMF/WB_SAPs	(0.697)	(0.6630	(0.8980	(0.518)	(0.823)	(0.369)	(-1.324)	(-0.724)
	0.001	0.004***	0.000	0.004***	0.001	0.006***	0.004***	0.006*
pol_right	(1.291)	(3.944)	(0.431)	(3.279)	(1.029)	(5.195)	(3.733)	(5.441)
	0.024***		0.012**		0.009		0.015***	
british	(4.167)		(1.970)		(1.642)		(2.596)	
	0.008*		0.005		0.007		0.007	
french	(1.645)		(1.027)		(1.586)		(1.339)	
	0.014**		-0.001		0.000		0.010	
COMESA	(2.133)		(-0.134)		(-0.021)		(1.483)	
	0.016**		-0.011		-0.003		-0.009	
ECOWAS	(2.100)		(-1.576)		(-0.397)		(-1.337)	
	0.000		-0.008*		-0.003		0.009**	
Elect_system	(0.093)		(-1.8990		(-0.884)		(2.056)	
	0.001	0.009	0.005	-0.010	0.013***	0.013	0.016***	0.019*
Openness	(0.125)	(0.969)	(1.0830	(-0.976)	(2.989)	(1.575)	(3.130)	(1.927)
	0.650***	-0.338**	-0.228***	-0.587***	-3.787***	-3.670***	0.023	0.064
ρ	(9.235)	(-2.468)	(-2.885)	(-4.625)	(-8.659)	(-5.465)	(0.432)	(0.751)
	-0.353***	0.212**	0.342*	0.364	0.534***	0.500***	-0.326***	0.775***
λ	(-5.578)	(2.323)	(1.793)	(1.522)	(4.710)	(4.365)	(-10.374)	(5.907)
R^2	0.284	0.460	0.175	0.427	0.314	0.456	0.308	

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A15. Transportation and Communication-SSA

Variable	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	GMM	GMM FE	GMM	GMM_FE	GMM	GMM_FE	GMM	GMM_FE
	0.005		-0.006		0.004		0.009**	
constant	(0.065)		(-0.100)		(0.131)		(2.305)	
	0.010**	-0.013**	0.014***	-0.012**	0.015***	-0.020***	0.009**	-0.020***
aid_pc	(2.285)	(-2.409)	(2.954)	(-2.005)	(3.204)	(-3.010)	(1.976)	(-3.099)
	0.000	-0.008	0.000	-0.009	0.001	-0.006	-0.008	-0.008
gdp_pc	(-0.123)	(-1.404)	(-0.093)	(-1.392)	(0.233)	(-0.9310	(-1.314)	(-1.317)
	-0.015***		-0.008**		-0.006		-0.001	
land_area	(-3.615)		(-1.967)		(-1.404)		(-0.294)	
	-0.044***	-0.080***	-0.046***	-0.112***	-0.055***	-0.084	-0.069***	-0.139***
literacy	(-3.435)	(-2.742)	(-3.359)	(-3.142)	(-3.831)	(-1.6170	(-4.739)	(-3.528)
	-0.076	0.232*	-0.037	0.200	-0.150	0.108	0.023	0.337*
pop_0-14	(-0.795)	(1.731)	(-0.368)	(1.3530	(-1.445)	(0.6390	(0.578)	(1.943)
	0.083*	0.156***	0.079*	0.151***	0.022	0.136**	0.178***	0.208***
pop_65+	(1.866)	(2.766)	(1.674)	(2.660)	(0.443)	(2.2250	(5.415)	(3.520)
	0.005	0.012***	0.007*	0.014***	0.018***	0.019***	0.009**	0.016***
IMF/WB_SAPs	(1.507)	(3.518)	(1.770)	(3.587)	(3.719)	(4.262)	(2.087)	(3.546)
	0.005***	0.003***	0.005***	0.004***	0.005***	0.002*	0.004***	0.004***
pol_right	(4.773)	(2.672)	(4.232)	(2.859)	(4.010)	(1.718)	(3.451)	(2.830)
	0.006		0.009		0.005		0.021***	
british	(0.982)		(1.400)		(0.719)		(3.325)	
	-0.020		-0.017***		-0.025***		-0.016***	
french	(-4.061)		(-3.066)		(-4.516)		(-2.916)	
	0.000		-0.006		-0.008		-0.025***	
COMESA	(-0.019)		(-0.942)		(-1.221)		(-3.756)	
	-0.006		-0.010		-0.007		-0.019***	
ECOWAS	(-0.750)		(-1.317)		(-0.822)		(-2.602)	
	-0.006		-0.002		0.001		-0.004	
Elect_system	(-1.619)		(-0.504)		(0.241)		(-0.869)	
	0.055***	0.026***	0.056***	0.024**	0.054***	0.029***	0.045***	0.027**
Openness	(11.098)	(2.654)	(10.992)	(2.374)	(10.128)	(2.780)	(8.431)	(2.532)
	0.714***	0.667***	0.420***	0.513***	0.981***	0.855**	-0.012	0.066
ρ	(8.298)	(5.227)	(3.876)	(3.269)	(3.667)	(2.220)	(-0.295)	(1.040)
	-0.358***	-0.333***	0.005	-0.015	0.456	0.475	0.587***	0.631***
λ	(-2.983)	(-2.814)	(0.038)	(-0.101)	(0.590)	(0.601)	(9.661)	(6.130)
R^2	0.506	0.545	0.380	0.553	0.325	0.530	0.216	

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A16. Individual Tax Revenue–SADC

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	0.734***		0.819***		0.780***		0.046	
constant	(3.643)		(3.500)		(3.150)		(0.415)	
	-0.025	0.019	-0.016	0.018	-0.011	0.024**	-0.010	0.024**
aid_pc	(-1.433)	(1.403)	(-0.870)	(1.231)	(-0.582)	(2.312)	(-0.724)	(2.171)
	-0.023**	-0.068***	0.011	-0.065***	-0.013	-0.081***	-0.019***	-0.085***
gdp_pc	(-2.376)	(-4.827)	(0.896)	(-4.653)	(-1.268)	(-5.7530	(-2.763)	(-5.296)
	-0.044***		-0.025*		-0.048***		0.023	
land_area	(-3.009)		(-1.648)		(-2.909)		(1.619)	
	0.324***	-0.174**	0.286***	-0.182**	0.157**	-0.155***	0.256***	-0.214***
literacy	(4.886)	(-2.091)	(4.189)	(-2.011)	(2.489)	(-3.221)	(5.631)	(-3.547)
	-1.501***	-1.347***	-1.391***	-1.086***	-1.256***	-1.312***	-0.184	-1.235***
pop_0-14	(-4.152)	(-3.595)	(-3.601)	(-2.764)	(-3.273)	(-5.220)	(-0.940)	(-4.074)
	-0.158	1.780	-0.259**	1.831	-0.057	-1.007	0.217	1.564
pop_65+	(-1.210)	(1.347)	(-1.846)	(1.381)	(-0.412)	(-1.006)	(1.632)	(1.634)
	-0.008	0.014	0.016	0.020*	0.000	0.005	0.037***	0.013
IMF/WB_SAPs	(-0.702)	(1.347)	(1.228)	(1.845)	(0.012)	(0.565)	(3.768)	(1.474)
	0.007*	-0.001	-0.002	-0.002	0.004	-0.008***	-0.002	-0.003
pol_right	(1.761)	(-0.399)	(-0.412)	(-0.527)	(0.867)	(-2.943)	(-0.484)	(-0.961)
	0.014		0.022		-0.004		0.094***	
british	(0.7200		(0.990)		(-0.198)		(3.929)	
	-0.218***		-0.218***		-0.247***		-0.020	
french	(-6.287)		(-6.038)		(-5.599)		(-0.720)	
SADC								
Membership	0.011		0.034*		0.000		0.008	
Dummy	(0.684)		(1.885)		(0.023)		(0.648)	
	-0.060**	-0.023	-0.136***	-0.009	-0.167***	-0.038*	-0.065***	-0.007
Openness	(-2.546)	(-0.868)	(-7.098)	(-0.324)	(-6.278)	(-1.873)	(-4.304)	(-0.273)
	-0.566***	0.194	-0.167***	0.107	0.245*	0.161***	-0.577***	0.602***
ρ	(-5.503)	(1.509)	(-3.709)	(1.693)	(1.702)	(10.65)	(-9.735)	(7.4890
	0.099*	-0.183***	0.008	-0.065	-0.023*	-0.734***	0.149***	-0.420***
λ	(1.650)	(-5.351)	(0.038)	(-0.426)	(-1.725)	(-4.944)	(6.089)	(-4.728)
R^2	0.577	0.759	0.574	0.756	0.519	0.736	0.730	0.747

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A17. Corporate Tax Revenue–SADC

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	-0.362		-0.156		-0.352*		-0.123	
constant	(-1.390)		(-0.866)		(-1.743)		(-0.665)	
	-0.065***	-0.080***	-0.064***	-0.062***	-0.052***	-0.066***	-0.067***	-0.076***
aid_pc	(-3.843)	(-4.444)	(-3.609)	(-3.248)	(-2.756)	(-3.625)	(-3.652)	(-4.390)
	0.078***	0.043**	0.057***	0.038**	0.080***	0.029	0.079***	0.069***
gdp_pc	(8.175)	(2.364)	(5.661)	(2.127)	(8.585)	(1.493)	(6.854)	(3.000)
	-0.078***		-0.088***		-0.087***		-0.102***	
land_area	(-5.253)		(-6.007)		(-6.066)		(-5.271)	
	-0.194***	-0.204*	-0.254***	-0.188*	-0.196***	-0.581***	-0.180***	-0.125
literacy	(-3.205)	(-1.950)	(-3.7850	(-1.696)	(-3.103)	(-3.973)	(-2.829)	(-1.206)
	1.629***	0.981*	1.298***	0.118	1.878***	0.734	1.332***	0.794
pop_0-14	(4.106)	(1.921)	(4.213)	(0.225)	(5.171)	(1.622)	(4.494)	(1.609)
	0.079	2.360	0.078	2.704	0.164	1.798	-0.073	0.722
pop_65+	(0.578)	(1.380)	(0.682)	(1.592)	(1.237)	(1.070)	(-0.703)	(0.430)
	0.026**	0.007	0.009	0.012	0.016	0.007	0.022**	0.017
IMF/WB_SAPs	(2.148)	(0.528)	(0.669)	(0.880)	(1.339)	(0.570)	(1.997)	(1.242)
	-0.004	0.012**	0.001	0.011**	-0.003	0.011**	-0.003	0.009*
pol_right	(-0.940)	(2.583)	(0.153)	(2.239)	(-0.704)	(2.399)	(-0.787)	(1.854))
	-0.067***		-0.081***		-0.068***		-0.101***	
british	(-3.290)		(-4.115)		(-3.459)		(-3.768)	
	-0.109***		-0.124***		-0.101***		-0.163***	
french	(-3.011)		(-3.920)		(-2.929)		(-4.452)	
SADC								
Membership	-0.053***		-0.060***		-0.062***		-0.054***	
Dummy	(-3.429)		(-3.457)		(-3.784)		(-3.285)	
	-0.055***	-0.029	-0.042**	-0.084**	-0.067***	-0.037	-0.071***	-0.059
Openness	(-2.959)	(-0.783)	(-2.218)	(-2.181)	(-3.809)	(-1.081)	(-3.307)	(-1.403)
	0.107	0.173	0.077***	0.144***	-0.130	-0.580***	0.085	0.358***
ρ	(1.106)	(1.378)	(4.062)	(3.590)	(-1.116)	(-3.374)	(1.091)	(2.794)
	-0.095***	-0.169***	-0.069	-0.090	0.122***	0.333***	-0.090***	-0.194***
λ	(-4.418)	(-22.98)	(-0.378)	(-0.549)	(2.793)	(5.766)	(-17.58)	(-6.377)
R^2	0.570	0.583	0.588	0.544	0.574	0.560	0.567	0.555

Figures in parentheses are asymptotic t-statistics.
* significant at 10%; **significant at 5%; *** significant at 1%

Table A18. Value Added Tax–SADC

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	1.777***		0.229**		1.520***		1.511***	
constant	(7.302)		(2.141)		(6.885)		(5.725)	
	0.008	0.018	-0.007	0.019	-0.003	0.018	0.016	0.012
aid_pc	(0.409)	(1.026)	(-0.318)	(1.111)	(-0.157)	(1.043)	(0.805)	(0.943)
	-0.021*	0.003	-0.002	0.005	-0.029***	0.003	-0.032**	-0.008
gdp_pc	(-1.946)	(0.192)	(-0.235)	(0.314)	(-2.664)	(0.173)	(-2.380)	(-0.424)
	-0.094***		-0.107***		-0.001		-0.057**	
land_area	(-5.610)		(-6.037)		(-0.031)		(-2.593)	
	-0.633***	-0.448***	-0.433***	-0.464***	-0.743***	-0.317***	-0.571***	-0.198***
literacy	(-8.714)	(-4.341)	(-5.405)	(-4.669)	(-9.249)	(-3.020)	(-7.793)	(-2.750)
	-2.259***	-2.304***	0.156	-2.337***	-2.123***	-1.910***	-1.772***	-1.562***
pop_0-14	(-5.463)	(-5.310)	(0.771)	(-5.385)	(-5.142)	(-4.243)	(-4.273)	(-4.143)
	-0.230	-1.606	0.690***	-1.563	-0.123	-1.278	0.116	-0.764
pop_65+	(-1.529)	(-1.006)	(6.538)	(-0.985)	(-0.812)	(-0.868)	(0.832)	(-0.683)
	0.025*	-0.005	-0.019	-0.008	0.018	-0.004	0.020	-0.001
IMF/WB_SAPs	(1.790)	(-0.400)	(-1.213)	(-0.621)	(1.317)	(-0.271)	(1.514)	(-0.096)
	0.021***	0.007	0.029***	0.007	0.019***	0.006	0.020***	0.007*
pol_right	(4.456)	(1.600)	(5.850)	(1.490)	(4.257)	(1.296)	(4.164)	(1.765)
	-0.092***		-0.046**		-0.024		-0.024	
british	(-4.035)		(-2.028)		(-0.876)		(-0.943)	
	-0.209***		-0.136***		-0.135***		-0.193***	
french	(-4.865)		(-4.089)		(-2.782)		(-4.463)	
SADC Membership	0.090***		0.044**		0.088***		0.086***	
Dummy	(5.062)		(2.068)		(4.976)		(4.631)	
	-0.195***	-0.119***	-0.205***	-0.117***	-0.118***	-0.109***	-0.195***	-0.077**
Openness	(-8.690)	(-3.590)	(-8.668)	(-3.580)	(-3.889)	(-3.475)	(-7.935)	(-2.496)
	-0.456***	-0.051	0.091***	-0.005	-0.720***	0.536***	-0.003	0.405***
ρ	(-4.205)	(-0.398)	(4.708)	(-0.115)	(-5.088)	(3.380)	(-0.039)	(7.098)
	0.067***	-0.027	-0.218***	-0.104	0.140***	-0.335***	-0.047***	-0.451***
λ	(13.69)	(-0.576)	(-7.319)	(-1.113)	(21.052)	(-11.852)	(-1697)	(-10.57)
R^2	0.600	0.740		0.740	0.615	0.739	0.570	0.726
Observations	242	242	242	242	242	242	242	242

Figures in parentheses are asymptotic t-statistics.
* significant at 10%; **significant at 5%; *** significant at 1%

Table A19. Excise Tax-SADC

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	-1.123**		-0.506**		-1.202***		-1.362***	
constant	(-2.439)		(-2.591)		(-4.577)		(-3.801)	
	-0.106***	-0.032*	-0.069**	-0.035*	-0.125***	-0.038*	-0.106***	-0.025
aid_pc	(-3.263)	(-1.659)	(-2.087)	(-1.849)	(-4.212)	(-1.928)	(-3.888)	(-1.211)
	0.033*	-0.012	0.014	-0.017	0.017	-0.014	0.010	-0.014
gdp_pc	(1.901)	(-0.638)	(0.777)	(-0.924)	(1.117)	(-0.756)	(0.712)	(-0.697)
	0.088***		0.060		-0.031		-0.017	
land_area	(3.106)		(2.180)**		(-1.195)		(-0.596)	
	0.203	0.249**	0.134	0.244**	0.871***	0.264**	0.311***	0.154*
literacy	(1.454)	(2.247)	(1.121)	(2.239)	(6.473)	(2.340)	(3.423)	(1.801)
	1.849**	1.710***	0.738**	1.608***	2.723***	1.726***	2.526***	1.073**
pop_0-14	(2.489)	(3.374)	(2.054)	(3.234)	(4.516)	(3.392)	(4.502)	(2.428)
	0.046	5.748***	-0.342**	5.744***	0.070	5.973***	0.771***	3.196**
pop_65+	(0.188)	(3.253)	(-1.995)	(3.292)	(0.320)	(3.436)	(3.462)	(2.143)
	-0.046**	-0.002	-0.071***	-0.003	-0.048***	-0.004	-0.037**	-0.009
IMF/WB_SAPs	(-2.238)	(-0.141)	(-2.988)	(-0.195)	(-2.645)	(-0.289)	(-2.029)	(-0.722)
	0.015**	-0.007	0.018**	-0.007	0.013**	-0.008	0.009	-0.007*
pol_right	(2.095)	(-1.499)	(2.302)	(-1.490)	(1.982)	(-1.527)	(1.435)	(-1.674)
	0.113***		0.094***		0.058*		-0.034	
british	(3.088)		(2.604)		(1.868)		(-0.755)	
	0.273***		0.201***		0.249***		-0.059	
french	(4.032)		(3.864)		(4.579)		(-0.703)	
SADC Membership	0.055**		0.037		0.055**		0.021	
Dummy	(1.971)		(1.151)		(2.155)		(0.856)	
	0.236***	-0.020	0.219***	-0.013	0.077**	-0.015	0.204***	-0.003
Openness	(6.946)	(-0.556)	(5.994)	(-0.363)	(2.257)	(-0.415)	(7.020)	(-0.083)
	-0.363	0.207	-0.008	-0.001	-0.804***	-0.144	-0.638***	0.307***
ρ	(-1.459)	(1.366)	(-0.155)	(-0.023)	(-9.395)	(-0.985)	(-7.564)	(3.309)
	0.064	-0.153***	-0.171**	0.012	0.288***	0.048	0.020	-0.303***
λ	(0.268)	(-3.651)	(-2.070)	(0.268)	(15.032)	(1.412)	(1.083)	(-9.907)
R^2	0.419	0.821	0.400	0.821	0.545	0.821	0.537	0.820
Observations	242	242	242	242	242	242	242	242

Figures in parentheses are asymptotic t-statistics.
* significant at 10%; **significant at 5%; *** significant at 1%

Table A20: International Trade Taxes–SADC

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	-0.298		-0.123		-0.592		-0.649**	
constant	(-1.080)		(-1.075)		(-1.549)		(-2.253)	
	0.079***	-0.007	0.084**	0.036	0.086***	-0.004	0.062*	0.013
aid_pc	(2.690)	(-0.254)	(2.601)	(1.407)	(2.768)	(-0.146)	(1.909)	(0.489)
	-0.092***	-0.070**	-0.113***	0.085**	-0.117***	-0.070**	-0.097***	-0.102***
gdp_pc	(-5.289)	(-2.549)	(-7.084)	(2.570)	(-6.981)	(-2.511)	(-4.511)	(-3.314)
	0.117***		0.071***		0.054**		0.019	
land_area	(4.776)		(2.786)		(2.076)		(0.647)	
	-0.044	-0.079	0.371**	0.079	0.209*	-0.032	0.233**	-0.222*
literacy	(-0.422)	(-0.452)	(3.347)	(0.532)	(1.942)	(-0.198)	(2.213)	(-1.674)
	0.939	1.300**	0.127	3.005***	1.131*	2.805***	1.099**	1.081
pop_0-14	(1.579)	(2.027)	(0.515)	(4.701)	(1.704)	(3.654)	(2.322)	(1.519)
	1.114***	2.866	0.719***	-0.233	1.096***	0.953	0.916***	3.177
pop_65+	(5.113)	(1.264)	(5.037)	(-0.101)	(4.633)	(0.370)	(6.050)	(1.410)
	0.008	0.051***	0.032	0.067***	-0.013	0.056**	-0.024	0.066***
IMF/WB_SAPs	(0.448)	(2.835)	(1.466)	(3.628)	(-0.621)	(2.540)	(-1.262)	(3.295)
	-0.024***	-0.020***	-0.032**	-0.018***	-0.023***	-0.030***	-0.027***	-0.026***
pol_right	(-3.611)	(-3.079)	(-4.442)	(-2.746)	(-3.178)	(-4.061)	(-3.755)	(-3.708)
	0.111***		0.042		0.081**		0.005	
british	(3.386)		(1.278)		(2.267)		(0.131)	
	0.141**		0.037		0.123**		0.078	
french	(2.450)		(0.801)		(1.964)		(1.622)	
SADC Membership	-0.144***		-0.124***		-0.177***		-0.174***	
Dummy	(-5.518)		(-3.998)		(-6.466)		(-6.255)	
	0.168***	-0.008	0.218***	-0.007	0.213***	0.004	0.212***	-0.004
Openness	(4.954)	(-0.166)	(6.040)	(-0.143)	(5.876)	(0.069)	(5.907)	(-0.077)
	-0.655***	-0.774***	-0.041*	-0.265***	-0.152	-0.216**	0.063	0.311***
ρ	(-5.760)	(-5.634)	(-1.945)	(-7.008)	(-1.441)	(-2.095)	(0.751)	(4.097)
	0.238***	0.390***	-0.315*	0.322***	0.055***	-0.041	-0.114**	-0.251***
λ	(5.341)	(4.079)	(-1.653)	(10.236)	(3.276)	(-1.158)	(-2.025)	(-3.303)
R^2	0.678	0.702	0.646	0.655	0.621	0.708	0.626	0.712
Observations	242	242	242	242	242	242	242	242

Figures in parentheses are asymptotic t-statistics.
* significant at 10%; **significant at 5%; *** significant at 1%

Table A21. General Public Services–SADC

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	0.073		-0.071		-0.231		-0.398***	
constant	(0.211)		(-0.624)		(-1.274)		(-2.745)	
	-0.055**	0.015	-0.039*	0.008	-0.054**	0.024	-0.061***	0.026
aid_pc	(-2.356)	(0.449)	(-1.695)	(0.203)	(-2.538)	(0.799)	(-2.959)	(0.699)
	-0.027**	-0.080*	-0.047***	-0.054	-0.038***	-0.081**	0.021	-0.089*
gdp_pc	(-2.122)	(-1.765)	(-4.256)	(-1.358)	(-3.460)	(-2.000)	(1.389)	(-1.787)
	0.115***		0.091***		0.075***		0.053**	
land_area	(5.677)		(4.860)		(4.489)		(2.191)	
	-0.345***	-0.229	-0.305***	-0.232	-0.138*	-0.155	-0.032	-0.224
literacy	(-2.808)	(-1.051)	(-3.651)	(-0.963)	(-1.743)	(-1.108)	(-0.462)	(-1.115)
	0.370	-0.953	0.328	-0.408	1.364***	-1.314*	0.812***	-1.267
pop_0-14	(0.747)	(-0.864)	(1.489)	(-0.348)	(3.046)	(-1.802)	(3.215)	(-1.292)
	-0.009	1.557	0.081	1.932	0.354**	-0.995	-0.317***	1.684
pop_65+	(-0.050)	(0.436)	(0.731)	(0.526)	(2.107)	(-0.343)	(-2.618)	(0.524)
	0.002	0.014	-0.053***	0.025	0.014	0.005	-0.017	0.014
IMF/WB_SAPs	(0.096)	(0.472)	(-3.197)	(0.822)	(0.956)	(0.197)	(-1.317)	(0.472)
	-0.002	-0.003	0.007	-0.001	-0.001	-0.008	-0.001	-0.004
pol_right	(-0.428)	(-0.266)	(1.376)	(-0.104)	(-0.204)	(-1.013)	(-0.282)	(-0.346)
	0.098***		0.108***		0.092***		0.016	
british	(3.457)		(4.479)		(4.050)		(0.495)	
	0.184***		0.176***		0.191***		0.161***	
french	(3.914)		(5.075)		(4.773)		(4.479)	
SADC Membership	0.041**		0.009		0.021		0.052***	
Dummy	(2.002)		(0.402)		(1.075)		(2.829)	
	0.138***	-0.012	0.160***	-0.007	0.049**	-0.038	0.118***	-0.011
Openness	(5.505)	(-0.163)	(6.401)	(-0.095)	(2.174)	(-0.644)	(4.356)	(-0.129)
	-0.208	0.292*	0.075***	0.205	-1.012***	1.158***	0.209***	0.602**
ρ	(-1.262)	(1.752)	(4.166)	(1.589)	(-8.062)	(3.660)	(2.793)	(2.178)
	-0.010	-0.182***	-0.215***	-0.264***	0.325***	-0.723**	-0.257***	-0.336***
λ	(-0.227)	(-17.142)	(-7.979)	(-4.873)	(3.778)	(-2.534)	(-7.375)	(-24.32)
R^2	0.386	0.370	0.460	0.395	0.531	0.344	0.477	0.413
Observations	242	242	242	242	242	242	242	242

Figures in parentheses are asymptotic t-statistics.
* significant at 10%; **significant at 5%; *** significant at 1%

Table A22: Defense–SADC

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	-0.271		-0.048*		-0.327		0.329***	
constant	(-1.274)		(-1.655)		(-1.347)		(4.253)	
	0.019	-0.074**	-0.009	-0.062**	0.012	-0.051	0.007	-0.020
aid_pc	(1.142)	(-2.075)	(-0.679)	(-2.099)	(0.804)	(-1.538)	(0.536)	(-0.795)
	0.003	0.037	-0.024***	0.039	0.005	0.026	-0.015*	0.013
gdp_pc	(0.349)	(1.208)	(-4.090)	(1.395)	(0.596)	(0.7940	(-1.842)	(0.606)
	0.037***		0.063***		0.037***		0.064***	
land_area	(2.699)		(5.613)		(2.802)		(3.913)	
	0.073	-0.491**	0.132***	-0.170	0.115**	-0.680**	0.058	-0.549
literacy	(1.372)	(-2.166)	(2.855)	(-1.002)	(2.185)	(-2.056)	(1.332)	(-2.571)
	0.500	0.598	-0.141*	0.022	0.402	0.488	-0.486***	-0.496
pop_0-14	(1.488)	(0.696)	(-1.691)	(0.028)	(1.281)	(0.599)	(-3.660)	(-0.695)
	0.079	1.793	-0.078	2.778	0.030	2.051	-0.198***	1.236
pop_65+	(0.642)	(0.608)	(-1.374)	(1.063)	(0.258)	(0.6770	(-2.678)	(0.545)
	-0.018*	0.017	0.004	0.012	-0.020**	0.003	-0.026***	-0.006
IMF/WB_SAPs	(-1.780)	(0.733)	(0.484)	(0.572)	(-1.994)	(0.123)	(-3.142)	(-0.365)
	0.008**	0.011	0.003	0.010	0.006	0.010	0.000	0.009
pol_right	(2.360)	(1.224)	(0.930)	(1.408)	(1.595)	(1.192)	(-0.048)	(1.603)
	0.047***		0.072***		0.046**		0.066***	
british	(2.621)		(4.784)		(2.506)		(3.055)	
	0.056*		0.100***		0.036		-0.020	
french	(1.744)		(4.698)		(1.099)		(-0.787)	
SADC Membership	0.004		0.020		0.005		-0.007	
Dummy	(0.287)		(1.552)		(0.376)		(-0.629)	
	-0.041**	-0.042	0.008	-0.089	-0.035**	-0.046	0.011	-0.004
Openness	(-2.500)	(-0.599)	(0.573)	(-1.516)	(-1.987)	(-0.782)	(0.552)	(-0.108)
	0.014	-0.214	-0.230***	0.163***	0.422***	-0.826***	0.479***	-0.482***
ρ	(0.088)	(-0.767)	(-7.461)	(2.654)	(2.843)	(-0.782)	(7.318)	(-6.820)
	-0.045	0.284***	0.510	-0.079	-0.244***	0.566***	-0.387***	0.647***
λ	(-0.290)	(53.782)	(1.329)	(-0.623)	(-6.978)	(5.779)	(-10.08)	(107.1)
R^2	0.359	0.236	0.561	0.291	0.385	0.265	0.497	0.356
Observations	242	242	242	242	242	242	242	242

Figures in parentheses are asymptotic t-statistics.
* significant at 10%; **significant at 5%; *** significant at 1%

Table A23: Education–SADC

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	0.479***		0.113*		0.551***		0.434***	
constant	(3.175)		(1.681)		(3.227)		(3.181)	
	-0.007	0.028	-0.006	0.010	-0.004	0.024	-0.014	0.018
aid_pc	(-0.564)	(0.723)	(-0.493)	(0.261)	(-0.414)	(0.619)	(-1.208)	(0.518)
	0.003	0.016	0.019***	-0.011	0.000	0.010	0.008	0.005
gdp_pc	(0.411)	(0.463)	(3.526)	(-0.289)	(-0.027)	(0.259)	(1.561)	(0.126)
	-0.048***		-0.030***		-0.039***		-0.032***	
land_area	(-4.813)		(-2.839)		(-3.462)		(-2.762)	
	0.150***	-0.392	0.201***	-0.382	0.087*	-0.364	0.217***	-0.306
literacy	(3.014)	(-1.516)	(4.842)	(-1.624)	(1.940)	(-1.414)	(6.020)	(-1.541)
	-0.508**	-1.790*	-0.017	-2.159**	-0.531**	-2.029**	-0.492**	-1.862**
pop_0-14	(-2.146)	(-1.894)	(-0.138)	(-2.180)	(-2.337)	(-1.966)	(-2.140)	(-2.0620
	-0.238***	-1.488	-0.046	-1.465	-0.221***	-1.736	-0.258**	-1.639
pop_65+	(-2.7750	(-0.451)	(-0.762)	(-0.402)	(-2.729)	(-0.507)	(-2.453)	(-0.528)
	-0.034***	-0.008	-0.021***	-0.004	-0.031***	-0.011	-0.031***	-0.006
IMF/WB_SAPs	(-4.477)	(-0.269)	(-2.626)	(-0.122)	(-3.883)	(-0.397)	(-3.904)	(-0.242)
	-0.008***	0.006	-0.009***	0.007	-0.007***	0.006	-0.011***	0.005
pol_right	(-2.952)	(0.581)	(-3.261)	(0.708)	(-2.883)	(0.5710	(-3.888)	(0.566)
	-0.010		0.029*		-0.001		-0.003	
british	(-0.743)		(1.833)		(-0.043)		(-0.176)	
	-0.130***		-0.092***		-0.116***		-0.113***	
french	(-5.284)		(-5.095)		(-4.884)		(-4.494)	
SADC Membership	0.000		-0.001		0.000		0.004	
Dummy	(0.005)		(-0.077)		(-0.040)		(0.429)	
	0.011	-0.098	0.002	-0.111	0.008	-0.122*	0.046***	-0.120*
Openness	(0.928)	(-1.380)	(0.168)	(-1.506)	(0.613)	(-1.696)	(3.026)	(-1.724)
	-0.034	-0.404	-0.074***	-0.193*	0.265**	0.276	-0.480***	0.305*
ρ	(-0.213)	(-1.412)	(-2.896)	(-1.707)	(2.327)	(0.731)	(-4.424)	(1.831)
	-0.004	0.285***	0.189	0.133**	-0.194***	-0.042**	0.083***	-0.129***
λ	(-0.051)	(8.646)	(1.327)	(1.989)	(-19.45)	(-2.272)	(13.06)	(-3.528)
R^2	0.559	0.487	0.577	0.488	0.574	0.464	0.562	0.519
Observations	242	242	242	242	242	292	242	242

Figures in parentheses are asymptotic t-statistics.
* significant at 10%; **significant at 5%; *** significant at 1%

Table A24: Health–SADC

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	0.133		0.037		0.036		0.103	
constant	(1.086)		(0.630)		(0.910)		(0.851)	
	0.007	-0.029	0.013	-0.031	0.000	-0.033	0.008	-0.026
aid_pc	(0.722)	(-0.617)	(1.275)	(-0.693)	(0.044)	(-0.714)	(0.845)	(-0.486)
	-0.001	-0.009	0.003	-0.015	-0.002	-0.019	-0.003	-0.018
gdp_pc	(-0.170)	(-0.195)	(0.562)	(-0.354)	(-0.565)	(-0.4190	(-0.568)	(-0.374)
	0.009		0.007		0.023***		0.015	
land_area	(1.058)		(0.773)		(3.378)		(1.547)	
	-0.016	0.242	-0.046	0.129	0.011	0.249	-0.013	0.179
literacy	(-0.453)	0.902)	(-1.205)	(0.463)	(0.312)	(0.941)	(-0.408)	(0.774)
	-0.241	1.708	-0.044	1.032	0.057	1.599	-0.194	1.291
pop_0-14	(-1.164)	(1.390)	(-0.406)	(0.811)	(0.330)	(1.382)	(-0.987)	(1.154)
	0.065	5.619	0.138**	4.609	0.116*	5.965	0.084	4.434
pop_65+	(0.870)	(1.294)	(2.583)	(1.075)	(1.791)	(1.391)	(1.025)	(1.136)
	0.005	-0.002	0.001	-0.001	0.009*	-0.003	0.010	-0.006
IMF/WB_SAPs	(0.832)	(-0.045)	(0.188)	(-0.017)	(1.746)	(-0.073)	(1.338)	(-0.194)
	0.003	-0.007	0.004*	-0.007	0.002	-0.007	0.003	-0.007
pol_right	(1.439)	(-0.610)	(1.799)	(-0.590)	(0.837)	(-0.547)	(1.405)	(-0.661)
	0.013		0.021		0.034***		0.021	
british	(1.144)		(1.585)		(3.7040		(1.487)	
	-0.007		0.005		0.046***		0.003	
french	(-0.333)		(.299)		(2.756)		(0.155)	
SADC Membership	0.012		0.002		-0.007		0.011	
Dummy	(1.377)		(0.176)		(-0.803)		(1.277)	
	-0.005	-0.024	-0.012	-0.043	0.001	-0.014	-0.002	-0.007
Openness	(-0.426)	(-0.276)	(-1.125)	(-0.499)	(0.144)	(-0.159)	(-0.150)	(-0.074)
	-0.139	0.294	-0.017	-0.165	-1.733***	0.014	-0.172*	0.223
ρ	(-1.010)	(0.799)	(-0.383)	(-0.974)	(-11.71)	(0.4310	(-1.940)	(0.907)
	0.062	-0.229	0.192	0.158*	0.606***	-0.007	0.034***	-0.170***
λ	(0.519)	(-0.488)	(1.273)	(1.798)	(7.096)	(-1.312)	(4.552)	(-7.513)
R^2	0.097	0.017	0.106	0.029	0.465		0.119	
Observations	242	242	242	242	242	242	242	242

Figures in parentheses are asymptotic t-statistics.
* significant at 10%; **significant at 5%; *** significant at 1%

Table A25: Transportation and Communication-SADC

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	0.303***		0.009		0.293**		0.153**	
constant	(2.631)		(0.117)		(2.507)		(2.023)	
	0.008	-0.012	0.003	0.032	0.008	-0.041	0.004	-0.005
aid_pc	(0.944)	(-0.204)	(0.316)	(0.615)	(0.877)	(-0.330)	(0.418)	(-0.091)
	-0.003	-0.068	0.011	0.102*	-0.001	-0.025	0.003	-0.002
gdp_pc	(-0.580)	(-1.110)	(2.122)**	(1.940)	(-0.186)	(-0.131)	(0.531)	(-0.048)
	-0.009		-0.004		-0.006		0.000	
land_area	(-1.207)		(-0.534)		(-0.697)		(0.037)	
	-0.185***	-0.029	-0.117***	0.098	-0.202***	-0.662	-0.146***	0.299
literacy	(-6.283)	(-0.060)	(-3.487)	(0.315)	(-6.122)	(-0.889)	(-4.817)	(0.494)
	-0.389**	0.852	0.090	1.652	-0.370*	2.202	-0.209	1.372
pop_0-14	(-2.062)	(0.601)	(0.698)	(1.332)	(-1.918)	(0.613)	(-1.5890	(0.847)
	0.003	2.813	0.137	-0.253	0.020	-4.453	0.045	1.177
pop_65+	(0.051)	(0.558)	(2.569)**	(-0.053)	(0.294)	(-0.361)	(0.947)	(0.219)
	-0.010*	0.046	-0.001	0.068*	-0.010*	0.056	-0.001	0.007
IMF/WB_SAPs	(-1.733)	(1.159)	(-0.227)	(1.775)	(-1.750)	(0.528)	(-0.216)	(0.177)
	0.008***	-0.016	0.007***	-0.010	0.008***	-0.038	0.006***	-0.008
pol_right	(3.770)	(-1.112)	(3.363)	(-0.709)	(3.863)	(-0.979)	(2.937)	(-0.617)
	0.010		0.025		0.014		0.031***	
british	(0.982)		(2.398)**		(1.399)		(2.713)	
	-0.072***		-0.040***		-0.067***		-0.037***	
french	(-3.983)		(-2.647)		(-3.754)		(-2.717)	
SADC Membership	-0.012		-0.006		-0.010		-0.011	
Dummy	(-1.570)		(-0.629)		(-1.2010		(-1.432)	
	0.061***	-0.003	0.053***	-0.015	0.063***	-0.047	0.064***	-0.132
Openness	(6.447)	(-0.029)	(5.164)	(-0.164)	(5.947)	(-0.172)	(6.200)	(-1.472)
	0.184	-0.930***	-0.051**	-0.213***	0.123	-0.094	0.257***	-0.615***
ρ	(1.573)	(-2.987)	(-2.1950	(-5.677)	(1.167)	(-1.315)	(3.479)	(-6.205)
	-0.004	0.550***	-0.108	0.820***	-0.005	0.233***	-0.148***	0.491***
λ	(-0.196)	(4.120)	(-0.736)	(3.501)	(-0.072)	(17.401)	(-18.67)	(106.8)
R^2	0.570	0.158	0.540	0.218	0.561		0.543	
Observations	242	242	242	242	242	242	242	242

Figures in parentheses are asymptotic t-statistics.
* significant at 10%; **significant at 5%; *** significant at 1%

Table A26: SSA Tax Revenues–Generalized Spatial Two Stage Least Squares (GS2SLS) Estimations

	$W^{CONTIGUITY}$				
Variable	**Individual Tax**	**Corporate Tax**	**VAT**	**Excise Taxes**	**Int. Trade Taxes**
	0.390***	0.003	0.786***	0.434***	0.454**
constant	(4.975)	(0.043)	(8.014)	(3.652)	(2.485)
	0.007	-0.033***	0.068***	0.000	-0.022
aid_pc	(1.056)	(-4.755)	(7.682)	(0.046)	(-1.508)
	0.001	0.042***	-0.027***	0.014**	-0.099***
gdp_pc	(0.323)	(9.456)	(-4.858)	(2.326)	(-10.865)
	0.043***	0.011	0.031***	-0.040***	-0.070***
land_area	(6.216)	(1.624)	(3.608)	(-4.622)	(-5.229)
	0.022	-0.090***	-0.044*	0.029	0.014
literacy	(1.142)	(-4.652)	(-1.818)	(1.081)	(0.333)
	-0.851***	0.120	-1.500***	-0.411**	0.149
pop_0-14	(-5.586)	(0.775)	(-8.241)	(-2.063)	(0.464)
	-0.217***	-0.066	-0.287***	-0.530***	0.440***
pop_65+	(-3.524)	(-1.047)	(-3.737)	(-5.861)	(3.405)
	0.008	0.007	0.014*	-0.023***	0.014
IMF/WB_SAPs	(1.261)	(1.159)	(1.8710	(-2.725)	(1.049)
	0.003*	-0.003*	-0.011***	0.010***	-0.018***
pol_right	(1.651)	(-1.762)	(-4.694)	(3.835)	(-4.586)
	0.043***	0.011	0.104***	-0.031**	-0.088***
british	(4.538)	(1.141)	(8.039)	(-2.462)	(-4.381)
	-0.002	-0.030***	0.018	-0.071***	0.032*
french	(-0.252)	(-3.646)	(1.482)	(-5.374)	(1.732)
	0.025**	0.057***	0.125***	0.083***	-0.098***
COMESA	(1.999)	(4.976)	(8.418)	(5.428)	(-4.003)
	0.007	0.039***	0.041**	0.017	-0.014
ECOWAS	(0.513)	(3.021)	(2.416)	(0.976)	(-0.496)
	0.042***	0.005	0.022**	-0.004	-0.050***
Elect_system	(6.925)	(0.823)	*2.547)	(-0.568)	(-4.070)
	-0.030***	0.012	-0.046***	0.039***	0.093***
Openness	(-3.089)	(1.266)	(-4.122)	(3.539)	(4.494)
	0.262***	0.578	0.119**	-0.565***	-0.264***
ρ	(4.334)	(8.339)	(1.970)	-4.635)	(-3.744)
	-0.109	-0.252***	-0.066	0.118	0.0951
λ	(-1.571)	(-3.760)	(-0.767)	(1.305)	(0.655)
Observations	660	660	660	660	660

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A27: SSA Expenditures–GS2SLS

	$W^{CONTIGUITY}$				
Variable	**Gen. Public Expenditures**	**Defense**	**Education**	**Health**	**Transport & Communication**
	0.539***	0.434***	-0.085	0.087	0.045
constant	(3.739)	(4.914)	(-1.008)	(1.299)	(0.714)
	0.031***	0.023***	-0.024***	0.001	0.018***
aid_pc	(2.839)	(2.914)	(-3.476)	(0.232)	(3.302)
	-0.044***	-0.003	0.014***	-0.004	-0.003
gdp_pc	(-4.567)	(-0.471)	(2.588)	(-1.033)	(-0.589)
	-0.018*	0.001	-0.023***	0.005	0.002
land_area	(-1.677)	(0.185)	(-4.080)	(1.0130	(0.426)
	0.017	-0.105***	0.069***	0.034**	-0.038**
literacy	(0.512)	(-4.680)	(3.364)	(2.062)	(-2.325)
	-0.546**	-0.130	0.456***	-0.052	-0.035
pop_0-14	(-2.245)	(-0.880)	(3.429)	(-0.497)	(-0.335)
	-0.476***	0.045	0.070	0.056	0.031
pop_65+	(-4.068)	(0.646)	(1.108)	(1.112)	(0.630)
	-0.029***	-0.028***	0.002	0.001	0.009*
IMF/WB_SAPs	(-3.203)	(-4.281)	(0.251)	(0.204)	(1.770)
	0.003	0.006***	-0.002	0.000	0.004***
pol_right	(1.085)	(3.119)	(-1.417)	(0.274)	(3.017)
	-0.016	-0.026**	0.021**	0.016**	0.015**
british	(-1.079)	(-2.506)	(2.252)	(1.982)	(1.964)
	0.012	-0.031***	-0.001	0.001	-0.018**
french	(0.790)	(-3.039)	(-0.111)	(0.109)	(-2.453)
	-0.024	0.001	-0.007	-0.003	-0.012
COMESA	(-1.319)	(0.051)	(-0.703)	(-0.343)	(-1.551)
	-0.058***	-0.082***	-0.021	-0.020**	-0.006
ECOWAS	(-3.050)	(-5.933)	(-1.628)	(-1.984)	(-0.566)
	-0.003	-0.045***	0.014*	0.001	0.010*
elect_system	(-0.296)	(-5.899)	(1.920)	(0.135)	(1.856)
	0.071***	-0.068***	0.026***	0.007	0.047***
Openness	(5.665)	(-8.126)	(3.459)	(1.220)	(7.555)
	0.389***	-0.749***	-0.301***	-0.694***	-0.465***
ρ	(4.096)	(-13.834)	(-2.693)	(-7.181)	(-3.210)
	-0.222***	0.500***	0.499***	0.500***	0.499***
λ	(-2.525)	(8.285)	(9.075)	(11.59)	(11.58_
Observations	660	660	660	660	660

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A28: SADC Tax Revenues–GS2SLS

			$W^{CONTIGUITY}$		
Variable	**Individual Tax**	**Corporate Tax**	**VAT**	**Excise Taxes**	**Int. Trade Taxes**
	0.701***	-0.263	1.522***	-2.372***	-0.299
constant	(3.035)	(-1.009)	(5.881)	(-4.933)	(-0.765)
	-0.035*	-0.053***	-0.039**	-0.120***	0.053*
aid_pc	(-1.864)	(-2.892)	(-1.974)	(-4.160)	(1.741)
	-0.032***	0.075***	-0.048***	-0.014	-0.072***
gdp_pc	(-3.014)	(6.664)	(-4.085)	(-0.812)	(-3.812)
	-0.026	-0.079***	-0.068***	0.128***	0.089***
land_area	(-1.444)	(-4.586)	(-3.814)	(4.818)	(3.080)
	0.289***	-0.208***	-0.277***	0.512***	0.201*
literacy	(3.871)	(-3.262)	(-3.840)	(3.970)	(1.893)
	-1.393***	1.567***	-2.412***	2.963***	0.565
pop_0-14	(-3.781)	(3.759)	(-6.094)	(4.311)	(0.914)
	-0.175	0.125	-0.613***	-0.136	1.096***
pop_65+	(-1.340)	(0.886)	(-4.229)	(-0.627)	(4.881)
	0.008	0.024**	0.013	-0.056***	0.028
IMF/WB_SAPs	(0.729)	(1.966)	(0.983)	(-3.125)	(1.436)
	0.003	-0.006	0.041***	0.019***	-0.019***
pol_right	(0.664)	(-1.454)	(8.897)	(2.874)	(-2.775)
	0.027	-0.061**	-0.043*	0.241***	0.077*
british	(1.043)	(-2.311)	(-1.646)	(5.841)	(1.847)
	-0.143**	-0.125**	-0.112*	0.679***	-0.071
french	(-2.170)	(-2.069)	(-1.902)	(6.909)	(-0.760)
	0.025	-0.065***	0.129***	0.093***	-0.148***
SADC Year Dummy	(1.442)	(-3.896)	(7.374)	(3.708)	(-5.437)
	0.034	-0.014	0.097***	0.235***	-0.092**
Elect_system	(1.078)	(-0.524)	(3.668)	(5.791)	(-2.280)
	-0.030	-0.052**	-0.134***	0.318***	0.162***
Openness	(-1.270)	(-2.305)	(-5.533)	(9.357)	(4.294)
	-0.665***	0.147	-0.549***	0.048	-0.732***
ρ	(-5.073)	(1.387)	(-5.305)	(0.208)	-6.186)
	0.499***	0.019	0.134*	0.062	0.192*
λ	(7.768)	(0.285)	(1.922)	(0.612)	(1.807)
Observations	242	242	242	242	242

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A29. SADC Expenditures–GS2SLS

	$W^{CONTIGUITY}$				
Variable	**Gen. Public Expenditures**	**Defense**	**Education**	**Health**	**Transport & Communication**
	0.133	0.262	0.942***	0.104	0.420***
constant	(0.396)	(1.489)	(6.080)	(0.756)	(3.474)
	-0.053**	0.014	0.003	-0.001	0.011
aid_pc	(-2.237)	(0.974)	(0.208)	(-0.102)	(1.133)
	-0.034**	0.003	0.000	-0.012**	-0.006
gdp_pc	(-2.358)	(0.316)	(-0.053)	(-2.000)	(-1.093)
	0.129***	0.015	-0.001	0.023**	-0.005
land_area	(5.903)	(1.143)	(-0.060)	(2.423)	(-0.560)
	-0.509***	0.056	0.058	-0.024	-0.281***
literacy	(-4.209)	(1.015)	(0.982)	(-0.606)	(-8.349)
	0.508	-0.075	-0.619**	-0.158	-0.455**
pop_0-14	(1.049)	(-0.263)	(-2.474)	(-0.717)	(-2.291)
	-0.109	-0.010	-0.101	0.004	0.011
pop_65+	(-0.627)	(-0.091)	(-1.097)	(0.053)	(0.169)
	0.004	-0.007	-0.024***	0.002	-0.004
IMF/WB_SAPs	(0.220)	(-0.744)	(-3.069)	(0.324)	(-0.672)
	-0.007	0.002	-0.055***	-0.002	0.006***
pol_right	(-1.290)	(0.535)	(-16.315)	(-0.638)	(2.967)
	0.122***	-0.017	-0.018	0.034**	0.034**
british	(3.989)	(-0.948)	(-1.183)	(2.452)	(2.540)
	0.300***	-0.081*	-0.186***	0.074**	-0.062*
french	(4.307)	(-1.871)	(-4.822)	(2.271)	(-1.874)
	0.029	0.003	0.005	0.018*	-0.016*
SADC Year Dummy	(1.335)	(0.188)	(0.409)	(1.715)	(-1.712)
	0.066**	-0.065***	-0.010	0.047***	-0.005
elect_system	(2.149)	(-3.592)	(-0.6470	(3.411)	(-0.355)
	0.136***	-0.053***	0.030**	0.027**	0.051***
Openness	(4.793)	(-3.043)	(1.983)	(2.020)	(4.569)
	-0.645***	-0.588***	-0.162***	-0.762***	-0.271
ρ	(-4.029)	(-3.961)	(-6.313)	(-5.061)	(-1.627)
	0.285***	0.499***	0.499***	0.499***	0.500***
λ	(3.435)	(9.792)	(11.15)	(12.81)	(15.16)
Observations	242	242	242	242	242

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A30. Tax Revenue/Expenditures Ratio–SSA

	SSA					
Variable	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}	
	GMM	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	1.446***		-0.074		0.107	
constant	(2.738)		(-0.147)		(0.965)	
	-0.063	0.059	-0.046	0.076	-0.006	0.148**
aid_pc	(-1.308)	(1.034)	(-0.943)	(1.136)	(-0.110)	(2.392)
	0.204***	0.140*	0.241***	0.225**	0.309***	0.465***
gdp_pc	(6.448)	(1.923)	(8.070)	(2.471)	(8.122)	(5.409)
	0.177***		0.163***		0.230***	
land_area	(3.267)		(2.900)		(3.999)	
	0.560***	0.112	0.692***	0.146	0.642***	0.596***
literacy	(3.092)	(0.300)	(3.784)	(0.447)	(3.991)	(2.699)
	-1.705*	1.798	1.078	5.696***	-0.671*	2.951*
pop_0-14	(-1.676)	(1.424)	(1.044)	(3.771)	(-1.691)	(1.824)
	-2.080***	0.439	-1.472***	0.332	-1.122***	0.505
pop_65+	(-5.493)	(0.760)	(-3.490)	(0.440)	(-3.651)	(0.654)
	-0.033	0.018	-0.022	0.058	-0.045	0.018
IMF/WB_SAPs	(-0.750)	(0.455)	(-0.506)	(1.238)	(-1.183)	(0.4340
	0.041***	0.033**	0.044***	0.049***	0.040***	0.065***
pol_right	(3.2140	(2.510)	(3.362)	(3.153)	(2.857)	(4.164)
	-0.002		0.001		-0.006*	
ttrend	(-0.690)		(0.151)		(-1.799)	
	0.216***		0.260***		0.280***	
British	(3.168)		(3.655)		(4.122)	
	0.059		0.147**		0.016	
French	(0.914)		(2.186)		(0.264)	
	-0.036		-0.105**		-0.053	
COMESA	(-0.699)		(-2.090)		(-1.093)	
	-0.191*		-0.057		-0.350***	
SADC	(-1.901)		(-0.600)		(-3.435)	
	0.071		0.149***		0.068	
Elect_system	(1.536)		(3.077)		(1.615)	
	0.154**	0.215**	0.088	0.277**	0.182**	0.563***
Openness	(2.245)	(1.974)	(1.308)	(2.129)	(2.466)	(4.386)
	-0.095***	-0.399***	-0.136***	-0.204***	0.028***	0.012
ρ	(-4.018)	(-9.029)	(-5.041)	(-4.331)	(3.079)	(1.081)
	0.026	0.186***	0.112**	0.086	0.166***	0.166***
λ	(1.244)	(7.254)	(2.308)	(1.559)	(12.090)	(11.966)
R^2	0.226	0.349	0.318	0.350	0.18	0.352
Observations	660	660	660	660	660	660

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A31. Tax Revenue/Expenditures Ratio–SADC

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	1.850***		-0.135		-2.132**	
constant	(2.955)		(-0.341)		(-2.052)	
	0.166	0.153	0.047	0.212	0.100	0.482***
aid_pc	(0.978)	(0.999)	(0.346)	(1.386)	(0.645)	(5.152)
	0.239***	0.362***	0.107*	0.523***	0.214***	0.275**
gdp_pc	(2.703)	(2.852)	(1.840)	(3.451)	(3.017)	(2.063)
	0.236*		0.455***		0.234	
land_area	(1.869)		(3.993)		(1.489)	
	0.703	-0.753	0.090	-0.155	0.375	0.316
literacy	(1.240)	(-0.752)	(0.189)	(-0.173)	(0.597)	(0.533)
	-3.206**	6.332*	-1.294	10.446***	4.099*	2.291
pop_0-14	(-2.304)	(1.779)	(-1.364)	(2.777)	(1.903)	(0.863)
	-1.751**	-17.308	-0.135	-17.965	-1.465	1.032
pop_65+	(-2.456)	(-1.371)	(-0.221)	(-1.288)	(-1.284)	(0.114)
	0.036	0.080	0.029	0.090	0.056	-0.069
IMF/WB_SAPs	(0.336)	(0.802)	(0.305)	(0.806)	(0.478)	(-0.862)
	0.035	0.013	0.045	-0.024	0.049	0.044
pol_right	(0.938)	(0.343)	(1.452)	(-0.609)	(1.337)	(1.593)
	-0.027**		-0.009		-0.003	
ttrend	(-2.365)		(-1.029)		(-0.285)	
	0.510***		0.882***		0.158	
British	(2.990)		(5.803)		(0.553)	
	0.012		0.650***		0.930***	
French	(0.051)		(3.233)		(2.749)	
SADC						
Membership	-0.142		-0.208		-0.005	
Dummy	(-0.914)		(-1.582)		(-0.030)	
	0.209	0.550**	0.403***	0.788***	0.553***	0.033
Openness	(1.148)	(2.017)	(2.831)	(2.796)	(3.123)	(0.153)
	-0.282***	-0.320***	-0.202***	-0.205***	-0.035	-0.145***
ρ	-6.838)	(-7.523)	(-8.329)	(-4.916)	(-1.251)	(-10.81)
	0.078***	0.149***	0.382**	0.136	-0.036**	0.247***
λ	(26.465)	(9.579)	(2.452)	(0.590)	(-1.983)	(8.658)
R^2	0.314	0.254	0.486	0.269	0.237	0.228
Observations	242	242	242	242	242	242

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A32. Moran I and LM Spatial Error Tests-SSA

	SSA							
	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**Moran I Statistic**	**LM Statistic**	**Moran I Statistic**	**LM Statistic**	**Moran I Statistic**	**LM Statistic**	**Moran I Statistic**	**LM Statistic**
Revenues (Shares of Total Revenue)								
	-2.696***	7.806***	-0.996	1.040	-3.501***	13.448***	-4.350***	20.054***
Individual Taxes	(0.007)	(0.005)	(0.319)	(0.308)	(0.0004)	(0.0002)	(0.00001)	(0.000007)
	3.290***	10.180***	0.998	0.910	2.686***	5.659**	-0.503	0.428
Corporate Taxes	(0.001)	(0.001)	(0.318)	(0.340)	(0.007)	(0.017)	(0.614)	(0.512)
	-1.290	1.928	1.964**	3.647*	-2.782***	8.787***	-3.062***	10.227***
VAT	(0.197)	(0.165)	(0.049)	(0.056)	(0.005)	(0.003)	(-0.002)	(0.001)
	-2.137**	4.998**	-0.775	0.642	-3.105***	10.764***	-2.813***	8.707***
Excises	(0.033)	(0.025)	(0.438)	(0.423)	(0.002)	(0.001)	(0.005)	(0.003)
	-1.327	2.031	-1.768*	3.181*	-0.505	0.547	-0.545	0.484
International Trade	(0.185)	(0.154)	(0.077)	(0.074)	(0.613)	(0.460)	(0.585)	(0.489)
Expenditures (Shares of Total Expenditure)								
	0.184	0.555	-2.654***	6.987***	1.012	0.579	0.184	0.001
Gen. Public Services	(0.854)	(0.456)	(0.008)	(0.008)	(0.311)	(0.447)	(0.854)	(0.971)
	-1.274	4.319**	-0.026	0.004	-3.043***	10.372***	-1.274	2.009
Defense	(0.202)	(0.037)	(0.979)	(0.953)	(0.002)	(0.001)	(0.202)	(0.156)
	-2.482**	7.002***	-0.233	0.069	-2.207**	5.763**	-2.482**	6.866***
Education	(0.013)	(0.008)	(0.815)	(0.792)	(0.027)	(0.013)	(0.013)	(0.009)
	-1.751*	15.071***	-0.701	0.522	-2.308**	6.247**	-1.751*	3.581*
Health	(0.079)	(0.0001)	(0.483)	(0.470)	(0.021)	(0.0123)	(0.079)	(0.058)
Transport and	-0.939	2.226	1.892*	3.339*	-0.050	0.079	-0.938	1.172
Communication	(0.348)	(0.135)	(0.058)	(0.068)	(0.959)	(0.777)	(0.348)	(0.279)

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A33. Moran I and LM Spatial Error Tests-SADC

	SADC							
Variable	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	Moran I Statistic	**LM Statistic**	**Moran I Statistic**	**LM Statistic**	**Moran I Statistic**	**LM Statistic**	**Moran I Statistic**	**LM Statistic**
Revenues (Shares of Total Revenue)								
Individual	-3.471***	13.987***	-0.555	0.354	-2.052**	4.833**	-2.588***	7.624***
Taxes	(0.005)	(0.0002)	(0.579)	(0.551)	(0.040)	(0.028)	(0.009)	(0.006)
Corporate	-1.275	2.762*	-1.219	1.534	-2.007**	4.640**	-2.483**	7.053***
Taxes	(0.202)	(0.09)	(0.222)	(0.215)	(0.044)	(0.031)	(0.013)	(0.008)
	-4.010***	14.751***	-1.117	1.298	-1.085	1.530	-2.595***	7.666***
VAT	(0.0001)	(0.0001)	(0.264)	(0.254)	(0.278)	(0.217)	(0.009)	(0.006)
	-0.772	1.855	-2.763***	7.487***	-1.261	1.992	-3.579***	14.117***
Excises	(0.440)	(0.173)	(0.005)	(0.006)	(0.207)	(0.158)	(0.0003)	(0.0002)
International	-0.528	2.131	-1.289	1.709	-3.113***	10.580***	-1.888*	4.232**
Trade	(0.598)	(0.144)	(0.197)	(0.191)	(0.002)	(0.001)	(0.059)	(0.040)
Expenditures (Shares of Total Expenditure)								
Gen. Public	-1.772*	4.059**	-2.711***	7.214***	-0.635	3.182*	-2.652***	7.984***
Services	(0.076)	(0.044)	(0.007)	(0.007)	(0.102)	(0.074)	(0.008)	(0.005)
	-0.336	0.433	0.446	0.141	-0.940	1.194	-1.012	1.383
Defense	(0.736)	(0.510)	(0.656)	(0.707)	(0.347)	(0.274)	(0.311)	(0.240)
	-0.611	0.193	-0.256	0.093	-0.023	0.034	-0.461	0.387
Education	(0.541)	(0.660)	(0.798)	(0.760)	(0.979)	(0.853)	(0.645)	(0.534)
	-0.700	1.128	-1.068	1.193	-0.101	0.067	-1.672*	3.385*
Health	(0.484)	(0.288)	(0.285)	(0.274)	(0.919)	(0.796)	(0.095)	(0.065)
Transport and								
Communicati	2.139**	2.905*	-1.682*	2.851*	-1.334	2.205	0.004	0.024
on	(0.032)	(0.088)	(0.092)	(0.091)	(0.182)	(0.137)	(0.997)	(0.877)

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A34. Results Summary Table-SSA

Coefficient	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	GMM	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
				Individual Taxes				
	0.061**	0.328***	0.043**	0.214***	0.013	0.076***	-0.021	0.052***
ρ	(2.149)	(12.244)	(2.114)	(5.633)	(1.178)	(5.928)	(-1.224)	(4.744)
	-0.038***	-0.209***	-0.079	-0.056	0.149***	-0.021***	0.137***	0.224***
λ	(-3.303)	(-9.938)	(-0.940)	(-0.416)	(17.314)	(-23.313)	(30.033)	(6.720)
				Corporate Taxes				
	0.046*	0.092*	0.040*	0.061	0.022***	0.011*	-0.017	-0.015
ρ	(2.203)	(2.354)	(1.669)	(1.407)	(4.062)	(1.732)	(-1.270)	(-1.045)
	-0.003	-0.026***	0.059**	0.040	0.144***	0.119***	0.128***	0.125***
λ	(-0.603)	(-3.355)	(2.222)	(0.966)	(14.158)	(18.602)	(36.548)	(32.63)
				Value Added Taxes				
	0.236***	0.296***	0.141***	0.012	0.067***	-0.005	0.021	0.060***
ρ	(8.031)	(8.865)	(5.546)	(0.260)	(6.808)	(-0.323)	(1.492)	(6.626)
	-0.093***	-0.204***	0.057	0.012	-0.038***	0.106***	0.146***	0.213***
λ	(-120.4)	(-5.356)	(0.872)	(0.146)	(-40.39)	(19.261)	(19.939)	(6.416)
				Excise Taxes				
	0.014	0.399***	-0.045	0.269***	-0.114***	0.049***	-0.084***	-0.025
ρ	(0.403)	(13.228)	(-1.402)	(7.395)	(-7.903)	(4.696)	(-4.694)	(-1.185)
	-0.037	-0.230***	-0.036	-0.148***	0.092***	-0.046***	0.136***	0.125***
λ	(-1.281)	(-3.731)	(-0.783)	(-2.699)	(62.77)	(-8.541)	(28.768)	(19.61)
				International Trade Taxes				
	0.017	-0.124**	-0.021	-0.040	-0.009	0.066***	0.024**	0.067***
ρ	(0.898)	(-2.314)	(-0.979)	(-0.735)	(-0.853)	(5.659)	(2.020)	(7.062)
	-0.022	0.031***	0.231***	-0.128***	0.104***	-0.026***	0.165***	0.277***
λ	(-0.773)	(18.873)	(19.723)	(-12.751)	(28.58)	(-50.34)	(17.796)	(5.526)
				General Public Services				
	0.203***	-0.341***	0.077***	0.011	0.062***	0.042***	0.061***	0.043***
ρ	(5.543)	(-6.321)	(6.911)	(0.204)	(10.369)	(6.188)	(5.7500	(4.320)
	-0.092***	0.155***	-0.284***	-0.188	0.213***	-0.061***	0.234***	-0.069***
λ	(-8.261)	(2.906)	(-3.145)	(-0.866)	(10.49)	(-11.44)	(6.611)	(-29.67)
				Defense				
	-0.052*	0.105*	-0.195***	-0.206***	-0.001	0.041***	0.057***	0.073***
ρ	(-1.763)	(1.860)	(-8.351)	(-4.653)	(-0.059)	(4.865)	(4.217)	(6.307)
	-0.013	-0.041***	0.500***	0.361**	0.164***	0.223***	0.233***	0.307***
λ	(-1.449)	(-3.432)	(2.614)	(2.120)	(18.966)	(11.12)	(11.490)	(4.643)

Coefficient	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
	GMM	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
				Education				
	0.102***	0.302***	0.095***	0.262***	-0.048***	-0.011	0.054***	0.083***
ρ	(5.617)	(8.502)	(5.709)	(5.190)	(-3.405)	(-0.464)	(4.136)	(6.154)
	-0.031***	-0.178*	0.022	-0.019	0.111***	0.134***	0.203***	-0.113***
λ	(-42.47)	(-2.122)	(0.301)	(-0.198)	(28.329)	(21.01)	(12.364)	(-834.7)
				Health				
	0.171***	0.328***	-0.195***	-0.366***	-0.057***	-0.286***	-0.002	-0.027
ρ	(5.021)	(8.020)	(-9.013)	(-8.397)	(-3.160)	(-7.335)	(-0.175)	(-1.1940
	-0.148	-0.176***	0.489**	0.487*	0.161***	0.083***	-6.088***	0.188***
λ	(-13.232)	(-10.678)	(2.193)	(1.913)	(25.95)	(75.384)	(800.11)	(16.39)
				Transportation and Communication				
	-0.073***	-0.014	-0.067***	-0.005	0.014	-0.050***	-0.030*	0.031*
ρ	(-2.707)	(-0.245)	(-2.741)	(-0.093)	(1.291)	(-2.766)	(-1.894)	(1.737)
	0.032	0.026	0.072	0.028	0.202***	0.113***	0.163***	0.205***
λ	(0.911)	(1.038)	(0.568)	(0.217)	(9.230)	(31.429)	(19.824)	(12.55)

Table A35. Results Summary Table-SADC

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
				Individual Taxes				
	-0.132***	0.319***	-0.167***	0.107	-0.010	0.003	-0.435***	0.405***
ρ	(-2.685)	(6.032)	(-3.709)	(1.693)	(-0.595)	(0.171)	(-14.803)	(7.532)
	-0.016***	-0.209***	0.008	-0.065	-0.020***	-0.013***	0.706***	-0.247***
λ	(-22.343)	(-67.808)	(0.038)	(-0.426)	(-3.573)	(-12.171)	(15.22)	(-18.42)
				Corporate Taxes				
	0.181***	0.226***	0.077***	0.144***	-0.027***	0.022	-0.079**	-0.375***
ρ	(5.219)	(6.241)	(4.062)	(3.590)	(-3.4040	(1.300)	(-2.164)	(-6.809)
	-0.092***	-0.167***	-0.069	-0.090	-0.002	-0.017***	-0.009	0.160***
λ	(-11.35)	(-42.296)	(-0.378)	(-0.549)	(-0.325)	(-3.944)	(-1.637)	(18.381)
				Value Added Taxes				
	0.036	-0.196***	0.091***	-0.005	0.025	0.055**	-0.001	-0.150***
ρ	(0.838)	(-3.995)	(4.708)	(-0.115)	(1.237)	(2.217)	(-0.037)	(-3.212)
	-0.132***	0.076***	-0.218***	-0.104	-0.027**	-0.027***	-0.050***	0.060***
λ	(-121.529)	(42.360)	(-7.319)	(-1.113)	(-2.163)	(-3.633)	(-4.168)	(3.193)
				Excise Taxes				
	-0.133*	0.116**	-0.008	-0.001	-0.011	0.017	-0.480***	0.111
ρ	(-1.746)	(2.283)	(-0.155)	(-0.023)	(-0.539)	(1.355)	(-5.251)	(1.623)
	-0.073	-0.101***	-0.171**	0.012	-0.031***	-0.014***	-0.048**	-0.134***
λ	(-1.143)	(-7.562)	(-2.070)	(0.268)	(-2.607)	(-3.781)	(-1.999)	(-9.238)
				International Trade Taxes				
	-0.067***	-0.193***	-0.041*	-0.265***	-0.011	0.001	-0.107**	-0.103**
ρ	(-2.798)	(-3.754)	(-1.945)	(-7.008)	(-0.945)	(0.086)	(-2.509)	(-2.222)
	0.011	0.076**	-0.315*	0.322***	-0.031***	-0.012***	-0.091***	-0.004*
λ	(0.776)	(2.038)	(-1.653)	(10.236)	(-6.892)	(-3.809)	(-6.849)	(-1.798)
				General Public Services				
	-0.032	0.292*	0.075***	0.205	-0.002	0.104**	0.107**	0.442***
ρ	(-0.558)	(1.752)	(4.166)	(1.589)	(-0.139)	(2.203)	(2.162)	(3.559)
	-0.094***	-0.182***	-0.215***	-0.264***	-0.018***	-0.161***	-0.149***	-0.431***
λ	(-4.474)	(-17.142)	(-7.979)	(-4.873)	(-33.40)	(-40.705)	(-51.81)	(-6.039)
				Defense				
	-0.168***	0.006	-0.230***	0.163***	0.033	0.001	0.075	-0.482***
ρ	(-3.2910	(0.061)	(-7.461)	(2.654)	(1.362)	(0.032)	(1.400)	(-6.820)
λ	0.075*	0.086***	0.510	-0.079	-0.024	0.015***	-0.084***	0.647***

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}		W^{GDPPC}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
	(1.679)	(6.628)	(1.329)	(-0.623)	(-0.989)	(57.953)	(-46.98)	(107.1)
				Education				
	-0.064***	-0.455***	-0.074***	-0.193*	0.012**	0.072	0.011	-0.478***
ρ	(-3.203)	(-4.7820	(-2.896)	(-1.707)	(2.555)	(1.388)	(0.407)	(-5.649)
	0.006	0.263***	0.189	0.133**	-0.005	-0.048***	-0.006***	0.253***
λ	(0.300)	(13.1070	(1.327)	(1.989)	(-0.992)	(-66.61)	(-3.210)	(17.86)
				Health				
	0.078	0.216*	-0.017	-0.165	0.001	0.014	-0.176***	-0.080
ρ	(1.321)	(1.903)	(-0.383)	(-0.974)	(0.049)	(0.4310	(-2.622)	(-0.456)
	-0.066	-0.230	0.192	0.158*	-0.033	-0.007	-0.053***	0.006
λ	(-19.422)	(-0.729)	(1.273)	(1.798)	(-1.383)	(-1.312)	(-4.252)	(0.069)
				Transportation and Communication				
	-0.166***	-0.284**	-0.051**	-0.213***	0.033***	-0.094	-0.129***	-0.615***
ρ	(-4.540)	(-2.295)	(-2.1950	(-5.677)	(3.657)	(-1.315)	(-3.275)	(-6.205)
	0.067***	0.164***	-0.108	0.820***	-0.009***	0.233***	0.023***	0.491***
λ	(3.161)	(131.8)	(-0.736)	(3.501)	(-5.660)	(17.401)	(3.261)	(106.8)

Table A36. Tax Revenues–Generalized Spatial Two Stage Least Squares (GS2SLS) Estimations

	$W^{CONTIGUITY}$				
Variable	**Individual Tax**	**Corporate Tax**	**VAT**	**Excise Taxes**	**Int. Trade Taxes**
			SSA		
ρ	0.038	0.047**	0.159***	-0.033	-0.002
	(1.465)	(2.234)	(8.336)	(-1.128)	(-0.097)
λ	-0.043	-0.004	-0.147*	-0.051	-0.030
	(-0.652)	(-0.049)	(-1.896)	(-0.595)	(-0.200)
			SADC		
ρ	-0.106*	-0.332***	-0.299***	-0.281***	-0.342***
	(-1.775)	(-7.137)	(-4.300)	(-4.223)	(-6.300)
λ	-0.043	-0.004	-0.147	-0.051	-0.030
	(-0.652)	(-0.049)	(-1.895)	(-0.595)	(-0.235)

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A37. Expenditures–GS2SLS

	$W^{CONTIGUITY}$				
Variable	**Gen. Public Expenditures**	**Defense**	**Education**	**Health**	**Transport & Communication**
			SSA		
ρ	0.135***	-0.054**	0.105***	0.211***	-0.090***
	(7.504)	(-2.090)	(6.891)	(10.306)	(-4.758)
λ	-0.146*	-0.018	-0.043	-0.170***	0.100***
	(-1.824)	(-0.284)	(-0.942)	(-5.446)	(3.148)
			SADC		
ρ	-0.106*	-0.332***	-0.299***	-0.281***	-0.342***
	(-1.775)	(-7.137)	(-4.300)	(0.067)	(-6.300)
λ	0.174	0.179***	0.199***	0.175***	0.206***
	(1.372)	(3.036)	(2.263)	(3.193)	(4.931

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A38. Tax Revenue/Expenditures Ratio

	$W^{CONTIGUITY}$		$W^{DISTANCE}$		W^{HDI}	
Variable	**GMM**	**GMM FE**	**GMM**	**GMM FE**	**GMM**	**GMM FE**
			SSA			
	-0.095***	-0.399***	-0.136***	-0.204***	0.028***	0.012
ρ	(-4.018)	(-9.029)	(-5.041)	(-4.331)	(3.079)	(1.081)
	0.026	0.186***	0.112**	0.086	0.166***	0.166***
λ	(1.244)	(7.254)	(2.308)	(1.559)	(12.090)	(11.966)
			SADC			
	-0.282***	-0.320***	-0.202***	-0.205***	-0.035	-0.145***
ρ	-6.838)	(-7.523)	(-8.329)	(-4.916)	(-1.251)	(-10.81)
	0.078***	0.149***	0.382**	0.136	-0.036**	0.247***
λ	(26.465)	(9.579)	(2.452)	(0.590)	(-1.983)	(8.658)

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A39. Spatial Coefficients Results: Selected Periods-SSA

	1980-1985	1986-1990	1991-1995	1996-2001
Coefficient	**GMM FE**	**GMM FE**	**GMM FE**	**GMM FE**
		Individual Taxes		
	-0.149**	-0.321***	0.316***	0.317***
ρ	(-2.162)	(-9.503)	(6.548)	(4.492)
	0.059***	0.189***	-0.194***	-0.220***
λ	(33.735)	(36.193)	(-42.969)	(-5.774)
		Corporate Taxes		
	0.310***	0.300***	-0.308***	-0.267***
ρ	(7.602)	(5.545)	(-5.959)	(-7.306)
	-0.210***	-0.273***	0.146***	0.130***
λ	(-6.872)	(-6.746)	(3.736)	(14.562)
		Value Added Taxes		
	-0.452***	0.144	0.255***	0.267***
ρ	(-11.921)	(1.326)	(3.347)	(6.769)
	0.517***	-0.123*	-0.172***	-0.167**
λ	(18.414)	(-1.829)	(-3.822)	(-6.555)
		Excise Taxes		
	0.259***	-0.086	-0.345***	0.244***
ρ	(4.309)	(-0.983)	(-2.874)	(6.275)
	-0.184***	0.009	0.111**	-0.145***
λ	(-4.220)	(0.111)	(2.279)	(-3.867)
		International Trade Taxes		
	-0.427***	-0.364***	0.264***	-0.222***
ρ	(-5.236)	(-5.573)	(4.275)	(-3.042)
	0.171***	0.178**	-0.214***	0.110***
λ	(2.473)	(2.350)	(-4.340)	(3.588)
		General Public Services		
	0.301***	-0.292***	0.253**	0.030
ρ	(5.772)	(-2.924)	(2.277)	(0.343)
	-0.195***	0.138***	-0.124***	-0.105***
λ	(-5.239)	(7.438)	(-4.709)	(-5.809)
		Defense		
	-0.076	0.412***	0.178**	0.095
ρ	(-0.915)	(5.116)	(2.577)	(1.319)
	0.006***	-0.165***	-0.075***	-0.047***
λ	(5.284)	(-4.852)	(-155.12)	(-5.131)
		Education		
	0.116	0.001	0.260***	0.222***
ρ	(1.371)	(0.016)	(3.198)	(3.707)
	-0.133***	-0.004	-0.139***	-0.176***
λ	(-4.147)	(-0.304)	(-4.526)	(-5.247)
		Health		
	0.281***	0.258***	-0.355***	0.166***
ρ	(7.147)	(3.785)	(-5.897)	(2.747)
	-0.209***	-0.176***	0.201**	-0.138***
λ	(-324.99)	(-4.216)	(2.268)	(-2.756)
		Transportation and Communication		
	0.406***	0.289***	0.406***	0.258***
ρ	(4.993)	(4.137)	(4.643)	(3.840)
	-0.182***	-0.123***	-0.300***	-0.066
λ	(-4.478)	(-3.095)	(-3.369)	(-0.943)

Table A40. Spatial Coefficients Results: Selected Periods-SADC

	1980-1985	1986-1990	1991-1995	1996-2001
Coefficient	**GMM FE**	**GMM FE**	**GMM FE**	**GMM FE**
		Individual Taxes		
	-0.513***	-0.140*	-0.171	0.014
ρ	(-8.281)	(-1.720)	(-1.449)	(0.166)
	0.154***	0.055***	0.045	-0.051***
λ	(12.57)	(2.652)	(1.272)	(-2.875)
		Corporate Taxes		
	0.228***	-0.316***	-0.215**	0.100
ρ	(3.028)	(-4.013)	(-2.341)	(1.409)
	-0.178***	0.130***	0.045***	-0.115***
λ	(-16.764)	(20.03)	(205.6)	(-24.18)
		Value Added Taxes		
	-0.709***	-0.390***	-0.427***	0.151**
ρ	(-6.187)	(-3.007)	(-4.680)	(2.135)
	0.219***	0.129***	0.200***	-0.140***
λ	(7.311)	(4.997)	(3.865)	(-22.249)
		Excise Taxes		
	0.299**	-0.052	0.077	0.234***
ρ	(2.206)	(-0.478)	(0.722)	(3.152)
	-0.067	0.001	-0.079***	-0.150***
λ	(-0.519)	(0.020)	(-70.29)	(-5.373)
		International Trade Taxes		
	-0.381***	-0.214***	0.212***	0.116*
ρ	(-4.862)	(-3.781)	(2.615)	(1.914)
	0.695***	0.093	-0.152***	0.006
λ	(17.09)	(1.184)	(-3.615)	(0.507)
		General Public Services		
	-0.549	-0.333	-0.457	0.093
ρ	(-0.941)	(-1.020)	(-1.080)	(0.190)
	0.218***	0.512***	0.244***	-0.107***
λ	(10.05)	(22.85)	(11.58)	(-106.4)
		Defense		
	-0.029	-0.299	-0.437**	-0.360**
ρ	(-0.065)	(-0.626)	(-1.850)	(-2.241)
	0.110***	0.437***	0.452***	0.440***
λ	(12.25)	(43.333)	(61.556)	(32.20)
		Education		
	-0.708	-0.615	0.126	0.016
ρ	(-0.770)	(-0.822)	(0.258)	(0.083)
	0.229***	0.355***	-0.072***	-0.022
λ	(33.124)	(22.46)	(-6.972)	(-1.600)
		Health		
	0.309	0.045	-0.464	0.227
ρ	(0.254)	(0.064)	(-0.822)	(0.794)
	-0.135	-0.151	0.504	-0.142
λ	(-0.401)	(-1.215)	(1.268)	(-0.518)
		Transportation and Communication		
	-0.392	-0.225	-0.153	0.120
ρ	(-0.669)	(-0.522)	(-0.252)	(0.330)
	0.403***	0.129***	0.134***	-0.004
λ	(20.126)	(11.15)	(10.08)	(-0.165)

Table A41. SSA Tax Revenues–Maximum Likelihood (MLE) Estimations

	$W^{CONTIGUITY}$				
Variable	**Individual Tax**	**Corporate Tax**	**VAT**	**Excise Taxes**	**Int. Trade Taxes**
	0.363***	-0.136*	0.796***	0.319	0.174
constant	(7.507)	(-1.657)	(25.484)	(1.182)	(1.015)
	0.005	-0.031***	0.067***	-0.010	-0.021
aid_pc	(0.744)	(-4.051)	(8.449)	(-0.917)	(-1.346)
	0.004	0.049***	-0.027***	0.011*	-0.098***
gdp_pc	(0.926)	(10.632)	(-5.252)	(1.821)	(-10.475)
	0.037***	0.021***	0.028***	-0.051***	-0.075***
land_area	(5.835)	(3.040)	(3.690)	(-5.454)	(-5.232)
	0.026	-0.080***	-0.046**	0.060	0.023
literacy	(1.554)	(-3.912)	(-2.336)	1.562)	(0.503)
	-0.735***	0.425***	-1.476***	-0.359	0.560*
pop_0-14	(-5.827)	(2.742)	(-10.751)	(-0.828)	(1.701)
	-0.223***	-0.009	-0.282***	-0.483***	0.535***
pop_65+	(-4.471)	(-0.147)	(-5.430)	(-2.964)	(4.062)
	0.007	-0.001	0.015**	-0.024***	0.009
IMF/WB_SAPs	(1.246)	(-0.189)	(2.065)	(-2.700)	(0.676)
	0.004**	-0.001	-0.011***	0.009***	-0.016***
pol_right	(2.363)	(-0.322)	(-4.927)	(3.534)	(-3.951)
	0.044***	0.027**	0.099***	-0.028*	-0.087***
british	(5.250)	(2.559)	(9.279)	(-1.923)	(-4.224)
	-0.009	-0.034***	0.013	-0.050***	0.015
french	(-1.168)	(-3.677)	(1.294)	(-3.363)	(0.778)
	0.009	0.047***	0.122***	0.082***	-0.105***
COMESA	(0.819)	(3.588)	(8.712)	(4.833)	(-4.175)
	-0.010	0.015	0.034**	0.030	-0.046*
ECOWAS	(-0.866)	(1.122)	(2.388)	(1.581)	(-1.655)
	0.043***	0.018***	0.018***	0.000	-0.055***
Elect_system	(7.881)	(2.9290	(2.607)	(-0.044)	(-4.270)
	-0.023**	0.024***	-0.045***	0.044***	0.120***
Openness	(-2.541)	(2.631)	(-4.258)	(3.492)	(6.410)
	0.127***	0.141***	0.075***	-0.019	-0.032***
ρ	(4.285)	(10.946)	(2.819)	(-0.220)	(-5.394)
	-0.155***	0.043	-0.087***	-0.086***	-0.007
λ	(-8.449)	(1.100)	(-7.720)	(-19.40)	(-0.095)
R^2	0.275	0.352	0.348	0.237	0.347
Observations	660	660	660	660	660

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A42. SSA Expenditures–Maximum Likelihood (MLE) Estimations

	$W^{CONTIGUITY}$				
Variable	**Gen. Public Expenditures**	**Defense**	**Education**	**Health**	**Transport & Communication**
	0.517***	0.421***	-0.078	-0.013	-0.001
constant	(9.012)	(41.951)	(-1.638)	(-0.779)	(-0.024)
	0.021**	-0.010*	-0.016***	0.007**	0.010**
aid_pc	(2.205)	(-1.675)	(-2.997)	(2.062)	(2.308)
	-0.041***	-0.019***	0.021***	0.000	0.003
gdp_pc	(-5.823)	(-4.277)	(4.894)	(-0.176)	(0.699)
	-0.015	0.002	-0.037***	0.001	-0.013***
land_area	(-1.444)	(0.297)	(-7.336)	(0.216)	(-2.994)
	-0.027	-0.037**	0.021	0.011	-0.063***
literacy	(-1.095)	(-2.270)	(1.423)	(1.156)	(-5.115)
	-0.424***	-0.262***	0.371***	-0.048***	-0.006
pop_0-14	(-7.304)	(-4.213)	(10.968)	(-6.782)	(-0.058)
	-0.356***	-0.237***	0.086*	0.114***	0.097**
pop_65+	(-5.589)	(-5.918)	(1.678)	(11.619)	(2.117)
	-0.024***	-0.028***	0.001	0.002	0.003
IMF/WB_SAPs	(-2.980)	(-6.264)	(0.207)	(0.898)	(0.906)
	0.001	0.003*	-0.001	0.001*	0.005***
pol_right	(0.353)	(1.852)	(-0.981)	(1.809)	(4.702)
	-0.017	-0.033***	0.012*	0.016***	0.008
british	(-1.210)	(-3.884)	(1.676)	(3.466)	(1.385)
	-0.013	0.001	-0.010	0.002	-0.022***
french	(-1.321)	(0.183)	(-1.488)	(0.441)	(-4.373)
	-0.003	-0.051***	-0.012	0.008	-0.004
COMESA	(-0.164)	(-5.221)	(-1.454)	(1.3930	(-0.607)
	-0.047***	-0.096***	-0.016*	0.010	-0.009
ECOWAS	(-2.830)	(-8.557)	(-1.666)	(1.547)	(-1.227)
	-0.011	-0.015***	0.006	-0.008***	-0.006
elect_system	(-1.257)	(-2.636)	(1.192)	(-2.716)	(-1.520)
	0.072***	-0.040***	0.011*	0.006	0.057***
Openness	(5.942)	(-5.145)	(1.756)	(1.3230	(11.26)
	0.194***	0.509***	0.232***	0.551***	0.365***
ρ	(8.760)	(15.16)	(6.284)	(36.85)	(10.31)
	-0.318***	-0.649***	-0.151***	-0.619***	-0.306
λ	(-6.172)	(-19.56)	(-15.45)	(-48.333)	(-12.34)
R^2	0.255	0.606	0.358	0.452	0.452
Observations	660	660	660	660	660

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A43. SADC Tax Revenues–Maximum Likelihood (MLE) Estimations

	$W^{CONTIGUITY}$				
Variable	**Individual Tax**	**Corporate Tax**	**VAT**	**Excise Taxes**	**Int. Trade Taxes**
	0.853***	-0.389*	1.471***	-1.474***	-0.081
constant	(3.705)	(-1.698)	(8.488)	(-3.608)	(-0.244)
	-0.025	-0.069***	-0.005	-0.099***	0.069**
aid_pc	(-1.602)	(-4.142)	(-0.561)	(-3.249)	(2.425)
	-0.012	0.078***	-0.037***	0.038**	-0.112***
gdp_pc	(-1.238)	(8.455)	(-6.016)	(2.279)	(-7.409)
	-0.031**	-0.079***	-0.157***	0.077***	0.118***
land_area	(-1.981)	(-5.317)	(-11.597)	(3.013)	(5.196)
	0.147*	-0.182***	-0.287***	0.300**	0.000
literacy	(1.761)	(-3.143)	(-4.968)	(2.537)	(0.000)
	-1.437***	1.767***	-1.903***	2.179***	0.352
pop_0-14	(-4.025)	(4.654)	(-7.505)	(3.438)	(0.641)
	-0.162	0.102	-0.190**	0.110	0.856***
pop_65+	(-1.258)	(0.762)	(-2.242)	(0.482)	(4.278)
	-0.016	0.023**	0.003	-0.047**	0.003
IMF/WB_SAPs	(-1.382)	(1.981)	(0.387)	(-2.363)	(0.172)
	0.008**	-0.004	0.016***	0.017**	-0.027***
pol_right	(92.13)	(-1.061)	(7.192)	(2.382)	(-4.231)
	0.013	-0.067***	-0.160***	0.121***	0.089***
british	(0.631)	(-3.334)	(-8.860)	(3.425)	(3.029)
	-0.220***	-0.102***	-0.333***	0.300***	0.101*
french	(-6.092)	(-2.917)	(-11.23)	(4.729)	(1.886)
	0.013	-0.055***	0.029***	0.054**	-0.136***
SADC Year Dummy	(0.926)	(-3.539)	(3.236)	(2.003)	(-5.340)
	-0.118***	-0.052***	-0.142***	0.232***	0.203***
Openness	(-4.854)	(-2.879)	(-8.403)	(6.926)	(6.709)
	-0.035	0.034	0.748***	-0.082	-0.515***
ρ	(-0.211)	(0.345)	(25.362)	(-0.442)	(-6.242)
	-0.369**	-0.143	-1.314***	0.005	0.408***
λ	(-2.182)	(-1.174)	(-289.3)	(0.025)	(4.502)
R^2	0.574	0.575	0.859	0.414	0.691
Observations	242	242	242	242	242

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

Table A44. SADC Expenditures-Maximum Likelihood (MLE) Estimations

	$W^{CONTIGUITY}$				
Variable	**Gen. Public Expenditures**	**Defense**	**Education**	**Health**	**Transport & Communication**
	-0.235	-0.268	0.378***	0.179*	0.293***
constant	(-0.755)	(-1.378)	(2.677)	(1.681)	(2.689)
	-0.034*	0.019	-0.008	0.005	0.008
aid_pc	(-1.741)	(1.295)	(-0.880)	(0.586)	(0.944)
	-0.036***	0.003	0.005	-0.002	-0.002
gdp_pc	(-3.138)	(0.408)	(0.917)	(-0.354)	(-0.514)
	0.095***	0.036***	-0.037***	0.008	-0.009
land_area	(4.665)	(2.787)	(-3.943)	(1.062)	(-1.278)
	-0.144	0.072	0.044	0.012	-0.185***
literacy	(-1.444)	(1.396)	(0.988)	(0.363)	(-5.824)
	0.464	0.518	-0.368*	-0.273	-0.367**
pop_0-14	`(1.025)	(1.628)	(-1.687)	(-1.538)	(-2.090)
	0.103	0.086	-0.169**	0.042	0.011
pop_65+	(0.638)	(0.755)	(-2.163)	(0.654)	(0.166)
	-0.005	-0.018	-0.030***	0.003	-0.010*
IMF/WB_SAPs	(-0.369)	(-1.831)	(-4.112)	(0.561)	(-1.888)
	-0.003	0.008**	-0.008***	0.003	0.008***
pol_right	(-0.652)	(2.446)	(-3.360)	(1.480)	(3.851)
	0.105***	0.047***	-0.003	0.012	0.011
british	(3.776)	(2.638)	(-0.236)	(1.227)	(1.081)
	0.165***	0.058*	-0.096***	-0.018	-0.070***
french	(3.568)	(1.891)	(-4.083)	(-1.006)	(-4.118)
	0.031*	0.004	0.000	0.012	-0.012
SADC Year Dummy	(1.774)	(0.258)	(-0.025)	(1.401)	(-1.529)
	0.167***	-0.041**	0.009	0.003	0.060***
Openness	(7.063)	(-2.573)	(0.797)	(0.314)	(6.528)
	0.318**	0.003	0.380***	-0.534***	0.143
ρ	(2.520)	(0.012)	(3.140)	(-4.474)	(0.886)
	-0.547***	-0.055	-0.466***	0.508***	-0.004
λ	(-4.235)	(-0.216)	(-3.422)	(4.975)	(-0.022)
	0.475	0.36	0.620	0.250	0.559
Observations	242	242	242	242	242

Figures in parentheses are asymptotic t-statistics.

* significant at 10%; **significant at 5%; *** significant at 1%

APPENDIX B: FIGURES

Figure 1. Corporate Taxes-SADC

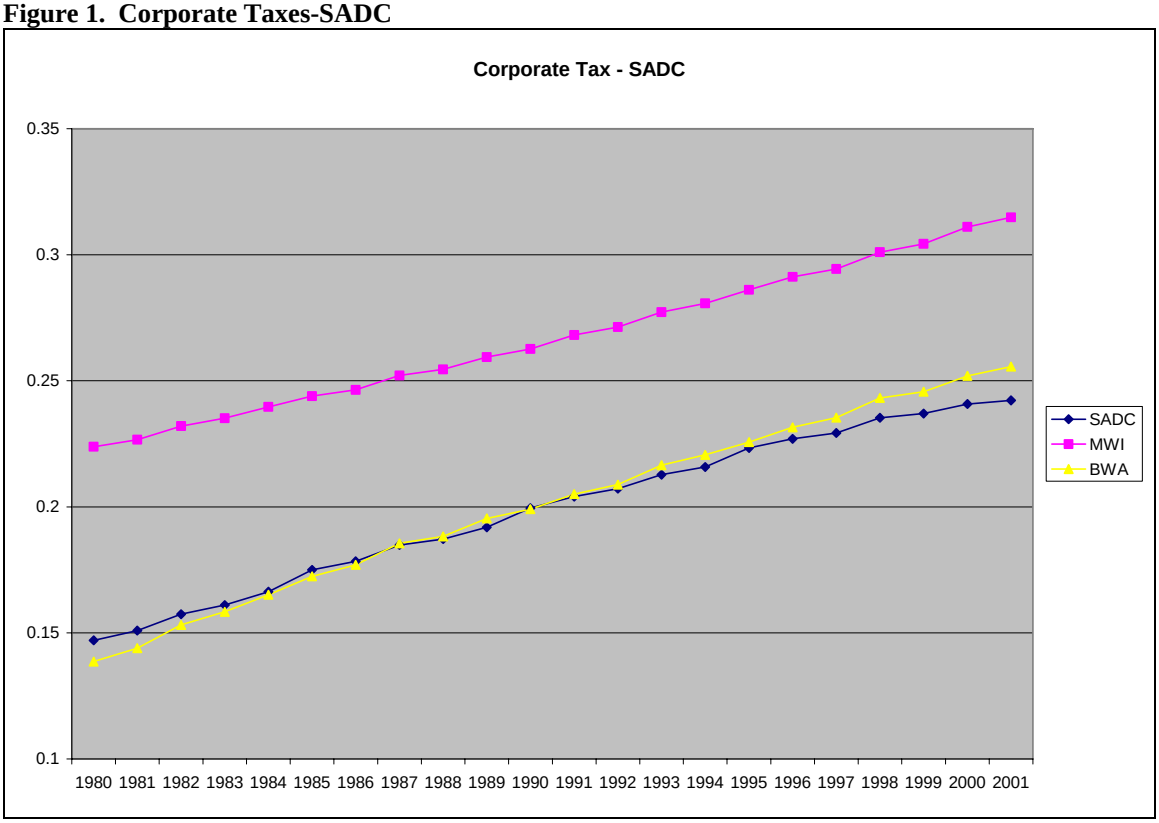


Figure 2. VAT-SADC

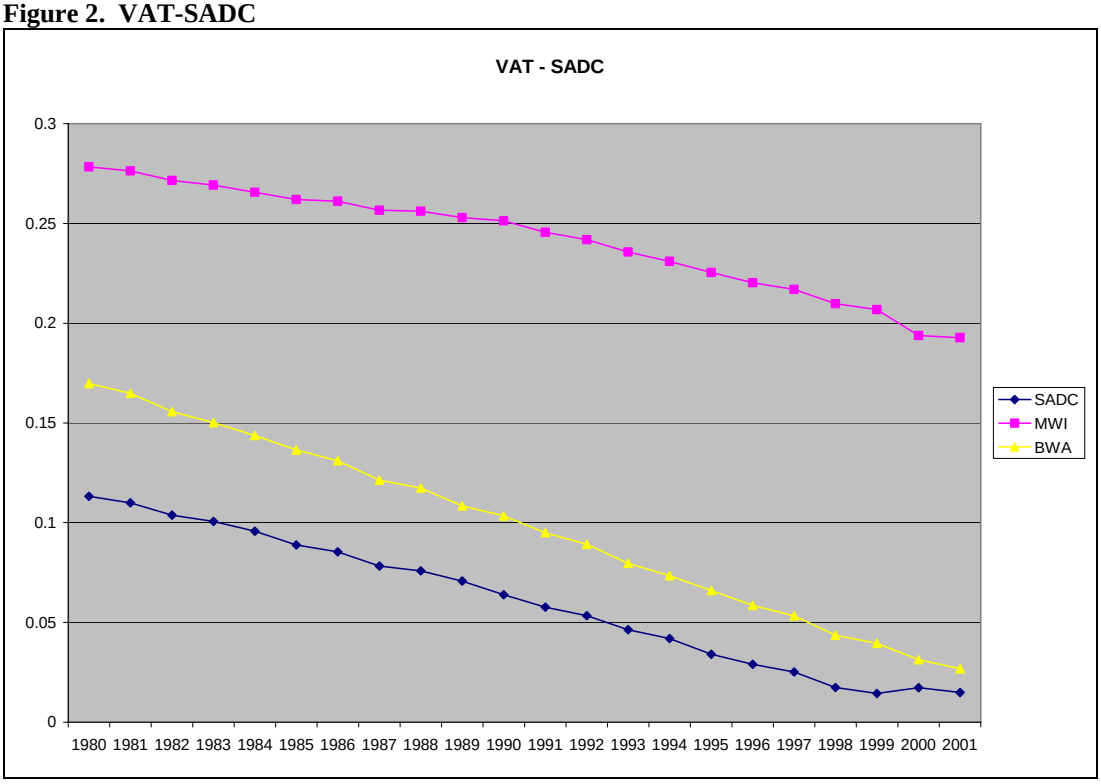


Figure 3. Excise Taxes-SADC

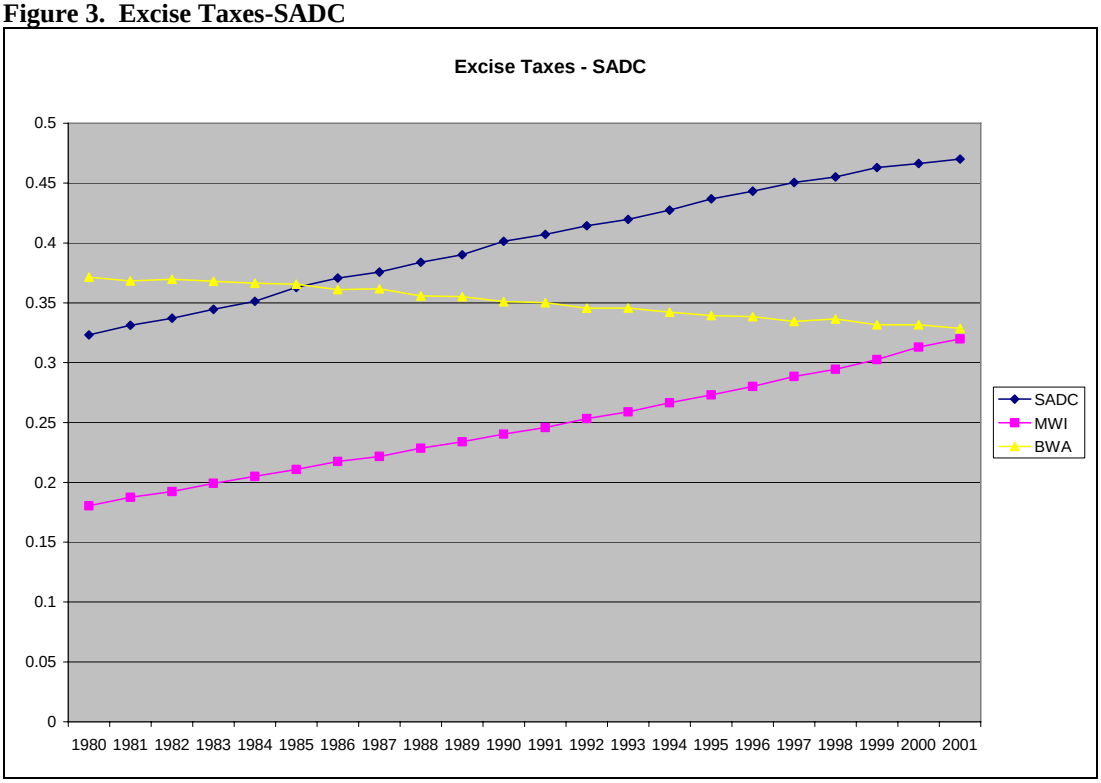


Figure 4. International Trade Taxes-SADC

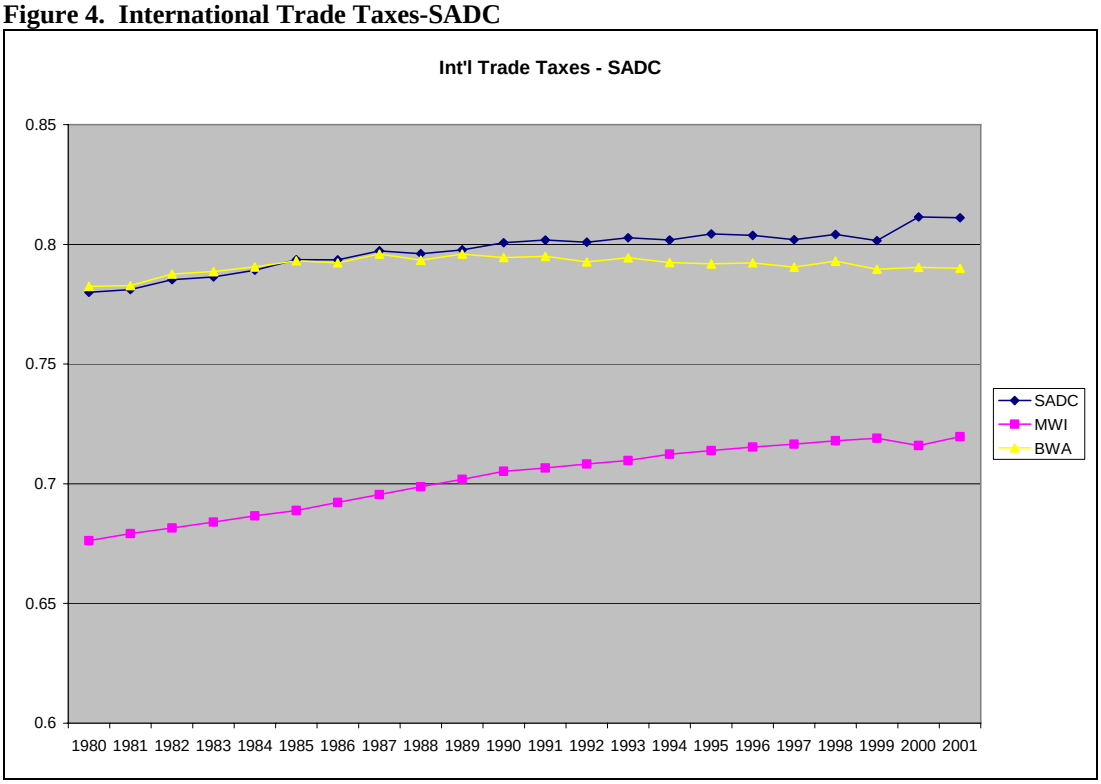


Figure 5. General Public Services-SADC

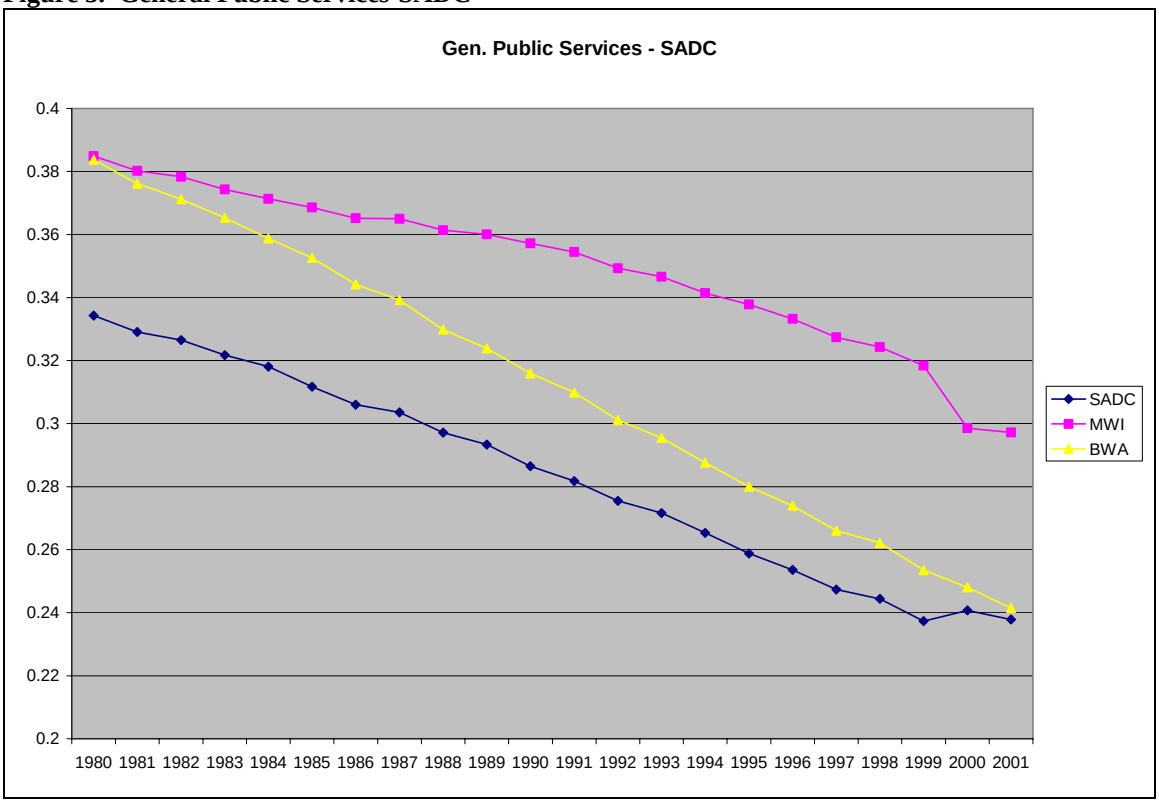


Figure 6. Defense Expenditures-SADC

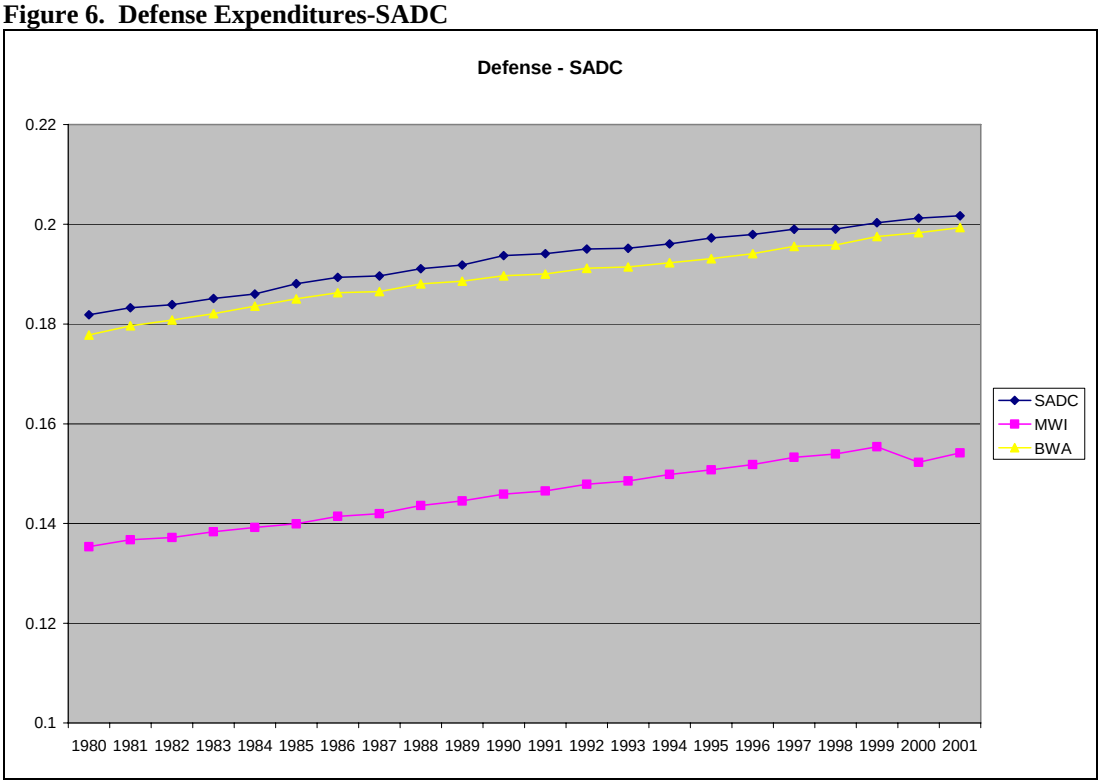


Figure 7. Individual Taxes-SSA

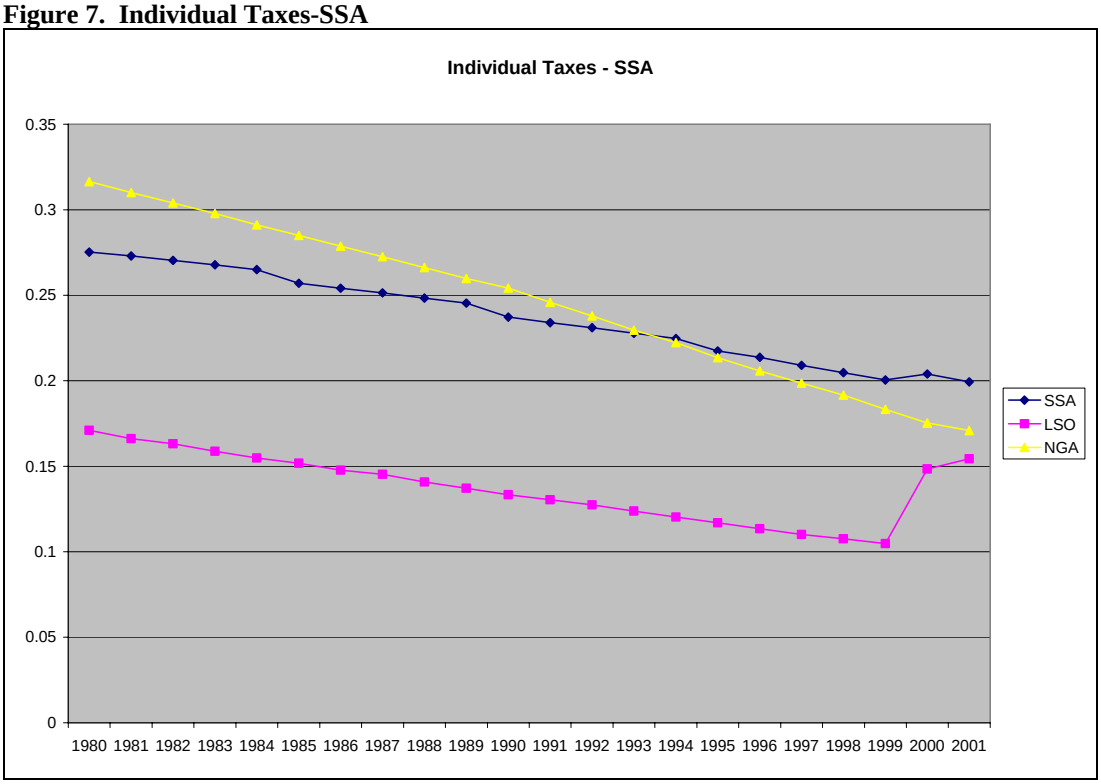


Figure 8. Corporate Taxes-SSA

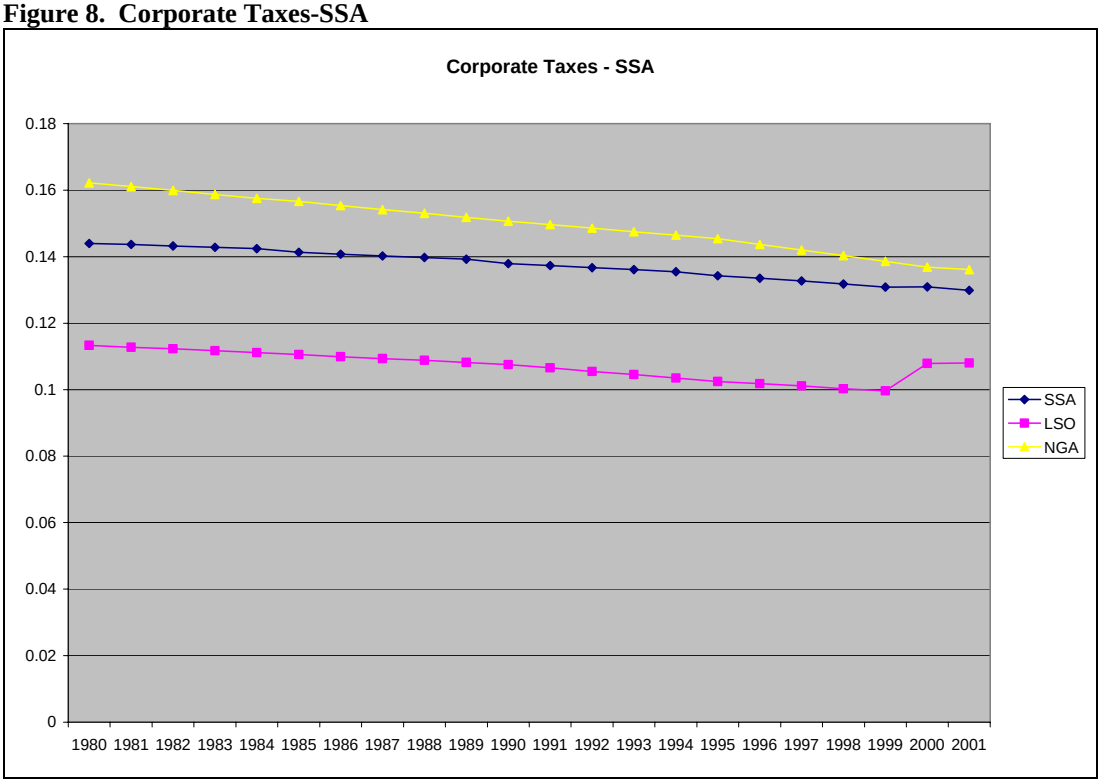


Figure 9. VAT-SSA

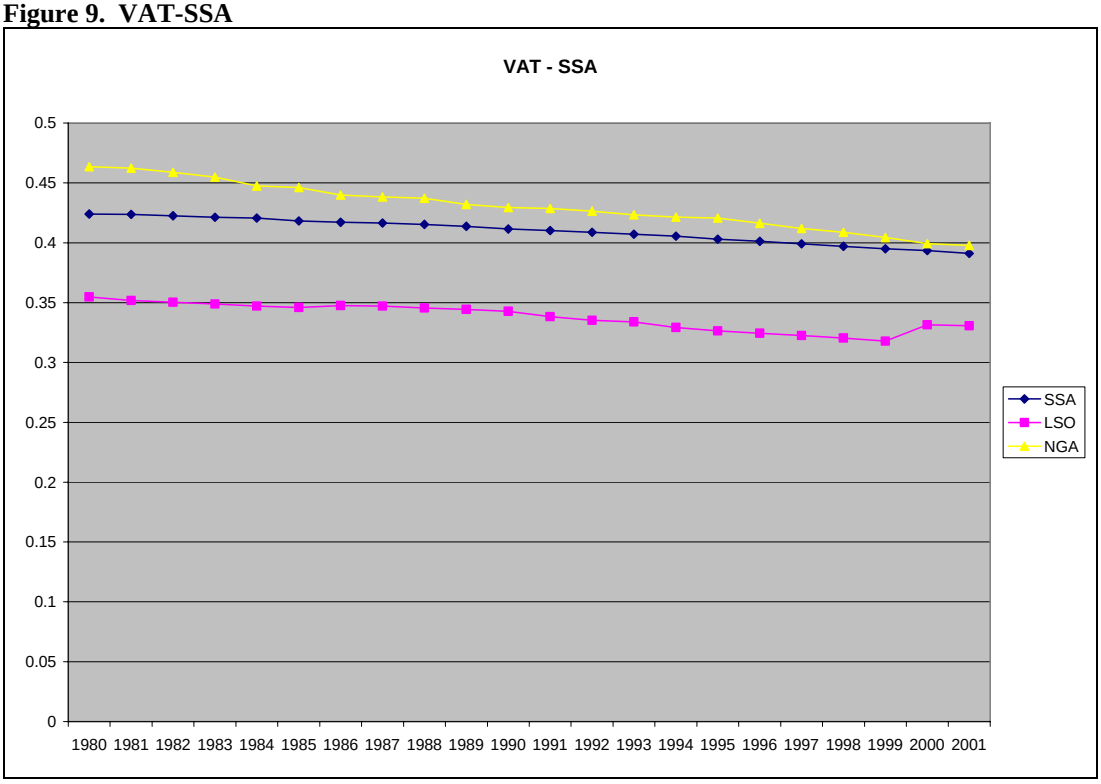


Figure 10. Excise Taxes-SSA

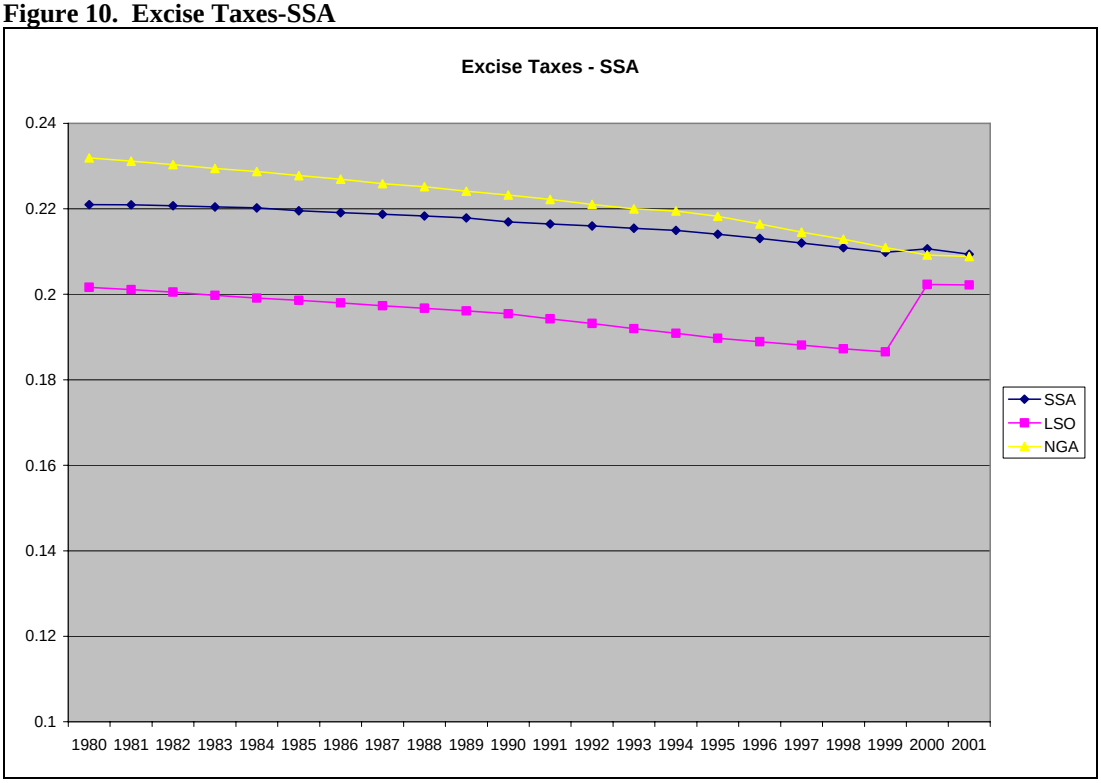
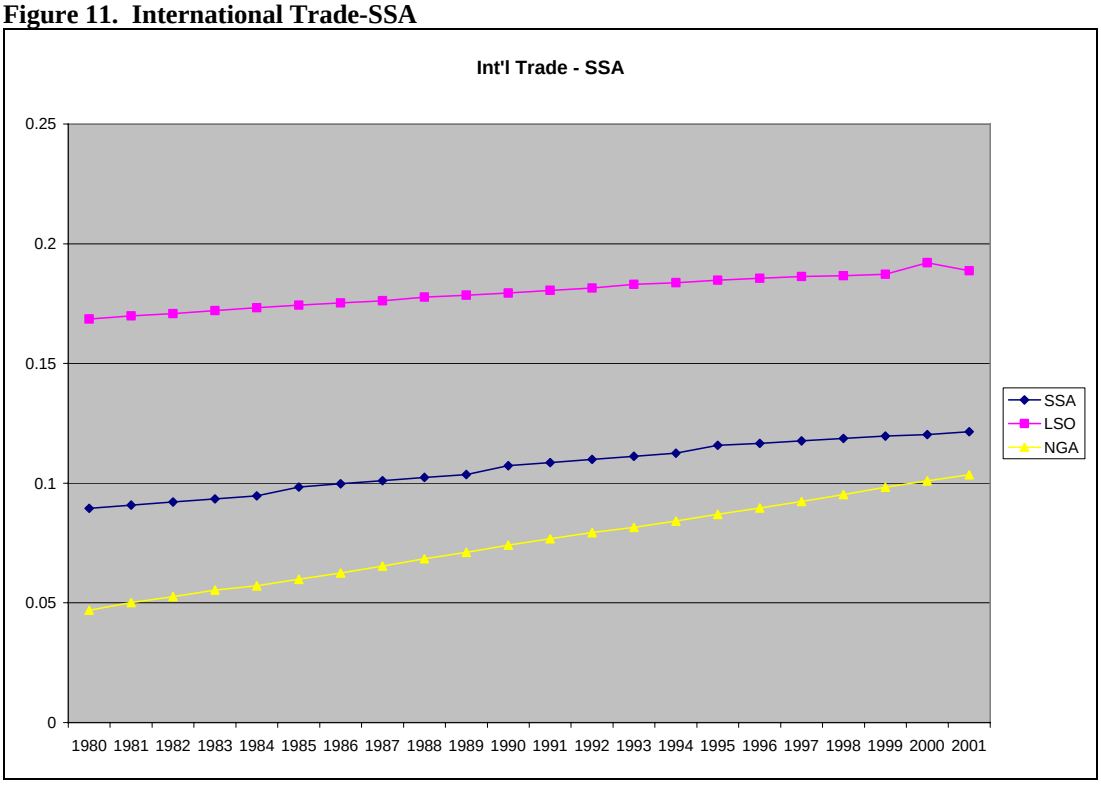


Figure 11. International Trade-SSA



APPENDIX C: Total Differentiation-The Expenditure Theoretical Model

In this appendix we give the full differentiation of Equation (4.4) with utilities as given in Equation (4.5).

$$\partial V^i(.)/\partial G^i = \partial V^i(.)/\partial(Y^i - T^i) \qquad \text{(B.1)}$$

But $C^i = Y^i - T^i$ is private consumption, and incorporating G^j in (B.1) we get;

$$\partial V^i(G^i, C^i, G^j)/\partial G^i - \partial V^i(G^i, C^i, G^j)/\partial(C^i) = 0 \qquad \text{(B.2)}$$

Totally differentiating (B.2) yields:

$$\frac{\partial^2 V(.)}{\partial G^i \partial G^j} dG^j - \frac{\partial^2 V(.)}{\partial C^i \partial G^j} dG^j + \frac{\partial^2 V(.)}{\partial G^i \partial G^i} dG^i - \frac{\partial^2 V(.)}{\partial C^i \partial G^i} dG^i + \frac{\partial^2 V(.)}{\partial G^i \partial C^i} dC^i - \frac{\partial^2 V(.)}{\partial C^i \partial C^i} dC^i = 0$$

…… (B.3)

From $C^i = Y^i - T^i$ we get $dC = dY - dT$, but $dT = dG$, $\Rightarrow dC = dY - dG$ and if $dY = 0$ then $dC = -dG$.

We can re-write the last two terms of the above function (B.3) as:

$$-\frac{\partial^2 \mathrm{V}(.)}{\partial \mathrm{G}^i \partial C^i} \partial G^i + \frac{\partial^2 \mathrm{V}(.)}{\partial (\mathrm{C}^i)^2} \partial G^i \qquad \text{(B.4)}$$

Substituting (e) into (d) and collecting like terms from (d) yields:

$$\frac{\partial^2 V(.)}{\partial G^i \partial G^j} dG^j - \frac{\partial^2 V(.)}{\partial C^i \partial G^j} dG^j + \frac{\partial^2 V(.)}{\partial G^i \partial G^i} dG^i - \frac{\partial^2 V(.)}{\partial C^i \partial G^i} dG^i - \frac{\partial^2 V(.)}{\partial G^i \partial C^i} dG^i + \frac{\partial^2 V(.)}{\partial C^i \partial C^i} dG^i = 0$$

……. (B.5)

and this simplifies to:

$$dG^j \left[\frac{\partial^2 V(.)}{\partial G^i \partial G^j} - \frac{\partial^2 V(.)}{\partial C^i \partial G^j} \right] = dG^i \left[-\frac{\partial^2 V(.)}{\partial (G^i)^2} + \frac{\partial^2 V(.)}{\partial C^i \partial G^i} + \frac{\partial^2 V(.)}{\partial G^i \partial C^i} - \frac{\partial^2 V(.)}{\partial C^i \partial C^i} \right] \qquad \text{(B.6)}$$

Consequently,

$$\frac{dG^i}{dG^j} = \frac{\left[\frac{\partial^2 V(.)}{\partial G^i \partial G^j} - \frac{\partial^2 V(.)}{\partial C^i \partial G^j} \right]}{\left[-\frac{\partial^2 V(.)}{\partial (G^i)^2} + \frac{\partial^2 V(.)}{\partial C^i \partial G^i} + \frac{\partial^2 V(.)}{\partial G^i \partial C^i} - \frac{\partial^2 V(.)}{\partial C^i \partial C^i} \right]} \qquad \text{(B.7)}$$

Multiplying both the numerator and denominator by (-1) and simplifying the above expression we get the following which is Equation (B.6):

$$\frac{dG^i}{dG^j} = \frac{\frac{\partial^2 V^i}{\partial G^i \partial G^j} - \frac{\partial^2 V^i}{\partial G^j \partial C^i}}{2\frac{\partial^2 V^i}{\partial G^i \partial C^i} - \frac{\partial^2 V^i}{\partial (G^i)^2} - \frac{\partial^2 \partial V^i}{\partial (C^i)^2}} = \phi \qquad \text{(B.8)}$$

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Christine Ega Mbakile-Moloi was born in Francistown, Botswana. She completed her Bachelors of Arts degree in Economics and Accounting at the University of Botswana in 1989, upon which she joined the Bank of Botswana and worked as an Assistant Research Officer. In 1991, the Bank awarded her a scholarship to pursue a Master of Science degree in Policy Economics at the University of Illinois at Urbana-Champaign. Christine completed her M.Sc. in 1994 and returned to the Bank of Botswana where she worked as a Research Officer in the Money and Financial Markets Unit of the Research Department. In 1997, she worked as a Dealer in the International Department of the Bank, managing foreign exchange reserves and in 1998 she transferred back to the Research Department to work as a Senior Economist.

At the Bank, Christine also served in the Open Market Coordinating Committee that oversees monetary policy issues, the Investment Committee that manages the foreign exchange reserves, was a member of the Annual Report Editorial Committee as well as the Bank of Botswana publication, *Endnotes,* Editorial Committee. She also coordinated the Bank of Botswana Annual Report and served as Secretary to the Bank of Botswana/Ministry of Finance and Development Planning Working Group.

In 2000, Christine was awarded a doctoral scholarship by the Bank of Botswana and joined the Andrew Young School of Policy Studies in August, 2001, to pursue a Ph.D. degree in Economics. While pursuing her doctorate, Christine worked as a graduate research assistant on a number of research projects. She has published articles on reserve management and financial sector liberalization issues and she has also co-

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