



HAL
open science

Assessing public sector performance in developing countries : four essays on public financial management and public service delivery

Babacar Sarr

► **To cite this version:**

Babacar Sarr. Assessing public sector performance in developing countries: four essays on public financial management and public service delivery. Economics and Finance. Université d'Auvergne - Clermont-Ferrand I, 2015. English. NNT : 2015CLF10465 . tel-01168592

HAL Id: tel-01168592

<https://theses.hal.science/tel-01168592v1>

Submitted on 26 Jun 2015

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Université d'Auvergne, Clermont-Ferrand 1

Ecole d'Economie

École Doctorale des Sciences Économiques, Juridiques et de Gestion

Centre d'Études et de Recherches sur le Développement International (CERDI)

**ASSESSING PUBLIC SECTOR PERFORMANCE IN DEVELOPING COUNTRIES
FOUR ESSAYS ON PUBLIC FINANCIAL MANAGEMENT AND PUBLIC SERVICE DELIVERY**

Thèse Nouveau Régime

Présentée et soutenue publiquement le 19 Janvier 2015

Pour l'obtention du titre de Docteur ès Sciences Économiques

Par

Babacar SARR

Sous la Direction de

Monsieur Jean-François BRUN et Monsieur Gérard CHAMBAS

Composition du Jury

Rapporteurs	Mr. Michel Normandin	Professeur, HEC Montréal
	Mr. Marc Raffinot	Maître de Conférences HDR, Université Paris Dauphine
Directeurs	Mr. Jean-François Brun	Maître de Conférences HDR, Université d'Auvergne
	Mr. Gérard Chambas	Chargé de Recherches, CNRS, Université d'Auvergne
Suffragants	Mr. Jean Louis Combes	Professeur, Université d'Auvergne
	Mr. Paolo De Renzio	Senior Research Fellow, International Budget Partnership

L'Université d'Auvergne n'entend donner aucune approbation ou improbation aux opinions émises dans cette thèse. Ces opinions doivent être considérées comme propres à leur auteur.

*A mon frère Aziz,
Mes sœurs Ngoné et Ami.*

Remerciements / Acknowledgements

La thèse est un travail de solitaire mais dont le résultat est largement tributaire du soutien de quelques êtres chers et collègues que je voudrais remercier ici.

Une fois n'est pas coutume, j'aimerais dire vivement MERCI en tout premier lieu à mon père et à ma mère pour m'avoir donné la vie, d'avoir veillé sur moi, et de m'avoir soutenu tout au long de mon cursus scolaire. Je n'aurais rien accompli sans eux.

Je souhaiterais ensuite remercier mes directeurs de thèse Messieurs Jean-François Brun et Gérard Chambas qui ont accepté de me diriger et qui ont suivi avec attention mon travail tout au long de ma thèse. Je les remercie de m'avoir ainsi guidé tout en me laissant une liberté totale dans mon cheminement intellectuel. Mes remerciements s'adressent également à Messieurs Michel Normandin et Marc Raffinot pour avoir accepté de rapporter cette thèse. Je voudrais aussi remercier chaleureusement Messieurs Jean Louis Combes et Paolo De Renzio d'avoir accepté de me faire le grand honneur et la joie d'être membres de mon jury de thèse. Leurs commentaires et recommandations me permettront sans aucun doute d'approfondir les thèmes ici abordés.

J'ai aussi une pensée pour mes camarades du Magistère avec qui j'ai passé des moments de joie et de rigolade ; je pense notamment à Grand Niang, Didier, Dimitri, Louis Farba, Patrice pour ne citer qu'eux. Je remercie aussi mes camarades de thèse Florian, Gwen, Antoine, Moussa et Céline et leur souhaite bonne chance.

Mes remerciements s'adresse aussi à mes compatriotes sénégalais de Clermont-Ferrand, ayant par ailleurs eu l'honneur d'être Président de l'Association Sénégalaise de Clermont-Ferrand pendant une année.

Last but not the least comme on dit, je remercie profondément Maria pour son soutien sans faille depuis le jour où je l'ai connue et qui a toujours été présente du jour de mon inscription en thèse à la rédaction de ces remerciements, qui signe la fin de ce long parcours académique.

SUMMARY

The public sector plays a major role in society. In most developing countries, public expenditure represents a significant part of gross domestic product (GDP) and public sector entities are substantial employers and major capital market participants. The public sector determines, usually through a political process, the outcomes it wants to achieve and the different types of intervention. How the public sector achieves results matters as its size and economic significance make it a major contributor to growth and social welfare. Its achievements emerge in the quality and nature of its financial management, the infrastructure it finances and the quality of its social and economic regulation. How well those public sector activities deliver their expected outcomes is a key development variable; yet explicit evidence base for understanding what works and why in the public sector remains strikingly limited compared with other policy areas. There are two main reasons for this situation: the performance in these areas is difficult to analyze because the outputs of many such services are hard to measure or even to define, and the lack of quantitative and qualitative longitudinal data precludes rigorous econometric analysis.

Therefore the objective of this thesis is to document this literature and to propose different ways of measuring public sector performance in developing countries. The dissertation is divided into two Parts: the first Part – Chapters 1 and 2 – presents two essays on “upstream” public sector performance while the second Part – Chapters 3 and 4 – presents two essays on “downstream” public sector performance. The Chapter 1 makes use of the Blinder-Oaxaca Decomposition to examine how the quality of budget institutions affects fiscal performance – Primary Balance and Public Debt – in sub-Saharan Africa. In Chapter 2 we use a Synthetic Control Approach to investigate the impact of Semi-Autonomous Revenue Authorities (SARAs) on revenue mobilization in twenty developing countries. The chapter 3 provides a first systematic Benchmarking of Africa’s infrastructure performance on four major sectors: electricity, water and sanitation, information and communication technologies, and transportation. Finally we evaluate the effects of the establishment of an Independent Regulatory Authority (IRA) on electricity sector performance in developing countries in Chapter 4.

Keywords: *Evaluation, Public Sector, Public Financial Management, Infrastructure, Africa, Developing Countries, Benchmarking, Matching, Double-Difference, Synthetic Control Method, Blinder-Oaxaca Decomposition.*

RESUME

Le secteur public joue un rôle important dans la société. Dans la plupart des pays en développement, les dépenses publiques constituent une partie importante du PIB et les entités du secteur public sont les principaux pourvoyeurs d'emploi et les principaux acteurs du marché des capitaux. Le secteur public détermine, généralement par le biais d'un processus politique, ses objectifs économiques et sociaux ainsi que les différents types d'intervention à mettre en place pour les atteindre. Comment le secteur public atteint ses objectifs constitue une question cruciale étant donné que sa taille et son importance économique en font un moteur principal de la croissance et du bien-être social. Ses performances sont jugées à travers la qualité et la nature de sa gestion des finances publiques, les infrastructures qu'il finance ainsi que la qualité de sa régulation des activités économiques. La manière dont les activités du secteur public délivrent les résultats attendus est ainsi une variable clé du développement; pourtant les études empiriques pour comprendre ce qui fonctionne dans le secteur public et pourquoi restent remarquablement limitées. Deux principales raisons expliquent cette situation: les performances dans ce secteur sont difficiles à analyser car les outputs des divers services qu'il fournit sont difficiles à mesurer et même à définir, et le manque de données quantitatives et qualitatives rend difficile une analyse économétrique rigoureuse.

Dès lors, l'objectif de cette thèse est de documenter cette littérature et de proposer différentes méthodes empiriques pour évaluer les performances du secteur public dans les pays en développement. Notre analyse est organisée comme suit: la Première Partie - Chapitres 1 et 2 - présente deux essais sur l'évaluation des performances du secteur public "en amont" tandis que la Seconde Partie - Chapitres 3 et 4 - présente deux essais sur l'évaluation des performances du secteur public "en aval". Le Chapitre 1 fait usage de la technique de Blinder-Oaxaca pour examiner comment la qualité des institutions budgétaires affecte les performances budgétaires – déficit budgétaire et dette publique - en Afrique sub-Saharienne. Dans le Chapitre 2, nous utilisons une approche par le Synthetic Control pour étudier l'impact des Offices de Recettes sur la mobilisation des ressources publiques dans une vingtaine de pays en développement. Le Chapitre 3 présente un Benchmarking systématique des performances infrastructurelles de l'Afrique dans les secteurs de l'électricité, de l'eau et de l'assainissement, des technologies de l'information et de la communication, et des transports. Enfin nous évaluons, dans le Chapitre 4, les effets de la mise en place d'une Autorité Indépendante de Régulation sur les performances du secteur de l'électricité dans les pays en développement.

Mots Clés: *Evaluation, Secteur Public, Gestion des Finances Publiques, Infrastructures, Afrique, Pays en Développement, Benchmarking, Matching, Double-Différence, Méthode du Synthetic Control, Décomposition de Blinder-Oaxaca.*

MAIN CONTENTS

<u>GENERAL INTRODUCTION.....</u>	<u>1</u>
<u>PART 1: “UPSTREAM” PUBLIC SECTOR PERFORMANCE.....</u>	<u>15</u>
CHAPTER 1: WHAT ARE THE DRIVERS OF FISCAL PERFORMANCE GAPS BETWEEN FRANCOPHONE AND ANGLOPHONE AFRICA? A BLINDER OAXACA DECOMPOSITION..	16
CHAPTER 2: ASSESSING REVENUE AUTHORITY PERFORMANCE IN DEVELOPING COUNTRIES: A SYNTHETIC CONTROL APPROACH.....	49
<u>PART 2: “DOWNSTREAM” PUBLIC SECTOR PERFORMANCE.....</u>	<u>83</u>
CHAPTER 3: BENCHMARKING DES PERFORMANCES INFRASTRUCTURELLES DE L’AFRIQUE	84
CHAPTER 4: PUBLIC UTILITY REGULATION IN DEVELOPING COUNTRIES AND EFFICIENCY: THE CASE OF ELECTRICITY SECTOR.....	110
<u>GENERAL CONCLUSION</u>	<u>137</u>
<u>BIBLIOGRAPHY</u>	<u>144</u>

TABLE OF CONTENTS

GENERAL INTRODUCTION.....	1
WHAT IS THE PUBLIC SECTOR?.....	2
HOW TO ASSESS PUBLIC SECTOR PERFORMANCE?.....	5
THE PROBLEM OF THE COUNTERFACTUAL.....	6
THE PROBLEM OF SELECTION BIAS.....	8
OUTLINE OF THIS THESIS	11
PART 1: “UPSTREAM” PUBLIC SECTOR PERFORMANCE.....	15
CHAPTER 1: WHAT ARE THE DRIVERS OF FISCAL PERFORMANCE GAPS BETWEEN FRANCOPHONE AND ANGLOPHONE AFRICA? A BLINDER OAXACA DECOMPOSITION	16
1.1 INTRODUCTION	18
1.2 RELEVANT LITERATURE REVIEW.....	20
1.2.1 Budget institutions in sub-Saharan Africa.....	20
1.2.2 Budget institutions and fiscal performance.....	21
1.3 THE CONSTRUCTION OF THE BUDGET INSTITUTIONS INDEXES	23
1.3.1 Centralization.....	23
1.3.2 Comprehensiveness	24
1.3.3 Fiscal and Procedural Rules and Controls.....	25
1.3.4 Sustainability and Credibility	25
1.3.5 Transparency.....	26
1.4 DATA AND METHODOLOGY	27
1.5.1 Sample and Data.....	27
1.5.2 Methodology.....	27
1.5 EMPIRICAL INVESTIGATION	30
1.5.1 Descriptive statistics	30
1.5.2 Graphical Analysis.....	31
1.5.3 Spearman Rank’s correlation.....	32
1.5.4 Regression analysis.....	34
1.5.5 Blinder-Oaxaca Decomposition.....	35
1.5.5.1 Public Debt.....	35

1.5.5.2	Primary Balance.....	36
1.5.6	Disaggregating the effects of Budget Institutions	37
1.5.6.1	Public Debt	38
1.5.6.2	Primary Balance.....	39
1.5.7	Robustness checks	39
1.6	DISCUSSION AND CONCLUSION.....	41
1.7	APPENDICES.....	43
CHAPTER 2: ASSESSING REVENUE AUTHORITY PERFORMANCE IN DEVELOPING COUNTRIES: A SYNTHETIC CONTROL APPROACH		49
2.1	INTRODUCTION	51
2.2	ORIGIN OF THE MODEL AND MOTIVATION FOR REFORM.....	52
2.3	LITERATURE REVIEW.....	54
2.3.1	Determinants of government revenue	54
2.3.2	Revenue Authority Performance	54
2.4	EMPIRICAL METHODOLOGY.....	56
2.5	DATA AND SAMPLE	58
2.6	RESULTS.....	60
2.6.1	Positive impacts in Argentina, Bolivia, Guyana, Malawi and South Africa.....	60
2.6.2	Negative impacts in Kenya, Mexico, Peru, Tanzania, Venezuela and Zambia	63
2.6.3	Ambiguous impacts in Colombia, Guatemala, Rwanda, Uganda and Zimbabwe.....	65
2.6.4	Statistically insignificant impacts.....	67
2.7	DISCUSSION AND CONCLUSION.....	69
2.8	APPENDICES.....	73
<u>PART 2: “DOWNSTREAM” PUBLIC SECTOR PERFORMANCE.....</u>		83
CHAPTER 3: BENCHMARKING DES PERFORMANCES INFRASTRUCTURELLES DE L’AFRIQUE		84
3.1	INTRODUCTION	86
3.2	REVUE DE LA LITTERATURE	87
3.3	METHODOLOGIE ET BASE DE DONNEES	89
3.3.1	Le Benchmarking	89
3.3.2	Construction de la base de données.....	91
3.4	ANALYSE SECTORIELLE DE LA PERFORMANCE DES PAYS AFRICAINS	92
3.4.1	ENERGIE.....	92
3.4.2	EAU ET ASSAINISSEMENT.....	95

3.4.3	TRANSPORTS	97
3.4.4	TECHNOLOGIES DE L'INFORMATION ET DE LA COMMUNICATION.....	99
3.5	DISCUSSION ET CONCLUSION	101
3.6	ANNEXES	104
CHAPTER 4: PUBLIC UTILITY REGULATION IN DEVELOPING COUNTRIES AND EFFICIENCY: THE CASE OF ELECTRICITY SECTOR.....		110
4.1	INTRODUCTION	112
4.2	THEORETICAL AND CONCEPTUAL FOUNDATIONS	114
4.3	METHODOLOGY	116
4.3.1	The Propensity Score.....	118
4.3.2	The Matched Difference-in-Difference estimator	119
4.3.3	Impact Indicators	120
4.4	DATA	121
4.5	RESULTS AND ROBUSTNESS CHECKS	123
4.5.1	Descriptive Statistics.....	123
4.5.2	Probit Estimation	123
4.5.3	Electricity Power Transmission and Distribution Losses	124
4.5.4	Electricity Generation per capita	125
4.5.5	Energy Efficiency.....	125
4.5.6	Robustness Checks	126
4.6	DISCUSSION AND CONCLUSION.....	126
4.7	APPENDICES.....	128
<u>GENERAL CONCLUSION</u>		<u>137</u>
<u>BIBLIOGRAPHY</u>		<u>144</u>

GENERAL INTRODUCTION

Governments in developing countries are facing pressures to improve the policies and practices of their public sectors. Indeed, an effective and efficient public sector is a prerequisite to achieving economic growth, social development, and poverty alleviation (World Bank 1999). This issue is even more salient in an uncertain economic climate, where governments must define and show the effectiveness of their programs and policies. Likewise, providing evidence on the results of government activities in meeting promised goals and objectives can be an effective tool of public sector management through better resource decision-making, and better monitoring of public initiatives in producing anticipated outcomes and impacts. A well functioning public sector should be able to mobilize revenues, to ensure performance in the delivery of public goods through provision, funding, or regulation, and to openly engage with and accept challenge from citizens, parliaments, and other accountability institutions.

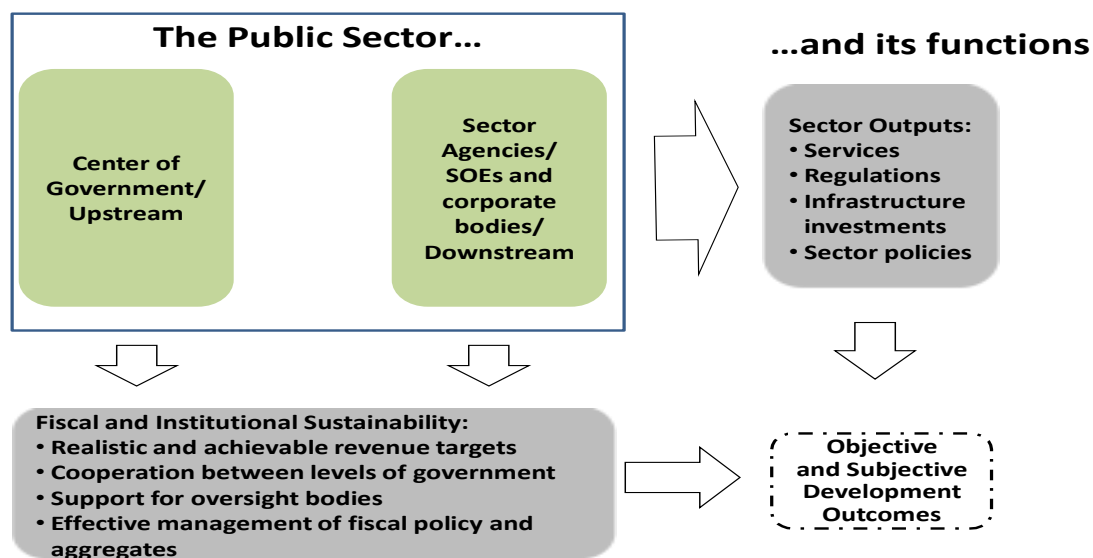
The public sector plays a major role in society. In most developing countries, public expenditure forms a significant part of gross domestic product (GDP) and public sector entities are substantial employers and major capital market participants. The public sector determines, usually through a political process, the outcomes it wants to achieve and the different types of intervention. Sound public sector governance encourages better decision-making and the efficient use of resources, and strengthens accountability for the stewardship of those resources. It is characterized by robust scrutiny, which provides important pressures for improving public sector performance and tackling corruption. It can also improve management, leading to more effective implementation of the chosen interventions, better service delivery, and, ultimately, better outcomes. People's lives are thereby improved.

What is the Public Sector?

In general terms, the public sector consists of governments and all publicly controlled or publicly funded agencies, enterprises, and other entities that deliver public programs, goods, or services (See Figure 1). It comprises “Upstream” core ministries and central agencies such as the Ministry of Finance, “Downstream” bodies including sector ministries that deliver services under the direction of the government, and non-executive state institutions such as

the Parliament and the Supreme Audit Institution (World Bank 2012). In modern governance, the public sector is regarded as the nerve center of the machinery of government.

Figure 1: The Public Sector and its functions



Sources: World Bank (2012).

The “Upstream” public sector is responsible for some critical outcomes. It must encourage both fiscal and institutional sustainability, and provide systems and processes that enable governments to manage public revenues, expenditures and debt. It must also manage the allocation of fiscal, administrative and functional authorities across levels of government in a way that ensures cooperative and constructive engagement between them. Finally, the public sector must work with and support accountability and governance mechanisms to ensure that they provide transparency through credible arms-length oversight.

More particularly, Public Financial Management (PFM) is the system by which the public sector plans, directs and controls financial resources to enable the efficient and effective delivery of public service goals. It drives the performance of the public sector through effective and efficient use of public money and spans a range of activities including planning and budgeting, management accounting, financial reporting, financial controls, and internal and external auditing that contribute to effective, transparent governance and strong public accountability. The effectiveness of the overall PFM system in a given country depends on a network of interlocking processes, which operate within a framework of public sector entities

at national and sub-national levels. The quality of PFM depends on a number of important variables, including how well PFM systems in individual organizations work, the quality of inputs provided to the system and the feedback and control mechanisms that ensure a rigorous focus on delivery of outputs and achievement of outcomes. Strong PFM also requires the reporting of fiscal forecasts and other relevant information in an accurate, transparent, and timely manner for public accountability and decision-making. Fiscal transparency is a key element of effective PFM.

The “Downstream” public sector delivers tangible outputs that directly matter to citizens. It provides services, such as health, education, transport, electricity or water to households. It manages infrastructure and other public investments, which the private sector may be unable to finance or for which the private sector may be unwilling to bear all the risk. It also possesses the power to regulate entities operating in certain sectors of the economy to safeguard and promote the interests of citizens and other stakeholders, and to achieve sustainable benefits. These regulatory systems are designed to respond to natural monopolies and market failures associated with network industries such as electricity, gas, water, telecommunications, and transport. They also aim to encourage efficient, low-cost, and reliable service provision while ensuring financial viability and new investment. It is also hoped that regulatory agencies would depoliticize tariff setting and would improve the climate for operational management and private investment through more transparent and predictable decision-making.

How the public sector - “Upstream” and “Downstream” - achieves these results matters. The size and economic significance of the public sector make it a major contributor to growth and social welfare. Hence it is important to understand, and improve, what it is achieving with its very significant expenditures. Its achievements emerge in the quality and nature of its financial management, the infrastructure it finances and the quality of its social and economic regulation. How well those public sector activities deliver their expected outcomes is a key development variable; yet the explicit evidence base for understanding what works and why in the public sector remains strikingly limited compared with other policy areas.

Therefore methods to understand the impacts of such activities are main themes of this dissertation. Evaluating whether a government policy is having the intended outcomes helps

to build the science of delivery, and fosters the generation and exchange of knowledge about what works and what does not.

How to assess public sector performance?

Although a lot of research has been done in terms of impact assessment at the microeconomic level, the literature on the evaluation of public policies at a macroeconomic level is relatively scant. In the case of public sector performance, the vast majority of the related literature deals with the analysis of public spending efficiency in health and education. For instance, Gupta and Verhoeven (2001) measure the efficiency of government expenditures on education and health in a group of African countries employing the Free Disposable Hull (FDH) method. Herrera and Pang (2005) quantify efficiency in both sectors using a panel of 160 countries employing the FDH and the Data Envelopment Analysis (DEA).

When it comes to the empirical assessment of PFM systems or other public services like water, electricity or transport, the existing literature is mostly in the form of accumulated wisdom rather than a set of rigorous theoretical propositions supported by empirical observations and statistical tests (Wood and Marshall 1993). There are two main reasons for this situation: (1) performance in these areas is difficult to analyze because the outputs of many such services are hard to measure or even to define and (2) the lack of quantitative and qualitative longitudinal data that allow rigorous econometric analysis. Therefore the objective of this thesis is to document this literature and to propose different ways of measuring public sector performance, with a focus on PFM systems and economic infrastructure services.

Several approaches can be used to evaluate policies or programs. Monitoring tracks key indicators of progress over the course of a program as a basis on which to evaluate outcomes of the intervention. Operational Evaluation examines how effectively programs were implemented and whether there are gaps between planned and realized outcomes. Impact Evaluation studies whether the changes in outcomes are indeed due to the program intervention and not to other factors.

These evaluation approaches can be conducted using quantitative methods (i.e. survey data collection or simulations) before or after a program is introduced. Ex-ante evaluation predicts program impacts using data before the program intervention, whereas ex-post evaluation examines outcomes after programs have been implemented. Reflexive Comparisons are a type of ex-post evaluation; they examine program impacts through the difference in outcomes before and after program implementation. In this thesis, evaluation will be based on the accountability concept, and then will have a retrospective characteristic; thus it will refer to the systematic examination of certain indicators on the potential outcomes of a public policy intervention and the passing of judgments on the worth of the measured impacts.

However, there are two main challenges across these different types of impact evaluation mentioned above: the first one is to find a good counterfactual - namely, the outcome if the reform would not occur, and the second one is to adequately control the potential selection bias. The different methods used in the following Chapters to overcome these challenges include Benchmarking, Propensity Score Matching, Double-Difference, Synthetic Control Method, and Blinder-Oaxaca Decomposition. Each of these methods involves a different set of assumptions in accounting for potential selection bias in participation that might affect construction of program and policy treatment effects.

The Problem of the Counterfactual

The main challenge when we try to assess the effectiveness of a given policy intervention is to determine what would have happened if this intervention had not existed. In fact the difficulty is we cannot simultaneously observe the outcome when a government implements a reform and the situation where the reform does not occur. Thus estimate a causal impact requires finding a way to approximate a quantity that is not available. Without this point of comparison, the only situation of the treatment is not informative of the treatment effect. That is, one has to determine for instance the government revenue (Chapter 2) in the absence of the intervention (Implementation of a Revenue Authority). The government revenue in the absence of the intervention would be its counterfactual. The problem of counterfactual

situation was described by Rubin (1974) and appeared in all causal analysis, far beyond the scope of the evaluation of public policies.

A program or policy intervention seeks to alter changes in a given situation. Ex post, one observes outcomes of this intervention in a given country. Does this change relate directly to the intervention? For instance, has this intervention caused revenues to grow? Not necessarily. In fact, with only a point observation after treatment, it is impossible to reach a conclusion about the impact. At best one can say whether the objective of the intervention was met. But the result after the intervention cannot be attributed to the policy itself. The challenge of an impact assessment is to create a convincing and reasonable comparison group for the treated units or countries in light of the missing data. Ideally, the perfect impact assessment is to compare how the same country would have fared with and without an intervention but it is impossible to do so because the same country cannot have two simultaneous existences at a given point in time. Finding an appropriate counterfactual constitutes the main challenge of an evaluation exercise and then will be the main challenge in the remainder of this thesis.

Looking for a Counterfactual: With-and-Without Comparisons

For instance, consider the fiscal performance of a given country after a public policy implementation as $Y1$ and the performance of a similar country without any policy intervention as $Y2$. The with-and-without countries' comparison measures the policy's effect as $Y1 - Y2$. Is this measure a right estimate of policy effect? Without knowing why the "treated" country implemented the public policy while others did not, such a comparison could be deceptive. Without such information, one does not know whether $Y2$ is the right counterfactual outcome for assessing the intervention's effect. For example, fiscal performance is different across the treated and control country before the intervention; this differential might be due to underlying differences that can bias the comparison across the two countries. Therefore the counterfeit comparison could yield an over- or under-estimation of the intervention's effect depending on the pre-intervention situations of treated and control countries.

Looking for a Counterfactual: Before-and-After Comparisons

Still consider the case of a country implementing a policy to improve its fiscal performance. Another counterfactual could be a comparison between the pre- and post- treatment performance. We then have two points of observations for the same country: pre-intervention outcome (Y_0) and post-intervention outcome (Y_1). Accordingly, the intervention's effect might be estimated as $(Y_1 - Y_0)$. The literature refers to this approach as the Reflexive Method of impact, where resulting country's outcomes before the intervention function as comparison outcomes. Does this method offer a realistic estimate of the program's effect? Probably not.

The time series certainly makes reaching better conclusions easier, but it is in no way conclusive about the impact of a policy. Indeed, such a simple difference method would not be an accurate assessment because many other factors may have changed over the period. Not controlling for those other factors will bias the impact evaluation. For example, a country with a Revenue Authority may have improved its revenue collection after the reform. Although this improvement may be due to the Revenue Authority, it may also be because the economy is recovering from a past crisis. Unless they are carefully done, reflexive comparisons cannot distinguish between the intervention's effects and other external effects, thus compromising the reliability of results. They may be useful in evaluations where there is no scope for a control group. Even when the intervention is not as far reaching, if outcomes for treated countries are observed over several years, then structural changes in outcomes could be tested for (Ravallion 2008).

The Problem of Selection Bias

As we mentioned earlier, an impact evaluation is essentially a problem of missing data, because one cannot observe the outcomes of treated countries had they not been treated. Without information on the counterfactual, the next best alternative is to compare outcomes of treated individuals or countries with those of a comparison group that has not been treated. In doing so, one attempts to pick a comparison group that is very similar to the treated group,

such that those who received treatment would have had outcomes similar to those in the comparison group in absence of treatment.

Successful impact evaluation lays on finding a good comparison group. There are two broad approaches that researchers can use to mimic the counterfactual of a treated group: (a) create a comparator group through a statistical design, or (b) modify the targeting strategy of the reform itself to wipe out differences that would have existed between the treated and non-treated groups before comparing outcomes across the two groups.

Equation (1) presents the basic evaluation problem comparing outcomes Y across treated and non-treated countries i :

$$Y_i = \alpha X_i + \beta T_i + \epsilon_i \quad (1)$$

Here, T is a dummy equal to 1 for countries that receive the treatment and 0 for those who do not receive it. X is set of other observed characteristics of countries. Finally, ϵ is an error term reflecting unobserved characteristics that also affect Y . Equation (1) reflects an approach commonly used in impact evaluations, which is to measure the direct effect of the program T on outcomes Y .

The problem with estimating equation (1) is that policy interventions are not often random because there may be a problem of self-selection (for instance establishing a Revenue Authority is not a random intervention but rather a government decision). That is, reforms are designed according to the need of the countries, which in turn self-select given policy design and implementation. Self-selection could be based on observed characteristics, unobserved factors, or both. In the case of unobserved factors, the error term in the estimating equation will contain variables that are also correlated with the treatment dummy T . One cannot measure these unobserved characteristics in equation (1), which leads to unobserved selection bias.

That is, covariance $(T, \epsilon) \neq 0$ implies the violation of one of the key assumptions of ordinary least squares in obtaining unbiased estimates: independence of covariates from the disturbance term ϵ . The correlation between T and ϵ naturally biases the other estimates in the equation, including the estimate of the intervention effect β . This problem can also be represented in a more conceptual framework. Suppose we are interested in assessing the

impact of an independent regulatory body on electricity generation (Chapter 4). Let Y_i represent the electricity generated in country i . For treated countries, $T_i = 1$, and the value of Y_i under treatment is represented as $Y_i(1)$. For non-treated countries, $T_i = 0$, and Y_i can be represented as $Y_i(0)$. If $Y_i(0)$ is used across non-treated countries as a comparison outcome for treated countries' outcomes $Y_i(1)$, the average effect of this regulatory policy might be represented as follows:

$$D = E(Y_i(1) | T_i = 1) - E(Y_i(0) | T_i = 0) \quad (2)$$

The problem is that the treated and non-treated groups may not be the same prior to the intervention, so the expected difference between those groups may not be due entirely to the implementation of a regulatory body. If, in equation (2), one then adds and subtracts the expected outcome for non treated countries had they implemented an independent regulatory body— $E(Y_i(0) | T_i = 1)$:

$$\begin{aligned} D &= E(Y_i(1) | T_i = 1) - E(Y_i(0) | T_i = 0) \\ &+ [E(Y_i(0) | T_i = 1) - E(Y_i(0) | T_i = 1)] \quad (3) \\ \Rightarrow D &= ATE + [E(Y_i(0) | T_i = 1) - E(Y_i(0) | T_i = 0)] \quad (4) \\ &\Rightarrow D = ATE + B \quad (5) \end{aligned}$$

In these equations, ATE is the average treatment effect [$E(Y_i(1) | T_i = 1) - E(Y_i(0) | T_i = 1)$], namely, the average gain in outcomes of the treated relative to the non-treated countries, as if the latter were also treated. The ATE corresponds to a situation in which a randomly chosen country from the sample is assigned to introduce the reform, so treated and non-treated countries have an equal probability of introducing the reform T .

The term B , [$E(Y_i(0) | T_i = 1) - E(Y_i(0) | T_i = 0)$], is the extent of selection bias that crops up in using D as an estimate of the ATE . Because one does not know $E(Y_i(0) | T_i = 1)$, one cannot calculate the magnitude of selection bias. As a result, if one does not know the extent to which selection bias makes up D , one may never know the exact difference in outcomes between the treated and the control groups.

The basic objective of a sound impact assessment is then to find ways to get rid of selection bias ($B = 0$) or to find ways to account for it. Several approaches, discussed in this

dissertation, can be used to mitigate this bias. It has also been argued that selection bias would disappear if one could assume that whether or not countries receive a treatment (conditional on a set of covariates, X) is independent of the outcomes that they will have. This assumption is called the assumption of unconfoundedness, also referred to as the conditional independence assumption (see Lechner 1999; Rosenbaum and Rubin 1983):

$$(Y_i(1), Y_i(0)) \perp T_i \mid X_i \quad (6)$$

These different approaches and assumptions will be discussed in the following chapters. The soundness of the impact estimates depends on how justifiable the assumptions are on the comparability of treated and control groups; without any approaches or assumptions, one will not be able to assess the extent of bias B .

Outline of this thesis

The thesis is divided into two parts and each part consists of two chapters.

Through Chapters 1 and 2, the first part deals with the evaluation of “upstream” public sector performance in developing countries. Public Financial Management concerns the taxing and spending of government, which in turn influences resource allocation and income distribution. The Chapter 1 deals with the spending portion of the budget cycle, including budget preparation, approval, implementation, monitoring, and reporting arrangements. The revenue portion is closely related and is covered in Chapter 2.

Chapter 1 makes use of the Blinder-Oaxaca technique to examine how the quality of budget institutions affects fiscal performance – Primary Balance and Public Debt – in sub-Saharan Africa. The Blinder-Oaxaca technique was originally used in labor economics to decompose earnings gaps and to estimate the level of discrimination. It has been applied since in other social issues, including education and health where it can be used to assess how much of a gap is due to differences in characteristics (explained part) and how much is due to policy or system changes (unexplained part). To organize our approach, we categorize sub-Saharan

Africa countries according to their system of budgetary institutions: English-based system (Anglophone Africa) and French-based system (Francophone Africa). The quality of budget institutions is measured through five indicators: the Centralization of the budget process, the Comprehensiveness of the budget, the Fiscal and Procedural Rules and Controls, the Sustainability and the Credibility of the budget, and the Transparency of the budget process. Through this methodology we are able to capture the origins of the differences of budgetary outcomes between Anglophone and Francophone Africa.

Using a database of 35 African countries over the period 2002-2007, we show that, on average, Anglophone Africa countries have better budget institutions than their Francophone counterparts and this difference is the main determinant of the fiscal performance gap between the two groups. According to the decomposition results, the gap is mostly due to the characteristics effect, meaning that the poor fiscal performance of Francophone countries is not due to the French-based system itself but rather to the environment in which it operates. The budget process and procedures in these countries are less comprehensive, sustainable and transparent than in Anglophone countries and this adversely affects their fiscal performance.

In Chapter 2 we use recent developments in the empirics of comparative case studies to investigate the impact of Semi-Autonomous Revenue Authorities (SARAs) on revenue mobilization in twenty developing countries. In fact many developing countries have undertaken comprehensive reforms in their tax administrations during recent years and the implementation of SARAs constitutes one of their most visible expressions. Due to the lack of conclusive results after a series of reforms within the existing Ministries of Finance some have thought that the creation of autonomous structures responsible for managing tax revenue could improve revenue mobilization. To date there is no comprehensive assessment of how successful these SARAs have been in achieving that goal.

Our findings from the Synthetic Control Method show that the implementation of a SARA does not always produce the expected outcomes. Of the twenty SARAs surveyed only five have sustainably performed better than their Synthetic Control. In the other fifteen countries performance has been mixed or disappointing: five SARAs performed well for a few years but these performances have been unstable and six of them have poor performance compared to their Synthetic Control. Finally for four countries, the results are statistically insignificant, as the Synthetic Control Method does not provide suitable comparator countries.

This paper is a contribution to an ongoing discussion rather than a definitive assessment of the value of SARAs and highlights how it can be difficult in being conclusive on such reforms.

The second part of this thesis presents two evaluations of “downstream” public sector performance through Chapters 3 and 4. The two essays proposed in this part focus on the provision of infrastructure services. Raising and maintaining the standards of living in any economy are contingent on the adequacy of infrastructure services in terms of quantity and quality. In this sense, measuring performance in infrastructure activities is a central factor in ensuring adequate provision of these crucial services. Large parts of the population in many countries, especially the poor, bear substantial economic and human costs because of serious shortages in infrastructure services, in terms of both quantity and quality.

Chapter 3 provides a first systematic Benchmarking of Africa’s infrastructure performance on four major sectors: electricity, water and sanitation, information and communication technologies, and transportation. To benchmark is to compare performance against a standard. In an Evaluation framework, Benchmarking can help place an outcome in context and can help assess the reasonableness of targets that may be set. The Benchmarking is performed against a relevant sample of comparator countries from the developing world, clustered into 3 income groups: low income countries, lower middle-income countries and upper middle-income countries.

The results suggest that infrastructure’s performance in African countries is far below what would be expected from countries with the same level of revenue: access remains a major issue, especially in electricity. Infrastructure service delivery in telephony and roads is, on average, well below what would be expected; unless addressed, such infrastructure shortfalls are likely to adversely affect the welfare of Africa’s poor, the cost competitiveness and growth prospects of a range of economic sectors that depend critically on a stable and competitive supply of basic infrastructure service. The main policy implication is that there remain significant needs to scale up infrastructure investments and improve efficiency in all four major infrastructure sectors.

The last Chapter evaluates the effects of the establishment of an Independent Regulatory Authority (IRA) on electricity sector performance in developing countries. In fact, regulatory

systems for infrastructure sectors are a relatively new but important phenomenon in many developing countries. It has been estimated that close to 200 new infrastructure regulators have been created around the world in the past ten years (World Bank 2006). These regulatory systems are designed to respond to natural monopolies and market failures associated with network industries such as electricity, gas, water, telecommunications, and transport. The aim of regulation is to encourage efficient, low-cost, and reliable service provision while ensuring financial viability and new investment. It was hoped that regulatory agencies and contracts would depoliticize tariff-setting and would improve the climate for operational management and private investment through more transparent and predictable decision making.

Despite these good intentions, there is little evidence that these regulatory systems have met their expectations. Therefore the objective of Chapter 4 is to assess the impact of such reform on electricity generated, technical quality of the service and country energy efficiency. Double-Difference and Matching are used to address sources of selection bias in identifying impacts; our empirical approach utilizes the panel structure of the data to control for time-invariant unobservable characteristics at the country level by applying propensity-score-matched double difference comparison.

Our results suggest that introducing Independent Regulation in the electricity industry is effective in stimulating performance improvements: this leads to more generated electricity and better technical quality of the service. The impact on energy efficiency is positive but insignificant. The methodological lesson from this paper is that robust estimation of public sector reform is possible even in the absence of proper baseline survey.

PART 1: “UPSTREAM” PUBLIC SECTOR PERFORMANCE

**CHAPTER 1¹: WHAT ARE THE DRIVERS OF FISCAL
PERFORMANCE GAPS BETWEEN FRANCOPHONE AND
ANGLOPHONE AFRICA? A BLINDER OAXACA
DECOMPOSITION**

¹ A version of this Chapter is published in the South African Journal of Economics.

ABSTRACT

The Blinder-Oaxaca technique was originally used in labor economics to decompose earnings gaps and to estimate the level of discrimination. It has been applied since in other social issues, including education and health where it can be used to assess how much of a gap is due to differences in characteristics (explained part) and how much is due to policy or system changes (unexplained part). In this chapter we make use of this technique to examine how the quality of budget institutions affects fiscal performance – Primary Balance and Public Debt – in sub-Saharan Africa. To organize our approach, we categorize sub-Saharan Africa countries according to their system of budgetary institutions: English-based system (Anglophone Africa) and French-based system (Francophone Africa). The quality of budget institutions is measured through five indicators: the Centralization of the budget process, the Comprehensiveness of the budget, the Fiscal and Procedural Rules and Controls, the Sustainability and the Credibility of the budget, and the Transparency of the budget process. Through this methodology we are able to capture the origins of the differences of budgetary outcomes between Anglophone and Francophone Africa.

Using a database of 35 African countries over the period 2002-2007, we show that, on average, Anglophone Africa countries have better budget institutions than their Francophone counterparts and this difference is the main determinant of the fiscal performance gaps between the two groups. According to the decomposition results, the gaps are mostly due to the characteristics effect, meaning that the relative poor fiscal performance of Francophone countries is not due to the French-based system itself but rather to the environment in which it operates. The budget process and procedures in these countries are relatively less comprehensive, sustainable and transparent and that adversely affects their fiscal performance.

1.1 INTRODUCTION

Interest in the determinants of fiscal performance has increased substantially in the last two decades. Continuing difficulties that governments in developing countries have had in reducing deficits and the impact that deficits have had on their economies have raised pressing questions about the relevance of normative economic theories of fiscal policy (what should governments do) and have stimulated a search for a positive theory (why do governments do what they do).

The core of public finance is that some people spend other people's money. In democracies, voters delegate the power over public spending and taxes to elected politicians. Two aspects of this delegation arrangement are particularly important for the conduct of fiscal policy. The first is the principal-agent relationship between voters and politicians and the second is the common pool problem of public finances (von Hagen and Harden 1995). Several empirical studies have shown that such schisms result in higher spending levels, deficits, and debt². These adverse consequences can be mitigated by appropriately designing the institutions that govern the decisions over public finances.

The budget is the result of the budgeting process, the way in which decisions about the use and funding of public resources are made, from the drafting of a budget law to its implementation. These formal and informal rules and principles governing the budgeting process within the executive and the legislature are defined as Budget Institutions. They divide the budgeting process into different steps, determine who does what and when in each step, and regulate the flow of information among the various actors. They fulfill several important functions including setting priorities in the allocation of public resources, planning to achieve policy goals, managing operations with fiscal prudence, efficiency, and integrity, and improving government performance in service delivery. The effectiveness of these budgetary institutions has been recognized in the economics and political science literature as contributing to improved fiscal and economic outcomes (Alesina and Perrotti 1996; Alesina et al. 1999; Prakash and Cabezon 2008).

² For examples, see Annett (2000), Alesina et al. (1999), Alesina and Perotti (1996), Roubini and Sachs (1989).

In sub-Saharan Africa, budgetary processes and institutions are not yet well developed to perform the above-mentioned functions adequately and fiscal outcomes have been disappointing over these last decades. Most African countries inherited either a French-based or a British-based model³; each of them has its own regulatory frameworks and gives different roles and powers to the different actors of the budgeting process. Therefore the Preparation, the Implementation, and the Execution of the Budget in a given African country are based on the budget institutions inherited from the colonial power.

This chapter attempts to assess if and how the differences between the Anglophone and the Francophone models of institutional arrangements affect fiscal performance in sub-Saharan Africa countries. To do so, we use indexes specially designed to measure the quality of budget institutions in African countries⁴ across five characteristics: the Centralization of the budget process, the Comprehensiveness of the budget, the Fiscal and Procedural Rules and Controls governing the budget process, the Sustainability and Credibility of the budget and the Transparency of the budget process.

An important innovation introduced in this chapter is the methodology used to perform our analysis; we make use of a method of decomposition extensively used in Labor economics starting with the seminal papers of Oaxaca (1973) and Blinder (1973). Accordingly, the procedure is known in the literature as the Blinder-Oaxaca decomposition (BOD).

The Blinder-Oaxaca decomposition explains outcome differentials in terms of differences in individual characteristics (Characteristics effect/Explained part) and differences in the coefficients of outcome equations (Coefficients effect/Unexplained part). This method has been widely used to understand racial and gender wage differentials, the coefficients effect being often interpreted as a measure of discrimination. In the context of this chapter the decomposition analysis will allow us to separately assess the fiscal effects of how the budget institutions actually operate (Characteristics effect), and how they ought to operate on the basis of each system's regulatory framework (Coefficients effect).

³ Lusophone countries inherited a Portuguese-based system.

⁴ Gollwitzer (2011) develops a number of indexes measuring the adequacy of the institutions, rules and procedures governing the budget process in 46 African countries.

The structure of the chapter is as follows. Section 2 provides a relevant literature review on budget institutions and fiscal performance. Section 3 discusses the construction of the budget institutions' indexes. Section 4 and 5 present the decomposition methodology and the empirical results. Section 6 discusses the results and offers some concluding remarks.

1.2 RELEVANT LITERATURE REVIEW

1.2.1 Budget institutions in sub-Saharan Africa

Over the past decades, a substantial volume of literature has dwelled on the subject of colonization and economic performance of former African colonies. Economists became interested in colonial legacies in their search for the reasons why some countries have grown relatively slower than others. Notably, recent cross-country empirical evidence suggests that the identity of the colonizing power (or colonial origin) might help explain the observed economic performance differential amongst former colonies around the world⁵.

But surprisingly the literature on budget institutions in Africa is relatively small to date and mainly originates from technical assistance to improve budgeting. It includes Public Expenditure Reviews (PERs) of the World Bank, Working Papers of various institutions, and technical assistance of the IMF and other multilateral and bilateral institutions. Furthermore much of the published literature on budget institutions in Africa is descriptive in nature.

Moussa (2004) investigates if there is a Francophone PFM model by undertaking a comparison of Francophone Africa PFM systems. He concludes that although similarities to the French system are strong on the normative side (what is supposed to be done), such as the legal and institutional framework, differences between the French system and those of the Francophone African countries are striking when it comes to the positive side (what is actually done, in measurable and verifiable terms). The French budget formalism, aimed at safeguarding public funds through redundant control procedures, has been compounded in Africa with an acute sense of hierarchy and administrative slowness. Flexibility introduced in the French system with regard to the budget calendar (i.e., the complementary period) or exceptional spending procedures has been overused in francophone Africa. The budgetary

⁵ See for instance Klerman et al. (2008), Rostowski and Stacescu (2006), Bertocchi and Canova (2002), and Grier (1999).

prerogatives of the parliaments (vote of initial, supplementary, and review budget laws; control of the executive branches) and the control power of the public audits largely remain symbolic, thus ruling out any serious system of checks and balances to offset the powerful executive branches.

On the other hand Lienert and Sarraf (2001) consider whether poor fiscal performance in Anglophone Africa is due to weakness of budget institutions, domestic developments or external influences. They find that although all three factors play a role, weak institutional arrangements have particularly dampened budgetary outcomes. They particularly point out poor budget preparation, ineffective budget execution and unrealistic budget projections. Discipline, transparency and accountability are lacking at the various stage of the budget process and dual budgeting and opaque extra-budgetary funds are recurrent.

Lienert (2003) analyses the differences between PFM systems of Anglophone and Francophone Africa. He finds that budget preparation in the two regions is broadly similar but there are significant differences in budget execution procedures between the two systems, centering particularly on the role and powers of the Ministry of Finance and the degree of delegation of financial management to spending agencies. He also argues that greater centralization of fiscal management in Francophone countries should, in principle, produce better results for macroeconomic control; on the contrary, when it comes to producing quality and timely in-year fiscal reports and annual accounts, the Francophone African countries appear to have had severe problems. The Anglophone countries have inherited external audit arrangements that play a relatively more important role in the budget process than in Francophone countries. Therefore supreme audit institutions in Anglophone countries provide Parliament and the public with timely information on budget execution and the integrity of annual accounts.

1.2.2 Budget institutions and fiscal performance

The literature on the fiscal effects of budget institutions is well established. Shepsle (1979) has demonstrated that institutional arrangements help overcome the chaos inherent in social decision-making. In particular, he shows that the nature of the arrangements that underpin the decision-making process in a legislature affects equilibrium outcomes. Considerable empirical work over the last fifteen years has provided solid support for this thesis. Given the public

sector budget is one of the major focus of discussions and debates within government, this would imply that institutional arrangements that surround the budget process are likely to have some influence on budgetary outcomes.

Von Hagen (1992) considers the budgetary procedures and analyses whether they have an impact on the level of government expenditures and budget deficits. In doing so, he distinguishes five dimensions: the structure of negotiations within the government, where the focus is on the position of the Minister of Finance in the cabinet, the structure of the parliamentary process, the comprehensiveness of the budget draft, the flexibility of budget execution, and finally a long-term planning constraint. In these dimensions he constructs indicators for several sub-dimensions, and then used them to explain public deficits and debt in the European Union. He showed that a budgeting process that gives to the Prime or Finance Minister a lot of power over the spending ministers, that limits the amendment power of parliament, and that leaves little room for changes in the budget during the execution process is strongly conducive to fiscal discipline, i.e., relatively small deficits and public debt. De Hann et al. (1999) perform similar studies and get a negative coefficient for the quality of budget institutions' index, which is however significant only at the 10 percent level in their equation explaining the public-debt-to-GDP-ratio. Thus, they conclude that budget institutions affect fiscal policy outcomes, but the effect is quite small.

Alesina et al. (1999) use a similar approach in a sample of Latin American countries and show that more hierarchical and/or transparent procedures lead to lower primary deficits. Prakash and Cabezon (2008) measure the quality of public financial management by constructing an index capturing the quality of budget formulation, execution and reporting for 22 HIPC⁶ African countries. They find that the quality of PFM matters for fiscal balance and external debt. Allen et al. (2010) constructed multi-dimensional indices of the quality of budget institutions in low income countries and use it to support the hypotheses that strong budget institutions help improve fiscal balances and public external debt outcomes; and countries with stronger fiscal institutions have better scope to conduct countercyclical policies.

In each case, institutional arrangements are shown to systematically influence fiscal performance. The lesson to be drawn from the empirical literature is that to explore the role of budget institutions one has to consider the rules governing the different stages of the budget

⁶ Heavily Indebted Poor Countries.

process. The institutional elements that govern the budget process form a complex system of interrelated rules, and the quality of budget processes should therefore be assessed on the basis of the system of rules.

1.3 THE CONSTRUCTION OF THE BUDGET INSTITUTIONS INDEXES⁷

This section presents empirical measures that summarize characteristics of the institutional structure of the budget processes in Africa. Using a methodology similar to von Hagen (1992), Gollwitzer (2011) identifies and characterizes institutional elements of the budget process that strengthen the coordination and cooperation in public budgeting and constructs indexes as numerical representations of these qualitative properties of budget procedures. Allen et al. (2010) follow a similar procedure to construct an index measuring the quality of budget institutions in Low-Income Countries.

Following the literature on budgetary institutions mentioned in the previous Section, the budget process is divided into three stages: the negotiation and the planning stage, the legislative approval stage and the implementation stage. The quality of each of these stages is assessed through five criteria: centralization, rules and controls, sustainability and credibility, comprehensiveness, and transparency. These five criteria are measured through 34 indicators⁸. The overall Budget Institutions Index (BII) is a simple average of the 5 criteria mentioned above. More details about the indicators and the aggregation methodology are given in Appendices B and C.

1.3.1 Centralization⁹

At the heart of the common pool problem of public finances is an externality that results from using general tax funds to finance targeted public policies. Centralization can be defined as institutional structures that strengthen a comprehensive view of the budget over the particularistic view of the spending ministers and the members of parliament. Harden and

⁷ Adapted from Gollwitzer (2011).

⁸ See Appendix B for the definition of indicators.

⁹ For more discussion on centralization, see Harden and Von Hagen (1994).

Von Hagen argue that Centralization can help to reduce the common pool problem and thus excessive fiscal deficits. Alesina and Perotti also find that hierarchical systems, characterized by a powerful Ministry of Finance, are conducive to more fiscal discipline. Mulas-Granados et al. (2009) confirm the positive impact of a strong finance minister on fiscal outcomes for Eastern European countries. Prakash and Cabezon (2008) find that hierarchical systems seem to promote fiscal discipline in sub-Saharan Africa. Drawing on this literature, five criteria as used to measure centralization during the three stages of the budget process: Legal vesting of the power, Agenda setting, Amendments by the legislature, Executive veto and Disbursement specification.

In practice, delegation can take a variety of forms. In the French model, the finance minister and the prime minister together determine the overall allocations of the spending departments. These limits are considered binding for the rest of the process. Here, the finance minister has a strong role as agenda setter in the budgeting process. The English model, in contrast, evolves as a series of bilateral negotiations between the spending departments and the finance minister, who derives bargaining power from superior information, seniority, and political backup from the prime minister.

At the legislative stage, the delegation approach gives large agenda setting powers to the executive over parliament. One important instrument here is a limit on the scope of amendments parliamentarians can make to the executive's budget proposal. In France, for example, amendments cannot be proposed unless they reduce expenditures or create a new source of public revenues. In the United Kingdom, amendments that propose new charges on public revenues require the consent of the executive. Such restraints result in the budget constraint being felt more powerfully.

1.3.2 Comprehensiveness

Gollwitzer (2011) argues that there are two relevant dimensions of comprehensiveness in the budget process. The first dimension is the comprehensiveness of the coverage of the actual budget documents. The second dimension is the comprehensiveness of legislative approval of the annual budget. The legislature should receive and discuss detailed information on the components of the budget within the framework of overall budgetary objectives. This helps to

hinder budgetary malpractices, such as hidden or unrealistic budgeting and then reduce the occurrence of deficits and debt.

Six criteria are used to measure comprehensiveness during the budgetary process: Dual budgeting, Size of off-budget items, Inclusion of aid, Inclusion of debt, Voting sequence, and Votes of individual budgets.

1.3.3 Fiscal and Procedural Rules and Controls

Fiscal rules can be defined as statutory or constitutional restrictions on fiscal policy that sets a specific limit on a fiscal indicator such as the budgetary balance, debt, spending, or taxation. In other words these rules impose a specific, binding constraint on the government's range of policy options. Many African countries have legally anchored fiscal consolidation objectives in the context of regional convergence criteria¹⁰. Fiscal rules are complemented by procedural rules that govern and regulate the budgetary process. Several authors have linked fiscal and procedural rules to more fiscal discipline. Prakash and Cabezon (2008) examine whether PFM is significant in explaining fiscal performance and find that budgetary rules have a significant impact on fiscal outcomes in sub-Saharan African countries.

Gollwitzer (2011) uses seven criteria to measure fiscal and procedural rules: Fiscal rules, Sector budget ceilings, Time limit for approval, Procedures in case of failed approval, Audit body, Flexibility to increase funds, and Sanctions for poor performance.

1.3.4 Sustainability and Credibility

A sustainable and credible budgetary framework can help mitigate the time inconsistency of preferences. The most visible element in a sustainable budgetary framework is the MTEF (Medium-Term Expenditure Framework). MTEFs translate macro-fiscal objectives and constraints into broad budget aggregates as well as detailed expenditure plans by sector. The rationale of this budgeting tool is to enable the central government to more adequately incorporate future fiscal challenges into the annual budgets, thereby reducing an undue

¹⁰ Most Francophone African countries have fiscal rules embodied in supranational treaties (the West African Economic and Monetary Union and the Central African Economic and Monetary Community). Some Anglophone African countries like Kenya, Mauritius, Namibia, Nigeria and Uganda also have national fiscal rules (IMF, 2009).

emphasis on short-term goals. The key public finance problems that MTEFs are intended to overcome are dynamic common pool and time-inconsistent voters, which can lead to higher government spending and borrowing, resulting in sub-optimally high deficits and debt. Many African countries, both in Anglophone and Francophone have adopted multi-year budgeting but there is a lack of credibility of the macroeconomic and fiscal forecasts. The Credibility criterion assesses how realistic are the budget planning and the forecasts.

Seven criteria are used to measure the sustainability and the credibility: Multiannual expenditure plan, Fiscal framework, Sectoral framework, Scope of legislative approval, Legislative capacity, Inter-period transferability of funds, and Reallocation of funds between program and units.

1.3.5 Transparency¹¹

Increasing transparency and improving accountability make it more costly for politicians and public officials to violate rules and thus renege on agreements. Publishing the expenditure allocations, the agreed upon outcomes embodied in the expenditure plan and making the budget transparent make it more difficult for both politicians and officials to alter things midstream without sufficient cause since they will have to justify any such action to the public. Institutionalizing a process of reconciling actual expenditures of ministries with their annual budgeted allocations as well as reconciling their forward estimates with subsequent budget requests and publicizing all such reconciliations will lead to more fiscal discipline. Moreover, undertaking regular ex-post evaluations of major ministerial programs and publicizing the results makes line ministries more responsive to producing the outputs that they have promised to produce over the medium term period.

Nine criteria are used to assess transparency during the three stages of the budget process: Clarity of roles and responsibilities, Publication of draft budget, Publication of macroeconomic forecasts and assumptions, Information on macroeconomic risk, Public hearings on overall budget policy, Public hearings on individual budgets, Publication of in-year reports, Details of year-end report, Publication of performance targets.

¹¹ For more discussion on transparency, see Alesina and Perotti (1996).

1.4 DATA AND METHODOLOGY

1.5.1 Sample and Data

Our sample consists of 35 African countries including 16 Francophone countries and 19 Anglophone countries¹². African countries that use a mix of Francophone and Anglophone budgetary systems are not included in the analysis.

The construction of the Budget Institutions indexes relied upon an extensive data collection effort as no single type of document sufficiently describes the existing institutional arrangements for all countries or even individual countries¹³. Information on budgetary practices and performances come from PEFA reports, information on fiscal and procedural rules have been taken from the OECD International Best Practices and Procedures' database and the Open Budget Survey conducted by the International Budget Partnership is used to assess budget transparency.

Following the literature on fiscal adjustments we measure fiscal performance by the central government overall debt and the primary budget balance, both expressed as ratios to GDP.

The control variables of the model that might affect budget deficits and public debt include the GDP per capita to control for differences in economic and institutional development, the sectoral composition of output measured by the agriculture share in GDP, the degree of openness of the economy measured as the sum of exports and imports, foreign aid, the money supply, natural resources endowment, and foreign direct investment, all expressed as ratios to GDP. Information on fiscal performance is provided by the IMF World Economic Outlook and for the different control variables we rely on the World Development Indicators dataset.

1.5.2 Methodology

A regression analysis can reveal factors that may explain differences in fiscal performance between Anglophone (A) and Francophone (F) Africa. This type of analysis, however, cannot identify the relative importance of these factors in contributing to the differences, as we are specifically interested in finding at which point differences in the quality of budget

¹² See the list of countries in Appendix A.

¹³ See Allen et al. (2010), and Gollwitzer (2011).

institutions affect fiscal performance. To explore this issue further we borrow from a technique of decomposing inter-group differences in a dependent variable into those due to different observable characteristics across groups and those due to different "prices" of characteristics of groups (see Blinder 1973 and Oaxaca 1973). For instance, the technique has been widely used to decompose earnings gaps between whites and blacks or men and women¹⁴. The Blinder-Oaxaca Decomposition (BOD), however, can be used to decompose a gap between any two groups or even countries.

The standard assumption used in BOD is that the outcome variable is linearly related to the covariates, and that the error term is conditionally independent of the covariates. The model is specified as follows:

$$Y_{i,g} = X\beta_{i,g} + \varepsilon_{i,g}, \text{ with } E[\{\varepsilon_{i,g} | X_i\}] = 0 \text{ and } g = A, F \text{ [1]}$$

Y_i is the outcome variable (primary budget balance/public debt) for country i and X_i is a vector containing a set of predictors. β contains the slope parameters and the intercept, and ε is the error term. Letting $D_A = 1$ be an indicator if country i is Anglophone, and taking the expectations over X , the overall mean outcome gap Λ can be written as:

$$\begin{aligned} \Lambda &= E[\{Y_A | D_A = 1\}] - E[\{Y_F | D_A = 0\}] \text{ [2]} \\ &= (E[\{X | D_A = 1\}]\beta_A + E[\{\varepsilon_A | D_A = 1\}]) - (E[\{X | D_A = 0\}]\beta_F + E[\{\varepsilon_F | D_A = 0\}]) \text{ [3]} \end{aligned}$$

Where $E[\{\varepsilon_A | D_A = 1\}] = 0$ and $E[\{\varepsilon_F | D_A = 0\}] = 0$ by assumption. Adding and subtracting the average counterfactual outcome that Anglophone Africa would have under the Francophone Africa's coefficient β_F , the expression [3] becomes:

$$\begin{aligned} \Lambda &= E[\{X | D_A = 1\}]\beta_A - E[\{X | D_A = 1\}]\beta_F + E[\{X | D_A = 1\}]\beta_F - E[\{X | D_A = 0\}]\beta_F \\ &= E[\{X | D_A = 1\}] (\beta_A - \beta_F) + \beta_F (E[\{X | D_A = 1\}] - E[\{X | D_A = 0\}]) \text{ [4]} \end{aligned}$$

Replacing the expected value of the covariates $E[\{X | D_A = \theta\}]$, $\theta = (0; 1)$, by the sample average \bar{X}_g , Λ can be rewritten as:

$$\Lambda = \bar{X}_A \hat{\beta}_A - \bar{X}_A \hat{\beta}_F + \bar{X}_A \hat{\beta}_F - \bar{X}_F \hat{\beta}_F$$

¹⁴ See Blinder (1973), Reimers (1983), Cotton (1988), Neumark (1988), Oaxaca and Ransom (1994), among others.

$$= \bar{X}_A (\hat{\beta}_A - \hat{\beta}_F) + \hat{\beta}_F (\bar{X}_A - \bar{X}_F) [5]$$

$$\rightarrow \Lambda = \Lambda_C + \Lambda_X [6]$$

The first term, Λ_C , represents the part due to differences in the group processes determining the outcome, which is often referred to as the "unexplained" component, and the second term, Λ_X , represents the part of the gap that is due to group differences in average values of the independent variables. Λ_X and Λ_C can be further decomposed into the separate contributions from group differences in specific variables:

$$\Lambda_C = (\hat{\beta}_{A0} - \hat{\beta}_{F0}) + \sum_{k=1}^M \bar{X}_{Ak} (\hat{\beta}_{Ak} - \hat{\beta}_{Fk}) [7]$$

$$\Lambda_X = \sum_{k=1}^M (\bar{X}_{Ak} - \bar{X}_{Fk}) \hat{\beta}_{Fk} [8]$$

Decomposition [4] is formulated from the viewpoint of Francophone Africa. That is, the group differences in the predictors are weighted by the coefficients of (F) to determine the explained part. From the point of view of (A), the differential would be expressed as:

$$\Lambda = \bar{X}_F (\hat{\beta}_F - \hat{\beta}_A) + \hat{\beta}_A (\bar{X}_F - \bar{X}_A) [9]$$

A third prominent way to decompose the outcome difference between Anglophone and Francophone Africa and that we are going to adopt to perform the decomposition, is to use a non-discriminatory vector $\hat{\beta}^*$. As proposed by Jann (2008) the outcome difference can then be rewritten as:

$$\Lambda = [\bar{X}_A (\hat{\beta}_A - \hat{\beta}^*) + \bar{X}_F (\hat{\beta}^* - \hat{\beta}_F)] + \hat{\beta}^* (\bar{X}_A - \bar{X}_F) [10]$$

$$= \Lambda_C + \Lambda_X$$

The estimation of equations [5] and [9] is straightforward as $\hat{\beta}_A$ and $\hat{\beta}_F$ can be obtained separately from the two groups but for equation [10], $\hat{\beta}^*$ is unknown and there are many ways to estimate it¹⁵. For instance Blinder (1973) proposes to assume that $\hat{\beta}^* = \hat{\beta}_A$ or $\hat{\beta}^* = \hat{\beta}_F$. This option may hold in the discrimination literature¹⁶ but not in our case, as we cannot assume

¹⁵ For more examples see Jones (1983) and Cotton (1988).

¹⁶ In the discrimination literature for instance, one can assume that wage discrimination is only directed against women and there is no discrimination of men or otherwise assume that there is no discrimination of women but only positive discrimination towards men.

that the coefficient of one group is the “normal coefficient”. Furthermore there is an “Index number problem” as we can obtain different results depending on which group is taken for reference. To overcome this problem Neumark (1988) proposes to use the coefficients from a pooled regression over both groups. Here we pursue this latter track.

1.5 EMPIRICAL INVESTIGATION

1.5.1 Descriptive statistics

Before we turn to the regression and decomposition analysis, we investigate how Anglophone and Francophone Africa differ in terms of fiscal performance and budget institutions’ characteristics. Table 1 presents the descriptive statistics of the two groups.

Table 1: Summary statistics

Variables	Anglophone Africa	Francophone Africa	Sample Countries
BII	49.92 (1.31)	34.45 (1.45)	43.65 (1.05)
Centralization	52.91 (1.73)	61.88 (2.00)	56.55 (1.11)
Comprehensiveness	48.58 (1.81)	34.21 (2.12)	42.76 (1.32)
Rules and Controls	48.57 (1.44)	35.81 (1.75)	43.4 (1.3)
Sustainability	51.62 (1.95)	36.59 (1.21)	45.53 (1.27)
Transparency	49.89 (2.14)	20.37 (1.03)	37.95 (1.51)
Gross Debt	64.32 (3.76)	76.04 (5.75)	69.07 (3.300)
Primary Budget Balance	-0.31 (0.380)	-2.27 (0.350)	-1.11 (0.271)

Data are averaged over the period 2002-2007. Standard errors in parenthesis.

Table 1 highlights the difference between Anglophone and Francophone Africa in terms of the quality of their budget institutions. In fact the Anglophone Africa average BII score is 15

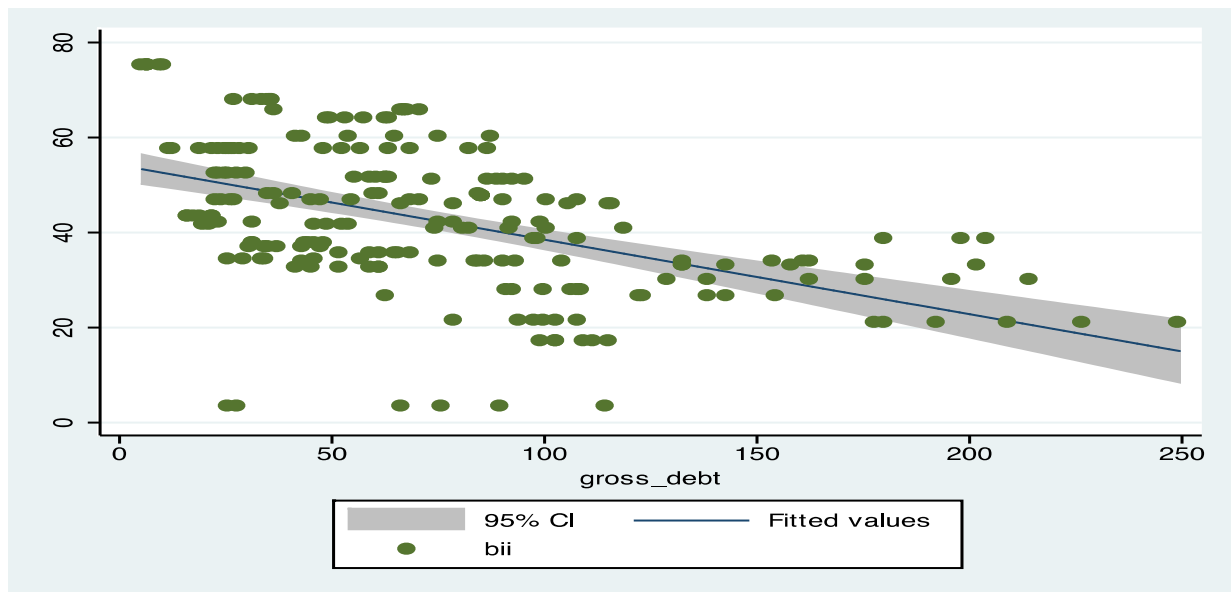
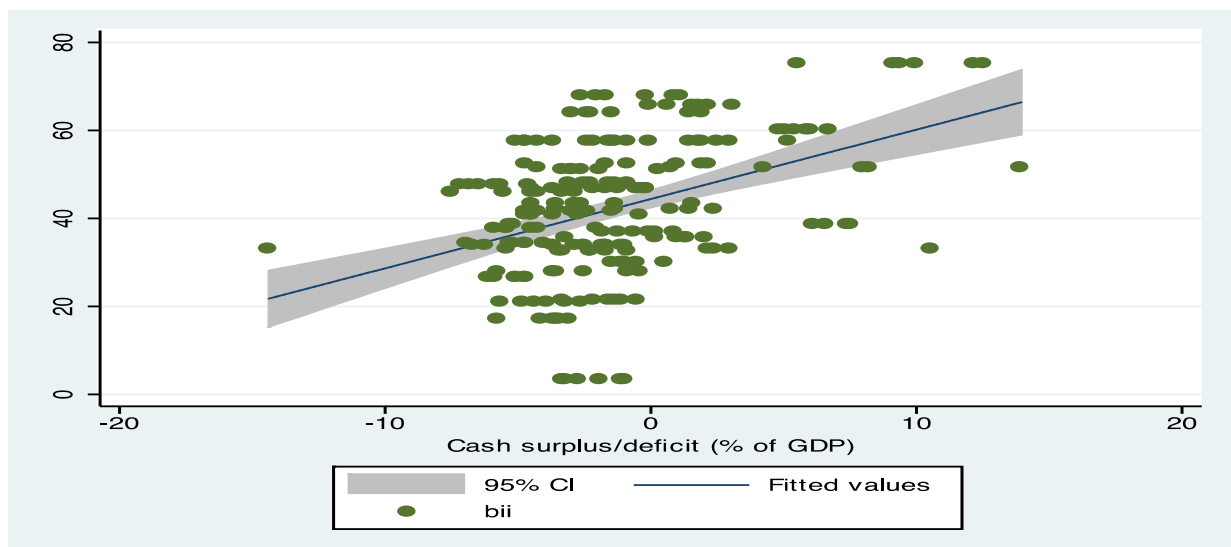
points higher than the Francophone score. If we look at the each of the components of the index, the Anglophone group performs better than the Francophone one in 4 out of the 5 sub-indicators. The Anglophone budgetary framework is on average more comprehensive, sustainable and credible by an average of 15 points. The gap is even larger when it comes to budget transparency where the Anglophone score is twice higher than the Francophone score. Centralization is the only component of the quality of budget institutions where Anglophone countries score less than their Francophone peers.

In terms of fiscal performance, Anglophone countries have on average higher primary budget balance and lower gross debt than Francophone countries. These results are consistent with previous findings, as countries with better budget institutions seem to have better fiscal performance. Nevertheless Table 1 can't tell us if there is a causal relationship between the quality of budget institutions and fiscal performance and at which point the differences in Anglophone and Francophone budgetary frameworks can explain their different budgetary outcomes. The decomposition analysis will allow us to deepen our analysis.

1.5.2 Graphical Analysis

Figures 1 and 2 present the observed relationship between budget institutions and fiscal performance. A first observation is that the aggregate index BII appears to have, as we expected, a strong positive relationship with the Primary Balance and a negative relationship with the Debt ratio. If we look at the correlation between fiscal performance and the different subcomponents of BII¹⁷, we can also see that they are all positively correlated with the Primary Balance and negatively correlated with Debt.

¹⁷ See Appendix D.

Figure 1: Correlation between BII and Gross Debt**Figure 2: Correlation between BII and Primary Balance**

1.5.3 Spearman Rank's correlation

Table 2 reports the Spearman rank correlation coefficients between the indexes and the fiscal performance variables. The sign of the Spearman correlation indicates the direction of association between two variables $X1$ and $X2$: if $X1$ tends to increase when $X2$ increases, the

Spearman correlation coefficient is positive, and if $X1$ tends to decrease when $X2$ increases, the Spearman correlation coefficient is negative.

Table 2: Spearman rank's correlation between Budget Institutions and Fiscal Performance¹⁸

	PBB	Debt	BII	CENT	COMP	RULES	SUST	TRANS
PBB	1							
Debt	-0.24	1						
BII	0.378	-0.549	1					
CENT	0.165	-0.221	0.286	1				
COMP	0.29	-0.318	0.7	0.245	1			
RULES	0.256	-0.374	0.75	0.315	0.561	1		
SUST	0.354	-0.417	0.8	0.228	0.454	0.661	1	
TRANS	0.342	-0.538	0.858	0.193	0.55	0.599	0.637	1

All coefficients are statistically significant at 1% level.

The results generally corroborate the earlier findings. All rank correlation coefficients have the expected sign, and are all statistically significant. Regarding the primary budget balance (PBB) the correlations with the indexes are positive and strongly significant; the rank correlation coefficient between PBB and SUST appears to be the highest correlation (0.354) while the correlation with CENTR is the weakest (0.165). The respective rank correlation between the gross debt ratio (DEBT) and the indexes show a similar pattern as the rank correlations between the budget balance ratios and the indexes, except that the coefficients display now a negative sign, as expected, and have slightly different values. The rank correlation between DEBT and TRANS is particularly high and statistically significant (-0.536). Besides, note that the different indexes of the quality of budget institutions are strongly correlated and TRANS appears to be the index that is the most highly correlated to the other indexes.

¹⁸ CENT: Centralization; COMP: Comprehensiveness; RULES: Rules and Controls; SUST: Sustainability and Credibility; TRANS: Transparency.

1.5.4 Regression analysis

The results of the baseline regressions, using the Ordinary Least Squares specifications, are summarized in Table 3. Columns (1) and (3) show the basic specification while columns (2) and (4) include a dummy variable for country groups. The explanatory variables can be found in standard empirical models to explain fiscal outcomes¹⁹. Variables that seem to negatively affect fiscal performance i.e. higher Public Debt and lower Primary balance are Agriculture share, M2 (near money), Trade, and Aid per GNI. GDP per capita is associated with higher Primary Balance and surprisingly with higher Public Debt.

Besides, our previous findings are confirmed as the Anglophone dummy is associated with lesser debt and higher primary balance: Anglophone countries' Debt and Primary balance are respectively on average 18.39 percentage points lower and 1.81 percentage points higher than those of their Francophone peers.

Table 3: Determinants of fiscal performance: baseline regressions

Dependent variable	Gross Debt		Primary Balance	
	(1)	(2)	(3)	(4)
GDP per capita	0.012*** (0.002)	0.012*** (0.002)	0.0005** (0.0002)	0.0005** (0.0002)
Agriculture VA (%GDP)	2.022*** (0.264)	1.942*** (0.257)	-0.086*** (0.028)	-0.078*** (0.027)
M2 (%GDP)	0.540*** (0.146)	0.651*** (0.145)	-0.02 (0.015)	-0.031** (0.015)
Trade (%GDP)	0.192* (0.077)	0.216** (0.075)	-0.011 (0.008)	-0.014* (0.008)
Natural Resources (%GDP)	0.317 (0.212)	0.249 (0.206)	-0.001 (0.022)	0.005 (0.022)
Aid (%GNI)	2.011*** (0.330)	2.136*** (0.322)	-0.066* (0.035)	-0.078** (0.034)
FDI (%GDP)	-0.861 (0.534)	-0.699 (0.520)	0.039 (0.056)	0.023 (0.055)
Anglophone		-18.39*** (5.281)		1.81*** (0.565)
Intercept	-8.12 (12.63)	-9.8 (12.70)	2.648* (1.345)	3.801*** (1.360)
Observations	185	185	185	185
Adjusted R2	0.442	0.475	0.198	0.238

Standard errors in parenthesis, * p<0.1 ** p<0.05 *** p<0.01.

¹⁹ See Prakash and Cabezon (2008), Allen et al. (2010), and Gollwitzer (2011) among others.

1.5.5 Blinder-Oaxaca Decomposition

1.5.5.1 Public Debt

The decomposition results for Debt are reported in the first two columns of Table 4. Overall, the average difference of Debt level between Anglophone and Francophone Africa is 11.73 percentage points. The overall characteristics and coefficients effects are respectively -12.47 and 0.74 percentage points. These results can be interpreted as follows: the negative value of the characteristics effect means that if the Anglophone and Francophone countries were to have the same coefficients, i.e., the same yield of characteristics on their debt level, then, solely on the basis of the differences in the characteristics, Anglophone countries' debt level would have been lower than that of the Francophone countries by 12.47 points. On the other hand, the coefficients effect of 0.74 implies that if both Anglophone and Francophone groups were to have the same characteristics, such that the difference in the Debt levels between the two groups arose from the differences in coefficients (i.e., the rates of return on the characteristics) alone, then the Anglophone group debt level would have been higher than that of the Francophone group by 0.74 points. Only the overall characteristics' effect appears to be statistically significant.

We can then further breakdown the characteristics effect into individual variables. This breakdown reported in Column 1 suggests that the quality of budget institutions is the main determinant of the Debt levels' difference between Anglophone and Francophone countries and this difference would be even larger *ceteris paribus*; for instance, if the characteristics and the returns on these measured characteristics for the two groups were to be equalized, on account of the BII index alone the difference in the Debt level would have been 19.23 points. The other significant factor explaining the performance difference in favor of Anglophones is the Agriculture-to-GDP-ratio: differences in this variable between the two groups explain 8.53 points of the difference in Debt levels. GDP per capita and M2 (Near money) also play significant roles in determining the performance gap (in favor of Francophone countries), as their coefficients are positive and statistically significant.

The overall coefficients effect is insignificant but the breakdown, in Column 2, shows that returns of GDP per capita and Aid per GNI favor the Anglophone countries and then widened the gap between the Debt levels of the two groups.

1.5.5.2 Primary Balance

The decomposition analysis for Primary Balances' difference is reported in Columns 3 and 4 of Table 4. The interpretation of the results is quite similar to what we did for the first two columns. As for the Debt level Anglophone countries have an edge over their Francophone peers, the average primary balances' difference between the two groups being 1.85 percentage points. The overall characteristics and coefficients effects are respectively 1.37 and 0.59 percentage points; here again only the overall characteristics effect appears to be statistically significant.

The breakdown of the characteristics effect shows that the quality of budget institutions is the only significant determinant of the performances' difference between the two groups. In fact the only difference in the BII scores explains, *ceteris paribus*, 1.22 percentage points of the difference in groups' average primary balances.

Even if the overall coefficients effect is not significant, a more detailed picture shows that the returns of four variables play a significant role in determining the differences. The return of the quality of Budget Institutions appears to play a significant role in explaining the differences between fiscal performances of the two groups. This finding is even more interesting and means that for the same level of BII, Anglophone budget institutions are conducive to higher Primary Balance.

The GDP per capita and the Agriculture-to-GDP ratio coefficients being negative and significant, Francophone countries have an edge over Anglophone countries *ceteris paribus* as differences in returns of these two variables are associated respectively with 2.42 and 2.68 points of primary balances in favor of the Francophone group. The return of FDI is favorable to Anglophone countries and is associated with 1.25 points difference of Primary Balances.

Table 4: Blinder-Oaxaca Decomposition results

Dependent Variable	Debt		Primary Balance	
	(1)	(2)	(3)	(4)
	X	C	X	C
Performance Difference	-12.47* (5.831)	0.746 (5.268)	1.371** (0.443)	0.596 (0.453)
GDP per capita	7.883** (2.751)	-12.57** (4.421)	0.377 (0.303)	-2.423*** (0.509)
Agriculture VA (%GDP)	-8.535** (2.968)	5.583 (15.38)	0.234 (0.189)	-2.684* (1.124)
M2 (GDP)	8.853*** (2.622)	-17.24 (19.09)	-0.391 (0.306)	-1.403 (0.982)
Aid (%GNI)	-0.735 (2.509)	-20.61** (7.260)	0.0246 (0.0843)	-0.0756 (0.532)
FDI (%GDP)	-1.103 (0.715)	3.292 (3.121)	0.0395 (0.0767)	1.255** (0.443)
Trade (%GDP)	1.920 (1.328)	-23.64 (18.59)	-0.124 (0.223)	1.491 (1.122)
Natural Resources (%GDP)	-1.523 (1.077)	-1.021 (5.755)	-0.0149 (0.102)	0.134 (0.352)
BII	-19.23*** (3.689)	9.90 (18.06)	1.224*** (0.329)	5.130*** (1.243)
Intercept		7.04 (13.44)		-0.828 (2.264)
Observations	185		185	
Model	Linear Decomposition		Linear Decomposition	
Y of Anglophone	64,32		-0,312	
Y of Francophone	76,05		-2,27	
N of Anglophone	110		110	
N of Francophone	81		81	

Standard Errors in parenthesis. *, ** and *** indicate significance at 10%, 5% and 1% respectively. X and C stand for characteristics and coefficients effect respectively.

1.5.6 Disaggregating the effects of Budget Institutions

As shown above the BII is the main determinant of the differences between Anglophone and Francophone Africa in terms of fiscal performance. To deepen our analysis we disaggregate the BII and look at the impact of each of its 5 components: Centralization, Comprehensiveness, Rules and Controls, Sustainability and Credibility, and Transparency. We rerun the same model as in Table 4 by replacing the BII by these 5 indicators. The merged results are presented in Table 5.

Table 5: Disaggregated decomposition results

Dependent Variable	Debt		Primary Balance	
	(1)	(2)	(3)	(4)
	X	C	X	C
BII	-19.23*** (3.689)	9.90 (18.06)	1.224*** (0.329)	5.130*** (1.243)
Centralization	7.105** (2.513)	4.990 (18.19)	-2.381* (1.157)	2.604** (0.833)
Comprehensiveness	-6.255** (2.292)	-5.33* (2.13)	0.426* (0.211)	1.283 (1.076)
Rules and Controls	-7.21*** (1.780)	9.968 (15.66)	0.677** (0.239)	1.202*** (0.014)
Sustainability	-8.916*** (2.656)	-1.84 (4.87)	1.280*** (0.345)	2.397*** (0.162)
Transparency	-6.93*** (0.512)	3.56*** (0.27)	1.104** (0.372)	1.016 (0.701)

Standard Errors in parenthesis. *, ** and *** indicate significance at 10%, 5% and 1% respectively. X and C stand for characteristics and coefficients effects respectively.

1.5.6.1 Public Debt

Our previous findings have shown that Anglophone countries have on average better budget institutions and this advantage is comparatively conducive to less public debt and deficits. The first two columns of Table 5 show the decomposition analysis for Public Debt. Among the 5 indicators only Centralization seems to play in favor of the Francophone group; in fact if the two groups were to have the same coefficients (returns of characteristics), Francophone countries would have on average 7.10 points Debt lesser than the Anglophone ones *ceteris paribus*. This finding is in line with our previous results as the Francophone system is more centralized with a powerful Ministry of Finance. The four other indicators also play a significant role in explaining the Public Debt gap between the two groups: each of these indicators is on average associated with lesser Debt (between 6 and 9 percentage points) in favor of Anglophone countries.

When it comes to the coefficients effect, only two indicators seem to play a significant role: Comprehensiveness and Transparency. These findings are particularly interesting as for the same level of Comprehensiveness Anglophone countries are comparatively in a better position to reduce their Public Debt. Then the coefficients effect for this variable is 5.33

percentage points. Even more interesting are the findings for Transparency as for the same level of this indicator Francophone countries have on average 3.56 points less Public Debt.

1.5.6.2 Primary Balance

The findings on the impact of the different indicators on Primary Balance are reported in Column 3 and 4 of Table 5. Concerning the characteristics effect the conclusions are the same as for Public Debt: Centralization is the only indicator in favor of the Francophone group and is associated with 2.38 points more Primary Balance for this group compared the other one *ceteris paribus*. The four remaining indicators i.e. Comprehensiveness, Sustainability, Rules and Controls, and Transparency play in favor of the Anglophone group and individually explain between 0.42 and 1.3 points of the difference between the two groups.

The returns of three of these indicators help also to explain this gap as the coefficients effect for Centralization, Rules and Controls, and Sustainability are positive and statistically significant. Then for the same level of one of these indicators, Anglophone countries have between 1.2 and 2.6 points more Primary Balance than the Francophone countries.

1.5.7 Robustness checks

In this section we conduct a robustness test of the results previously obtained and we are particularly interested in potential endogeneity and omitted variables issues as the differences between Anglophone and Francophone countries could be explained by the existence of unobservable factors that the Blinder-Oaxaca decomposition did not allow us to control for in our analysis. For instance the Bretton Woods institutions have played a significant role in the design of budget institutions in developing countries in recent years and this may have affected the fiscal performance of these countries. In addition, other factors such as the degree of politicization and the capacity of Budget Offices' are not captured in the analysis.

Therefore to control for the potential impacts of these factors, we make use of the Juhn-Murphy-Pierce decomposition - JMP decomposition hereafter - developed by Juhn et al. (1991). The main attraction of this decomposition method is that it seems to provide a way to show the effect of unobserved characteristics on fiscal performance explicitly. Indeed the JMP decomposition extends the BOD approach by accounting for the residual distribution and

decomposes the performance gap into three categories: the individual characteristics effect (resulting from a change in the distribution of the Xs), the return or “price” effect (resulting from a change in the β s) and the residual effect (or unobservable factors’ influence). The residual gap is further specified in terms of the standard deviation of the residuals and standardized residuals. The standard deviation of the residuals is considered as the price of unobserved characteristics²⁰.

Table 6: Juhn-Murphy-Pierce Decomposition results

Dependent Variable	Debt				Primary Balance			
	(1) T	(2) Q	(3) P	(4) U	(5) T	(6) Q	(7) P	(8) U
JMP Decomposition	-11.72*	-13.33**	1.29	0.34	1.96**	1.64*	0.26	0.05
	(5.3)	(4.52)	(1.11)	(1.22)	(0.443)	(0.53)	(0.155)	(0.713)
Observations	185				185			
Model	Linear				Linear			
Y of Group 1	64,32				-0,312			
Y of Group 2	76,05				-2,27			
N of Group 1	110				110			
N of Group 2	75				75			

Standard Errors in parenthesis. *, ** and *** indicate significance at 10%, 5% and 1% respectively. Group 1 is Anglophone countries and Group 2 is Francophone countries. T stands for Total Difference, Q for Quantity effect, P for Price effect, and U for Unobserved Prices et Quantities effect.

The JMP decomposition of fiscal performance gaps presented in Table 6 confirms our previous results, as countries’ characteristics (Q) are the main determinants of observed gaps both in the level of debt and primary balance while the price effect (P) is not significantly significant. And more importantly the effect of unobserved characteristics measured by (U) doesn’t seem to explain any portion of the gaps. Overall the JMP and the BOD results are similar although the characteristics effect is slightly higher in the JMP decomposition (13.33 points of the differences in Public debt and 1.64 points of the differences in Primary balance).

²⁰ A detailed presentation of the JMP decomposition method can be found in Appendix D.

1.6 DISCUSSION AND CONCLUSION

The empirical literature has recently emphasized the importance of sound budget institutions in ensuring good fiscal performance. In fact a large body of research and practical experience has shown that the outcomes of political decision-making processes are systematically shaped by the institutional environments within which these processes evolve. Besides highlighting the budget institutions' differences between Anglophone and Francophone Africa countries, this study attempts to make a novel contribution by investigating if and how these differences explain the fiscal performance gap between the two groups.

The first obstacle when one tries to work on African budget institutions' issues is data limitation. Most papers on this subject focused on European and Latin American countries but more recently a growing attention has been paid to the institutional arrangements in African countries and some authors have attempted to develop indicators to measure the quality of budget institutions in these countries.

Using a composite index constructed by Gollwitzer (2011) we have shown that Anglophone African countries have on average better budget institutions than their Francophone counterparts, the average scores of the two groups being 48 and 33 out of 100 respectively. A more detailed picture has also shown that the Anglophone budgetary processes and procedures are more comprehensive, sustainable, transparent and constraining. The only quality of budget institutions in favor of the Francophone system appears to be its high degree of centralization. We then investigate how these comparative advantages affect the fiscal performance of the two groups of countries.

The standard method used in the literature to conduct this type of analysis is the linear regression, which consists of introducing explanatory variables and a dummy variable (Anglophone/Francophone). Under the implicit hypothesis that the explanatory variables included in the regression have, for both groups, the same impact on the dependent variable, the coefficient associated with the dummy measures *ceteris paribus* the average difference of the dependent variable between two groups i.e. the total gap not explained by observable characteristics introduced in the regression. But if the underlying hypothesis is rejected or if the average characteristics of the two groups are different this coefficient will not be a good measure of the proportion of the unexplained gap.

Therefore we make use of the Blinder-Oaxaca Decomposition (BOD) traditionally used to explain the observed wage differentials between two groups of people (men and women, black and white, etc.). Starting from the idea that the characteristics of each individual may be valued differently in the labor market, Blinder (1973) and Oaxaca (1973) suggest that differences in wages between two groups can be disaggregated into two parts: the characteristics effect and the coefficients effect.

One limitation of the technique is that while the BOD is useful for quantifying the contribution of various factors to a difference or change in outcomes in an accounting sense, it may not necessarily deepen our understanding of the mechanisms underlying the relationship between factors and outcomes. In that sense, decomposition methods, just like program evaluation methods, do not seek to recover behavioral relationships. Nevertheless, by indicating which factors are quantitatively important, decompositions provide useful indications of particular hypotheses or explanations to be explored in more detail.

Our results confirm the hypothesis that the institutional design of the budget process in Africa does have an impact on fiscal outcomes as the differences between the Anglophone and the Francophone systems are the main drivers of the fiscal performance gaps between Francophone and Anglophone Africa. Another important finding is that the characteristics effect explains most of these gaps – both in Primary Balance and Debt, which means that the structural differences of two systems are not the main determinants. In other words, the problem is not the French budgetary model itself but rather the environment in which it operates. Major reforms are needed in Francophone countries if they want to catch up with their Anglophone counterparts; reforms are needed to improve the comprehensiveness, the sustainability and the credibility of the budget, and more importantly the transparency of the budget process where the performance of Francophone countries is particularly poor.

The present study contributes both to the growing empirical research on public sector assessment in general, and to the more specific literature on the economic effects of sound budget institutions.

1.7 APPENDICES

Appendix A: Sample Countries

English-based system	French-based system
Botswana	Benin
Egypt	Burkina Faso
Ethiopia	Burundi
Gambia	Cameroon
Ghana	Central African Republic
Kenya	Chad
Lesotho	Congo
Malawi	Congo, Democratic Republic
Namibia	Cote d'Ivoire
Nigeria	Gabon
Seychelles	Madagascar
Sierra Leone	Mali
South Africa	Niger
Sudan	Rwanda
Swaziland	Senegal
Tanzania	Togo
Uganda	
Zambia	
Zimbabwe	

Appendix B: Measurement of indicators at the different stages of the budget process

	Preparation	Legislative Approval	Implementation
Centralization	Legal vesting of power Agenda setting	Amendments by Legislature Executive veto	Disbursement specification
Rules and Controls	Fiscal rules Sectoral budget ceiling	Time limit for approval Procedure in case of failed approval	Audit body Flexibility to increase funds Sanction for poor performance
Sustainability and Credibility	Fiscal framework Sectoral framework Multiyear expenditure plans	Scope of legislative approval Legislative capacity	Inter period transferability of funds Reallocation of funds between programs and units
Comprehensiveness	Dual budgeting Size of Off-budget items Inclusion of Aid Inclusion of Debt	Voting sequence Votes on individual budgets	
Transparency	Clarity of roles and responsibilities Publication of Draft Budget Publication of macroeconomic forecasts and assumptions Information on macroeconomic risks	Public hearings on overall budget policy Public hearings on individual budgets	Publication of In-Year Reports Publication of Year-End report Publication of performance targets

Sources: Gollwitzer (2011)

Appendix C: Aggregation of the Index

For robustness checks three different methods have been used for the aggregation of the index: equal weights, principal component analysis (PCA) and geometric aggregation with the weights derived from PCA. The results obtained are robust to the type of aggregation.

The index has 5 components: Centralization (CT), Comprehensiveness (CP), Rules and Controls (RC), Sustainability and Credibility (SC) and Transparency (T).

As shown in Appendix 2 each of these components is measured through several sub-indicators; for instance, Centralization (CT) is calculated as follows:

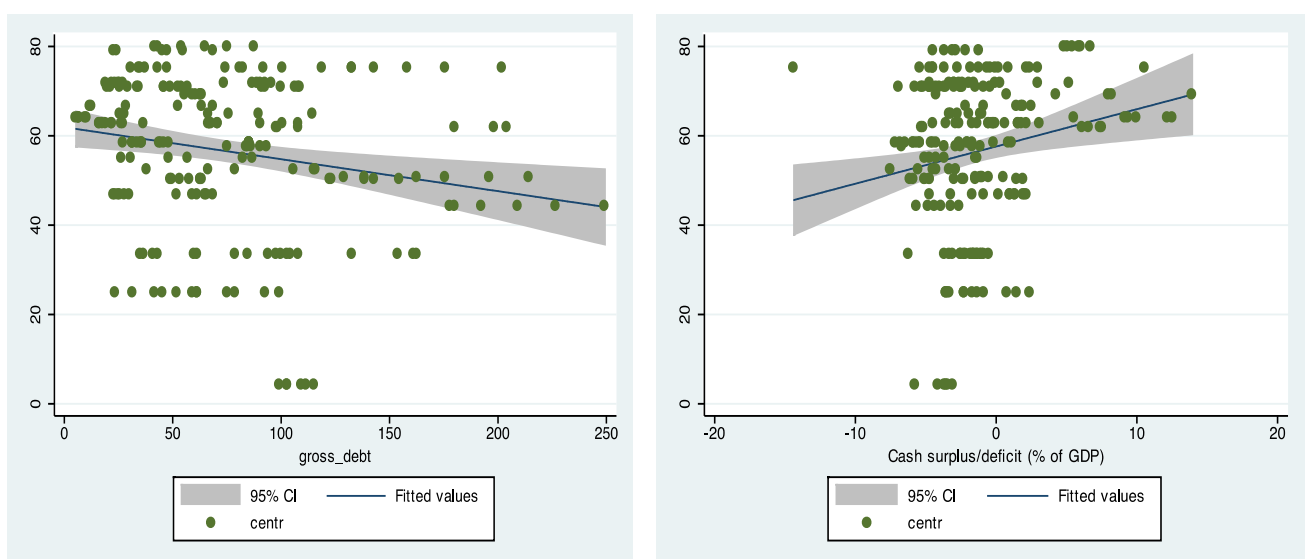
$$CT_i = \sum_{\lambda=1}^2 \lambda_i^P * w_P + \sum_{\lambda=1}^2 \lambda_i^A * w_A + \lambda_i^I * w_I$$

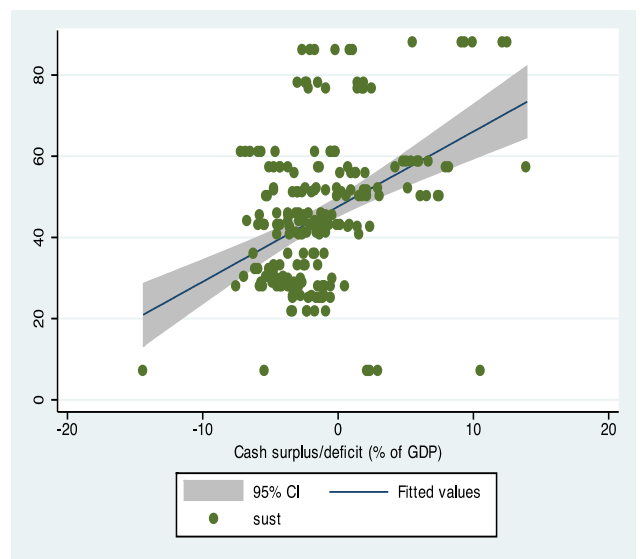
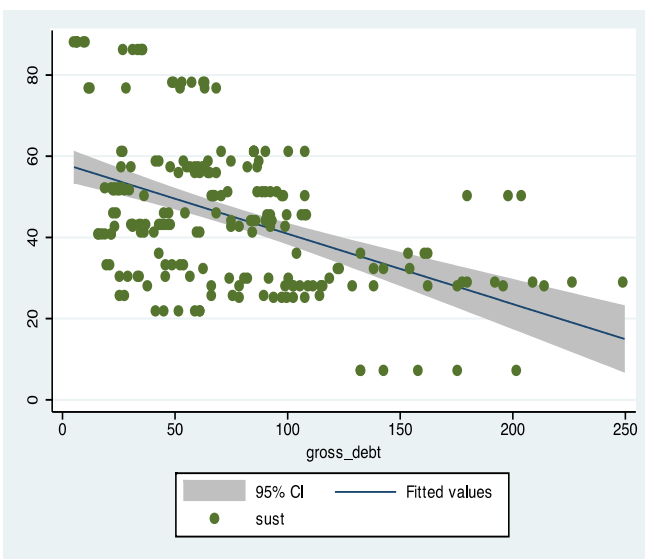
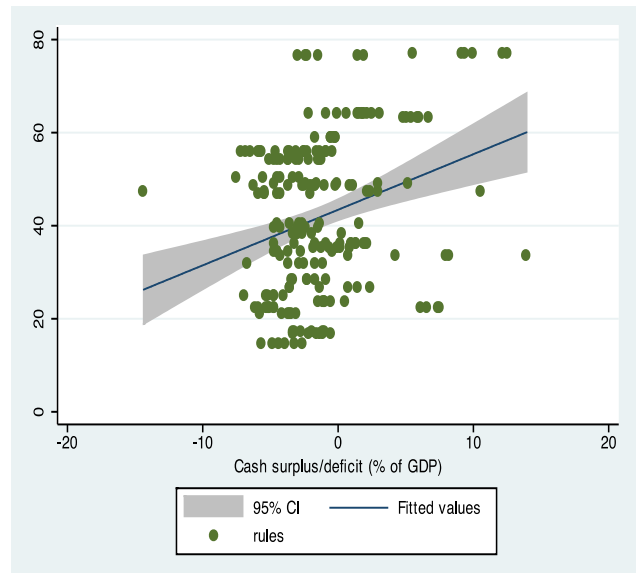
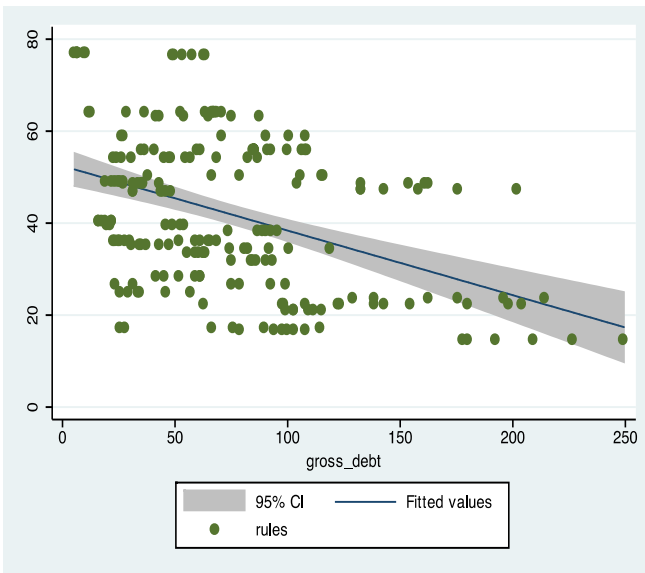
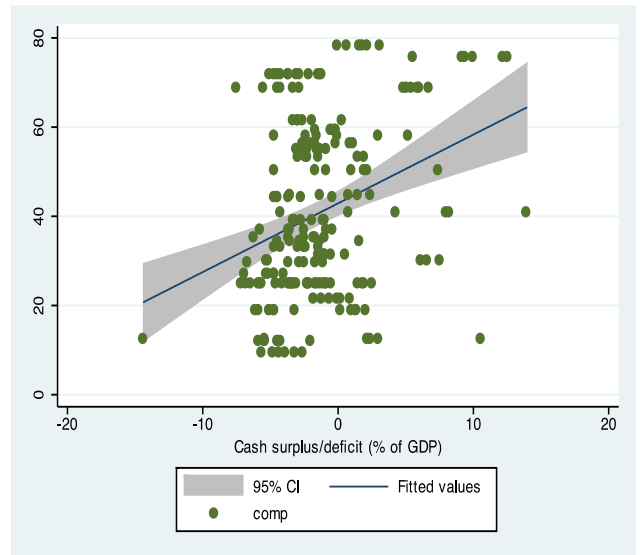
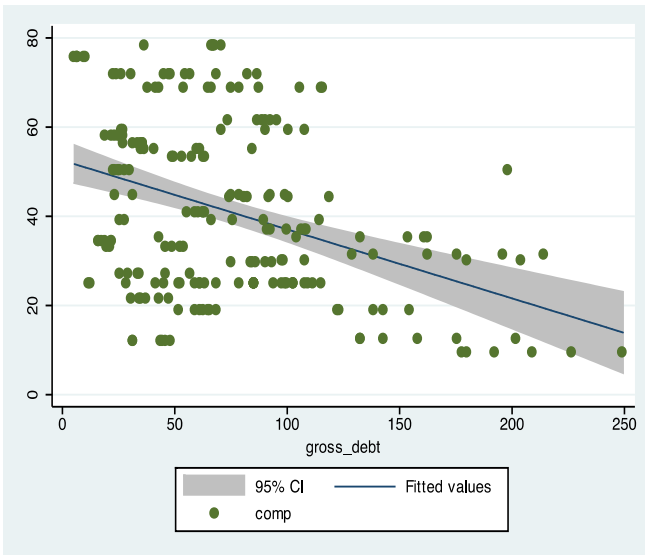
where λ is the component variable, w is the weighting assigned to each variable within the three stages. P is the Preparation stage, A is the approval stage and I is the implementation stage. The other four components are defined accordingly and they are then aggregated into an overall index:

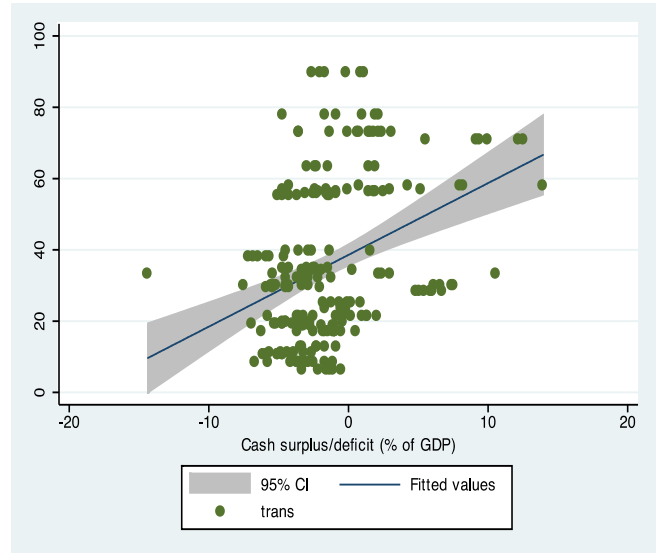
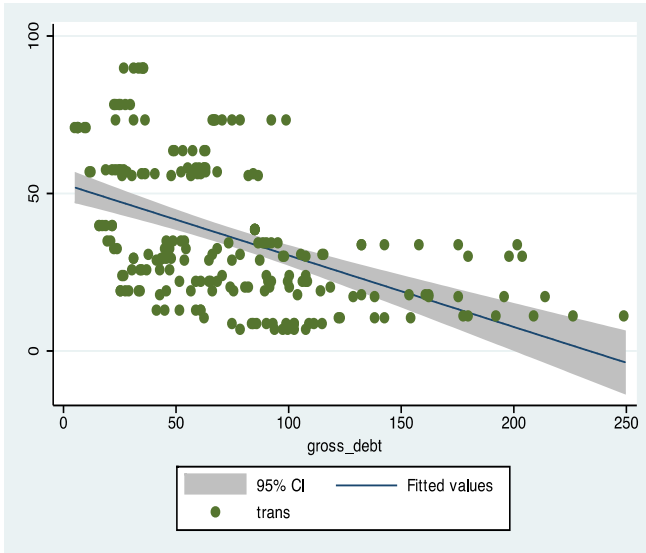
$$BII_i = CT_i + CP_i + RC_i + SC_i + T_i$$

All of them are given equal weights. Finally, the overall index is scaled to range between 0 and 100.

Appendix D: Correlation between fiscal performance and the subcomponents of BII







**CHAPTER 2²¹: ASSESSING REVENUE AUTHORITY
PERFORMANCE IN DEVELOPING COUNTRIES: A SYNTHETIC
CONTROL APPROACH**

²¹ A version of this chapter is forthcoming at the International Journal of Public Administration.

ABSTRACT

In many developing countries comprehensive reforms have been undertaken in tax administrations during recent years and the implementation of semi-autonomous Revenue Authorities (SARAs) constitutes one of their most visible expressions. In fact, due to the lack of conclusive results after a series of reforms within the existing Ministries of Finance some have thought that the creation of autonomous structures responsible for managing tax revenue could improve revenue mobilization. To date there is no comprehensive assessment of how successful these SARAs have been in achieving that goal. Using recent developments in the empirics of comparative case studies, this paper investigates the impact of SARAs on revenue mobilization in twenty countries in the developing world.

Our findings from the Synthetic Control Method show that the implementation of a SARA does not always produce the expected outcomes. Of the twenty SARAs surveyed only five have sustainably performed better than their Synthetic Control. In the other fifteen countries performance has been mixed or disappointing: five SARAs performed well for a few years but these performances have been unstable and six of them have poor performance compared to their Synthetic Control. Finally for four countries, the results are statistically insignificant, as the Synthetic Control Method does not provide suitable comparator countries.

This paper is a contribution to an ongoing discussion rather than a definitive assessment of the value of SARAs and highlights how it can be difficult in being conclusive on such reforms.

2.1 INTRODUCTION

Mobilizing more revenue is a priority for most developing countries. They have to finance their development agendas, and weak revenue mobilization is the root cause of fiscal imbalances in several countries. Of course, raising revenue is not an end in itself but is a way to fully exploit fiscal space, increase priority spending, and reduce dependence on budget support, which is not without limits. The importance of good administration has long been as obvious to all concerned with tax policy in developing countries as its absence in practice. A key component of any tax system is the manner in which it is administered, which affects its yield, its incidence, and its efficiency. “No tax is better than its administration, so tax administration matters – a lot”²².

In many developing countries, limited administrative capacity is a binding constraint on tax reform and the failure to improve tax administration when introducing new tax structures resulted in very uneven tax imposition, widespread tax evasion, and lower than anticipated revenue. The literature on taxation and development often refers to ineffective tax administration as one of the main constraint to the ability of states to collect revenues in general and direct taxes in particular (Bird 2008). Hadler (2000) estimates that better administration of existing tax legislation may increase revenue by 30% or more in many countries in sub-Saharan Africa.

To improve the quality and the effectiveness of tax administrations, a common suggestion was that an elite corps of tax administrators should be created, an idea that dates back to Kaldor (1956). In line with the New Public Management paradigm, strengthen revenue administration has been an important part of technical donor support to public sector reform in developing countries during the last two decades (Von Soest, 2007), and the proliferation of semi-autonomous revenue authorities (SARAs) constitutes its most visible expression. The semi-autonomous revenue authority model limits direct political interference by the Ministry of Finance and frees the tax administration from the constraints of the civil service system with the final objective to increase revenue and reduce the negative effects of the fiscal system on the economy.

²² Bahl and Bird (2008).

To date there is no comprehensive assessment of how successful these SARAs have been in achieving those goals. The lack of literature on this subject is due to the extreme difficulty to measure the contribution of revenue administration generally to particular outcomes because there are so many factors that may influence them.

This chapter proposes the first comprehensive assessment of revenue authorities' performance in developing countries. We use an approach recently implemented for comparative case studies - the synthetic control method (SCM) developed by Abadie and Gardeazabal (2003) and extended in Abadie, Diamond, and Hainmueller (2010) - to measure how successful have SARAs been in improving government revenue.

The structure of this chapter is as follows. Sections 2 and 3 present an overview of the origin and motivation of the revenue authority model and the literature review on revenue authority performance; in Section 4 and 5 we introduce respectively the empirical strategy for operationalizing the variables and the data employed in our analysis. Section 6 presents the findings and concluding remarks and discussions follow in Section 7.

2.2 ORIGIN OF THE MODEL AND MOTIVATION FOR REFORM

The Revenue Authority model has its origins in the New Public Management²³ (NPM) framework. The NPM is characterized by a management culture and orientation that emphasize the centrality of the citizen or customer, and accountability for results. Then there are some structural or organizational choices that reflect decentralized authority and control, with a wide variety of alternative service delivery mechanisms including quasi-markets with newly separated service providers competing for resourcing from the policy-makers and funders. The creation of semi-autonomous agencies for service delivery is one particular set of reforms that illustrates many of the NPM choices. The NPM argument for agencies is that service providers should concentrate on efficient production of quality services, with the distractions of evaluating alternative policies removed. NPM was conceived as a device for improving efficiency and responsiveness to political principals particularly in developing

²³ For a comprehensive literature, see for example Hood (1991), Pollitt (1993), Dunleavy and Hood (1994), Hood (1995), and Kernaghan (2000).

countries. Besides, the creation of SARA represents a credible commitment to taxpayers about the integrity of tax arrangements to solve the problem of time inconsistency of preferences²⁴.

Although each semi-autonomous revenue authority has been established under differing circumstances²⁵, there are similar patterns with respect to underlying political and economic conditions. Fjeldstad and Moore (2009) argued that the primary objective in sub-Saharan Africa and Latin America was to increase government revenue, especially in the face of fiscal deficits and expanding public expenditure needs. Kidd and Crandall (2006) ranked low effectiveness of tax administration and poor levels of compliance as the primary reasons for the creation of SARAs while the need for a catalyst to launch broader revenue administration reform (modernized operations, improved automation, integrated and function based structures) was another reason. Taliercio (2004) argued that the revenue authority reform represents an attempt by politicians to create a credible commitment to taxpayers that tax administration will be more competent, effective, and fair.

Additionally, private sector complaints regarding tax evasion and generalized corruption within the public sector have led to calls for wholesale reform of tax administration. Besides, customs inefficiency as well as better control of customs and tax functions represents other reasons of the implementation of SARAs. In developing countries, reforms of revenue collection functions within the existing finance ministries had not generally generated any sustainable improvements. The new semi-autonomous agency is granted, in law, some autonomy from central government, partly with the purpose of limiting direct political interference in its operations. Today there are close to forty SARAs around the world and most of them are located in sub-Saharan Africa and Latin America²⁶.

A revenue authority is not meant to be as autonomous as a central bank but is meant, in principle, to be quite independent of the financing and personnel rules that govern the public sector in general. Its managers can in principle recruit, retain and promote quality staff by paying salaries above civil service pay scales. All central government tax operations are integrated into one single-purpose agency. In addition, it should be noted that donor organizations such as the IMF and the World Bank as well as national development bodies

²⁴ Kydland et Prescott (1977).

²⁵ Box 2 provides three examples of motivation for the creation of a SARA in Guatemala, Peru and Uganda.

²⁶ See Appendix A.

such as the UK's Department for International Development (DFID) have, in the broader revenue reform program in line with the New Public Management, actively promoted the SARA model.

2.3 LITERATURE REVIEW

2.3.1 Determinants of government revenue

What affects revenues has been the subject of a long debate; the empirical findings have been mixed because of their sensitivity to the set of countries and the period of analysis but there is a consensus about some main determinants of government revenue. Lotz and Morss (1967) find that per capita income and trade share are determinants of the tax revenue, and this finding has been replicated since. Chelliah (1971), Chelliah et al. (1975) and several others studies highlight the relation between tax revenue and a set of explanatory variables such as mining share, non-mineral export ratio and agriculture share. In a related study covering developing countries, Tanzi (1992) finds that half of the variation in the tax ratio is explained by per capita income, import share, agriculture share and foreign debt share. Stotsky and WoldeMariam (1997) find that both agriculture and mining share are negatively related to the tax ratio, while export share and per capita income have a positive effect.

Recently, some studies have looked at the importance of institutional factors in determining revenue performance. For instance Ghura (1998) finds that other factors like corruption, structural reforms and human capital development affect tax revenue. Bird et al. (2004) find that factors such as corruption, rule of law, and entry regulations play key roles. A recent article by Fenocchietto and Pessino (2013) also confirmed these findings.

2.3.2 Revenue Authority Performance

The literature on Revenue Authority performance is relatively small to date and the analytical assessments of SARAs' performance in developing countries are scant. Most of the existing literature starts out from the organizational framework rather than the outcomes of revenue authorities.

Taliercio (2004) investigates the overall performance of SARAs by assessing six case studies across Latin America and sub-Saharan Africa: Peru, Mexico, Venezuela, Kenya, Uganda, and South Africa. Although he concludes results are mixed, he shows that performance improved most where the SARAs had comparatively more autonomy and where that autonomy was stable. This autonomy can solve administrative and corporate governance problems and deliver fair and effective revenue administration. Nevertheless, Taliercio underlines the fact that his analysis does not take into account the counterfactual of no reform or other types of reforms.

Another paper in 2004 by Mann makes summary of the advantages and disadvantages of implementing a SARA. On the advantages side he lists: enhanced revenues, greater efficiency, more competent staff, de-politicization of tax administration, reduced corruption, improved services, more professional work ethic, comprehensive accounting for tax revenues and integration of databases. Mann also points out that cost-benefit analyses are not usually carried out when considering the creation of SARA, something he advises should be done as a matter of importance. The paper makes a number of recommendations in terms of SARA's features and governance and in all cases recommending the maximum autonomy is the best practice. This paper does not address the issue of how the SARA impacts revenue administration. Given the caveats necessary on the quantitative analytical tools available and the relatively small sample size, Mann concludes that SARAs have neither lived up to expectations, nor can they be categorized as having failed.

Kidd and Crandall (2006) assess countries' own perceptions about how revenue authority may have contributed to tax administration reform. Further, their paper discusses data collection difficulties in carrying out an assessment using econometric analysis, and the problem of attributing changes in performance to a particular governance model. They conclude that while there are subjective perceptions among countries with revenue authorities that their model has led to improved revenue administration, there is no objective analysis that countries with SARAs have performed better in this regard than countries without SARAs.

All these papers grapple with the problem of quantification and how to assess whether the SARA governance model made a difference. In no case were any of the authors propose an analytical model that would produce measurable results for the SARAs. It is extremely difficult to accurately assess the contribution of tax administration reform to the improvement of resource mobilization; the next section proposes an empirical framework to this purpose.

2.4 EMPIRICAL METHODOLOGY

To assess whether revenue performance has been improved in a country with a semi-autonomous revenue authority, we need to identify a comparison country or countries that we can use to chart the counterfactual revenue trends of the country under investigation. There are several strategies for constructing such a comparison group. One possibility would be to select characteristics. An alternative strategy would be to employ a data-driven search for a comparison group based on pre-adoption revenue characteristics and trends. Here, we pursue this latter track by using the synthetic control method (SCM) developed by Abadie and Gardeazabal (2003) and extended in Abadie et al. (2010).

Synthetic control method is beginning to gain popularity in academic fields including economics, public policy and political science. For instance it has been used to measure: the effects of domestic ETA terrorism on regional growth within the Basque region of Spain (Abadie and Gardeazabal 2003), a new tobacco tax policy in California on cigarette sales (Abadie et al. 2010), the reunification of Germany on the wealth of people in the former West Germany (Abadie et al. 2011), a gun control laws on crime in several U.S. states (Donohue & Aneja 2012), or the political and institutional changes following « color revolutions²⁷ » (Kennedy 2012).

The Synthetic Control Method generates a counterfactual country that behaves as if it was not subject to an intervention or treatment phenomenon that has been applied to the country under investigation - the treated country. This counterfactual country comes complete with its own data on performance and descriptive attributes. It will closely mimic the treated country in both its descriptive characteristics and pre-treatment performance. Hence, the synthetic control will provide a better counterfactual than any single quantitative observation or qualitative case. We then can compare the relative performance of the treated country and the synthetic country to estimate the magnitude and direction of divergence attributable to the phenomenon of interest (creation of SARA). This method is also transparent as it provides visual evidence by graphing divergence between the outcomes of the unit of interest and its Synthetic Control.

²⁷ Color revolutions make reference to the Serbian Bulldozer revolution (2000), the Georgian Rose revolution (2003), the Ukrainian Orange revolution (2004), and the Kyrgyz Tulip revolution (2005).

For the general case in which Y_{it}^A denote the revenue of country i at time t with treatment (SARA), and accordingly, Y_{it}^N without treatment (N), the treatment effect would be described by:

$$a_{it} = Y_{it}^A - Y_{it}^N \quad (1)$$

Now suppose that there are $J+1$ countries where $J = 1$ denotes the treated country – which, in our case, corresponds to the establishment of a SARA – and $j = 2, \dots, J + 1$ are all untreated countries in the donor pool. Let T_0 be the number of pre-intervention periods, with $1 < T_0 < T$. For the treated country we have data about the actual revenue trend (Y_{1t}^A), but we are ignorant about the counterfactual revenue, which would have been obtained if this country had not been subject to the treatment. Thus, we have to find an estimate for Y_{1t}^N in order to obtain an estimate for the treatment effect a_{it} .

Abadie and Gardeazabal (2003) and Abadie et al. (2010) propose to make use of the observed characteristics of the countries in the donor pool. We assume that the intervention has no effect on the outcome before the implementation period, so for $t \in \{1, \dots, T_0\}$ and $i \in \{1, \dots, N\}$, we have that $Y_{it}^A = Y_{it}^N$. In practice, interventions may have an impact prior to their implementation (for example, via anticipation effects). In those cases, T_0 could be redefined to be the first period in which the outcome may possibly react to the intervention. Implicit in our notation is the usual assumption of no interference between units (see Rosenbaum 2007 for a detailed discussion). That is, we assume that outcomes of the untreated units are not affected by the intervention implemented in the treated unit (creation of a SARA).

The underlying idea is to find weights $W = (\omega_2, \dots, \omega_{J+1})'$, with $\omega_j \geq 0$ for $j = 2, \dots, J + 1$ and $\sum_{j=2}^J \omega_j = 1$, such that the weighted average of all countries in the donor pool resembles the treated country with respect to the government revenue level in the pre-intervention period and all other relevant aspects (Z). Formally, we seek W such that:

$$\sum_{j=2}^{J+1} \omega_j * Y_{jt} = Y_{1t} \text{ for all } t < T_0 \text{ and } \sum_{j=2}^{J+1} \omega_j * Y_{jt} = Z_1 \quad (2)$$

Then $\sum_{j=2}^{J+1} w_j^* Y_{jt}$ for $t > T_0$ is an estimate for the unobserved counterfactual revenue trend Y_{it}^N , and we obtain the following estimate for the treatment effect:

$$\hat{a}_{it} = Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt} \quad (3)$$

In general, a vector W such that equations (4) hold may not exist (in particular, if the weights $w_j \geq 0$ and, thus, extrapolation is prohibited). However, we can choose the weights such as:

$$W^* = \operatorname{argmin} (X1 - X0W)'V (X1 - X0W) \quad (4)$$

where $X1$ denotes a $(k \times 1)$ vector of pre-intervention characteristics of the treated country, which may include the pre-intervention revenue path, and $X0$ denotes a $(k \times J)$ matrix of the same variables for the J countries in the donor pool. The symmetric and positive definite matrix V weights the relative importance of the various characteristics included in X . Obviously, the optimal weights W depend on the weighting matrix V . We follow Abadie and Gardeazabal (2003) in choosing V such that the difference of the pre-intervention revenue trend of the treated country and its synthetic counterpart is minimized.

As the synthetic control method itself does not provide standard errors to infer statistical significance, Abadie and Gardeazabal (2003) and Abadie et al. (2010) suggest running placebo or permutation tests. The underlying idea is to predict counterfactual revenue trends for countries in the donor pool, i.e., for countries without any treatment. If and only if the gap between the actual revenue and the predicted one is the largest for the country where the treatment really occurred, then one can say that its development is “significantly” different from the business-as-usual scenario (Abadie and Gardeazabal 2003, Abadie et al. 2010). One of the central points of this article is that the synthetic control method provides the qualitative researcher with a quantitative tool to select or validate comparison units. In a regression analysis, typically all units contribute to the regression fit, and the contribution of units with large positive regression weights may be compensated or eliminated by the contributions of units with negative weights.

2.5 DATA AND SAMPLE

We use a panel dataset that covers 74 developing countries for the period 1980-2010. Our treatment group includes 20 countries and our donor pool 54 countries²⁸. Only SARAs that have been created before 2000 are included in the sample in order to have at least ten years of post-treatment period and to assess not only the short term but also the midterm impact of the reform.

The outcome variable, Y_{jt} , is the government revenue excluding grants in country j at time t . Revenue is cash receipts from taxes, social contributions, and other revenues such as fines, fees, rent, and income from property or sales. This variable is taken from the World Bank World Development Indicators. We use total government revenue rather than tax revenue for two reasons: (1) the lack of longitudinal data on tax revenues in developing countries, (2) several authors used total government revenue as a proxy when they assess the determinants of tax revenue²⁹.

For the pre-treatment characteristics in X_{jt} we rely on a standard set of government revenue predictors cited above in the literature review: per capita GDP, the value added of the agriculture sector, the natural resource share in GDP, the debt to GDP ratio, the degree of international trade, the investment rate, the money supply, foreign aid, the political regime and the ICRG quality of government index. To improve the matching between a treated country and its synthetic control we add five variables to control for other socio-political characteristics: the percentage of rural population, the existence of armed conflicts, the ethnic fractionalization rate, the human assets index (as a proxy for the level of education and health), the legal origin and the country's geographic localization. We experimented with a wide set of additional predictors, but their inclusion did not change our results substantively. We provide a list of all variables used in the analysis in the data appendix, along with data sources.

Using the techniques described in Section 4, we construct for each SARAer a synthetic country that best reproduces the values of the predictors of revenue in the SARAer in the pre-treatment period. The revenue predictors are weighted according to their predictive power of the revenue trajectory prior to the reform using a data-driven procedure. This ensures that the

²⁸ To construct this sample, we started by including all developing countries and then excluded countries for which there are no complete longitudinal series on government revenue. See the appendices A and B for the list of countries.

²⁹ See Gupta (2007).

synthetic country approximates SARAer most closely on the most important predictors. We estimate the effect of the revenue authority on revenue performance as the difference in revenue levels between each SARAer and its synthetic counterpart in the years following the reform.

2.6 RESULTS

In Figures 1-4 we show the results for the twenty countries under investigation. For each country we plot the predicted counterfactual and the actual government revenue between 1980 and ten years after the implementation of the revenue authority (left chart). In addition, the graphs show for each country the gap between the actual and the synthetic revenue trend (right chart). Additional information on the chosen characteristics X_0 and X_1 , weights W , the predictor balance and the *root mean squared prediction error (RMSPE)* are given in the appendix.

Results are grouped according to the estimated impact of the implementation of the revenue authority on revenue performance: positive, negative, ambiguous and insignificant impact.

Our estimate of the effect of SARA on revenue performance in each treated country is the difference between government revenue in this country and in its synthetic version after the introduction of the SARA.

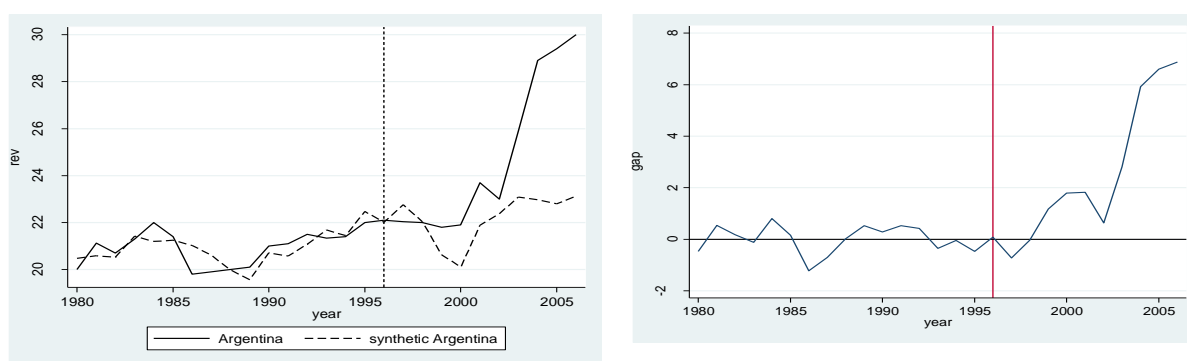
2.6.1 Positive impacts in Argentina, Bolivia, Guyana, Malawi and South Africa

Figure 1 shows results for countries in which the creation of a SARA has a positive effect on revenue performance i.e. Argentina, Bolivia, Guyana, Malawi and South Africa. Two years after the law's passage in Argentina, the two lines begin to diverge noticeably. While government revenue in the synthetic Argentina continued to fluctuate around its trend, the real Argentina experienced a sharp increase. The discrepancy between the two lines suggests a large positive effect of SARA on revenue performance. Figure 1 suggests that SARA reform had a large effect on government revenue, and that this effect increased over time. The

magnitude of the estimated impact is substantial. Our results also suggest that for the entire 1996-2010 period Argentina's government revenue was increased by an average of 4.08 percentage point per year³⁰. The same observation can be done for Bolivia and Malawi where the treatment effect becomes positive one or two years after the reform. In these countries the average treatment effects are respectively 2.06 and 2.87 percentage points per year. The other two countries where the introduction of a Revenue Authority has improved performances are South Africa and Guyana. Unlike the first three countries, the reform immediately had a significant and positive impact on government revenue; Guyana is the country where the reform has had the highest significant average impact over the post-treatment period with 6.03 percentage points more revenue than the Synthetic Control.

The creation of the South African Revenue Service (SARS) has significantly improved the tax administration system in South Africa and has improved revenue collected (2.73 percentage points per year compared to the Synthetic Control). Indeed, the SARS had a political commitment to raise more revenue to redeem the social debt of apartheid, and has been the most consistent success story among SARAs in sub-Saharan Africa³¹. Their staffs provide advisory services to many other SARAs in the region.

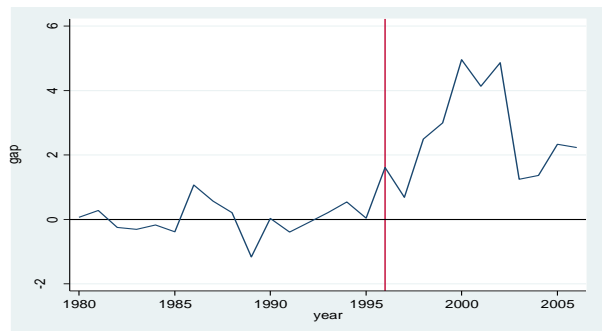
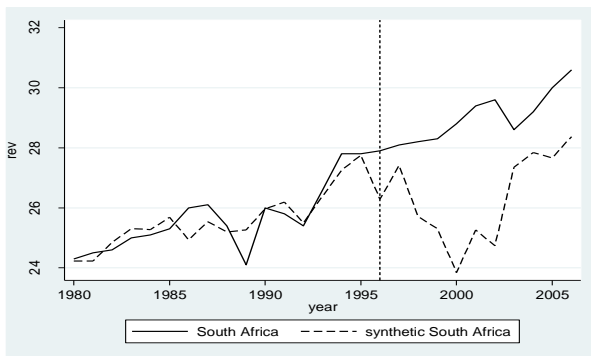
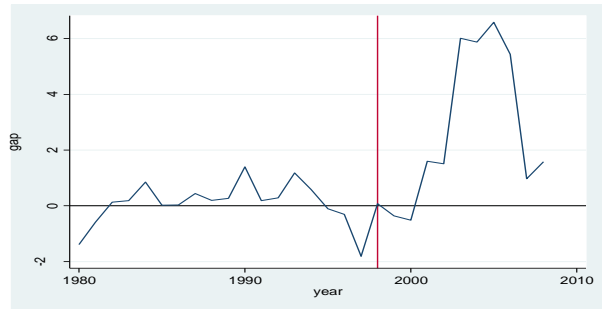
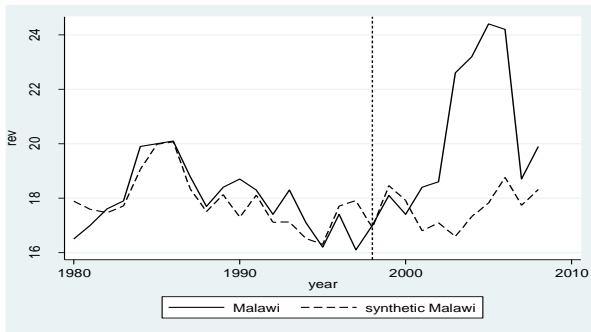
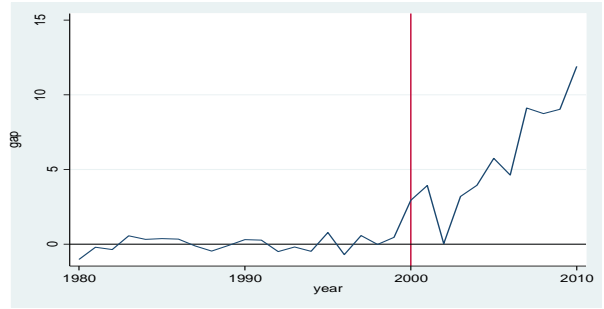
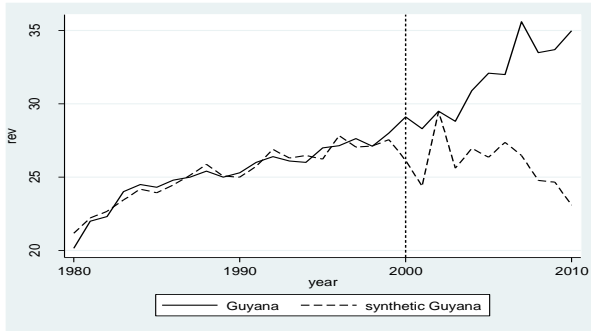
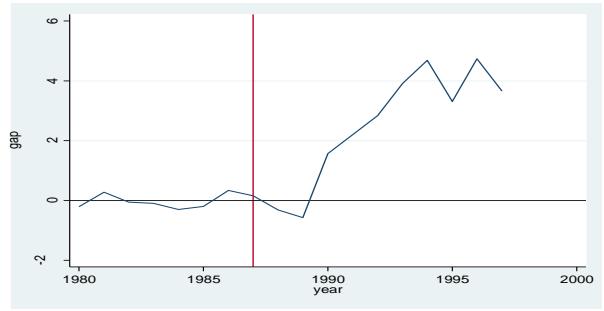
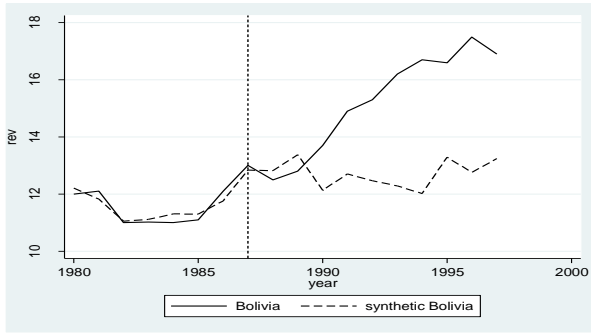
Figure 1: Synthetic Control for Argentina, Bolivia, Guyana, Malawi and South Africa³²



³⁰ See Table 1 for the Annual Average Impact by country.

³¹ Fjeldstad and Moore (2009).

³² For each country we plot the evolution of government revenue and its Synthetic Control (left), and the performance gap between them (right).

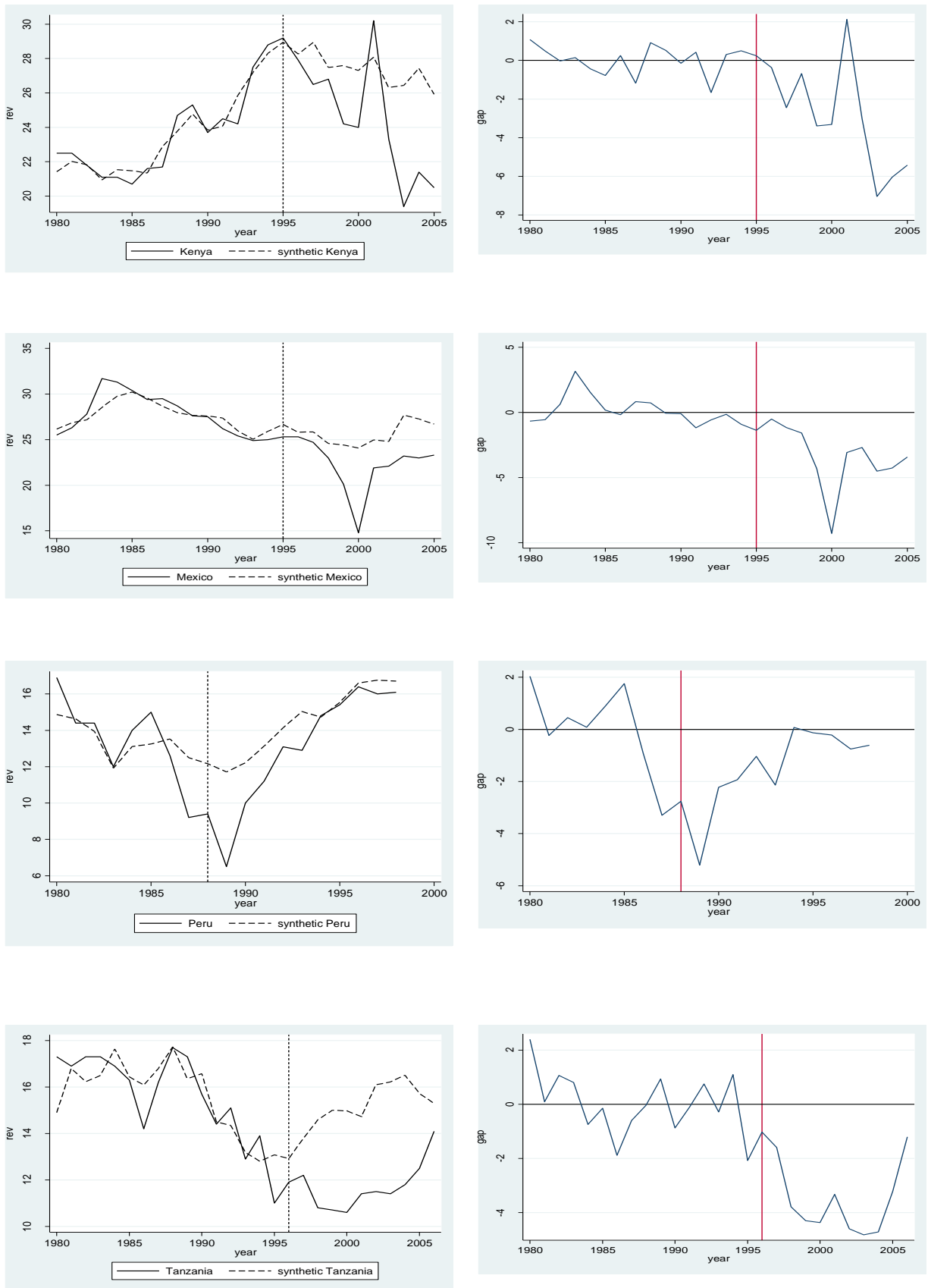


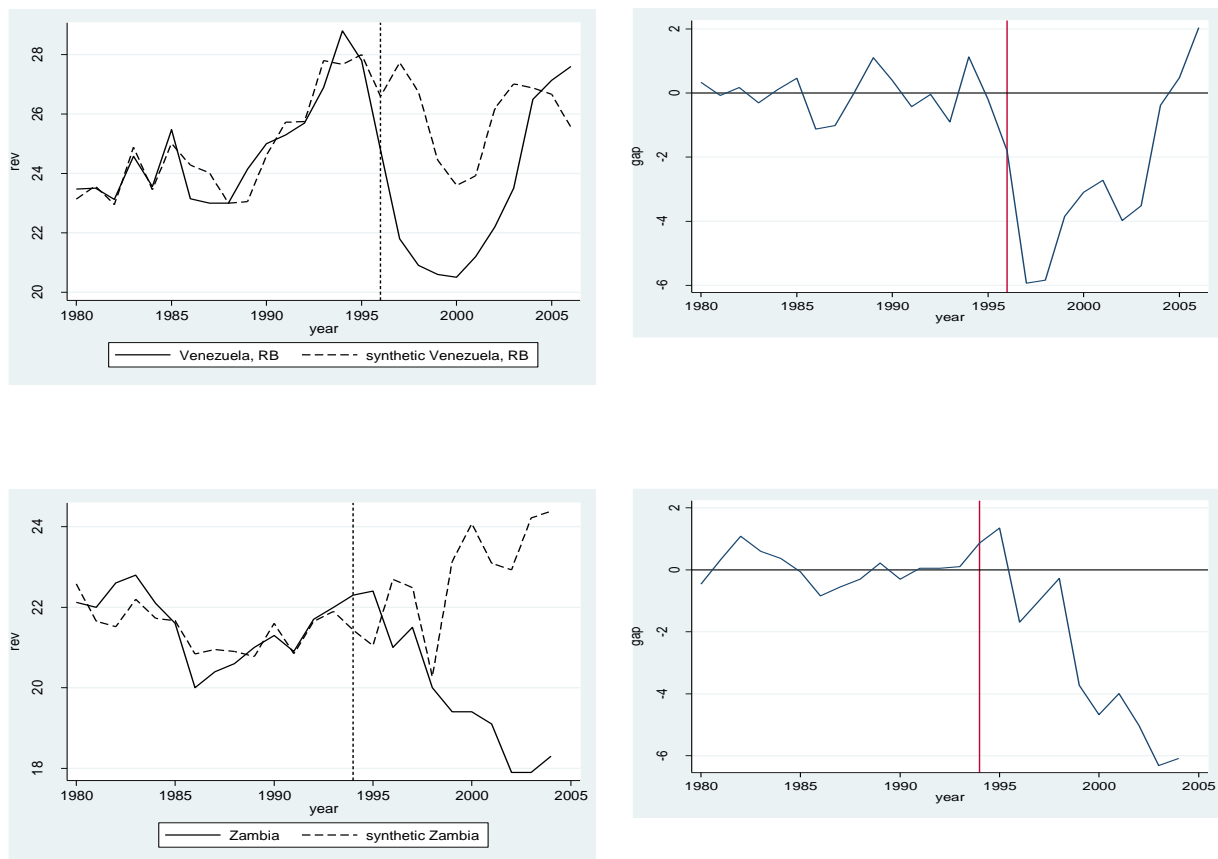
2.6.2 Negative impacts in Kenya, Mexico, Peru, Tanzania, Venezuela and Zambia

Figure 2 displays results for Kenya, Mexico, Peru, Tanzania, Venezuela and Zambia. In these countries the creation of a revenue authority does not seem to be a wise choice. The average treatment effect is negative the decade following the reform, with various trends by countries. In Kenya, it has a negative impact on the entire period except 2001. On average, revenue would be higher by 2.96 percentage points per year in the absence of this reform. In Zambia, immediately after the treatment, there was a brief positive impact the first two years, but the impact becomes negative on the rest of the period. For Mexico, Peru, Venezuela and Tanzania, the treatment effect is negative throughout the period, with a negative impact of around 3 percentage points per year in these countries. Some stylized facts explain these poor performances. For instance, Taliercio (2004) argues that Peru and Venezuela had serious problems with non-filers. In Venezuela 14% of large taxpayers did not file VAT declarations and 22% did not file corporate income tax declarations in 1997. In terms of small and medium taxpayers, approximately 53% did not file complementary VAT returns. Furthermore the autonomy of the SARA from political interferences decreased over time in this country, as it was the case in Mexico.

In Tanzania and Zambia experiences have shown that the SARAs have been vulnerable to political interference, in particular with respect to tax exemptions. Besides, a case study by Fjeldstad and Heggstad (2011) highlighted the existence of tough relationships between taxpayers and their tax administration in these countries. Tax officers have discretion over important decisions, such as those related to the determination of tax liabilities, selection of audits, litigation, and delays in VAT refunds, etc. They also noticed a lack of transparency and accountability in many administrative procedures, including those reporting tax revenue.

Figure 2: Synthetic Control for Kenya, Mexico, Peru, Tanzania, Venezuela and Zambia





2.6.3 Ambiguous impacts in Colombia, Guatemala, Rwanda, Uganda and Zimbabwe

Figure 3 displays results for Colombia, Guatemala, Rwanda, Uganda and Zimbabwe. In this group of countries, the impact of the introduction of a revenue authority has evolved unstable with fluctuations between positive and negative effects during the post-treatment period. For Colombia, Guatemala and Uganda, the introduction of the reform had an immediate positive effect on revenue performance, but the impact has faded over time.

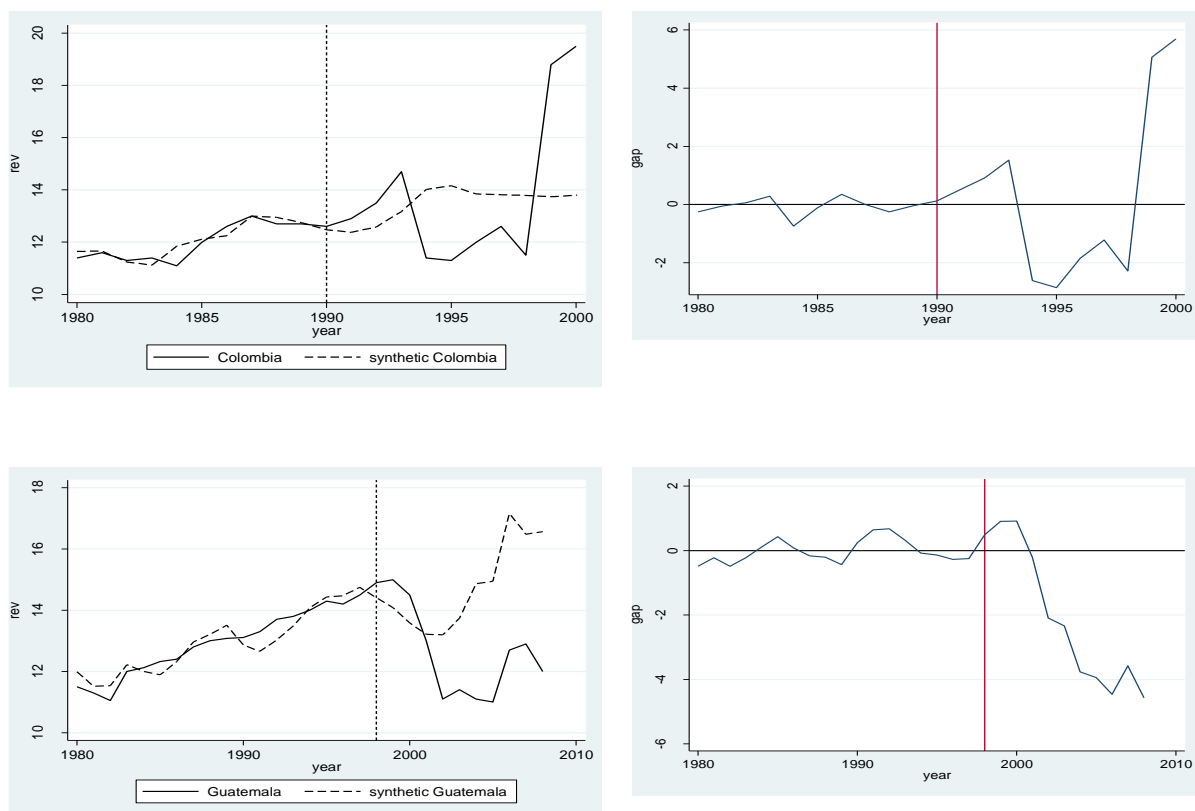
In the case of Uganda, President Museveni described in 2000 the Uganda Revenue Authority as a ‘den of thieves’ (Therkildsen 2004). In fact this SARA experienced a number of corruption scandals and an intervention by the Minister of Finance was necessary to correct the situation. The autonomy, which was intended to protect the organization from political interference and to allow management to improve performance, has promoted corrupt practices, therefore undermining the performance of the organization.

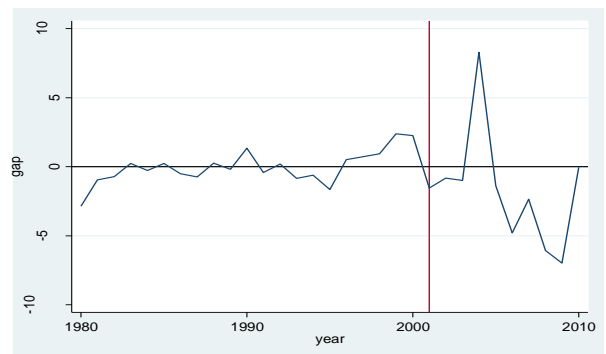
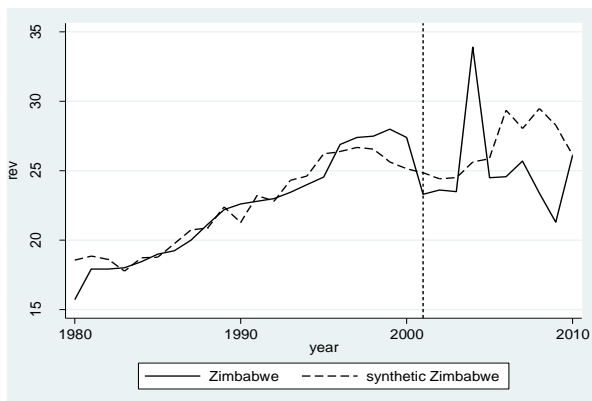
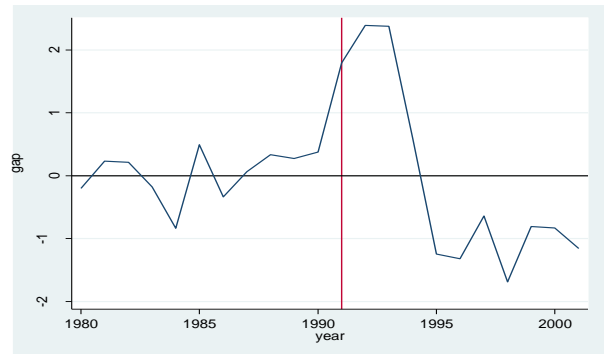
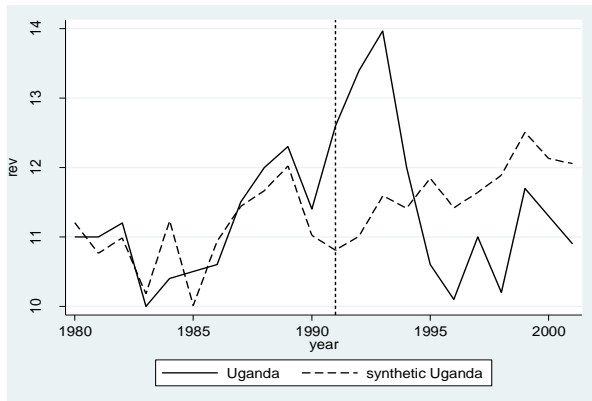
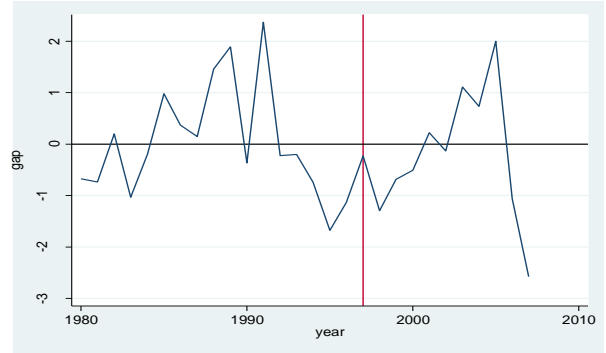
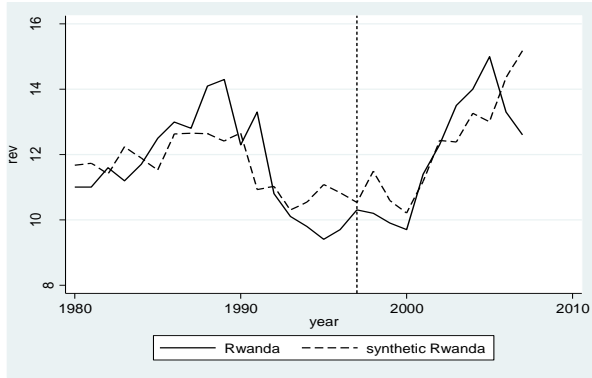
In Rwanda the SARA (Rwanda Revenue Authority) has been established as the first phase of a number of reforms aiming to ensure a rapid economic recovery after the 1994 genocide. The

Synthetic Control fails to mimic the level of revenue during the genocide as the level of government revenue failed to less than 10% of GDP during this period. The impact of the reform became positive only after four years, and this trend was reversed during the end of the post-treatment period. A recent report from the African Development Bank (2010) pointed out the necessity for the Rwanda Revenue Authority to build and sustain its management capacity, especially technical and professional skills, and to limit tax incentives and exemptions.

Finally, if we look at the average annual performance of the SARAs in this group of countries over the post-treatment period, only the SARA in Colombia has a positive impact (on average 0.29 percentage point more revenue collected per year). The average annual impacts in the five other countries are negative.

Figure 3: Synthetic Control for Colombia, Guatemala, Rwanda, Uganda and Zimbabwe



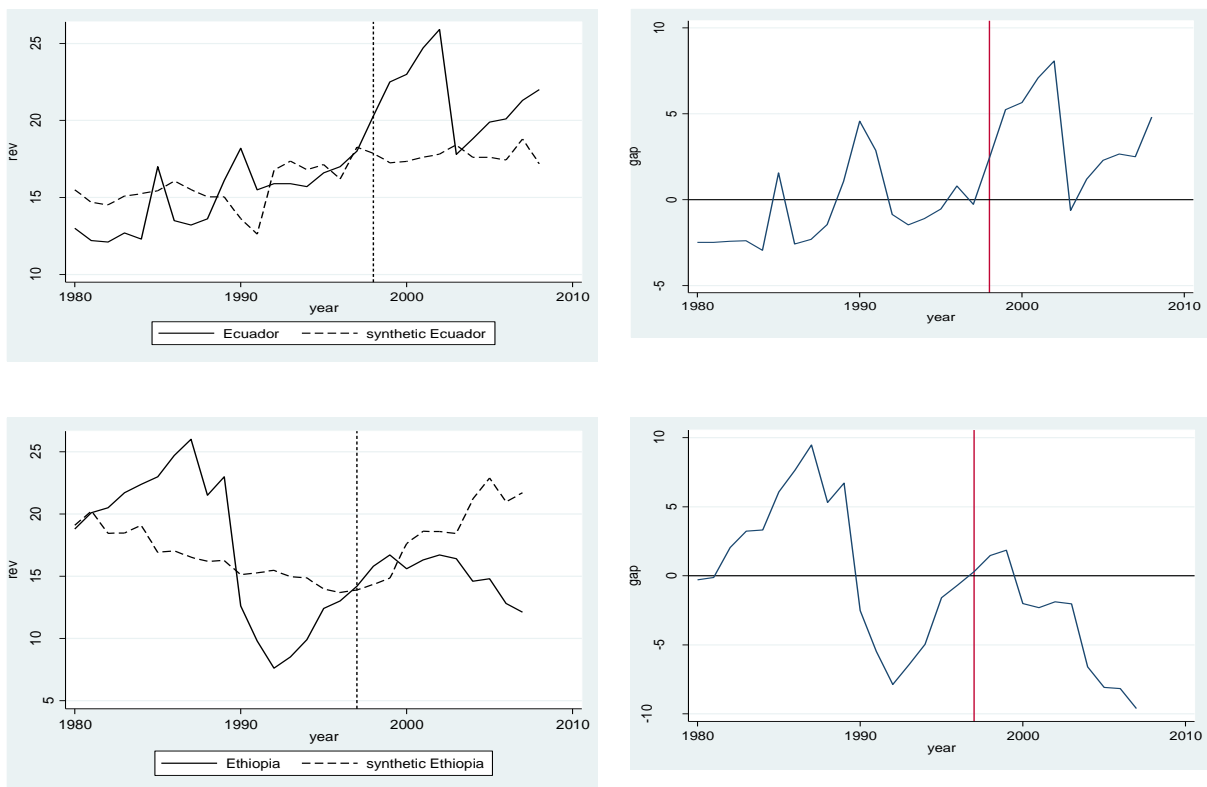


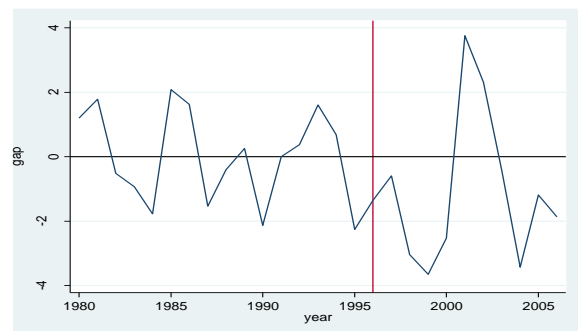
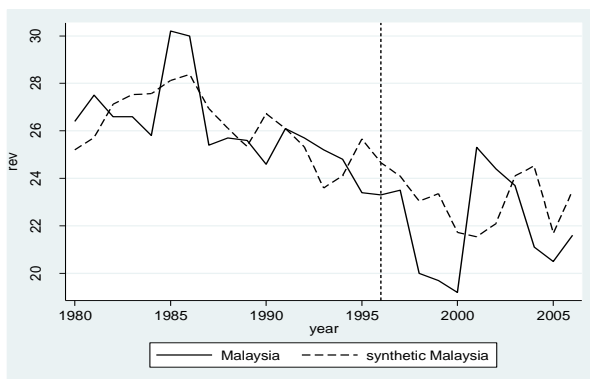
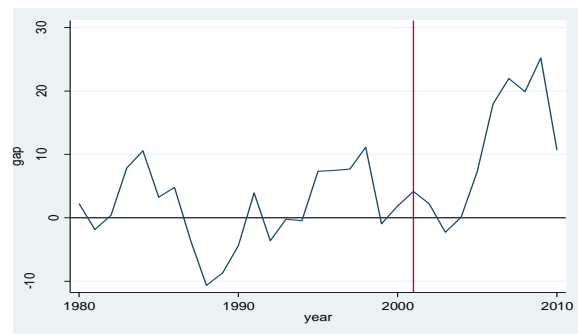
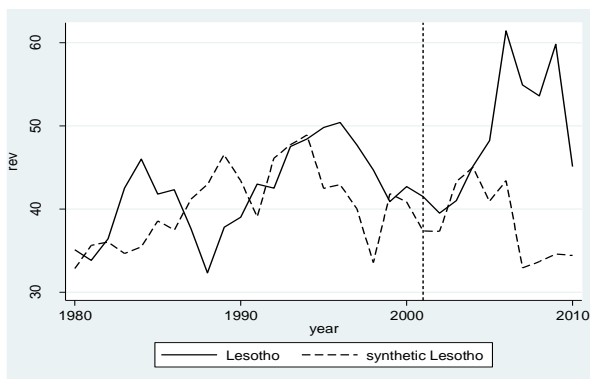
2.6.4 Statistically insignificant impacts

The last group consists of countries where the SCM failed to build counterfactual revenue trends similar to those of the treated countries before the treatment, and therefore where the RMSPE is too high. These countries are Ecuador, Ethiopia, Lesotho and Malaysia. The SARA' adoption seems to have a positive impact on government revenue in Ecuador and

Lesotho, the average annual impact being respectively 3.89 and 11.45 percentage points. This is not the case for Ethiopia and Malaysia where government revenue would be higher if these countries did not establish a SARA. But these results are not significant partly because in these countries, revenue trends before the SARA reform seem to be not explained by the explanatory variables contained in X. In Ethiopia, revenues rose by more than 20% of GDP in the 80s before falling to less than 10% in the 90s. Regarding Lesotho, government revenues, often above 40% of GDP before the reform is particularly high compared to other developing countries. For Ecuador, revenues were very low on average less than 15% of GDP over the pre-treatment period compared to others Latin America's countries.

Figure 4: Synthetic Control for Ecuador, Ethiopia, Lesotho, and Malaysia





2.7 DISCUSSION AND CONCLUSION

In many developing countries the implementation of semi-autonomous revenue authorities during recent years has been seen as a possible solution to mobilize more revenue for governments. In fact, due to the lack of conclusive results after a series of reforms within ministries of finance some have thought that the creation of autonomous structures responsible for managing revenue could help to mobilize more revenue. Moreover, the Bretton Woods institutions and some national government agencies (e.g., DFID, USAID) have at times actively promoted SARAs as a solution to poor revenue performance and provided technical assistance to some countries during the implementation of their revenue authority.

Governments all over the world, particularly in developing countries, are grappling with internal and external demands and pressures for improvements and reforms in public management; so the evaluation of the effectiveness of these reforms has become a major issue

since a number of developing countries in need of public resources to finance their development agenda are thinking of implementing a revenue authority.

In this chapter, we try to assess if the implementation of a revenue authority has been effective in improving revenue collection in developing countries. We use the Synthetic Control Method (SCM), which provides a systematic way to choose comparison units in comparative case studies. This systematization opens the door to precise quantitative inference in small-sample comparative studies, without precluding the application of qualitative approaches. A particular strength of the SCM resides in the fact that it shows transparently what countries have been selected to construct the synthetic control. Furthermore, this method takes into account the unobservable heterogeneity varying in time. Nevertheless, SCM cannot always provide answers. In particular, the method failed to create suitable synthetic matches for units that are outliers or have extreme values on the outcome measure of interest (Ecuador, Ethiopia, Lesotho and Malaysia). Hence, qualitative case studies may still be better suited for these countries.

Our results show that the implementation of SARAs does not always produce the expected outcomes. Of the 20 countries surveyed only 5 SARAs seem to sustainably perform better than traditional Ministry of Finance in terms of revenue collection throughout the post-treatment period. In some other 5 countries, SARAs' performance has been mixed. Finally in six countries, implementing a SARA seems to have worsened revenue mobilization, meaning that government revenue in these countries would be higher if they had kept revenue management in the traditional Ministry of Finance.

Many of our findings confirm those of some previous studies on revenue authority performance. Taliercio (2004)³³ mentions, as our findings, the good performance of the South Africa Revenue Service (SARS) and the mixed performance of revenue authorities in Mexico, Uganda and Venezuela. Our findings for Uganda also confirm those of Kidd and Crandall (2006) who stated that the Uganda Revenue Authority has been vehicle for both success and failure in tax administration over the past 20 years. Even if they also found that tax revenue

³³ Taliercio (2004) analyzes revenues authorities in six countries: Kenya, Mexico, Peru, South Africa, Venezuela and Uganda. He looks at the degree of autonomy and its impact on tax collection. Revenue Authorities in Kenya, Peru and South Africa were more autonomous and seemed to be more effective in increasing tax revenue. But his analysis did not take into account other exogenous factors that can affect tax revenue.

collection improved in Peru since the implementation of the revenue authority (SUNAT) they also underline the difficulty to gauge the percentage of this improvement attributable to the SARA. Finally for Guatemala, their analysis shows that the SARA has basic requirement for a modern tax administration but cannot operate effectively due to managerial instability, change in the agency's strategic focus and corruption. These problems could explain the mixed performance we find for this SARA during the post-treatment period. For Tanzania our results display poor SARA's performance and this finding confirms those of Mann (2004).

These different results show the difficulty in being conclusive on the impact of revenue authorities on revenue administration effectiveness but also confirm that establishing a revenue authority should not be viewed as a panacea³⁴. The quality of a revenue authority, which differs by country, may depend on several factors including the quality of the staff, the degree of independence of the agency from the political authorities and the absence of corruption. As it appears to be the case in South Africa, the success of a SARA is the result of relatively good remuneration, strong internal controls, and clear political support for the tax authorities' management and purpose. In instances where revenue administration is seriously dysfunctional and revenues relative to GDP are extremely low there may be a rationale for establishing a new agency rather than reforming the existing administration. In other instances, where revenue administration is reasonably effective and efficient, it may be risky to engage such reforms that may result in higher costs without increasing tax revenue. Some reforms can be achieved without creating a SARA.

Even if the creation of SARAs can increase the potential of governments to enhance central government revenues by acting as a conduit for the introduction of a range of sensible reforms in revenue administration, this initiative can be disappointing; it happens to be the case in many developing countries, where important reforms are still to be addressed. Moreover little to no cost-benefit analysis was undertaken, disadvantages of the SARA were often not considered, and evaluations were seldom undertaken after implementation, which can be a lengthy process. An autonomous SARA does not guarantee an end to political interference,

³⁴ "Creating a SARA is clearly expensive, may take a long time and require significant effort, and does not actually improve tax administration effectiveness". Kidd, Crandall (2006).

and there needs to be a proper supervisory framework, properly monitored, to ensure that autonomy is not abused.

In conclusion, SARAs were created to increase government revenues; to date they have contributed little to that goal, only five of them assessed in this paper seem to perform better than if the revenue administration was kept within the Ministry of Finance. The results show that tax administration reforms merit further empirical attention in research communities concerned about the political economy of public sector reform in developing countries.

2.8 APPENDICES

Table 1: Average annual impact of RA on revenue performance

Country	Average Annual Impact	SCM
Argentina	4.08	+
Bolivia	2.6	+
Colombia	0.29	*
Ecuador	3.89	#
Ethiopia	-3.74	#
Guatemala	-2.31	*
Guyana	6.03	+
Kenya	-2.96	-
Lesotho	11.45	#
Malawi	2.87	+
Malaysia	-1.06	#
Mexico	-3.47	-
Peru	-1.42	-
Rwanda	-0.22	*
South Africa	2.73	+
Tanzania	-3.59	-
Uganda	-0.23	*
Venezuela	-2.68	-
Zambia	-3.14	-
Zimbabwe	-1.68	*

+positive and significant impact – negative and significant impact *ambiguous impact # insignificant impact

Table 2: Weights, predictor balance, and the root mean squared prediction error (RMSPE) for the synthetic controls of *Argentina, Bolivia, Guyana, Malawi and South Africa*.

Argentina					Bolivia				
RMSPE	0.627				RMSPE	0.232			
Elements of X	Treated	Synthetic	Countries	Weights	Elements of X	Treated	Synthetic	Countries	Weights
GDP per capita 2005	8892.461	7758.555	Brazil	0.228	GDP per capita 2005	3351.949	1982.094	Algeria	0.101
Population	31.500	44.200	Chile	0.021	Population	5.710	8.950	Chad	0.505
Natural Resource rents	4.469	7.056	Costa Rica	0.301	Natural Resource rents	10.782	10.056	Guinea	0.244
Agriculture Value Added	7.438	12.979	El Salvador	0.113	Agriculture Value Added	19.750	29.075	Paraguay	0.073
Imports of G&S	7.048	25.872	Gabon	0.147	Imports of G&S	24.726	25.613	Turkey	0.062
Exports of G&S	8.556	25.483	Turkey	0.190	Exports of G&S	24.173	19.712	Uruguay	0.016
Armed Conflict	0.000	0.227			Armed Conflict	0.000	0.027		
Money	19.671	31.416			Money	19.029	19.080		
Rural Population	0.141	0.418			Rural Population	0.515	0.718		
Ethnic Fractionalization	0.255	0.395			Ethnic Fractionalization	0.740	0.686		
ICRG	0.564	0.564			Region	3.000	5.289		
Legal Origin	0.000	0.000			Revenue (1980&1987)	12.500	12.526		
Human Assets Index	87.630	71.652							
Democracy	0.813	0.705							
Revenue (1980&1996)	21.050	21.249							
Guyana					Malawi				
RMSPE	0.471				RMSPE	0.765			
Elements of X	Treated	Synthetic	Countries	Weights	Elements of X	Treated	Synthetic	Countries	Weights
GDP per capita 2005	1942.722	3868.015	Dominica	0.208	GDP per capita 2005	616.457	1383.344	Angola	0.077
Population	0.740	1.660	Jordan	0.238	Population	8.447	8.353	Burkina Faso	0.557
Natural Resource rents	13.783	3.436	Mauritania	0.314	Natural Resource rents	4.348	8.469	China	0.001
Agriculture Value Added	32.122	22.071	Panama	0.073	Agriculture Value Added	41.162	25.321	Guinea	0.173
Imports of G&S	93.896	68.431	Swaziland	0.044	Imports of G&S	34.245	34.765	Namibia	0.148
Exports of G&S	80.570	47.283	Tonga	0.093	Exports of G&S	23.742	23.698	Nepal	0.004
Armed Conflict	0.000	0.212	Vanuatu	0.031	Armed Conflict	0.000	0.049	Togo	0.040
Money	82.634	56.051			Money	20.691	19.934		
ICRG	0.293	0.360			Rural Population	0.887	0.800		
Legal Origin	1.000	0.376			Ethnic Fractionalization	0.674	0.724		
Human Assets Index	79.831	70.557			Legal Origin	1.000	0.152		
Democracy	0.000	0.279			Region	6.000	5.991		
Revenue (1980&2000)	24.620	23.661			Revenue (1980&2000)	17.000	16.923		
South Africa									
RMSPE	0.485								
Elements of X	Treated	Synthetic	Countries	Weights					
GDP per capita 2005	8093.192	7599.145	Brazil	0.115					
Population	33.300	35.000	Dominica	0.229					
Natural Resource rents	3.826	7.737	Gabon	0.185					
Agriculture Value Added	5.013	16.392	India	0.003					
Imports of G&S	21.952	43.040	Morocco	0.070					
Exports of G&S	26.445	36.802	Seychelles	0.059					
Armed Conflict	0.563	0.431	Thailand	0.207					
Money	52.827	46.081	Turkey	0.058					
Rural Population	0.490	0.442							
Ethnic Fractionalization	0.752	0.463							
ICRG	0.749	0.590							
Legal Origin	1.000	0.509							
Human Assets Index	76.846	72.400							
Democracy	0.000	0.622							
Region	6.000	3.340							
Revenue (1980&1996)	26.100	25.260							

Table 3: Weights, predictor balance, and the root mean squared prediction error (RMSPE) for the synthetic controls of *Kenya, Mexico, Peru, Tanzania, Venezuela and Zambia*.

Kenya					Mexico				
RMSPE	0.733				RMSPE	1.07			
Elements of X	Treated	Synthetic	Countries	Weights	Elements of X	Treated	Synthetic	Countries	Weights
GDP per capita 2005	1348.094	2660.120	Angola	0.028	GDP per capita 2005	10135.910	7868.720	Cameroon	0.411
Population	21.300	20.900	Cape Verde	0.377	Population	79.600	67.447	Chile	0.155
Natural Resource rents	2.453	2.454	Cote d'Ivoire	0.054	Natural Resource rents	11.365	13.500	Gabon	0.187
Agriculture Value Added	31.677	17.452	India	0.017	Agriculture Value Added	8.265	14.462	Seychelles	0.246
Imports of G&S	30.696	43.884	Morocco	0.249	Imports of G&S	15.332	36.528		
Exports of G&S	27.475	27.474	Seychelles	0.053	Exports of G&S	16.416	38.619		
Armed Conflict	0.067	0.183	Swaziland	0.146	Armed Conflict	0.067	0.027		
Money	30.874	38.752	Tonga	0.075	Money	26.855	27.154		
Rural Population	0.835	0.638			Rural Population	0.302	0.475		
Ethnic Fractionalization	0.859	0.377			Ethnic Fractionalization	0.542	0.577		
ICRG	0.590	0.287			ICRG	0.487	0.463		
Human Assets Index	48.816	56.820			Legal Origin	0.000	0.000		
Revenue (1980&1995)	29.200	28.953			Human Assets Index	78.269	62.231		
Peru					Democracy	0.000	0.052		
RMSPE	1.58				Revenue (1980&1995)	25.400	26.412		
Elements of X	Treated	Synthetic	Countries	Weights	Tanzania				
GDP per capita 2005	5879.219	5132.863	Bangladesh	0.003	RMSPE	1.11			
Population	18.800	26.400	Chad	0.144	Elements of X	Treated	Synthetic	Countries	Weights
Natural Resource rents	10.738	3.095	El Salvador	0.320	GDP per capita 2005	820.409	1240.622	C.A.R	0.475
Agriculture Value Added	9.688	21.738	Gabon	0.035	Population	23.900	23.300	China	0.018
Imports of G&S	17.258	23.046	Turkey	0.498	Natural Resource rents	5.685	5.679	Guinea	0.060
Exports of G&S	17.745	17.975			Agriculture Value Added	47.190	38.049	Guinea Bissau	0.011
Armed Conflict	0.875	0.572			Imports of G&S	40.548	38.493	Madagascar	0.148
Money	21.710	27.212			Exports of G&S	16.333	24.823	Mauritania	0.205
Rural Population	0.338	0.556			Armed Conflict	0.000	0.000	Togo	0.004
Ethnic Fractionalization	0.657	0.374			Money	20.651	20.731	Tonga	0.079
ICRG	0.301	0.323			Rural Population	0.823	0.681		
Legal Origin	0.000	0.003			Ethnic Fractionalization	0.735	0.717		
Region	3.000	3.045			ICRG	0.427	0.220		
Revenue (1980&1988)	13.150	13.514			Human Assets Index	34.782	34.749		
Venezuela					Revenue (1996)	11.900	12.925		
RMSPE	0.634				Zambia				
Elements of X	Treated	Synthetic	Countries	Weights	RMSPE	0.48			
GDP per capita 2005	10189.960	8575.632	Brazil	0.338	Elements of X	Treated	Synthetic	Countries	Weights
Population	18.600	50.700	Costa Rica	0.160	GDP per capita 2005	1340.266	3882.748	Angola	0.148
Natural Resource rents	29.305	7.926	Gabon	0.175	Population	7.114	6.785	C.A.R	0.101
Agriculture Value Added	5.713	10.740	Guinea Bissau	0.011	Natural Resource rents	9.621	9.645	China	0.001
Imports of G&S	22.195	21.951	Turkey	0.018	Agriculture Value Added	18.233	20.419	Gabon	0.117
Exports of G&S	26.641	24.653	Uruguay	0.306	Imports of G&S	37.621	42.064	Jordan	0.031
Armed Conflict	1.000	0.014			Exports of G&S	34.595	34.595	Senegal	0.409
Money	34.152	36.616			Armed Conflict	0.000	0.133	Seychelles	0.037
Rural Population	0.168	0.285			Money	28.844	25.614	Sudan	0.058
Ethnic Fractionalization	0.497	0.439			Rural Population	0.606	0.610	Swaziland	0.097
ICRG	0.551	0.556			Ethnic Fractionalization	0.781	0.647		
Human Assets Index	78.502	76.846			ICRG	1.000	0.155		
Revenue (1996)	24.800	26.603			Region	6.000	5.927		
					Human Assets Index	35.482	36.736		
					Democracy	0.000	0.020		
					Revenue (1994)	22.300	21.436		

Table 4: Weights, predictor balance, and the root mean squared prediction error (RMSPE) for the synthetic controls of *Colombia, Guatemala, Rwanda, Uganda and Zimbabwe*.

Colombia					Guatemala				
RMSPE	0.301				RMSPE	0.351			
Elements of X	Treated	Synthetic	Countries	Weights	Elements of X	Treated	Synthetic	Countries	Weights
GDP per capita 2005	5439.249	2730.643	Bhutan	0.475	GDP per capita 2005	3472.434	2731.678	Chad	0.416
Population	29.700	32.500	Chad	0.018	Population	8.675	3.500	El Salvador	0.017
Natural Resource rents	5.871	3.664	China	0.060	Natural Resource rents	2.141	3.031	Philippines	0.391
Agriculture Value Added	18.419	26.037	El Salvador	0.011	Agriculture Value Added	14.500	27.607	Turkey	0.176
Imports of G&S	13.700	26.892	Madagascar	0.148	Imports of G&S	21.524	28.600		
Exports of G&S	14.521	18.688	Thailand	0.279	Exports of G&S	16.923	20.598		
Armed Conflict	1.000	0.364	Turkey	0.165	Armed Conflict	0.889	0.701		
Money	29.909	32.569			Money	23.178	25.519		
Rural Population	0.349	0.692			ICRG	0.243	0.230		
Ethnic Fractionalization	0.601	0.600			Human Assets Index	53.557	46.032		
ICRG	0.478	0.293			Legal Origin	0.000	0.000		
Region	3.000	3.444			Region	3.000	3.290		
Revenue (1980&1990)	12.000	12.060			Revenue (1980&1998)	13.200	13.195		
Rwanda					Uganda				
RMSPE	1.069				RMSPE	0.375			
Elements of X	Treated	Synthetic	Countries	Weights	Elements of X	Treated	Synthetic	Countries	Weights
GDP per capita 2005	748.055	932.778	Bangladesh	0.003	GDP per capita 2005	544.770	1186.659	Chad	0.482
Population	6.128	270.000	Chad	0.227	Population	15.000	85.500	Indonesia	0.493
Natural Resource rents	3.379	4.349	China	0.242	Natural Resource rents	8.475	10.708	Madagascar	0.024
Agriculture Value Added	39.683	34.899	Comoros	0.221	Agriculture Value Added	57.523	29.532		
Imports of G&S	23.205	27.934	Niger	0.307	Imports of G&S	17.919	25.003		
Exports of G&S	8.515	16.322			Exports of G&S	11.165	19.696		
Armed Conflict	0.235	0.150			Armed Conflict	0.909	0.581		
Money	15.108	29.864			Money	11.587	20.054		
Rural Population	0.941	0.788			Rural Population	0.908	0.769		
Ethnic Fractionalization	0.324	0.433			Ethnic Fractionalization	0.930	0.799		
ICRG	0.360	0.360			ICRG	0.174	0.092		
Human Assets Index	25.517	28.890			Human Assets Index	34.547	33.080		
Revenue (1980&1997)	10.650	11.100			Democracy	0.455	0.000		
					Revenue (1991)	12.600	10.806		
Zimbabwe									
RMSPE	1.173								
Elements of X	Treated	Synthetic	Countries	Weights					
GDP per capita 2005	1369.000	2440.464	Algeria	0.107					
Population	10.200	4.763	Burkina Faso	0.174					
Natural Resource rents	3.575	4.242	Cape Verde	0.444					
Agriculture Value Added	16.673	16.694	Namibia	0.069					
Imports of G&S	29.202	47.452	Swaziland	0.206					
Exports of G&S	27.824	27.866							
Armed Conflict	0.000	0.059							
Money	27.333	38.258							
ICRG	0.535	0.283							
Human Assets Index	54.046	53.380							
Legal Origin	1.000	0.275							
Region	6.000	5.786							
Democracy	0.000	0.233							
Revenue (1980&2001)	19.500	21.700							

Table 5: Weights, predictor balance, and the root mean squared prediction error (RMSPE) for the synthetic controls of *Ecuador*, *Ethiopia*, *Lesotho* and *Malaysia*.

Ecuador					Ethiopia				
RMSPE	2.159				RMSPE	5.156			
Elements of X	Treated	Synthetic	Countries	Weights	Elements of X	Treated	Synthetic	Countries	Weights
GDP per capita 2005	5488.287	5326.262	Antigua	0.048	GDP per capita 2005	534.084	1835.813	Sudan	0.626
Population	9.898	9.512	China	0.003	Population	46.000	12.400	Tonga	0.374
Natural Resource rents	16.251	4.250	Dom. Rep.	0.876	Natural Resource rents	6.759	1.163		
Agriculture Value Added	8.833	13.209	Gabon	0.074	Agriculture Value Added	58.336	36.679		
Imports of G&S	27.889	38.984			Imports of G&S	12.069	31.700		
Exports of G&S	26.732	33.726			Exports of G&S	6.524	13.193		
Armed Conflict	0.000	0.000			Armed Conflict	1.000	0.516		
Money	22.198	26.920			Money	24.524	25.670		
ICRG	0.559	0.522			ICRG	0.110	0.239		
Ethnic Fractionalization	0.655	0.441			Ethnic Fractionalization	0.650	0.480		
Democracy	1.000	0.924			Rural Population	0.878	0.752		
Revenue (1980&1998)	16.650	16.674			Revenue (1980&1997)	16.500	16.499		
Lesotho					Malaysia				
RMSPE	6.028				RMSPE	1.398			
Elements of X	Treated	Synthetic	Countries	Weights	Elements of X	Treated	Synthetic	Countries	Weights
GDP per capita 2005	911.815	10187.870	Angola	0.322	GDP per capita 2005	6349.370	5626.419	China	0.008
Population	1.640	3.450	Seychelles	0.678	Population	17.100	11.200	Gabon	0.092
Natural Resource rents	3.425	10.490			Natural Resource rents	15.590	5.335	Jordan	0.187
Agriculture Value Added	21.519	7.086			Agriculture Value Added	17.971	16.108	Panama	0.295
Imports of G&S	125.790	61.465			Imports of G&S	65.245	62.319	Seychelles	0.093
Exports of G&S	21.575	57.895			Exports of G&S	66.437	57.168	Togo	0.323
Armed Conflict	0.000	0.061			Armed Conflict	0.063	0.059		
Money	42.618	42.400			Money	103.806	51.476		
Rural Population	0.854	0.545			Rural Population	0.518	0.513		
ICRG	0.197	0.320			Ethnic Fractionalization	0.588	0.596		
Ethnic Fractionalization	0.255	0.391			Democracy	0.000	0.129		
Human Assets Index	56.881	66.751			Revenue (1980&1996)	24.850	24.920		
Legal Origin	1.000	0.000							
Region	6.000	6.000							
Revenue (1980&2001)	38.300	35.098							

Appendix A: List of Developing Countries with a SARA (as of 2013)

Included in the sample			Not included in the sample		
Countries	Year the Law was passed	Website	Countries	Year the Law was passed	Website
Argentina	1996	www.afip.gov.ar	Botswana	2003	www.burs.org.bw
Bolivia	1987	www.impuestos.gob.bo	Burundi	2009	www.obr.bi
Colombia	1990	www.dian.gov.co	Gambia	2005	www.gra.gm
Ecuador	1997	www.sri.gob.ec	Ghana	2009	www.gra.gov.gh
Ethiopia	1997	www.erca.gov.et	Jamaica	2011	www.jamaicatax.gov.jm
Guatemala	1998	www.portal.sat.gob.gt	Mauritius	2004	www.mra.gov.mu
Guyana	2000	www.gra.gov.gy	Mozambique	2007	www.at.gov.mz
Kenya	1995	www.kra.go.ke	Nigeria	2007	www.firs.gov.ng
Lesotho	2001	www.lra.org.ls	Sierra Leone	2002	www.nra.gov.sl
Malawi	1998	www.mra.mw	Seychelles	2009	www.src.gov.sc
Malaysia	1996	www.hasil.org.my	Swaziland	2011	www.sra.org.sz
Mexico	1995	www.shcp.gob.mx			
Peru	1988	www.mpfm.gob.pe			
Rwanda	1997	www.rra.gov.rw			
South Africa	1997	www.sars.gov.za			
Tanzania	1996	www.tra.go.tz			
Uganda	1991	www.ura.go.ug			
Venezuela	2001	www.seniat.gob.ve			
Zambia	1994	www.zra.org.zm			
Zimbabwe	2001	www.zimra.co.zw			

Appendix B: List of countries in the Donor Pool

Donor Pool		
Algeria	Fiji	Paraguay
Angola	Gabon	Philippines
Antigua and Barbuda	Grenada	Senegal
Bangladesh	Guinea	Sri Lanka
Benin	Guinea-Bissau	Sudan
Bhutan	Honduras	Suriname
Brazil	India	Thailand
Burkina Faso	Indonesia	Togo
Cameroon	Jordan	Tonga
Cape Verde	Madagascar	Tunisia
Central African Republic	Mali	Turkey
Chad	Mauritania	Uruguay
Chile	Mongolia	Vanuatu
China	Morocco	
Comoros	Namibia	
Costa Rica	Nepal	
Cote d'Ivoire	Nicaragua	
Dominica	Niger	
Dominican Republic	Panama	
El Salvador	Papua New Guinea	

Appendix C: Definition of Variables

Variables	Description	Sources
Central Government Revenue (% GDP)	Revenue is cash receipts from taxes, social contributions, and other revenues such as fines, fees, rent, and income from property or sales.	World Bank. 2012. World Development Indicators 2012
GDP per capita 2005	GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. Data are in constant 2005 international dollars.	
Population	Population refers to the total population.	
Natural Resource rents (% GDP)	Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.	
Agriculture Value Added (% GDP)	Agriculture value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs.	
Imports of Goods and Services (% GDP)	Imports of goods and services represent the value of all goods and other market services received from the rest of the world.	
Exports of Goods and Services	Exports of goods and services represent the value of all goods and other market services provided to the rest of the world.	
Aid per capita	Net official development assistance (ODA) per capita consists of disbursements of loans made on concessional terms and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries.	
Money Supply (% GDP)	Money supply comprises the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. This definition of money supply is frequently called M2.	
Rural Population (% Population)	Rural population refers to people living in rural areas as defined by national statistical offices.	
Ethnic Fractionalization	This variable reflects the probability that two randomly selected people from a given country will belong to different such groups. The variable thus ranges from 0 to 1 (highly fragmented).	Alesina et al. (2003)
ICRG	The mean value of the ICRG variables "Corruption", "Law and Order" and "Bureaucracy Quality", scaled 0-1 (High quality of government).	International Country Risk Guide - The PRS Group
Legal Origin	Identifies the legal origin of the Company Law or Commercial code of each country. This variable takes the value 1 if the English common law is in place in the country, 0 otherwise.	Laporta et al. (1999)

Human Assets Index	The HAI provides information regarding the level of development of human capital. It is a combination of four indicators. There are two indicators of health and nutrition outcomes and two of education: percentage of population undernourished, mortality rate for children aged five year or under, gross secondary school enrollment rate and adult literacy rate.	Korachais (2011)
Democracy	A regime is considered a democracy if the executive and the legislature are directly or indirectly elected by popular vote and multiple parties are allowed.	Cheibub et al. (2010)
Armed Conflicts	A binary variable indicating the existence of internal armed conflicts in the country (scaled 0-1).	Themnér and Wallensteen (2012)

Box 1: Design considerations for a Revenue Authority

1. Degree of autonomy

The range of possibilities for the following specific areas needs to be assessed:

Legal form and status: from an agency relatively close to a normal government organization, to a corporate body with considerable independence.

Funding: from normal funding via parliamentary appropriations to direct retention of a percentage of collected revenues.

Budget flexibility: from limited flexibility to the complete flexibility of a one-line budget.

Financial policies (such as accounting, asset ownership and management, procurement): from a situation where the SARA is subject to standard civil service laws and regulations, or as determined by “corporate body” status (i.e. not part of the government’s accounting entity).

Human resources: from being within the civil service control framework, to being outside it.

Operational autonomy: from a situation where the minister has day-to-day authority to one where there is no involvement on the part of the minister in operational decisions.

2. Governance framework

Role of the minister of finance: from direct supervision of the authority by the minister, to a more limited role such as appointment of the board or CEO only and limited broad strategic and tax policy directive powers.

Role of the board: from no board at all to one with just advisory powers to fully empowered in legislation to take management decisions.

Role of commissioner general: from a coordinating role only to full responsibility for revenue operations with all vested powers from revenue laws.

3. Accountability

Reporting to the government and parliament: from being part of normal general government reporting, to the need to follow special requirements specified in legislation.

External audit: from being a legislated responsibility of the auditor-general, to the SARA or its board selecting the external auditor as it sees fit.

4. Scope

This refers to the scope of *taxes* and *taxing agencies* to be included. Usually, the RA includes the administration and enforcement of all direct and indirect taxes at the national level, and customs (and trade) administration. The RA may also include the collection of local taxes or fees and social taxes or levies, as well as the collection of social contributions.

Sources: Crandall (2010)

Box 2. What were the motivations for the establishment of a SARA?**A few examples****Guatemala**

In early 1997, the government introduced a program of reforms to achieve the objectives of the Peace Agreement, which was signed in December 1996. As part of this program, the authorities adopted a package of reforms to strengthen the tax system and administration. The main motivation for establishing a relatively more autonomous agency was to provide greater flexibility to the tax administration in order to create a corps of professional, appropriately paid and motivated tax administrators, based on a professional career system. The SAT was established on February 21, 1998, and took over the powers and responsibilities of the former Inland Revenue and Customs Departments.

Peru

The SUNAT was established in 1988. The authorities' main motivations for setting up the agency were the chaotic economic and political situation in the late 1980s and the very low tax revenue/GDP ratio (tax revenue collection reached a record low 5.8 percent of GDP in the first semester of 1991). Inflation reached 7,000 percent in 1990. The guerrilla movements made it very difficult to enforce the tax laws, and the average salary of tax department staff was US\$ 50/month. The creation of the SUNAT took place during a period of major political and economic changes. From its early days, the SUNAT followed a modernization strategy suggested by FAD. The strategy was based on simplifying the tax system, strengthening VAT administration, setting up a large taxpayer unit, and transferring the responsibility for processing tax returns and payments to the banking system. The most senior government authorities (including the president) fully supported the SUNAT.

Uganda

In the early 1990s, administration of national taxes and duties was the responsibility of four departments in the ministry of finance. Reasons for poor performance of these departments included: (1) low staff morale and productivity—partly due to low pay and shortage of resources; (2) corruption; (3) ineffective collection of tax; (4) weak management of revenue administration; (5) lack of a tax-paying culture—partly because taxpayers viewed the tax system to be unfair.

The argument for the SARA was that, by moving away from civil service terms and conditions of service and management practices, these problems would be overcome. With higher salaries, staff would not need to seek alternate sources of income and coupled with stricter discipline, corruption would reduce and productivity would increase as would revenue collections.

Sources: Adapted from Kidd and Crandall (2006)

**PART 2: “DOWNSTREAM” PUBLIC SECTOR
PERFORMANCE**

**CHAPTER 3: BENCHMARKING DES PERFORMANCES
INFRASTRUCTURELLES DE L'AFRIQUE³⁵**

³⁵ A version of this Chapter is forthcoming at the Journal 'Mondes en Développement'.

ABSTRACT

To benchmark is to compare performance against a standard. In an evaluation framework, Benchmarking can help place an outcome in context and can help assess the reasonableness of targets that may be set. This chapter provides a first systematic Benchmarking of Africa's infrastructure performance on four major sectors: electricity, water and sanitation, information and communication technologies, and transportation. The Benchmarking is performed against a relevant sample of comparator countries from the developing world, clustered into 3 income groups: low income countries, lower middle-income countries and upper middle-income countries.

The results suggest that infrastructure's performance in African countries is far below what would be expected from countries with the same level of revenue: access remains a major issue, especially in electricity. Infrastructure service delivery in telephony and roads is, on average, well below what would be expected; unless addressed, such infrastructure shortfalls are likely to adversely affect the welfare of Africa's poor, the cost competitiveness and growth prospects of a range of economic sectors that depend critically on a stable and competitive supply of basic infrastructure service. The main policy implication is that there remain significant needs to scale up infrastructure investments and improve efficiency in all four major infrastructure sectors.

3.1 INTRODUCTION

Ce chapitre propose une évaluation de la fourniture et de la qualité des infrastructures dans le continent africain. En effet la déficience des infrastructures dans cette région représente un obstacle majeur à sa croissance économique et à la réduction de la pauvreté.

Le rôle essentiel que joue une offre adéquate d'infrastructures sur une croissance économique durable est reconnu depuis assez longtemps et a été richement documenté dans la littérature (Banque Mondiale 1994). Les infrastructures ne contribuent pas seulement à la croissance économique mais aussi au développement humain³⁶: un accès convenable à l'eau potable réduit la diffusion des maladies graves telles que la diarrhée, une des grandes causes de la mortalité maternelle et infantile ; l'électricité facilite les services de santé et d'éducation et stimule la productivité des petites entreprises ; le développement des Technologies de l'Information et de la Communication TIC permet de réduire les coûts de transport en facilitant les transactions à distance ; enfin de bons réseaux de transport facilitent l'accès aux marchés locaux et mondiaux.

Le développement des infrastructures en Afrique représente un défi majeur du fait de la particularité du continent ; en effet il se caractérise par une faible densité de population, un nombre relativement élevé de pays enclavés, et un fort taux de croissance urbaine. Dans la plupart des pays africains, le déficit d'infrastructures représente une contrainte majeure à l'atteinte des Objectifs du Millénaire pour le Développement et cela malgré une hausse régulière des investissements dans ce domaine au cours de ces dernières années. En effet, la contribution agrégée des gouvernements, du secteur privé et des bailleurs de fonds pour le financement des infrastructures s'élève en moyenne à près de 45 milliards de dollars par an, soit 7% du PIB de l'Afrique³⁷. Malgré cette importante manne financière, une amélioration significative des performances infrastructurelles des pays africains tarde à se matérialiser.

Le niveau de fourniture des infrastructures sur le continent est insuffisant et la fourniture adéquate de ces services sociaux de base aux populations prendra encore plusieurs années. Cependant chaque pays doit pouvoir fournir, selon son niveau de développement économique, une certaine quantité d'infrastructure minimale à sa population; la principale question est de

³⁶ Pour plus de détails sur la relation entre infrastructures et développement humain, voir Leipziger et al. (2003), et Fay et al. (2005).

³⁷ Africa Infrastructure Country Diagnostic, BAD, 2010.

savoir comment déterminer ce minimum et donc de pouvoir fixer aux pays africains des objectifs de performances infrastructurelles réalisables à court et moyen termes.

Evaluer les performances infrastructurelles des pays en développement est un exercice difficile à entreprendre car la collecte des données sur les services d'infrastructure n'est pas systématique et efficiente, et la nature même de ces services limite les possibilités de mesure de leur productivité et de leur profitabilité.

Ce chapitre propose, à partir d'un Benchmarking systématique, une évaluation des performances des pays africains dans les services infrastructurels économiques de base à savoir l'électricité, l'eau et l'assainissement, les transports et les technologies de l'information et de la communication. Le Benchmarking nous permet de construire, à partir des performances des autres pays en développement, des indicateurs quantitatifs et qualitatifs – appelés benchmarks- auxquels comparer les performances des pays africains.

L'organisation de la suite du chapitre est la suivante : après une brève revue de la littérature existante, nous présentons la base de données et la méthodologie utilisée pour faire le Benchmarking dans la section 3. Ensuite, nous opérons l'évaluation des performances des pays africains dans chaque secteur infrastructurel dans la section 4. Dans la Section 5, nous faisons une discussion des résultats obtenus avant de conclure.

3.2 REVUE DE LA LITTÉRATURE

Cette revue de la littérature commence par mettre en exergue le rôle fondamental des infrastructures dans le développement économique. En effet, plusieurs auteurs se sont interrogés sur les liens qu'il pourrait y avoir entre services d'infrastructures, croissance économique, réduction de la pauvreté et développement social.

Dans un article fondateur publié en 1989, Aschauer montre que le stock d'infrastructures est un déterminant très significatif de la productivité globale des facteurs. Cependant, la robustesse de ce résultat a été remise en cause par plusieurs papiers notamment ceux de Holtz-Eakin (1994) et Baltagi et Pinnoi (1995) avec l'utilisation de méthodes économétriques plus sophistiquées.

Néanmoins, le rôle déterminant des infrastructures dans l'économie a été confirmé dans l'article de Roller et Waverman (2001) qui montre, en contrôlant pour l'endogénéité, que les

infrastructures de télécommunications ont un impact très significatif sur la croissance. Calderon et Serven (2003) trouvent un résultat similaire pour les pays d'Amérique Latine, en utilisant trois types d'infrastructures (télécommunications, transport, énergie) ; dans ce même papier ils conjecturent que le retard de croissance de l'Amérique Latine par rapport à l'Asie de l'Est enregistré dans les années 80 et 90 est largement dû au ralentissement de l'accumulation de capital d'infrastructures en Amérique Latine durant cette période.

Aussi l'importance des services d'infrastructures pour l'atteinte des Objectifs du Millénaire pour le Développement a été largement démontrée dans la littérature. Dans une étude sur 43 pays en développement, Leipziger et al. (2003) ont estimé que la différence dans l'accès à l'eau potable explique 25% de la différence de la mortalité infantile entre le quintile le plus riche et le quintile le plus pauvre ; cela signifie qu'augmenter le niveau d'accès à l'eau potable du quintile le plus pauvre jusqu'au niveau de celui du quintile le plus riche permettrait d'éliminer plus du quart de la différence de mortalité infantile entre les deux groupes. En Inde rurale, Javal et Ravallion (2001) ont montré que la prévalence et la durée de la diarrhée chez les enfants de moins de 5 ans étaient beaucoup plus faibles dans les familles ayant accès à l'eau potable. Calderon et Serven (2004) ont montré que dans les pays en développement, ce n'est pas seulement la croissance qui a été affectée positivement par la quantité et la qualité des infrastructures, mais aussi le niveau des inégalités qui a beaucoup baissé.

Maintenant si nous nous intéressons de manière plus spécifique aux études ayant porté sur le continent africain, ces dernières ont montré que la carence en infrastructures de qualité a négativement affecté l'ensemble des activités économiques. Par exemple, en utilisant des données sur les entreprises Ougandaises, Reinikka et Svensson (1999) ont montré que les problèmes d'électricité freinent considérablement les investissements des entreprises. Diao et Yanoma (2003) trouvent que la croissance du secteur agricole est contrainte par les coûts élevés liés aux carences en moyens de transport. Estache et Vagliasindi (2007) défendent l'idée selon laquelle le faible niveau de production d'électricité a significativement limité les possibilités de croissance économique du Ghana. Lumbila (2005) a montré que la quantité et la qualité des infrastructures en Afrique ont réduit le pouvoir de pénétration des Investissements Directs Etrangers. Estache et al. (2005) présentent un modèle de croissance de Solow augmenté incluant différents indicateurs infrastructurels. Leurs résultats montrent

que les routes, l'électricité et les infrastructures de télécommunication ont un impact positif sur la croissance en Afrique.

La littérature sur les infrastructures montre les multiples rôles qu'elles peuvent jouer aussi bien dans la croissance économique que dans l'amélioration des conditions de vie des populations ; cependant aucune étude exhaustive n'a été faite, à notre connaissance, pour tenter de mesurer les performances des pays africains, qui semblent être les moins dotés en infrastructures de qualité. Cela s'explique par la difficulté à mesurer les performances dans ce domaine, le niveau des infrastructures d'un pays étant dépendante de plusieurs facteurs géographique, socio-économique et de choix de politiques publiques.

3.3 METHODOLOGIE ET BASE DE DONNEES

3.3.1 Le Benchmarking

La première difficulté que l'on rencontre lorsqu'on s'intéresse aux infrastructures réside dans l'inexistence de bases de données exhaustives pouvant permettre une comparaison contemporaine et inter-temporelle des performances des pays en développement. Cela a pour conséquence de limiter les possibilités en termes d'utilisation de méthodologies de recherche élaborées et, dans le cadre plus particulier de l'évaluation, la construction d'un contrefactuel représentatif de l'élément d'investigation. A cela s'ajoute la difficulté de modéliser l'accès aux infrastructures dans les pays en développement, les facteurs à prendre en compte étant difficiles à mesurer. Par exemple, si nous cherchons à identifier les déterminants de l'accès à l'électricité, il faudrait à la fois avoir des données sur l'offre et la demande d'électricité mais aussi sur les caractéristiques socio-économiques et géographiques de chaque pays. Dès lors, contrairement aux autres chapitres de cette thèse où nous avons fait appel à des méthodes d'évaluation plus élaborées qui nous ont permis de prendre en compte tous les facteurs exogènes pouvant influencer sur la performance, nous utiliserons ici une approche relativement plus simple à mettre en place: le Benchmarking.

A la base, le Benchmarking est une technique utilisée en Management pour comparer les performances de plusieurs entreprises afin d'en retirer les meilleures pratiques ; pour une

entreprise, il s'agit de se comparer aux leaders qui se positionnent sur le marché, de s'inspirer de leurs idées, de leurs pratiques et de leurs modes de fonctionnement afin d'améliorer ses pratiques internes. Dans son article fondateur « A Theory of Yardstick Competition » paru en 1985, Shleifer a été l'un des précurseurs de l'utilisation du Benchmarking dans un cadre économique, en mettant en exergue la possibilité d'utiliser cette méthode pour réguler les « monopoles naturels »³⁸.

D'autres auteurs ont ensuite utilisé cette méthode comme outil de mesure de la performance. Par exemple, Basak et al. (2005) montrent comment le Benchmarking peut être utilisé dans la gestion du risque ; Song et Windram (2000) adoptent une approche similaire pour étudier l'efficacité des commissions d'Audit en Grande Bretagne. Evans et Simpson (2003) proposent d'utiliser le Benchmarking comme moyen de régulation du niveau de capital adéquat au système bancaire d'un pays. C'est aussi la méthode utilisée par la Banque Mondiale pour produire son rapport annuel Doing Business³⁹.

Ces études montrent que cette technique peut être utilisée dans différents contextes économiques et financiers, la principale réquisition étant de bien identifier et de bien délimiter la question à laquelle on souhaite répondre.

Pour construire un benchmark pour les pays africains, nous partons d'un échantillon comprenant tous les autres pays en développement; dans la littérature classique de l'évaluation et de l'analyse d'impact, ce groupe de pays correspond au « groupe de contrôle ». Partant de l'hypothèse selon laquelle le niveau des infrastructures d'un pays est fortement lié à son niveau de revenu⁴⁰, les pays sont regroupés en 3 catégories : les pays à Faible Revenu, les pays à Revenu Moyen Inférieur et les pays à Revenu Moyen Supérieur. Selon la classification 2010 de la Banque Mondiale⁴¹, nous avons en Afrique 29 pays à Faible Revenu, 15 à Revenu Moyen Inférieur et 9 à Revenu Moyen Supérieur. L'exercice consiste à comparer, pour chaque groupe de revenu et pour chaque indicateur infrastructurel, la

³⁸ Shleifer propose un mécanisme par lequel le prix d'un monopole naturel est déterminé en fonction des coûts des autres firmes identiques.

³⁹ <http://www.doingbusiness.org>

⁴⁰ Voir par exemple Calderon et Servén (2004), Estache (2006), et Canning (2006).

⁴¹ Pays à Faible Revenu: RNB par habitant inférieur ou égal à 975 dollars US; Pays à Revenu Moyen Inférieur: RNB par habitant compris entre 976 et 3855 dollars US; Pays à Revenu Moyen Supérieur: RNB par habitant compris entre 3856 et 11905 dollars US (Banque Mondiale 2010).

performance moyenne des pays africains avec celle des autres pays en développement. Les indicateurs sont calculés comme suit :

$$\Phi_{G,R} = \sum_{i=1}^n w_i * \Phi_{G,R,i}, 0 < w_i < 1 \quad (1)$$

Φ étant l'indicateur de performance, G le groupe d'appartenance (Afrique ou reste du monde en développement), R le niveau de revenu et w la pondération par la taille de la population de chaque pays. Dès lors l'exercice consiste à comparer, pour chaque indicateur et chaque groupe de revenu, Φ_{Afrique} et $\Phi_{\text{Benchmark}}$.

3.3.2 Construction de la base de données

Comme nous l'avons souligné plus haut, le manque de données comparables sur l'ensemble des pays constitue le principal obstacle à l'exercice du Benchmarking. La rédaction de ce chapitre a nécessité un long travail de recherche pour constituer la base de données la plus exhaustive possible. Nous avons utilisé plusieurs bases de données dont les principales sont la base WDI⁴² de la Banque Mondiale, le Global Competitiveness Report⁴³, le Demographic and Health Surveys⁴⁴, la base de l'Agence Internationale de l'Energie⁴⁵ et la base de données sur les infrastructures d'Estache et Goicoechea (2005).

C'est donc à partir de ces travaux, et en considérant les informations les plus récentes sur la période 2000-2010, que nous avons reconstruit une nouvelle base de données permettant de faire le Benchmarking. Vingt-six indicateurs⁴⁶ sur l'accès, la tarification et la qualité des infrastructures sont retenus. Les indicateurs d'accès permettent de mesurer la quantité d'infrastructures dans le pays à disposition des populations mais aussi de voir si tous les citoyens ont accès aux services sociaux de base. Les indicateurs de tarification et d'accessibilité permettent de voir si la provision des services d'infrastructures se fait à un prix raisonnable, c'est-à-dire voir si le niveau du prix des services est en adéquation avec le

⁴² World Development Indicators, Banque mondiale, 2010.

⁴³ <http://www.weforum.org/issues/global-competitiveness>

⁴⁴ <http://www.measuredhs.com>

⁴⁵ <http://www.iea.org>

⁴⁶ La définition des indicateurs est présentée en Annexes.

pouvoir d'achat des utilisateurs. Les indicateurs de qualité donnent une idée sur la qualité technique et la qualité perçue par les utilisateurs des services d'infrastructures ; certains de ces indicateurs sont qualitatifs et d'autres quantitatifs. A noter qu'aucun indicateur sur la tarification des secteurs de l'eau et des transports n'est disponible pour les pays de l'échantillon sur la période considérée.

3.4 ANALYSE SECTORIELLE DE LA PERFORMANCE DES PAYS AFRICAINS

3.4.1 ENERGIE

Le tableau 1 présente les résultats pour le secteur de l'énergie. En Afrique, la part de la population ayant accès au réseau d'électricité demeure l'une des plus faibles au monde ; en témoignent les taux d'accès relativement très faibles quel que soit le groupe de revenu considéré. En effet, dans le groupe des pays à Faible Revenu, la part de la population ayant accès au réseau, seulement 9,77%, est trois fois plus faible en Afrique que dans le reste du monde. De même, les pays africains à Revenu Moyen⁴⁷ sont très en retard par rapport à leurs homologues avec des taux d'accès de 32,75% et 42,86% alors que les benchmarks pour ces groupes de pays sont respectivement de 82% et 87%.

Si on s'intéresse directement aux ménages, l'écart entre les pays africains et les autres pays en développement se confirme, même s'il est moins important : pour les trois groupes de revenu, les taux d'accès des ménages sont de 14,42%, 41,5% et 69,5% en Afrique alors que les benchmarks sont respectivement de 32%, 74% et 84%.

Une comparaison des performances en milieu rural et urbain montre l'existence d'une nette différence en termes d'accès des ménages à l'électricité ; en effet pour les pays africains les plus pauvres, près de la moitié des ménages urbains a accès à l'électricité contre 3,47% pour les ménages ruraux. Ceci montre l'existence d'un réel « biais urbain » en Afrique qui est d'autant plus flagrant si on regarde l'écart rural-urbain dans le groupe de contrôle qui est beaucoup plus faible. Ce biais existe aussi pour les pays à Revenu Moyen où on constate un net déficit d'accès à l'électricité en milieu rural : 19,75% et 33,5% des ménages contre 30% et 68% dans les autres pays en développement.

⁴⁷ La catégorie "pays à Revenu Moyen" regroupe les pays à Revenu Moyen Inférieur et les pays à Revenu Moyen Supérieur.

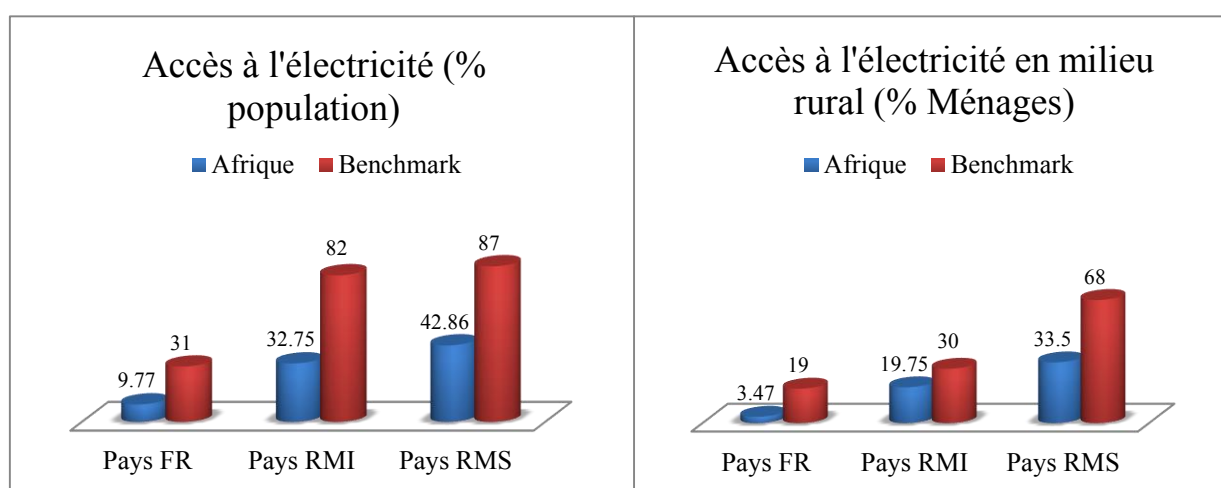
Le prix de l'électricité pratiqué en Afrique est en moyenne égal à celui pratiqué dans le reste du monde en développement. Cependant, il est à noter que les pays africains à Revenu Moyen Supérieur ont une tarification plus faible que le benchmark correspondant, 6,25 contre 9\$/kWh, et même plus faible que celle des pays africains à Revenu Moyen inférieur qui est de 8\$/kWh. On peut en conclure que les performances des pays africains en termes d'accessibilité et de tarification de l'électricité sont au même niveau que les autres pays en développement et que des facteurs autres que le prix sont à l'origine du très faible accès des ménages à l'électricité, surtout en milieu rural.

Nous avons deux indicateurs de la qualité du service d'électricité, un quantitatif et un qualitatif. La qualité, du point de vue technique du service d'électricité en Afrique, est dans l'ensemble semblable à celle des autres pays en développement avec de bonnes performances de la part des pays africains à Faible Revenu où la perte moyenne d'énergie électrique est de 19,75% alors qu'elle se situe à 22% pour le benchmark. On note par contre une très faible performance des pays africains à Revenu Moyen Inférieur dont la perte moyenne d'énergie électrique est de 22,11% contre 15% pour le groupe de comparaison. La performance des pays africains à Revenu Moyen Supérieur est quant à elle semblable à celle du benchmark. En termes de qualité perçue du service d'électricité, la performance des pays africains à Revenu Moyen est correcte en comparaison avec les autres pays en développement, leurs scores étant presque égaux aux benchmarks correspondants. Les données sur cet indicateur sont indisponibles pour les pays africains à Faible Revenu.

Tableau 1: Secteur de l'Énergie

INDICATEURS (Secteur de l'Énergie)	AFRIQUE			BENCHMARK		
	Faible Revenu	Revenu Moyen Inferieur	Revenu Moyen Supérieur	Faible Revenu	Revenu Moyen Inferieur	Revenu Moyen Supérieur
Accès à l'électricité	9,77	32,75	42,86	31	82	87
Accès à l'électricité (% ménages)	14,42	41,5	69,5	32	74	84
Ménages ruraux ayant l'électricité	3,47	19,75	33,5	19	30	68
Ménages urbains ayant l'électricité	47,45	79,5	87	63	90	95
Prix de l'électricité (en US cents/kWh)	5,5	8	6,25	6	8	9
Perte d'électricité	19,75	22,11	15	22	15	14
Perception de la qualité du service	..	4,18	5,28	2,8	4,2	5,2

Sources: Calculs de l'auteur.

Figure 1: Illustration des performances dans le secteur de l'Énergie

3.4.2 EAU ET ASSAINISSEMENT

Le secteur de l'eau et de l'assainissement est celui dont on dispose le moins de données, notamment sur la tarification, l'accessibilité et la qualité technique des services des eaux.

Les chiffres du tableau 2 montrent que la part de la population ayant accès à l'eau potable est faible dans les pays africains comparés aux autres pays en développement ; en effet, le pourcentage de la population ayant accès à l'eau potable est en moyenne de 5 à 15 points inférieur en Afrique, et cela quel que soit le groupe de revenu considéré. Et comparativement à leur benchmark respectif, les performances des pays africains à Faible Revenu sont relativement meilleures que celles des pays africains à Revenu Moyen.

En milieu urbain, l'accès à l'eau potable est relativement bien assuré avec un taux d'accès de 80,34% de la population pour les pays à Faible Revenu, 85,93% pour les pays à Revenu Moyen Inférieur et 88,89% pour les pays à Revenu Moyen Supérieur. Les écarts par rapport aux benchmarks sont très faibles montrant ainsi que l'eau potable est l'un des biens les plus accessibles aux populations en milieu urbain africain.

Cependant comme c'est le cas avec l'accès à l'électricité, il existe un gap non négligeable entre les performances en milieu rural et celles en milieu urbain et ceci dans tous les pays en développement. Mais ce gap est beaucoup plus marqué en Afrique que dans les autres pays, ce qui confirme l'existence du biais urbain⁴⁸. Le retard des pays africains à Revenu Moyen Inférieur est particulièrement frappant avec un taux d'accès à l'eau potable de 57,87% en milieu rural alors que son benchmark est de 76%.

L'accès à l'assainissement demeure faible en Afrique surtout dans les pays à Faible Revenu, seulement un tiers de la population. Cependant il est à noter que la performance de ces pays est relativement meilleure comparée à celle groupe des pays africains à Revenu Moyen ; en effet, alors que le gap par rapport au benchmark est de 8 points de pourcentage pour les pays à Faible Revenu, il est en moyenne de 25 points pour les pays à Revenu Moyen.

En termes de performances, les pays africains sont très en retard que ça soit en milieu urbain ou en milieu rural. Les résultats sont particulièrement faibles pour les pays africains à Revenu Moyen Inférieur où les taux d'accès en milieu rural et urbain sont de 30,2% et 60,4%, soit respectivement 27,8 et 24,6 points de moins que les benchmarks correspondants.

Du point de vue de la qualité du service, les performances sont mitigées : les pays africains à Revenu Moyen Supérieur sont en avance par rapport à leurs homologues du monde en

⁴⁸ Nous avons montré plus haut que ce biais existe aussi dans le secteur de l'énergie.

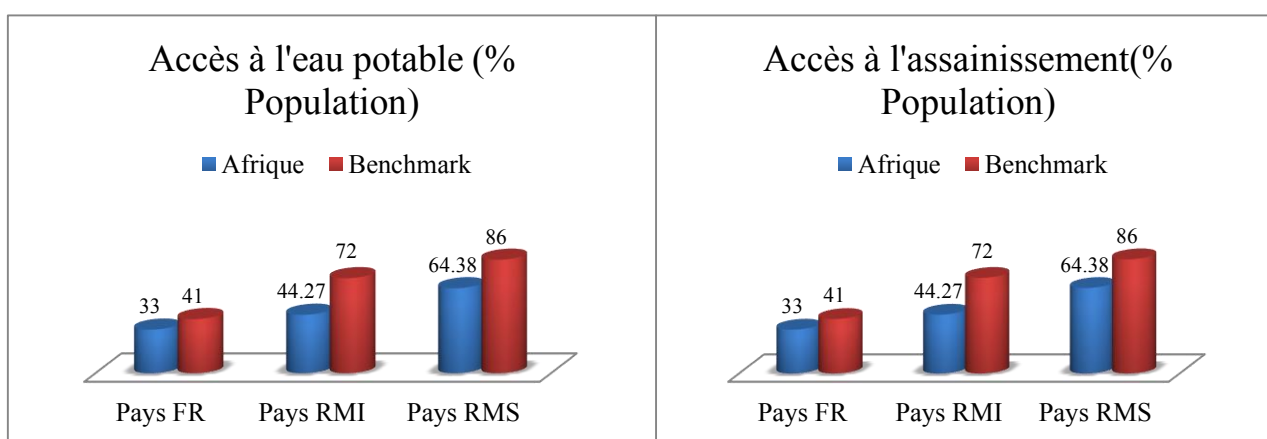
développement avec une note moyenne de 5,87/7 alors que les pays africains à Revenu Moyen Inférieur accusent un léger retard par rapport au benchmark avec une note de 4,2/7. Là aussi cet indicateur n'est pas disponible pour les pays africains à Faible Revenu.

Tableau 2 : Secteur de l'Eau et de l'Assainissement

INDICATEURS (Secteur de l'Eau et de l'Assainissement)	AFRIQUE			BENCHMARK		
	Faible Revenu	Revenu Moyen Inférieur	Revenu Moyen Supérieur	Faible Revenu	Revenu Moyen Inférieur	Revenu Moyen Supérieur
Accès à l'eau potable	59,24	70,47	82,11	65	85	93
Accès à l'eau en milieu rural	50,04	57,87	71,89	56	76	85
Accès à l'eau en milieu urbain	80,34	85,93	88,89	83	94	96
Accès à l'assainissement	33	44,27	64,38	41	72	86
Accès à l'assainissement en milieu rural	23,24	30,2	59,56	30	58	76
Accès à l'assainissement en milieu urbain	50,81	60,4	75,25	60	85	91
Perception de la qualité du service	..	4,2	5,87	4	4,8	5

Sources: Calculs de l'auteur.

Figure 2 : Illustration des performances dans le secteur de l'eau



3.4.3 TRANSPORTS

Le tableau 3 montre que de manière générale, les réseaux de transport en Afrique mesurés ici par la densité de routes et la densité de voies ferrées sont en moyenne moins denses que dans les autres pays en développement. La densité de routes en termes de population en Afrique est de 2,5 km/habitant dans les pays à Faible Revenu et les pays à Revenu Moyen Inférieur et 8,11 km/habitant dans les pays à Revenu Moyen Supérieur. Ces chiffres dénotent des performances en deçà de celles des autres pays en développement en matière d'infrastructures de transport, particulièrement dans les pays africains à Revenu Moyen Inférieur où la densité de routes équivaut à celle des pays africains à Faible Revenu.

La densité de routes mesurée en termes de surface amène aux mêmes conclusions mais le gap est beaucoup plus large et augmente avec les niveaux de revenu. En effet, comparées aux benchmarks, les performances des pays à Revenu Moyen sont beaucoup plus mauvaises que celles des pays à Faible Revenu.

Dans le secteur des transports ferroviaires, les pays africains, exception faite des pays à Revenu Moyen Supérieur, ont une faible densité de voies ferrées qu'elles soient exprimées par habitant ou par km². Comparée aux benchmarks, la densité de voies ferrées par habitant est 2 fois plus faible dans les pays africains à Faible Revenu et presque 3 fois plus faible dans les pays africains à Revenu Moyen Inférieur. Seuls les pays africains à Revenu Moyen Supérieur affichent de bonnes performances dans ce domaine.

En termes de surface, comme c'était le cas dans le secteur routier, les performances sont globalement médiocres et de manière inattendue, décroissent avec le niveau de revenu : en effet, elles sont 3 fois plus faibles dans les pays africains à Faible Revenu, 4 fois plus faible dans les pays africains à Revenu Moyen inférieur et 6 fois plus faibles dans les pays africains à Revenu Moyen Supérieur.

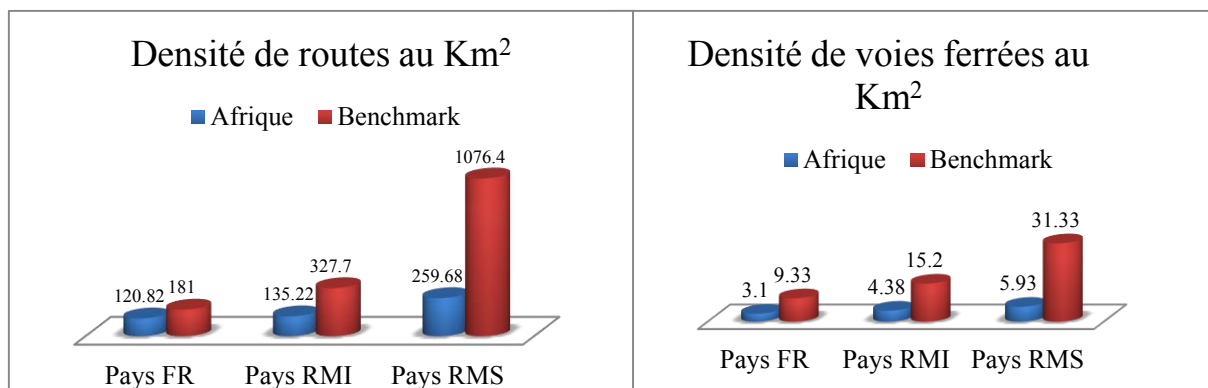
Les données disponibles sur la qualité technique des infrastructures de transport concernent le réseau routier plus précisément le pourcentage de routes goudronnées. Dans les pays africains à Faible Revenu, seuls 17,38% des routes sont goudronnées, ce chiffre étant de 36,79% dans les pays africains à Revenu Moyen Inférieur et de 51% dans les pays africains à Revenu Moyen Supérieur. Ces chiffres font état d'une qualité physique des routes en deçà des benchmarks avec des performances croissant avec le niveau de revenu.

La qualité perçue par les usagers donne des résultats différents et encourageants, les pays africains à Revenu Moyen ayant en moyenne des performances meilleures que celles des autres pays en développement.

Tableau 3: Secteur des Transports

INDICATEURS (Secteur des Transports)	AFRIQUE			BENCHMARK		
	Faible Revenu	Revenu Moyen Inferieur	Revenu Moyen Supérieur	Faible Revenu	Revenu Moyen Inferieur	Revenu Moyen Supérieur
Densité de routes en termes de population (km/1000 personnes)	2,5	2,5	8,11	3	4,9	9,2
Densité de routes en termes de surface (km/km ²)	120,82	135,22	259,68	181	327,7	1076,4
Densité de voies ferrées en termes de population (km/1000 personnes)	0,07	0,11	0,59	0,13	0,3	0,51
Densité de voies ferrées en termes de surface (km/km ²)	3,1	4,38	5,93	9,33	15,2	31,33
Routes pavées (% du réseau routier)	17,38	36,79	51	30	47	57
Perception de la qualité du service	..	4,53	5,5	3,4	4,2	4,1

Sources: Calculs de l'auteur.

Figure 3: Illustration des performances dans le secteur des Transports

3.4.4 TECHNOLOGIES DE L'INFORMATION ET DE LA COMMUNICATION

En termes de densité de lignes de téléphone fixe, le tableau 4 montre que le continent africain accuse un énorme retard par rapport aux autres régions du monde en développement malgré le boom significatif du secteur des TIC dans cette région au cours de ces quinze dernières années. Dans les pays à Faible Revenu, en moyenne 7,87 habitants pour 1000 possèdent une ligne téléphonique, soit 4 fois moins que le benchmark. Les pays à Revenu Moyen, aussi en retard, réalisent tout de même de meilleures performances que les pays à Faible Revenu : comparée aux benchmarks, la densité de lignes téléphoniques est 2,5 fois plus faible dans les pays africains à Revenu Moyen Inférieur et de 2,3 fois plus faible dans les pays africains à Revenu Moyen Supérieur. Les performances dans le secteur du téléphone mobile ne sont guère meilleures ; elles sont nettement inférieures à celles des autres pays en développement. Mais contrairement au secteur du téléphone fixe, les pays à Faible Revenu réalisent de meilleures performances relatives, comparés aux autres pays africains.

Il existe deux indicateurs dans la base de données permettant de mesurer l'accessibilité du secteur des télécommunications : le coût d'un appel local entre deux lignes téléphoniques et le coût d'un appel vers les Etats-Unis. En Afrique, un appel local d'une durée de 3 minutes coûte en moyenne 0.0943 \$ américain soit un prix légèrement supérieur à celui pratiqué dans les autres pays en développement. La performance des pays africains à Revenu Moyen Inférieur est la plus médiocre avec un prix 50% plus élevé que le benchmark.

Ces faibles performances se confirment si on regarde le coût des appels internationaux. Le coût d'un appel vers les Etats-Unis est en moyenne de 5,75\$/3minutes dans les pays à Faible Revenu, 3,64\$/3minutes dans les pays à Revenu Moyen inférieur et de 4,52\$/3minutes dans

les pays à Revenu Moyen Supérieur. Ce sont ces derniers qui enregistrent les plus mauvaises performances sachant que le benchmark correspondant est de 3,05\$/3minutes.

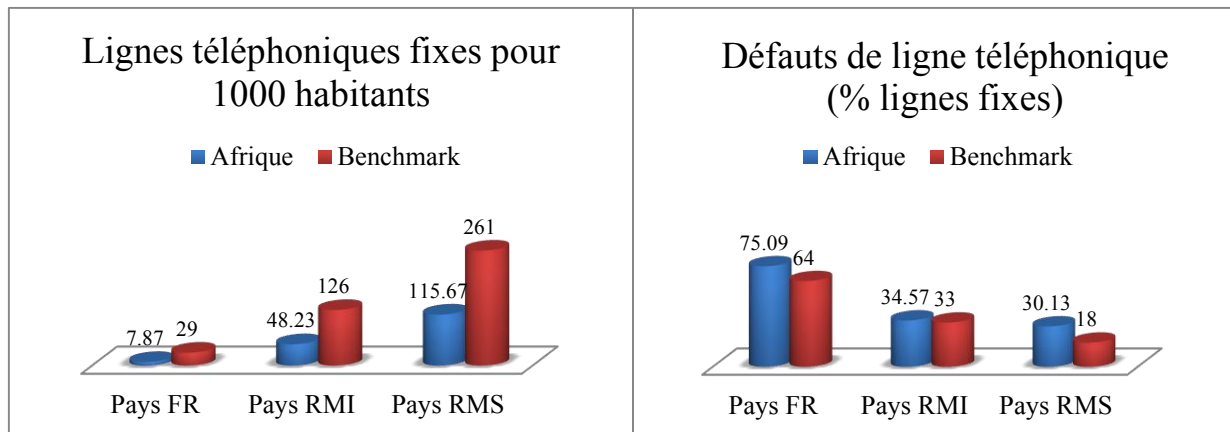
Deux indicateurs permettent d'évaluer la qualité technique des services de l'information et de la télécommunication : les défauts sur les lignes téléphoniques et le nombre de demandes insatisfaites. Sur ces critères, les performances africaines sont encore en deçà de celles du reste du monde en développement, notamment dans les pays à Faible Revenu où les défauts de lignes et les demandes insatisfaites sont très fréquents. Par ailleurs, on constate que les pays africains à Revenu Moyen Supérieur réalisent de bonnes performances avec des chiffres proches du benchmark.

En ce qui concerne la qualité perçue, les conclusions sont sensiblement les mêmes : les performances sont plus faibles en Afrique que dans les autres pays en développement.

Tableau 4: Secteur des TIC

INDICATEURS (Secteur des TIC)	AFRIQUE			BENCHMARK		
	Faible Revenu	Revenu Moyen Inferieur	Revenu Moyen Supérieur	Faible Revenu	Revenu Moyen Inferieur	Revenu Moyen Supérieur
Densité de lignes fixes (pour 1000 habitants)	7,87	48,23	115,67	29	126	261
Densité de téléphones mobiles (pour 1000 habitants)	24,85	79,07	223	37	179	381
Coût d'un appel local (US cents/3 minutes)	9,16	9,64	9,5	8	6	9
Coût d'un appel vers les Etats-Unis (US \$/3 minutes)	5,75	3,64	4,52	5,04	3,14	3,05
Défaut sur les lignes (% lignes fixes)	75,09	34,57	30,13	64	33	18
Demandes insatisfaites (% lignes fixes)	71,96	23,79	14,89	47	20	4
Perception de la qualité du service	..	4,04	5	3,4	4,9	5,6

Sources: Calculs de l'auteur.

Figure 4 : Illustration des performances dans le secteur des TICs

3.5 DISCUSSION ET CONCLUSION

Dans ce chapitre, nous avons proposé une évaluation des performances infrastructurelles des pays africains dans quatre secteurs majeurs à savoir le transport, l'énergie, les technologies de l'information et de la communication, l'eau et l'assainissement. L'entreprise d'un tel exercice peut s'avérer difficile étant donné les nombreux facteurs pouvant influencer ces performances et surtout le manque de données sur les pays en développement. Dès lors, l'utilisation du Benchmarking comme outil d'évaluation peut être un bon moyen pour surmonter ces obstacles et avoir une idée sur les performances relatives des pays africains.

Les résultats présentés ci-dessus confirment que les pays africains sont très en retard par rapport aux autres pays en développement, et cela dans tous les secteurs infrastructurels et quel que soit le groupe de revenu considéré. Bien que le mauvais état des réseaux d'infrastructures dans la plupart des pays africains ne soit plus à démontrer, cette étude a surtout permis, en faisant usage du Benchmarking, de relativiser et de mettre en perspective les performances de ces pays. Les besoins de financement du continent africain sont certes énormes, mais cela ne peut pas expliquer des écarts aussi importants par rapport à leurs homologues, qui font souvent face aux mêmes défis qu'eux. Les écarts sont considérables, notamment en termes de routes goudronnées, de lignes téléphoniques et surtout au niveau de l'accès à l'électricité. Il existe aussi un biais urbain dans la fourniture des infrastructures de base que les pays africains doivent s'atteler à réduire s'ils veulent rattraper leurs homologues du monde en développement. De plus, on note une mauvaise qualité technique des

installations notamment dans les secteurs de l'énergie et des TIC avec des défauts de lignes et des pertes de production nettement supérieurs dans les pays africains. Non seulement les réseaux d'infrastructures sont déficients, mais le prix des services fournis est très élevé ; que ce soit pour l'énergie, l'eau, le transport routier ou la téléphonie mobile, les tarifs moyens africains sont supérieurs à ceux pratiqués dans les autres parties du monde en développement.

Nous trouvons deux principales explications à ces faibles performances des pays africains. Elles peuvent être dues à un manque d'efficacité dans l'utilisation des ressources disponibles ou encore à des choix d'investissements et de politiques publiques infrastructurelles inadéquats. Ces choix et politiques doivent viser à contourner trois problèmes majeurs inhérents aux pays africains: leur situation géographique, le manque d'intégration de leur marché et la qualité de leurs institutions. Le Botswana, pays enclavé et dépendant des ressources naturelles, est un exemple de pays africain où ces désavantages n'ont pas empêché les gouvernements successifs de mettre en place des réseaux d'infrastructures de bonne qualité. La deuxième explication est liée au choix qui a été fait ces deux dernières décennies d'orienter les dépenses publiques vers les secteurs sociaux et de laisser le financement des infrastructures au secteur privé. Il faudrait reconsidérer ces choix stratégiques ou mettre en place des systèmes de régulation des secteurs infrastructurels afin d'assurer qu'ils demeurent accessibles à tous les citoyens.

Les pays africains doivent aussi faire des choix stratégiques en choisissant les secteurs requérant l'attention la plus urgente. Il est apparu de cette étude que l'accès à l'électricité soit le problème majeur dans les pays africains et cela quel que soit le niveau de revenu considéré ; ceci est encore plus saillant en milieu rural où seulement 13% de la population africaine a accès à l'électricité. Ensuite vient le domaine des transports terrestres où l'étude a montré la très mauvaise qualité du réseau routier et à l'absence de réseaux de voies ferrées. Le secteur de l'eau et de l'assainissement est celui où on enregistre les résultats les plus encourageants et cela est corroboré par l'atteinte de l'OMD 7 visant à réduire de moitié le nombre d'individus dans le monde n'ayant pas accès à l'eau potable.

Récemment, de nombreuses initiatives visant à apporter des solutions aux problèmes infrastructurels de l'Afrique ont vu le jour. Nous pouvons citer entre autres le Programme de Développement des Infrastructures en Afrique (PIDA) qui cherche à promouvoir le

développement socio-économique et la réduction de la pauvreté en Afrique grâce à la mise en œuvre des réseaux intégrés d'infrastructures régionales ; le Fonds pour les Infrastructures de l'Afrique Emergente (FIAE), financé par des organisations d'aide internationale, qui a pour objectif d'avoir un impact réel et durable sur le développement des infrastructures en Afrique sub-Saharienne ; ou encore le Consortium pour les Infrastructures en Afrique (CIA) lancé au cours du Sommet du G8 tenu à Gleneagles en 2005, et qui a pour vocation d'appuyer et de promouvoir l'accroissement de l'investissement tant public que privé dans les infrastructures en Afrique.

Enfin, les résultats du Benchmarking doivent être interprétés avec précaution et considérés comme indicatifs et non définitifs car les valeurs des indicateurs dans les groupes de comparaison peuvent ne pas être économiquement optimales. En effet, ces valeurs peuvent être faibles ou excessives et dans ce cas ne peuvent être prises comme références pour la mise en place de réformes. De plus, l'une des limites du Benchmarking dans le cadre économique réside dans le fait qu'il permette seulement de comparer les performances sans parvenir à identifier leurs causes. Cette comparaison des performances infrastructurelles devra, bien sûr, être combinée avec des analyses sectorielles plus approfondies afin d'avoir une vision plus exhaustive sur les performances des pays africains. Prises ensemble, de telles analyses pourraient fournir aux décideurs africains un guide utile sur les secteurs infrastructurels requérant une attention urgente.

3.6 ANNEXES

Annexe A : Définition des indicateurs

Energie

Accès à l'électricité: mesure l'accès à l'électricité au niveau de la population; il comprend l'électricité commercialement vendue mais aussi l'électricité autoproduite pour les pays où il existe un suivi de la consommation de la part du gouvernement. Les données n'incluent pas les connexions illégales.

Ménages ayant accès à l'électricité : Pourcentage de ménages ayant répondu OUI à la question : est-ce que votre ménage a l'électricité ?

Prix de l'électricité : prix réellement payé par le client, coûts de transport et taxes inclus. Ne comprend pas la TVA.

Perte d'électricité lors de la transmission ou de la distribution : Electricité perdue à cause d'opération sur le système, inclut aussi les pertes lors de la transmission entre la source de l'offre et les points de distribution.

Perception de la qualité du service : qualité perçue par les entreprises et les ménages en répondant à la question suivante : classez la qualité de l'offre d'électricité dans votre pays en termes d'interruptions et de fluctuations du voltage 1 à 7.

Eau et Assainissement

Accès à l'eau potable : mesure l'accès à au moins 20 litres d'eau potable par personne et par jour dans un rayon d'1 kilomètre du logement de l'utilisateur.

Accès à l'assainissement : mesure l'accès à un assainissement amélioré : connexion à un égout public, à un système septique, à une latrine de fosse simple ou améliorée.

Perception de la qualité du service : mesure la qualité du service des eaux perçue par les entreprises et les usagers en répondant à la question suivante : comment noteriez-vous la qualité et l'efficacité du service public des eaux ? 1 à 7.

Transports

Densité de routes en termes de population: c'est le total du réseau routier en kilomètre divisé par la population et multiplié par 1000 ; le réseau comprend les autoroutes, les routes nationales et régionales.

Densité de routes en termes de surface : c'est le nombre total de kilomètres du réseau routier divisé par la surface totale du pays en kilomètre-carré et multiplié par 1000.

Densité de voies ferrées en termes de population : c'est le nombre de kilomètres de voies ferrées divisé par la population totale et multiplié par 1000 ; ne prend en compte que les voies disponibles pour les services de train en ne tenant pas compte du parallélisme des voies.

Densité de voies ferrées en termes de surface : c'est le nombre de kilomètres de voies ferrées divisé par la surface totale du pays en kilomètre-carré et multiplié par 1000.

Routes pavées : c'est le pourcentage de routes couvertes de macadam ou de bitume, avec du béton ou des pavés.

Perception de la qualité du service : qualité perçue du service délivré par le département routier par les entreprises et les usagers, en répondant à la question suivante : pouvez-vous noter de 1 à 7 la qualité et l'efficacité du service délivré par le département routier ?

Technologies de l'Information et de la Communication

Densité de lignes de téléphone fixe : c'est le nombre de téléphones fixes pour 1000 habitants connectés au réseau public téléphonique.

Densité de téléphones mobiles : se réfère aux utilisateurs de téléphones portables, analogiques et digitaux, qui ont souscrit à un service public automatique de téléphones mobiles pour 1000 habitants.

Coût d'un appel local : c'est le coût en US cents d'un appel de 3 minutes à partir d'une ligne fixe vers une autre ligne fixe à l'intérieur du pays.

Coût d'un appel vers les Etats-Unis : c'est le coût moyen d'un appel de 3 minutes à partir d'une ligne fixe vers les Etats-Unis.

Défaut sur les lignes de téléphone fixe : c'est le nombre total de défauts sur un an divisé par le nombre de téléphones fixes et multiplié par 100.

Demandes insatisfaites : cet indicateur est un rapport entre nombre de demandes de connexion au réseau public insatisfaites et le nombre lignes fixes. Il ne prend en compte que les demandes enregistrées et donc peut ne pas refléter la totalité des demandes insatisfaites.

Perception de la qualité du service : qualité perçue du service par la population et les entreprises en répondant à la question suivante : est-ce qu'il est facile ou difficile d'obtenir l'installation d'une ligne téléphonique ? 1 à 7.

Annexe B: Bases de données utilisées

Global Competitiveness Report www.weforum.org

World Business Environmental Survey <http://info.worldbank.org/governance/wbes/>

Demographic and Health Surveys <http://www.measuredhs.com/>

UN Millennium Indicators Database http://unstats.un.org/unsd/mi/mi_goals.asp

UN-habitat Database http://www.unhabitat.org/programmes/guo/guo_indicators.asp

Energie

International Energy Agency www.iea.org

World Energy Outlook www.worldenergyoutlook.org

Energy Information Administration www.eia.doe.gov/emeu/international/electric.html

South African Development through Electricity SAD-ELEC [//www.sad-elec.com/](http://www.sad-elec.com/)

Energy Regulators Regional Association <http://www.erranet.org/Products/TariffDatabas>

Eau et Assainissement

Joint Monitoring Programme WHO-UNICEF <http://www.wssinfo.org/en/welcome.html>

World Health Organization <http://www.who.int/en/>

Water Utilities Partnership Africa <http://www.wupafrica.org/spbnet/angl/waterf.html>

Transport

Railisa Database <http://www.uic.asso.fr/stats>

Janes World Railways <http://jwr.janes.com>

Technologies de l'Information et de la Communication

International telecommunications Union <http://www.itu.int/home/index.html>

ITU Regulatory Database <http://www.itu.int/ITU-D/treg/profiles/guide.asp?lang=en>

Universal Postal Union <http://www.upu.int/statistics/en/index.shtml>

Annexe C : Nombre d'indicateurs par secteur infrastructurel

	ENERGIE	EAU ET ASS.	TRANSPORTS	TIC
ACCES	3	6	4	2
TARIFICATION	1	0	0	2
QUALITE	2	1	2	3

Tableau 5: Pays africains de l'échantillon

Pays à Faible Revenu⁴⁹	Pays à Revenu Moyen Inférieur	Pays à Revenu Moyen Supérieur
BENIN	ANGOLA	AFRIQUE DU SUD
BURKINA FASO	CAMEROUN	ALGERIE
BURUNDI	CAP-VERT	BOTSWANA
CENTRAFRIQUE	CONGO	GUINEE EQUATORIALE
COMORES	COTE D'IVOIRE	GABON
ERYTHREE	DJIBOUTI	LYBIE
ETHIOPIE	EGYPTE	ILES MAURICE
GAMBIE	LESOTHO	NAMIBIE
GHANA	MAROC	SEYCHELLES
GUINEE	NIGERIA	
GUINEE BISSAU	SAO TOME ET PRINCIPE	
KENYA	SENEGAL	
LIBERIA	SOUDAN	
MADAGASCAR	SWAZILAND	
MALAWI	TUNISIE	
MALI		
MAURITANIE		
MOZAMBIQUE		
NIGER		
REP. DEM. DU CONGO		
RWANDA		
SIERRA LEONE		
SOMALIE		
TANZANIE		
TCHAD		
TOGO		
OUGANDA		
ZAMBIE		
ZIMBABWE		

⁴⁹ Pays à Faible Revenu: RNB par habitant inférieur ou égal à 975 dollars US.

Pays à Revenu Moyen inférieur: RNB par habitant compris entre 976 et 3855 dollars US.

Pays à Revenu Moyen Supérieur: RNB par habitant compris entre 3856 et 11905 dollars US.

Sources: Banque Mondiale, classification 2010.

**CHAPTER 4⁵⁰: PUBLIC UTILITY REGULATION IN DEVELOPING
COUNTRIES AND EFFICIENCY: THE CASE OF ELECTRICITY
SECTOR**

⁵⁰ A version of this Chapter is under the status “Revise and Resubmit” at the Journal “Utilities Policy”.

ABSTRACT

This Chapter evaluates the effects of the establishment of an Independent Regulatory Authority (IRA) on electricity sector performance in developing countries. In fact, regulatory systems for infrastructure sectors are a relatively new but important phenomenon in many developing countries. It has been estimated that at least 200 new infrastructure regulators have been created around the world in the past twenty years (World Bank 2006). These regulatory systems are designed to respond to natural monopolies and market failures associated with network industries such as electricity, gas, water, telecommunications, and transport. The aim of regulation is to encourage efficient, low-cost, and reliable service provision while ensuring financial viability and new investment. It was hoped that regulatory agencies and contracts would depoliticize tariff setting and would improve the climate for operational management and private investment through more transparent and predictable decision-making.

Despite these good intentions, there is little evidence that these regulatory systems have met their expectations. Therefore the objective of Chapter 4 is to assess the impact of such reform on electricity generated, technical quality of the service and country energy efficiency. Double-Difference and Matching are used to address sources of selection bias in identifying impacts; our empirical approach utilizes the panel structure of the data to control for time-invariant unobservable characteristics at the country level by applying propensity-score-matched double difference comparison.

Our results suggest that introducing Independent Regulation in the electricity industry has been effective in stimulating performance improvements: this lead to more generated electricity and better technical quality of the service. The impact on energy efficiency is positive but insignificant. The methodological lesson from this paper is that robust estimation of public sector reform is possible even in the absence of proper baseline survey.

4.1 INTRODUCTION

Over the last two decades electricity sector in developing countries has been subject to restructuring to introduce private capital and new regulatory regimes. The increase in private participation in this sector was accompanied by a change in thinking on how it should be organized and regulated (Newbery 1999; Gomez-Ibanez 2003). In economic theory, ownership and the degree of competition are both important factors in determining output levels, costs of production and prices⁵¹. Public utilities (transport, telecommunications, water and sanitation, energy) have traditionally been considered to be industries where regulation is necessary to achieve efficiency. The expectation was that regulation mechanisms would reduce costs, improve service quality in a cost effective way, stimulate the introduction of new products and services and stimulate efficient investment. Therefore, the establishment of independent regulation agency - IRA hereafter - should lead to improved economic performance.

The electricity sector has three components: generation, transmission and distribution. In most countries this sector is a strategic activity with natural monopoly characteristics resulting from the existence of economies of scale and scope. Regulation is required especially in the areas of electricity supply that remain dominated by one or a very small number of operators, to prevent monopoly abuse. In many countries, instead of direct regulation by a government department, the establishment of independent or quasi-independent regulatory agencies has been favored, drawing on the regulatory models of the United States and the United Kingdom. This form of independent regulation is expected to encourage private capital to invest in capacity in the face of a potential hold up problem under conditions of incomplete contracts (Spiller 1996; Schmitz 2001).

The literature on estimating the effect of regulatory governance arrangements on infrastructure outcomes is relatively small to date, particularly for the electricity sector. A particularly important study is the one by Kirkpatrick et al. (2008) who use data for 1985-2003 and apply a fixed-effects panel data estimation technique to explore the impacts of

⁵¹ See Vickers and Yarrow (1988).

competition, privatization and regulation on electricity sector performance⁵² in 36 developing and transitional countries. In their results, the regulation variable is not a significant, correctly signed explanatory variable in any of the regressions reported. However in this paper, the regulatory variable is a dummy which is not dated; for instance a country like Ethiopia establishing an independent regulatory body in 1999 scores 1 for the whole of the estimation period, as would Costa Rica, which did so in 1928. Therefore the experience of the regulator is not taken into account in their model.

Bortolotti et al. (1998), who use data on the privatization of electricity generation in 38 countries between 1977 and 1997, conclude that effective regulation is crucial to the success of privatization. Cubbin and Stern (2006) assessed for 28 developing countries over the period 1980-2001 whether the existence of a regulatory law and higher quality regulatory governance are significantly associated with superior electricity outcomes. Their empirical analysis concludes that these factors are positively and significantly associated with higher per capita generation capacity levels and that this positive effect increases over time as experience develops and regulatory reputation grows.

Empirical testing of the performance of regulation seems to concentrate on case studies and the application of panel-data econometrics⁵³. These methods cannot allow a statistically robust separation of the effects of other changes like privatization from the impact of the establishment of an independent regulatory agency. Cross-section econometric modeling faces huge problems of multicollinearity between the relevant independent variables and simple time-series modeling per country is not relevant to the underlying question.

To overcome these aforementioned problems, we propose to interpret the introduction of an independent regulator as a natural experiment, in order to re-establish the conditions of a randomized experiment and represent the IRA as a treatment. This leads us to perform propensity score matching as an alternative to the widely used regression approach. We seek to overcome the methodological limitations of usual regression techniques by letting the data

⁵² They used these indicators to measure sector performance: Net electricity generation per capita, Installed generation per capita, Net electricity generation per employee and Generation relative to average capacity.

⁵³ See Guasch et al. (2002), Gutierrez (2003), and Pargal (2003) for good recent examples.

select the controls for IRA establishment. No government agency is absolutely independent of political control and the degree of independence can be expected to vary across countries and over time. Simplifying regulatory policies into a dummy that reflects only the declared existence of an independent regulator by government was only necessitated by data availability. Even if the effectiveness or quality of regulation may differ depending on the country, we seek more to assess the impact of country's propensity to undertake such regulatory reform.

We use the matched double difference method, which combines the Propensity Score Matching (PSM) and Double Difference (DD). Heckman et al. (1997) and Heckman et al. (1998) have argued that combining PSM and DD can substantially reduce the bias found in non-experimental evaluations. First, we match countries from the control and treatment groups using their Propensity Score. This matching removes the selection bias due to the observed differences between the treated and control countries. Then we apply Double-Difference to correct for possible bias due to the differences in time-invariant unobserved characteristics between the two groups.

The rest of the paper is organized as follows. The next section introduces the basic theoretical and conceptual foundations of regulation theory. Section 3 addresses data issues and section 4 sets out our estimation method, based on a combination of propensity score matching and double differencing on pre-regulation and post-regulation data. The results are presented in section 5 while section 6 offers some conclusions.

4.2 THEORETICAL AND CONCEPTUAL FOUNDATIONS

The optimism of the late 1980s and early 1990s that electricity and other similar infrastructure industries in developing countries could be commercialized and financed from private investment flows was associated with an optimistic view that viable and effective regulatory arrangements could readily be established in most countries⁵⁴. Amid growing dissatisfaction

⁵⁴ See Levy and Spiller (1994).

with the performance of publicly owned enterprises, particularly in the developing world, there has been a broad movement towards the regulation option.

The traditional rationale for economic regulation of an industry has to do with its natural monopoly characteristics. Electricity industries are characterized by large, unavoidable fixed costs and many of these investments are sunk. Electricity generation, transmission and distribution sectors may have significantly declining average costs over all that it is less costly for one enterprise to satisfy all demand than it is for more than one.

Natural monopolies have little chance of being driven out of a market by more efficient new entrants; consequently, some form of regulation is necessary to protect the customers' rights in monopoly industries such as electricity transmission and distribution. Broadly defined, regulation is designed to achieve efficient use of energy, minimize production costs, provide clear investments incentives and result in efficient organization of electric services industry. It can play an important role in determining the operational framework for the regulated business, and it also has significant impacts on the overall development of the industry, because firms tend to adapt to their operating environment. In other words, firms aim at optimizing their performance under a given regulatory regime. This sets high requirements to regulation, especially in an industry with long asset lifetimes, because of the far-reaching impacts of today's decisions. Distribution companies need to believe that they are able to obtain adequate returns on their investments if the industry is to be maintained an attractive investment object. Another important issue is to make sure that the so called viability constraint of regulation is met, because regardless of the stakeholders' price and quality expectations, the regulated companies will only supply the monopoly services if it is profitable for them to do so.

Nevertheless economic regulation is a complex task that requires a great deal of information if it is to be done well. It requires the hiring of expert regulatory staff in economies where the skills needed may have a large opportunity cost. Regulated enterprises have better information concerning their operations than do the regulators, and they may use the control of information strategically to try to influence the regulatory outcome. The most common regulatory schemes, which base allowed prices on enterprise costs, fail to provide strong incentives for the enterprise to operate efficiently and may actively encourage the enterprise to adopt a more capital-intensive production technology than would be most efficient. And

even knowledgeable regulators may be captured by the enterprises that they regulate, as they come consciously or unconsciously to equate the welfare of the regulated enterprise and sector with the welfare of the public.

To summarize this section, the objectives of regulation are as follows:

- Increase efficiency and quality of service,
- Reduce costs and reduce prices to final consumers so that prices correspond to the economic costs of supply,
- Allow companies and investors to have the expectation of a normal rate of return,
- Enforce competition policy goals and prevent market abuse in potentially competitive elements,
- Reduce excess capacity margins,
- Maintain universal service obligation.

The following sections will assess if, in developing countries, regulation reform in electricity sector has led to these theoretically expected outcomes.

4.3 METHODOLOGY

A true measure of the impact of an intervention is the difference between the observed outcome for a group of beneficiaries and the (counterfactual) outcome for the same group without the benefit of intervention. Because counterfactuals are never observed, the challenge of the evaluation work is to find the plausible proxies for such unobserved outcomes.

We use micro-econometric techniques usually applied in non-experimental contexts, borrowed from the program evaluation literature. To be consistent with this literature in this section we may refer to the establishment of IRA as treatment, to the IRAers as the treated group and to the non-IRAers as the control group.

Let D be a binary indicator that equals unity if a country has established an IRA and zero otherwise. Also, let Y^t denote the value of certain outcome in period t if the country has an

IRA and Y^0_t if not. Given a set of observable country attributes X , the average effect of the IRA on Y_t is:

$$\psi = E [(Y^1_t - Y^0_t) | X, D = 1] = E [Y^1_t | X, D = 1] - E [Y^0_t | X, D = 1] \quad (1)$$

It is clear from (1) that we face an identification problem since $E [Y^0_t | X, D = 1]$ is not observable. It is convenient to rewrite (1) in a slightly different way, closer to what we actually use in our empirical work. Suppose that IRA was created in period k . Then, for $t_0 < k < t_1$, (1) is equivalent to

$$\psi = E [(Y^1_{t_1} - Y^0_{t_0}) | X, D = 1] - E [(Y^0_{t_1} - Y^0_{t_0}) | X, D = 1] \quad (2)$$

This way of representing ψ allows us to exploit the panel data nature of the sample, and hence to control for fixed factors that could be correlated with the outcomes.

A common approach to estimate the expectation $E [(Y^0_{t_1} - Y^0_{t_0}) | X, D = 1]$ is to replace it with the observable average outcome in the untreated state $E [(Y^0_{t_1} - Y^0_{t_0}) | X, D = 0]$ and, hence, consider the statistic:

$$\hat{\psi} = E [(Y^1_{t_1} - Y^0_{t_0}) | X, D = 1] - E [(Y^0_{t_1} - Y^0_{t_0}) | X, D = 0] \quad (3)$$

However, normally $E [Y^0_{t_1} | X, D = 1] \neq E [Y^0_{t_1} | X, D = 0]$, so (3) will render biased estimates of ψ from two sources. The first arises from the presence of IRAers in the sample that are not comparable with non-IRAers and vice versa. The second is due to different distributions of the X between the treated and the control groups, which are usual in non-randomized samples like a dataset of countries. Fortunately, matching methods deal with these shortcomings.

*Matching methods*⁵⁵

The idea behind matching techniques is to eliminate the aforementioned biases by pairing IRAers with non-IRAers that have similar observed characteristics. The goal is to estimate a

⁵⁵ The notation and exposition in this section borrows from Vega and Winkelried (2005).

suitable counterfactual for each IRAer, to re-establish the conditions of a randomized experiment when no such data are available. Under these circumstances, the difference between the outcome of the treated and that of a matched counterfactual can be attributed to the treatment effect.

4.3.1 The Propensity Score

Usually, determining along which dimension to match the countries or what type of weighting scheme is a difficult task. Rosenbaum and Rubin (1983) reduce the dimensionality of this problem by suggesting that the match can be performed on the basis of a single index that summarizes all the information from the observable covariates. This index, the propensity score, is the probability of treatment conditional on observable characteristics:

$$P_{\text{score}}(X) = E [D|X] = \Pr (D = 1|X) \quad (4)$$

and should satisfy the *balancing hypothesis*, which states that observations with the same propensity score must have the same distribution of observable and unobservable characteristics independently of the treatment status, formally $D \perp X/P_{\text{score}}(X)$. Hence, equation (2) can be rewritten as :

$$\hat{\psi} = E [(Y^1_{t_1} - Y^0_{t_0}) | P_{\text{score}}(X), D = 1] - E [(Y^0_{t_1} - Y^0_{t_0}) | P_{\text{score}}(X), D = 1] \quad (5)$$

The first source of bias (non-comparability among IRAers and non-IRAers) can be eliminated by only considering countries within the common support, the interval on the real line where both distributions $\{P_{\text{score}}(X) | D = 1\}$ and $\{P_{\text{score}}(X) | D = 0\}$ have positive densities. The second source of bias (difference in the distribution of the observable variables) is eliminated by reweighting the non-IRAers observations.

Estimating the propensity score is straightforward, as any probabilistic model suits equation (4). For instance, we can adopt the parametric form $\Pr (D_i = 1|X_i) = F (h (X_i))$ where $F (\cdot)$ is the normal cumulative distribution (i.e. a probit). However, two points are to be handling with care. First, the estimation requires choosing a set of conditioning variables X that are not influenced by the establishment of IRA. Otherwise, the matching estimator will not correctly

measure the treatment effect, because it will capture the endogenous changes in the distribution of X induced by the IRA establishment. For this reason, the X variables should measure country attributes before the treatment. Second, the model selection, i.e. the form of $h(X_i)$, can be seen as a way of testing the balancing hypothesis.

4.3.2 The Matched Difference-in-Difference estimator

Given the propensity score, there are various methods available for finding a counterfactual for each IRAer. Following Heckman et al. (1997) and Heckman et al. (1998a), we can compute a consistent estimator of the counterfactual by means of a kernel-weighted average of outcomes.

This approach not only has good statistical properties but is also a convenient way to work with a sample of countries, as it could be difficult to find an actual non-IRAer for each IRAer. Let C denote the set of non-IRAers countries whose propensity scores are over the region of the common support. The counterfactual of the outcome Y^0_{it} is:

$$\tilde{Y}^0_{it} = \frac{\sum_{j \in C} K\left(\frac{p_j - p_i}{h}\right) Y_{jt}^0}{\sum_{j \in C} K\left(\frac{p_j - p_i}{h}\right)} \quad (6)$$

Where $K(\cdot)$ is a kernel function (with bandwidth parameter h) that weights the outcome of country j inversely proportional to the distance between its propensity score value (p_j) and the one of the IRAer i (p_i).

Having found the matched pairs of IRAers and non-IRAers, the treatment effect estimator for country i in period t can be written as:

$$\hat{\Psi}_{i,t} = \left(Y_{i,t}^1 - \frac{1}{k-1} \sum_{\tau=1}^{k-1} Y_{i,\tau}^0 \right) - \left(\tilde{Y}_{i,t}^0 - \frac{1}{k-1} \sum_{\tau=1}^{k-1} \tilde{Y}_{i,\tau}^0 \right) \quad (7)$$

Where the pre-treatment outcome $Y^0_{t_0}$ has been replaced by the time averages of $Y^0_{i,\tau}$ and $\tilde{Y}^0_{i,\tau}$ before the treatment. The estimator (7) has no analytical variance, so standard errors are to be

computed by bootstrapping. Finally, the average of all possible $\hat{\psi}_{i,t}$ constitutes an unbiased estimator of (2).

4.3.3 Impact Indicators

To assess the impact of a policy one should track changes across different performance dimensions. In practice, several indicators need to be constructed for each type of intervention and the choice of these indicators is determined by the practicalities of the evaluation and data collection. Impact or outcome indicators have to be measurable with the data at hand, and be linked directly to, and respond relatively quickly to the intervention in question. However, in our case a number of indicators already exist but the main problem remains the availability of data for all countries in the sample. Indeed, the existence of an independent regulatory authority should impact consumption or competition in the market but we cannot use these indicators due to lack of longitudinal data.

To measure the impact of IRA on performance in electricity sector, we used three indicators: Electricity Power Transmission and Distribution Losses (EL), Electricity Generation per capita (GEN) and GDP per Unit of Energy Use (GDPU). These three indicators appear to be the only ones available for all countries before and after the treatment.

GDP per unit of energy use (PPP \$ per kg of oil equivalent⁵⁶) refers to apparent consumption, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport. This indicator measures energy intensity and therefore a measure of the energy efficiency of a nation's economy; differences in this ratio over time and across countries reflect structural changes in the economy and changes in the energy efficiency. Energy efficiency offers a powerful and cost-effective tool for achieving a sustainable energy future. Improvements in energy efficiency can reduce the need for investment in energy infrastructure, cut fuel costs, increase competitiveness and improve consumer welfare. Regulation effects on this indicator may be

⁵⁶ The kg of oil equivalent is a unit of energy: the amount of energy released by burning one kg of crude oil (as different crude oils have different calorific values, the exact value of the toe is defined by convention).

ambiguous; in fact, regulation can lead to an increase in electricity production and consumption so its impact on energy efficiency will depend on the GDP growth.

Electricity Power Transmission and Distribution Losses (as a percentage of Generation) include electricity losses due to operation of the system and the delivery of electricity as well as those caused by unmetered supply. This comprises all losses due to transport and distribution of electrical energy and heat. Electric power transmission and distribution losses include losses in transmission between sources of supply and points of distribution and in the distribution to consumers, including pilferage. As stipulated in regulation theory, the establishment of an IRA is expected to improve the technical quality of electricity service and lead to a decline in this impact indicator.

The third indicator used in this paper, the *Electricity Generation per capita* (Giga-Watt Hour per capita) captures the extent of electricity available to the economy.

This indicator takes into account all the electricity production from different sources⁵⁷. The establishment of an IRA would reduce costs, improve service quality, stimulate efficient investment, and then lead to higher generation per capita.

4.4 DATA

The analysis in this paper is based on several data sources. The main database used is the World Bank World Development Indicators, which presents the most current and accurate global development data from officially recognized sources.

For information on the establishment of regulatory policies we rely on the dataset constructed by Wallsten et al (2004); the authors set out to compile a comprehensive and consistent dataset through an extensive survey of telecommunications and electricity regulators in developing countries. Our sample includes 24 countries⁵⁸ that have established an independent regulatory agency of their electricity sector between 1995 and 2000. The choice of the sample countries was based on access to data and especially information on regulation

⁵⁷ Coal, oil, natural gas, nuclear, and hydroelectric sources.

⁵⁸ See Table 1 for the list of countries.

reform. To assess the regulation's impact we have built a control group comprising 34 developing countries that do not independently regulate their electricity sector. It should be also noted that the choice of control countries is based only on data availability. This could be a source of bias especially if we use usual regression techniques but we overcome this problem by letting the data select the controls for IRA establishment.

The performance indicators used in the study are, as mentioned above, net electricity generation per capita, gross domestic product per unit of energy used and electricity power transmission and distribution losses. These indicators capture the extent of electricity available to the economy and quality of the service. We would like to investigate the impact of regulation on the prices charged to consumers, but there is a lack of sufficient comparable data across our sample of countries to carry out such an analysis.

A number of variables are included in the model to control and define a particular profile of an economy. These variables, used to generate the propensity score for each country, include GDP per capita, population, gross domestic savings (GDS), the openness of an economy (Openness ratio), the gross fixed capital formation of the private sector (GFCF), foreign direct investment (FDI), oil rents to GDP, the population density, the polity score⁵⁹ and dummy variables for privatization and legal origin. We experimented with a wide set of additional variables, but their inclusion did not change our results substantively⁶⁰. We tested for the balancing hypothesis and selected the most parsimonious specification.

For each country we calculate the average of the above variables for the five years previous the establishment of an Independent Regulatory Authority. For the control group, we use the five years previous to 1997⁶¹ given that the treatment did not occur the same year for all treated countries.

⁵⁹ See Table 7 for a complete description of variables.

⁶⁰ For robustness checks we added 3 variables: inflation, urbanization and fuel consumption. See table 5.

⁶¹ 1997 is the average establishment date of an IRA in the Treatment group. For robustness checks, we also use 1995 as reference year given that this is the earliest date of IRA adoption in our sample. See results in Table 5.

4.5 RESULTS AND ROBUSTNESS CHECKS

4.5.1 Descriptive Statistics

(Table 2 here)

Table 2 displays the mean values of our three outcome indicators across IRAers and non-IRAers before and after the introduction on an independent regulation authority and the descriptive statistics of control variables. For the latter, there is a clear difference between IRAers and non-IRAers and this justifies the use of matching to remove the selection bias due to the observed differences between the treatment and the control group.

Regarding the impact indicators, performances are in average somewhat better in IRAer countries compared to non-IRAer countries before the introduction of independent regulators. A part from non-IRAers' electricity losses, they generally moved in the expected direction over time, with a tendency to increase over the period in both IRAer and non-IRAer countries. In average, the treatment group had greater improvements but the key question is whether they are attributable to the introduction of the independent regulatory authority.

4.5.2 Probit Estimation

(Table 3 here)

We model the probability that a country has established an independent regulation authority as a function of a large set of variables that includes economic and political characteristics. We are not making any a priori assumptions about which variables have an impact on IRA establishment.

The Probit estimates are shown in Table 3 column 1; adjusted pseudo- R^2 is 0.398. This is an acceptable level of explanatory power; an R^2 that was too high could indicate the existence of fundamental differences between the characteristics of IRAers and Non-IRAers, which would make the formation of a proper control group very problematic. Six coefficients in the table are not significant, PIB per capita, Population, FDI, Oil rents, Legal Origin and Density.

Democracy, FDI and the privatization of one dimension of the electricity sector increase the probability of IRA adoption. Gross fixed capital formation of the private sector has a quite negative influence on the probability of IRA establishment.

However, remind that the purpose of the estimation is to calculate the propensity score and not the structural modeling of an underlying selection mechanism. Kernel density estimates of the propensity score for the countries from the treated and control groups are then constructed by using these results.

4.5.3 Electricity Power Transmission and Distribution Losses

(Table 4 here)

Losses are estimated from the discrepancy between energy produced (as reported by power plants) and energy sold to end customers more simply the difference between what is produced and what is consumed. Given the insufficiency of energy production in developing countries, minimizing power transmission and distribution losses represent a major challenge; so it is important to ask whether an independent regulation can improve the technical quality of the sector.

The Kernel propensity score matching double-difference estimation of the impact of IRA on Electricity Power Transmission and Distribution Losses is shown in Table 4. The first two rows show results of simple difference-in-difference estimates with and without covariates and the last two rows present results for our model specification presented above in Section 4. Under our assumptions, these estimations reflect causal effects of Independent Regulation Authority establishment. One or two stars indicate whether each change is significantly different from zero at the 10 and 5 percent significance levels respectively.

Overall, we see a decline in our outcome indicator; focusing on the Kernel PS based estimates, the establishment of IRA resulted in a significant decline in Electricity power T&D losses by 7.368 percentage points if we consider the unmatched sample. The matched sample shows an even larger statistically significant difference, the outcome indicator declining by 8.42 percentage points. These results are consistent with the independent regulation's effects on productivity and efficiency gains.

4.5.4 Electricity Generation per capita

(Table 4 here)

Concerning Electricity Generation the simple DD estimates - with and without covariates - show an increase in the average generation per capita respectively by 0.766 and 0.946 GW-h per capita; the Kernel PS based estimates confirm these results, the average impact being 0.883 for the matched sample. This positive impact of regulation can be explained by the fact that it allows more competition and generate gains in productive and allocative efficiency. These results are consistent with those of Cubbin and Stern (2006) whose confirm the theoretically outcome effect of regulation which leads to higher generation per capita.

4.5.5 Energy Efficiency

(Table 4 here)

Efficiency improvements in electricity sector are fundamental, moreover in developing countries, for two reasons. First, increase the GDP per unit of energy used reduces costs and may result in financial cost saving to consumers. Second, reducing energy use could be a key solution in reducing global emissions of greenhouse gases. An independent regulation authority could enhance energy efficiency and by this way increase competitiveness and improve consumer welfare. As for previous outcome indicators, we first perform simple Double-Difference estimates with and without covariates before implementing the Kernel PS method.

Overall, the establishment of an independent regulation authority is associated with more energy efficiency, the GDP per unit of energy used increased by 1.029 to 1.402 \$ per kg of oil equivalent. However, none of the four estimates do provide statistically significant results, meaning that we cannot conclude that IRA establishment has significantly improve energy efficiency in developing countries.

4.5.6 Robustness Checks

(Table 5 here)

We now test the sensitivity of our results to a set of alternative specifications. First, we consider changes in the Probit specification by adding three new variables: inflation, fuel consumption and urban population. As depicted by the first four columns of table 5, results are qualitatively similar to the ones in table 4.

Second we change the reference year for the control group from 1997 to 1995 in order to test the sensitivity of our results to the chosen year of reference for the control group. In fact, unlike traditional impact evaluation model, the establishment of IRAs did not occur the same year in all countries so the choice of the reference year for the control group may seem arbitrary. Consequently, we have re-run our model by comparing outcomes in the treated countries to those of non-treated countries five years before and five years after 1995. Results presented in Table 4 Column 5-8 show that our basic results are robust to the choice of a different reference year for the control group. For illustration purpose, Table 6 presents the results from a regression analysis.

4.6 DISCUSSION AND CONCLUSION

In many developing countries, significant reforms have been undertaken in economic infrastructure sectors over these last two decades with the objectives to improve efficiency and the quality of service delivery. While many authors have empirically investigated the effects of privatization in infrastructure sectors, less attention has been paid to the potential role that regulatory policies can play in improving infrastructure outputs and outcomes. As in most infrastructure sectors, the electricity sector is characterized by long-term investments, therefore an effective regulatory system can be crucial to ensure both investor confidence and consumer protection. In fact one of the primary purpose of regulation system is to protect consumers from monopoly abuse, while providing investors with protection from arbitrary political action and incentives to promote efficient operation and investment.

This paper attempts to contribute to this literature by investigating the impact of the creation of an Independent Regulatory Authority on infrastructure performance. To do so, we investigate the impact of such reform on power generation, quality and efficiency of the electricity sector in developing countries. We have combined macroeconomic data on regulation with program evaluation techniques to assess the theoretical foundations of such reform. The interpretation we gave to IRA establishment, that of a natural experiment, allowed us to use powerful evaluation tools normally applied in micro-econometrics, where the odds to identify policy effects are by far higher than in macroeconomics. We remove the selection bias due to observable and time-invariant unobservable characteristics in identifying IRA' impacts by combining Propensity Score Matching combined with Double-Difference method.

Our findings support the idea that IRA establishment delivers some promised outcomes. It improves the technical quality of electricity service: electricity power T&D losses fall in average by 8.42 percentage points. It also increases the average Electricity Generated by 0.88 GW-h per capita. The impact on energy efficiency measured by the GDP per unit of energy used is also positive but insignificant. We would like to measure the treatment impact on more outcome indicators such as the price of electricity or universal access to electricity but we face the lack of longitudinal data.

These findings do confirm that the establishment of independent regulation agencies in public utilities can significantly improve the productivity and quality of the service, and improve the coverage and the access to basic infrastructure. This paper demonstrates that robust evaluation of public sector reform is possible even in the absence of proper baseline survey. The evidence presented also provides an input to the development and implementation of effective reform in economic infrastructure sectors in developing countries.

4.7 APPENDICES

Table 1: Sample Countries

Treated Group	Year Independent Regulator was established ⁶²	Control Group
Albania	1999	Azerbaijan
Armenia	1997	Belarus
Bulgaria	2000	Benin
Cameroon	1998	Bolivia
Costa Rica	1996	Botswana
Dominican Republic	1998	Cap-Verde
Ecuador	1998	Chile
El Salvador	1996	Congo Democratic Republic
Ethiopia	1996	Congo Republic
Georgia	1997	Cuba
India	1998	Djibouti
Ivory Coast	1998	Eritrea
Jamaica	1997	Gabon
Kazakhstan	1999	Ghana
Latvia	1996	Gambia
Lithuania	1998	Guatemala
Moldova	1997	Guinea Bissau
Namibia	2000	Honduras
Nicaragua	1995	Iran
Panama	1996	Jordan
Romania	1999	Lebanon
South Africa	1996	Libya
Thailand	1999	Morocco
Zambia	1995	Paraguay
		Peru
		Nepal
		Senegal
		Sudan
		Syrian Arab Republic
		Tajikistan
		Tunisia
		Ukraine
		Uruguay
		Yemen

⁶² Wallsten et al. (2004).

Table 2: Summary Statistics for variables

Impact Indicators	Treated Group		Control Group	
	T ₀ ⁶³	T ₁	T ₀	T ₁
EL	20.61*** (2.403)	15.91*** (1.818)	14.70*** (1.886)	17.88*** (1.490)
GDPU	4.722*** (0.626)	6.057*** (0.616)	5.319*** (0.684)	5.625*** (0.658)
GEN	1.627*** (0.229)	2.346*** (0.219)	1.293*** (0.201)	1.188*** (0.162)

Covariates	Treated Group		Control Group	
	Mean	S.E	Mean	S.E
Log GDP per Capita	7.059***	0.203	6.801***	0.223
Log POP	2.218***	0.329	2.230***	0.216
Privatization	0.714***	0.101	0.348***	0.102
Trade	78.44***	8.411	72.53***	6.063
Oil Rents	1.474*	0.692	3.125	1.892
FDI	2.020***	0.276	1.922**	0.716
GFCF	19.18***	1.065	21.43***	0.975
Density	89.92***	18.98	52.50***	10.87
Polity 2 score	5.886***	0.877	1.470	1.174
Legal Origin	0.286**	0.101	0.174*	0.0808
Inflation	241.7*	104.7	172.4*	74.86
Urban population	49.07***	3.197	51.30***	4.377
Fuel Consumption	62.40***	5.953	54.18***	6.383

⁶³ T₀ and T₁ refer respectively to the five years before and after the IRA adoption.

Table 3: Propensity Score estimation, Probit regression

Dependent Variable: Independent Regulatory Authority		
	(1)	(2)
Log GDP per capita	-0.0263 (0.309)	1.001 (0.631)
Log Population	0.258 (0.270)	0.376 (0.360)
Privatization	1.131** (0.486)	1.139 (0.729)
Polity 2 score	0.144** (0.0622)	0.170** (0.0859)
GFCF	-0.140** (0.0681)	-0.253** (0.101)
FDI	0.0352 (0.104)	-0.0837 (0.131)
Trade	0.0201* (0.0128)	0.0282* (0.0207)
Oil Rents	0.0366 (0.0496)	0.0822 (0.0639)
Legal Origin	0.742 (0.615)	-0.297 (0.891)
Density	0.00198 (0.00400)	0.000656 (0.00442)
Inflation		0.00103 (0.000819)
Urban population		-0.104** (0.0455)
Fuel consumption		0.0163 (0.0158)
Intercept	-0.727 (2.289)	-2.121 (3.327)
N	49	46
Pseudo R ²	0.398	0.5

*** Significant at 1%, ** significant at 5% and * significant at 10% level. Standard errors in parentheses.

Table 4: Average impact of IRA adoption

Treatment Effect	(1)	(2)	(3)	(4)
	Diff-in-Diff		PS Kernel Matched DD	
	With Covariates		Common Support	
Electricity T&D losses	-7.919** (3.525)	-7.626** (3.476)	-7.368** (3.635)	-8.425* (4.671)
GDP per unit of Energy used	1.402 (1.175)	1.312 (0.945)	1.226 (1.217)	1.029 (1.585)
Generation per Capita	0.766** (0.360)	0.946** (0.364)	0.862** (0.392)	0.883* (0.515)

*** Significant at 1%, ** significant at 5% and * significant at 10% level. Standard errors are given in parentheses.

Table 5: Robustness checks

	Augmented Probit				1995 as year of reference for the control group			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Diff-in-Diff		PS Kernel Matched DD		Diff-in-Diff		PS Kernel Matched DD	
	With Covariates		Common Support		With Covariates		Common Support	
Electricity T&D losses	-7.919** (3.525)	-7.943** (3.554)	-7.551** (3.701)	-7.582* (6.128)	7.158** (3.300)	-7.090** (3.227)	-6.759* (3.409)	-7.783* (4.186)
GDP per unit of Energy used	1.402 (1.175)	1.192 (0.896)	1.216 (1.228)	1.340 (1.502)	1.620 (1.209)	1.585 (0.975)	1.512 (1.257)	1.437 (1.541)
Generation per Capita	0.766** (0.360)	0.969*** (0.361)	0.880** (0.390)	0.899* (0.498)	0.763** (0.354)	0.897** (0.355)	0.859** (0.385)	0.933* (0.496)

*** Significant at 1%, ** significant at 5% and * significant at 10% level. Standard errors are given in parentheses.

Table 6: Panel Regression

	OLS			Propensity Score Weighted			Propensity Score Weighted (Common Support)		
	(1) EL	(2) GDPU	(3) GEN	(4) EL	(5) GDPU	(6) GEN	(7) EL	(8) GDPU	(9) GEN
IRA	-2.792** (1.043)	-0.134 (0.188)	0.470** (0.162)	-3.047** (1.010)	0.0930 (0.129)	0.462*** (0.119)	-4.264*** (1.043)	0.198 (0.159)	0.209 (0.151)
Log GDP per Capita	-3.194*** (0.550)	2.152*** (0.0984)	0.257** (0.0843)	-3.445*** (0.607)	2.263*** (0.0904)	0.277*** (0.0568)	-3.123*** (0.931)	2.044*** (0.113)	0.691*** (0.157)
Log Population	-3.031*** (0.469)	-0.454*** (0.0798)	0.0582 (0.0725)	-3.249*** (0.525)	-0.166* (0.0710)	0.0739 (0.0523)	-4.976*** (0.657)	-0.372*** (0.0831)	-0.0693 (0.0701)
Privatization	-2.948** (0.932)	-0.543** (0.169)	-0.893*** (0.146)	-3.229** (1.078)	-0.548*** (0.144)	-0.864*** (0.175)	-2.254 (1.521)	-0.776*** (0.173)	-1.472*** (0.239)
Polity 2 score	0.383*** (0.0823)	-0.0104 (0.0148)	0.0307* (0.0127)	0.386*** (0.0808)	-0.0133 (0.0156)	0.0321* (0.0135)	0.254 (0.134)	-0.00693 (0.0216)	-0.0619*** (0.0172)
GFCF	0.0265 (0.0800)	0.00866 (0.0143)	-0.0106 (0.0125)	0.0308 (0.0818)	-0.00575 (0.0145)	-0.0151 (0.00976)	0.308** (0.102)	-0.0178 (0.0161)	0.0130 (0.0147)

(End of Table 6)

FDI	-0.00517 (0.125)	-0.0225 (0.0227)	0.00842 (0.0195)	-0.0274 (0.0942)	-0.0210 (0.0210)	0.0123 (0.0144)	-0.176 (0.109)	-0.0497* (0.0252)	0.00964 (0.0186)
Trade	-0.0756*** (0.0148)	-0.0320*** (0.00266)	0.0127*** (0.00229)	-0.0784*** (0.0167)	-0.0301*** (0.00309)	0.0131*** (0.00193)	-0.0903*** (0.0222)	-0.0175*** (0.00328)	0.0247*** (0.00444)
Oil Rents	0.269** (0.0823)	-0.0546*** (0.0151)	-0.00724 (0.0129)	0.275*** (0.0663)	-0.0501*** (0.0136)	-0.00969 (0.0119)	0.217* (0.0961)	-0.0448** (0.0167)	-0.0759*** (0.0194)
Legal Origin	-1.225 (1.103)	-0.355 (0.202)	-0.628*** (0.173)	-1.172 (1.204)	-0.479** (0.173)	-0.662*** (0.136)	-2.617 (1.484)	-0.815*** (0.184)	-1.975*** (0.354)
Density	0.0378*** (0.00641)	0.00278* (0.00116)	-0.00219* (0.00101)	0.0404*** (0.00813)	0.000816 (0.000741)	-0.00231** (0.000794)	0.0350*** (0.00927)	0.00105 (0.000969)	-0.0066*** (0.00134)
Intercept	42.11*** (3.668)	-6.729*** (0.650)	-0.560 (0.557)	44.10*** (4.089)	-7.298*** (0.592)	-0.638* (0.295)	37.99*** (5.214)	-6.256*** (0.544)	-3.002*** (0.767)
Observations	474	495	490	474	490	490	283	299	299
R ²	0,19	0,59	0,23	0,22	0,65	0,25	0,3	0,66	0,43

*** Significant at 1%, ** significant at 5% and * significant at 10% level. Standard errors are given in parentheses.

Table 7: Description of variables

Variables	Description	Sources
IRA	Separate regulatory agency not directly under the control of a ministry	Wallsten et al. (2004)
Privatization	Binary variable equal to 1 if there is a private participation in one of the electricity sector components, zero otherwise	Estache and Goicoechea (2005)
Polity 2 score	Index of the level of democracy and Autocracy (from -10 to +10)	Polity 4 Project, Jaggers et al. (2011)
Legal Origin	Binary variable equal to 1 the legal system is based on English Common law, 0 otherwise	Laporta et al. (2008)
Density	Population density is midyear population divides by land area in square kilometers	World Development Indicators (2010)
FDI	Foreign Direct Investment (net inflows) to acquire a lasting management interest	
Fuel consumption	Fossil fuel comprises coal, oil, petroleum, and natural gas products (% total)	
GFCF	Gross Fixed Capital Formation of private sector (% GDP)	
Inflation	Inflation as the consumer price index reflects the average annual change in the cost to the average consumer of acquiring a basket of G&S	
Log GDP per capita	Logarithm of the Gross Domestic Product per capita	
Log Population	Logarithm of the total Population	
Oil Rents	Oil rents are the difference between the value of crude oil production at world prices and total costs of production (% GDP)	
Trade	Trade is the sum of imports and exports of goods and services (% GDP)	
Urban population	Urban population refers to people living in urban area (% total population)	

GENERAL CONCLUSION

A well-functioning public sector that delivers quality public services consistent with citizen preferences and that fosters economic growth while managing fiscal resources prudently is considered critical to alleviate poverty and to achieve the Millennium Development Goals. In many developing countries, public trust in public sector in delivering services consistent with citizen preferences is often considered weak. Therefore many governments have restructured their public sectors during these last years in an attempt to deal with the twin problems of indebtedness and growing citizen disenchantment with government.

The renewed interest of academics, policy makers and international organizations on the analysis and quantification of the efficiency of public sector has been recently motivated by the current challenging global conditions. The adverse position often faced by governments (increasing budgetary pressures and narrowing margins of action to significantly raise tax revenue) and the costly consequences of fiscal imbalances prompted by excessive accumulation of government debt to finance high spending levels, experienced by a handful of countries in recent past decades, has turned the attention to the ability of governments to achieve public policy outcomes employing the least possible amount of resources. Unfortunately, the literature on public sector performance is not abundant and international comparisons of government performance are largely scarce due to data unavailability, limiting the analysis of the empirics of the optimality of public sector decisions and actions.

Therefore the objective of this thesis was to document the literature on public sector performance measurement and to do so, we have presented four essays in which different econometric techniques are used to assess the performance of public sectors in developing countries. Our analysis is divided into two parts: through Chapters 1 and 2, the first part has dealt with the evaluation of “upstream” public sector performance in developing countries. The second part of this thesis has presented the evaluation of “downstream” public sector performance through Chapters 3 and 4.

Main results

Chapter 1 makes use of the Blinder-Oaxaca Decomposition (BOD) to examine how the quality of budget institutions affects fiscal performance – Primary Balance and Public Debt – in sub-Saharan Africa. The BOD was originally used in labor economics to decompose earnings gaps and to estimate the level of discrimination. It has been applied since in other social issues, including education and health where it can be used to assess how much of a gap is due to differences in characteristics (explained part) and how much is due to policy or system changes (unexplained part). To organize our approach, we categorize sub-Saharan Africa countries according to their system of budgetary institutions: English-based system (Anglophone Africa) and French-based system (Francophone Africa). The quality of budget institutions is measured through five indicators: the Centralization of the budget process, the Comprehensiveness of the budget, the Fiscal and Procedural Rules and Controls, the Sustainability and the Credibility of the budget, and the Transparency of the budget process. Through this methodology we are able to capture the origins of the differences of budgetary outcomes between Anglophone and Francophone Africa.

Using a database of 35 African countries over the period 2002-2007, we show that, on average, Anglophone Africa countries have better budget institutions than their Francophone counterparts and this difference is the main determinant of the fiscal performance gap between the two groups. According to the decomposition results, the gap is mostly due to the characteristics effect, meaning that the poor fiscal performance of Francophone countries is not due to the French-based system itself but rather to the environment in which it operates. The budget process and procedures in these countries are less comprehensive, sustainable and transparent than in Anglophone countries and this adversely affects their fiscal performance.

In Chapter 2 we use recent developments in the empirics of comparative case studies to investigate the impact of Semi-Autonomous Revenue Authorities (SARAs) on revenue mobilization in twenty developing countries. In fact many developing countries have undertaken comprehensive reforms in their tax administrations during recent years and the implementation of SARAs constitutes one of their most visible expressions. Due to the lack of conclusive results after a series of reforms within the existing Ministries of Finance some have thought that the creation of autonomous structures responsible for managing tax revenue

could improve revenue mobilization. To date there is no comprehensive assessment of how successful these SARAs have been in achieving that goal.

Our findings from the Synthetic Control Method show that the implementation of a SARA does not always produce the expected outcomes. Of the twenty SARAs surveyed only five have sustainably performed better than their Synthetic Control. In the other fifteen countries performance has been mixed or disappointing: five SARAs performed well for a few years but these performances have been unstable and six of them have poor performance compared to their Synthetic Control. Finally for four countries, the results are statistically insignificant, as the Synthetic Control Method does not provide suitable comparator countries.

This paper is a contribution to an ongoing discussion rather than a definitive assessment of the value of SARAs and highlights how it can be difficult in being conclusive on such reforms.

Chapter 3 provides a first systematic Benchmarking of Africa's infrastructure performance on four major sectors: electricity, water and sanitation, information and communication technologies, and transportation. To benchmark is to compare performance against a standard. In an Evaluation framework, Benchmarking can help place an outcome in context and can help assess the reasonableness of targets that may be set. The Benchmarking is performed against a relevant sample of comparator countries from the developing world, clustered into 3 income groups: low income countries, lower middle-income countries and upper middle-income countries.

The results suggest that infrastructure's performance in African countries is far below what would be expected from countries with the same level of revenue: access remains a major issue, especially in electricity. Infrastructure service delivery in telephony and roads is, on average, well below what would be expected; unless addressed, such infrastructure shortfalls are likely to adversely affect the welfare of Africa's poor, the cost competitiveness and growth prospects of a range of economic sectors that depend critically on a stable and competitive supply of basic infrastructure service. The main policy implication is that there remain significant needs to scale up infrastructure investments and improve efficiency in all four major infrastructure sectors.

Finally Chapter 4 evaluates the effects of the establishment of an Independent Regulatory Authority (IRA) on electricity sector performance in developing countries. The study assesses

the impact of such reform on electricity generated, technical quality of the service and country energy efficiency. Double-Difference and Matching are used to address sources of selection bias in identifying impacts; our empirical approach utilizes the panel structure of the data to control for time-invariant unobservable characteristics at the country level by applying propensity-score-matched double difference comparison.

Our results suggest that introducing Independent Regulation in the electricity industry is effective in stimulating performance improvements: this leads to more generated electricity and better technical quality of the service. The impact on energy efficiency is positive but insignificant. The methodological lesson from this paper is that robust estimation of public reform is possible even in the absence of proper baseline survey.

Recommendations

Overall our analysis in Part 1 has shown that the quality of budget institutions plays a critical role in the performance of the public sector. Developing countries, especially African countries should ensure that their budgetary institutions work adequately to ensure the effectiveness of other reforms to be introduced in the public sector. The main recommendation from the Chapter 1 goes to Francophone African countries, which must introduce radical reforms in their “upstream” public sector management to improve the transparency and the sustainability of the government budget. Besides, Chapter 2 also showed in a less tangible way that the quality of PFM systems also matters indirectly for the effectiveness of Semi-Autonomous Revenue Authorities (SARAs). Indeed, in many developing countries the establishment of a SARA did not improve revenue mobilization performance, and that is probably due to the general weaknesses of the public sector management in these countries. The main recommendation for countries that are thinking of establishing a SARA is to first assess how well their broad public sector is functioning, as it would be inefficient to introduce a SARA in a country where public sector management is particularly poor. Furthermore, new reforms can be introduced in the tax administration without necessarily establishing a revenue authority.

The results obtained in Part 2 of this thesis suggest that the performance of the "downstream" public sector in African countries can and must be significantly improved. Although these

countries face multiple challenges and display a low level of economic development, their level of infrastructure services is well below what it should be, compared to the rest of developing countries. Here again the main recommendation, as in Part 1, is to first improve the “upstream” public sector management, which can in turn improve public service delivery. Furthermore sound Public Financial Management would attract more FDI, give more confidence to the private sector and then leverage additional investments in infrastructure sectors.

Moreover, as we have shown in Chapter 4, the movement toward more independent regulation of public utilities in developing countries can have enormous potential benefits for the provision of infrastructure, depending on the context in which this regulation takes place. Given that most infrastructures are provided by the private sector or by State monopolies, it would be judicious to establish independent regulatory authorities, free from any political influence, responsible for ensuring that public services remain public goods accessible to all citizens. An independent regulatory system can encourage and support stable and sustainable long-term economic and legal commitments by both governments and investors, and promote credible commitments on both sides; investors will then have adequate incentives to commit their capital to new investments.

The connection between strong public sector management and social and economic development seems evident but is hard to pin down precisely. Therefore one of the areas of research, and that we did not explore in this thesis, is to show evidence on the direct link between "upstream" and "downstream" public sector performance; in other words, the idea is to provide evidence on how sound PFM systems can significantly and directly improve the delivery of public services and citizens' daily lives. Public sector results require an integrated approach along the results-chain; sustained improvements in the access to water, electricity, and other sectors often depend on institutional reforms “Upstream”, at the center of government.

Data Issues on Public Sector Performance

One of the biggest challenges in research on public sector issues is to develop medium-term metrics of progress for public sector reform that credibly demonstrate improvement towards longer-term institution building. The current push towards open-source data provides an opportunity for governments and for public sector specialists to address the scarcity of data on public sector arrangements. Transparent and readily available data are expected to deepen public debate and to stimulate academic research. Moreover the international community also recognizes the lack of consensus on the data to be used to track whether and how public sector in developing countries are performing; indeed a key finding of the report of the High Level Panel on the Post-2015 Development Agenda is that "better data and statistics not only will help governments track progress and make sure their decisions are evidence-based but can also strengthen accountability." For this reason, the Indicators of the Strength of Public Management Systems (ISPMS) initiative coordinated by the World Bank has been recently launched with the objective of developing an international consensus around a comprehensive set of governance and public management performance indicators.

Concerning the infrastructure sectors, the problem that needs to be solved is to efficiently and systematically collect and process information about performance in infrastructure services. Since the nature of infrastructure services limits the relevance of simple productivity and profitability measures, one has to collect data on a variety of measures, both quantitative and qualitative. A key issue in comparisons against benchmarks is the role of exogenous factors that affect the production process and outputs; but systematic analysis of the role of exogenous noise in each specific situation is a desirable approach. Evaluating and using performance indicators poses problems of their own. One needs to have appropriate benchmarks and, as much as possible, to isolate the consequences of actions taken by service providers. This cannot be achieved easily through quantitative analysis.

BIBLIOGRAPHY

Dorotinsky, W., and R. Floyd (2004): “*Public Expenditure Accountability in Africa: Progress, Lessons, and Challenges*”. *Building State Capacity in Africa: New Approaches, Emerging Lessons*. Washington, DC: World Bank.

Fukuyama, F. (2013): “What is Governance?” *Governance*, vol. 26(3): 347-368.

Independent Evaluation Group (2008): “*Public Sector Reform: What Works and Why?*” Washington, DC: World Bank.

Kaufmann, D., A. Kraay, and M. Mastruzzi (2009): “Governance Matters VIII: Aggregate and Individual Governance Indicators, 1996–2008”. World Bank Policy Research Working Paper 4978.

Rodrik, D. (2008): “*The New Development Economics: We Shall Experiment, but How Shall We Learn?*” Cambridge, Mass., Harvard Kennedy School.

Shah, A. (2005): “*Fiscal Management*”. Washington, DC: World Bank.

World Bank and IMF (2003): “Public Expenditure Management: Country Assessment and Action Plan for HIPC Questionnaire: Benchmarks, Explanations, and Standard Tables”. PREM Public Sector Group, World Bank and Fiscal Affairs Department, IMF.

Chapter 1

Agbor, J., J.W. Fedderke and N. Viegli (2010): “How Does Colonial Origin Matter for Economic Performance in sub-Saharan Africa?” UNU-WIDER Working Paper Series, World Institute for Development Economic Research.

Alesina, A., and R. Perotti (1995): “The Political Economy of Budget Deficits”. *IMF staff papers*, vol. 42: 1-32.

Alesina, A., and R. Perotti (1996): “Fiscal Adjustments in OECD countries: Composition and Macroeconomic Effects”. NBER Working Paper 5730.

Alesina, A., R. Hausmann, R. Hommes and E. Stein (1999): "Budget Institutions and Fiscal Performance in Latin America". *Journal of Development Economics*, vol. 59(2): 253-273.

Allen, R., E. Dabla-Norris, S. Gollwitzer, E. Kvintradze, V. Lledo T. Prakash, I. Yackovlev, and L. Zanna (2010): "Budget Institutions and Fiscal Performance in Low Income Countries". IMF Working Paper 10/80.

Blinder, A.S. (1973): "Wage Discrimination: Reduced Form and Structural Estimates". *The Journal of Human Resources*, vol. 8: 436-455.

Cotton, J. (1988): "On the Decomposition of Wage Differentials". *The Review of Economics and Statistics*, vol. 70: 236-243.

Daymont, T. N., and P. J. Andrisani (1984): "Job Preferences, College Major, and the Gender Gap in Earnings". *The Journal of Human Resources*, vol. 19: 408-428.

DeRenzo, P., and J. Wehner (2013): "Citizens, Legislators, and Executive Disclosure: the Political Determinants of Fiscal Transparency". *World Development*, vol. 41:96-108.

Dolton, P. J., and G. H. Makepeace (1986): "Sample Selection and Male-Female Earnings Differentials in the Graduate Labor Market". *Oxford Economic Papers*, vol. 38: 317-341.

Fabrizio, S., and A. Mody (2006): "Can Budget Institutions Counteract Political Indiscipline?" IMF Working Paper 06/123.

Gardeazabal, J., and A. Ugidos (2004): "More on identification in detailed wage decompositions". *The Review of Economics and Statistics*, vol. 86: 1034-1036.

Gollwitzer, S. (2011): "Budget Institutions and Fiscal Performance in Africa". *Journal of African Economies*, Vol. 20: 111-152.

Hameed, F. (2005): "Fiscal Transparency and Economic Outcomes". IMF Working Paper 05/225.

Harden, I., and J. Von Hagen (1994): "National Budget Processes and Fiscal Performance". *European Economy Reports and Studies*, vol. 3: 311-418.

Harden, I., and J. Von Hagen (1995): "Budget Processes and Commitment to Fiscal Discipline". *European Economic Review*, vol. 39: 771-79.

International Budget Partnership (2008): "Open Budget Index". Center on Budget and Policy Priorities: Washington, D.C.

Jones, F.L. (1983): "On Decomposing the Wage Gap: A Critical Comment on Blinder's Method". *The Journal of Human Resources*, vol. 18: 126-130.

Jones, F. L., and J. Kelley (1984): "Decomposing Differences between Groups. A Cautionary Note on Measuring Discrimination". *Sociological Methods and Research*, vol. 12: 323-343.

Juhn, C., K.M. Murphy, and B. Pierce (1991): "Accounting for the Slowdown in Black-White Wage Convergence". In M. H. Koster (ed.), *Workers and Their Wages: Changing Patterns in the United States*, AEI Press: Washington D.C., 107-143.

Juhn, C., K.M. Murphy, and B. Pierce (1991): "Wage Inequality and the Rise in Returns to Skill". *Journal of Political Economy*, vol. 101(3): 410-442.

Kennedy, P. (1986): "Interpreting Dummy Variables". *The Review of Economics and Statistics*, vol. 68: 174-175.

Lienert, I. (2003): "A Comparison between Two Public Expenditure Management Systems in Africa". *OECD Journal on Budgeting* Vol. 3, No. 3.

Lienert, I., and F. Sarraf (2001): "Systemic Weaknesses of Budget Management in Anglophone Africa". IMF Working Paper 01/211.

Lin, E.S. (2007): "On the standard errors of Oaxaca-type Decompositions for Inter-Industry Gender Wage Differentials". *Economics Bulletin*, vol. 10(6): 1-11.

Moussa, Y. (2004): "Public Expenditure Management in Francophone Africa: A Cross-Country Analysis". IMF Working Paper 04/42.

Neumark, D. (1988): "Employers' Discriminatory Behavior and the Estimation of Wage Discrimination". *The Journal of Human Resources*, vol. 23: 279-295.

Oaxaca, R. (1973): "Male-Female Wage Differentials in Urban Labor Markets". *International Economic Review*, vol. 14: 693-709.

Oaxaca, R. L., and M. Ransom (1998): "Calculation of approximate variances for wage decomposition differentials". *Journal of Economic and Social Measurement*, vol. 24: 55-61.

Oaxaca, R. L., and M. R. Ransom (1994): "On Discrimination and the Decomposition of Wage Differentials". *Journal of Econometrics*, vol. 61: 5-21.

PEFA (2007): "Public Expenditure and Financial Accountability Reports". Washington, D.C: World Bank.

Prakash, T., and C. Ezequiel (2008): "Public Financial Management and Fiscal Outcomes in Sub-Saharan African Heavily Indebted Poor Countries". IMF Working Paper 08/217.

Reimers, C. W. (1983): "Labor Market Discrimination Against Hispanic and Black Men". *The Review of Economics and Statistics*, vol. 65:570-579.

Shah, A. (2007): "Budgeting and Budgetary Institutions". Washington, DC: World Bank.

Von Hagen, J. (1992): "Budgeting Procedures and Fiscal Performance in the European Communities". *European Economy - Economic Papers*, vol. 96.

The World Bank Group (2009): “Reports on the Observance of Standards and Codes”. Washington, D.C: World Bank.

Weichselbaumer, D., and R. Winter-Ebmer (2005): “A Meta-Analysis of the International Gender Wage Gap”. *Journal of Economic Surveys*, vol. 19: 479-511.

Chapter 2

Abadie, A., and J. Gardeazabal (2003): “The Economic Costs of Conflict: A Case Study of the Basque Country”. *American Economic Review*, Vol. 93:112-132.

Abadie, A., A. Diamond, and J. Hainmueller (2010): “Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program”. *Journal of the American Statistical Association*, Vol. 105:493-505.

Bahl, R., and R. Bird (2008): “Tax Policy in Developing Countries: Looking Back – and Forward”, *National Tax Journal*, pp. 279-301, p. 296.

Bird, R. (2003): “Taxation in Latin America: Reflections on Sustainability and the Balance between Equity and Efficiency”. ITP Paper 0306, Rotman Institute for International Business, Joseph L. Rotman School of Management, University of Toronto.

Bird, R. (2008): “Tax Challenges Facing Developing Countries”. Working Paper Series 12, Rotman Institute for International Business, Joseph L. Rotman School of Management, University of Toronto.

Chambas, G. (2005): “*Afrique au Sud du Sahara: Mobiliser des Ressources Fiscales pour le Développement*”. Economica, Paris.

Crandall, W. (2010): “Revenue Administration: Autonomy in Tax Administration and the Revenue Authority Model”. Technical Notes and Manual, Fiscal Affairs Department, International Monetary Fund.

Delay, S., N. Devas, and M. Hubbard (1999): "Reforming Revenue Administration: Lessons from Experience - a study for the International Development Department". School of Public Policy, University of Birmingham.

Fenochietto, R., and C. Pessino (2013): "Understanding Countries' Tax Effort". IMF Working Paper 13/244.

Fjeldstad, O-H. (2005): "Revenue Issues and Corruption: An Overview of Issues". Workshop on Corruption in Public Financial Management: Donor Perspectives, Michelsen Institute, Bergen, Norway.

Fjeldstad, O-H., and M. Moore (2009): "Revenue Authorities and Public Authority in sub-Saharan Africa". *Journal of Modern African Studies*, Vol. 47:1-18, Cambridge University Press.

Gray, J., and E. Chapman (2001): "Evaluation of Revenue Projects". Synthesis Report Volume I, UK Department for International Development.

Gupta, A.S. (2007): "Determinants of Tax Revenue Efforts in Developing Countries". IMF Working Paper 07/184.

Hadler, S.C. (2000): "Best Practice in Tax Administration in Sub-Saharan Africa: a Handbook for Officials". Cambridge, MA: International Tax Program, Harvard Law School.

Hubbard, M., S. Delay and N. Devas (1999): "Complex Management Contracts: The Case of Customs Administration in Mozambique". *Public Administration and Development*, Vol.19: 153-63.

Jenkins, G.P. (1994): "Modernization of Tax Administrations: Revenue Boards and Privatization as Instruments for Change". *Bulletin for International Fiscal Documentation*, Vol. 48, 2.

Kaldor, N. (1956): "Indian Tax Reform". *Journal of Indian School of Political Economy*, Vol. 5.1993:118-187.

Keen, M. (2003): "Changing Customs: Challenges and Strategies for the Reform of Customs Administration". Fiscal Affairs Department, International Monetary Fund.

Kidd, M., and W. Crandall (2006): "Revenue Authorities: Issues and Problems in Evaluating their Success". IMF Working Paper 06/240.

Kloaden, D. (2011): "Revenue Administration Reforms in Anglophone Africa since the early 1990s". IMF Working Paper 11/162.

Kydland, F.E., and E.C. Prescott. (1977): "Rules Rather than Discretion: the Inconsistency of Optimal Plans". *Journal of Political Economy* Vol. 85: 473-492.

Mann, A.J. (2004): "Are Semi-Autonomous Revenue Authorities the Answer to Tax Administration Problems in Developing Countries? A Practical Guide". Research Paper for the project Fiscal Reform in Support of Trade Liberalization (USAID funded).

Manning, N. (2001): "The Legacy of New Public Management in Developing Countries". *International Review of Administrative Sciences* Vol. 67:297-312.

McCarten, W. (2005): "The Role of Organizational Design in the Revenue Strategies of Developing Countries". World Bank Institute, Washington, DC: World Bank.

Moore, M., and A. Schneider (2004): "Taxation, Governance and Poverty: Where Do the Middle Income Countries Fit?" IDS Working Paper 230.

Silvani, C., and K. Baer (1997): "Designing a Tax Administration Reform Strategy: Experience and Guidelines". IMF Working Paper 97/30.

Taliercio, R. (2004): "Designing Performance: The Semi-autonomous Revenue Authority Model in Africa and Latin America". World Bank Policy Research Working Paper 3423.

Von Soest, C. (2007): “How Does Neopatrimonialism Affect the African State's Revenues? The Case of Tax Collection in Zambia”. *Journal of Modern African Studies*, Vol.45: 621-645.

Von Soest, C. (2007): “Measuring the Capability to Raise Revenue: Process and Output Dimensions and their Application to the Zambia Revenue Authority”. *Public Administration and Development*, Vol. 27:353-65.

Von Soest, C. (2008): “Donor Support for Tax Administration Reform in Africa: Experiences from Ghana, Tanzania, Uganda and Zambia”. German Development Institute, discussion paper 2, Bonn: German Development Institute.

Chapter 3

Agenor, P.R., and B. Moreno-Dodson (2006): “Public Infrastructure and Growth: New Channels and Policy Implications”. World Bank Policy Research Working Paper 4064.

Banerjee S., A. Diallo, V. Foster and Q. Wodon (2009): “Trend in household coverage of modern infrastructure services in Africa”. World Bank Policy Research Working Paper 4880.

Basak, S., A. Shapiro and L. Tepla (2005): “Risk Management with Benchmarking”. *Management Science*, Vol. 52: 542-557.

Briceno-Garmendia, C., A. Estache and N. Shafik (2004): “Infrastructure Services in Developing Countries: Access, Quality, Costs and Policy Reform”. World Bank Policy Research Working Paper 3468.

Bogetic, Z., and W.J. Fedderke (2006): “International Benchmarking of South Africa’s Infrastructure Performance”. World Bank Policy Research Working Paper 3830.

Bourguignon, F. (2006): “Rethinking Infrastructure for Development”. Presented at the World Bank Annual Bank Conference on Development Economics ABCDE, Tokyo.

Calderon, C., and L. Serven (2008): "Infrastructure and Economic Development in Sub-Saharan Africa". World Bank Policy Research Working Paper 4712.

Canning, D. (1998): "A database of world stocks of infrastructure, 1950-1995". *The World Bank Economic Review* 3, vol. 12: 529-47.

Estache, A., and A. Goicoechea (2005): "A Research Database on Infrastructure Economic Performance". World Bank Policy Research Paper 3643.

Estache A., M. Gonzales and L. Trujillo (2007): "Government Expenditures on Education, Health and Infrastructure: a Naive Look at Levels, Outcomes and Efficiency". World Bank Policy Research Working Paper 4219.

Evans J., and J. Simpson (2003): "Benchmarking of Economic and Regulatory Capital for International Banking Systems: A Theoretical Discussion". University of Wollongong in Dubai Working Paper 1.

Foster V, J. Pierce and T. Yepes (2009): "Making sense of Africa's Infrastructure Endowment". World Bank Policy Research Working Paper 4912.

Komoves, K., D. Whittington and X.Wu (2000): "Infrastructure Coverage and the Poor: a Global Perspective". Department for International Development DFID, UK.

Leipziger, D., M. Fay and T. Yepes (2003): "Achieving MDG: the Role of Infrastructure". Washington, DC: The World Bank.

Ndulu, B. (2005): "Infrastructure, Regional Integration and Growth in Sub-Saharan Africa: Dealing with Disadvantages of Geography and Sovereign Fragmentation". AERC Growth Project.

Rioja, F. (1999): "Filling Potholes: Macroeconomic Effort of Maintenance Versus New Investments in Public Infrastructure". Mimeograph, Department of economics, Georgia State University.

Roller, L.H., and L. Waverman (2001): “Telecommunications Infrastructure and Economic Development: a Simultaneous Approach”. *American Economic Review*, vol. 914: 909-923.

Shleifer, A. (1985): “A Theory of Yardstick Competition”. *The RAND Journal of Economics*, Vol. 16: 319-327.

Chapter 4

Bortolotti, B., M. Fantini, and D. Siniscalco (1998): “Regulation and Privatisation: the Case of Electricity”. Department of Economics and Finance Working Paper, University of Turin.

Bergara, M. E., W. T. Henisz, and P.T. Spiller (1998): “Political Institutions and Electric Utility Investment: a Cross-Nation Analysis”. *California Management Review*, p. 18-35.

Clarke, G., L. Haggarty, R. Kaneshiro, R. Noll, M. Shirley, S. Wallsten and L.C. Xu (2004): “New Tools for Studying Network Industry Reforms in Developing Countries: the Telecommunications and Electricity Regulation Database”. World Bank Policy Research Working Paper 3286.

Cubbin, J., and J. Stern (2005): “Regulatory Effectiveness: the Impact of Regulation and Regulatory Governance Arrangements on Electricity Industry Outcomes”. World Bank Policy Research Working Paper 3536.

Cubbin, J., and J. Stern. (2006): “The Impact of Regulatory Governance and Privatisation on Electricity Industry Generation Capacity in Developing Economies”. *World Bank Economic Review*, Vol. 20: 115-41.

Dehejia, R., and S. Wahba (1999): “Causal Effects in Non-Experimental Studies: Re-evaluating the Evaluation of Training Programs”. *Journal of the American Statistical Association* Vol. 94(448): 1053-62.

Domah, P., M. Politt, and J. Stern (2002): "Modeling the Costs of Electricity Regulation: Evidence of Human Resource Constraints in Developing Countries". London Business School Regulation Initiative, Working Paper 49.

Estache, A., and E. Kouassi (2002): "Sector Organization, Governance and the Inefficiency of African Water Utilities". World Bank Policy Research Working Paper 3374.

Estache, A., L. Perelman, and S. Trujillo (2005): "Infrastructure Performance and Reform in Developing and Transition Economies: Evidence from a Survey of Productivity Measures". World Bank Policy Research Working Paper 3514.

Estache, A., and M. Rodriguez-Pardina (1996): "Regulatory Lessons from Argentina's Power Concessions". World Bank, Public Policy for the Private Sector, p. 5-8.

Estache, A., and M. Rodriguez-Pardina (1999): "Light and Lightning at the End of the Public Tunnel: Reform of the Electricity Sector in the Southern Cone". World Bank Economic Development Institute Working Paper 2074.

Heckman, J., H. Ichimura, and P. Todd (1998): "Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Program". *Review of Economic Studies* Vol. 64(4): 605-654.

Heckman, J., H. Ichimura, J. Smith, and P. Todd (1998): "Characterizing Selection Bias using Experimental Data". *Econometrica*, Vol. 66: 1017-1099.

Holland, P.W. (1986): "Statistics and Causal Inference". *Journal of the American Statistical Association*, vol. 81(96): 945-960.

Joskow, P.L. (2005): "Incentive Regulation in Theory and Practice: Electricity Distribution and Transmission Networks". Joint Center for Regulatory Studies, Working Paper 05-18.

Kirkpatrick, C., D. Parker, and Y. F. Zhang (2008): “Electricity Sector Reform in Developing Countries: an Econometric Assessment of the Effects of Privatization, Competition and Regulation”. *Journal of Regulatory Economics*, Vol. 33(2): 159-178.

Levy, B., and P.T. Spiller (1994): “The Institutional Foundations of Regulatory Commitment: A Comparative Analysis of Telecommunication Regulation”. *Journal of Law Economics and Organization*, Vol. 10(2): 201-246.

Rosenbaum, P., and D. Rubin (1983): “The Central Role of the Propensity Score in Observational Studies for Causal Effects”. *Biometrika*, Vol. 70: 41-55.

Russell, P. (1999): “Regulation, Deregulation, and Competition Issues in Natural Monopoly Sectors”. Bucharest Institute for Economic Studies, Romanian Academy of Sciences.

Vega, M., and D. Winkelried (2005): “Inflation Targeting and Inflation Behavior: a Successful Story?” *International Journal of Central Banking* Vol. 1(3): 153-175.

Vickers, J., and G. Yarrow (1991): “Economic Perspectives on Privatization”. *Journal of Economic Perspectives*, Vol. 5(2): 111-132.

TABLE OF CONTENTS

<u>GENERAL INTRODUCTION.....</u>	<u>1</u>
WHAT IS THE PUBLIC SECTOR?.....	2
HOW TO ASSESS PUBLIC SECTOR PERFORMANCE?.....	5
THE PROBLEM OF THE COUNTERFACTUAL.....	6
THE PROBLEM OF SELECTION BIAS.....	8
OUTLINE OF THIS THESIS	11
<u>PART 1: “UPSTREAM” PUBLIC SECTOR PERFORMANCE.....</u>	<u>15</u>
CHAPTER 1: WHAT ARE THE DRIVERS OF FISCAL PERFORMANCE GAPS BETWEEN FRANCOPHONE AND ANGLOPHONE AFRICA? A BLINDER OAXACA DECOMPOSITION	16
1.1 INTRODUCTION	18
1.2 RELEVANT LITERATURE REVIEW.....	20
1.2.1 Budget institutions in sub-Saharan Africa.....	20
1.2.2 Budget institutions and fiscal performance.....	21
1.3 THE CONSTRUCTION OF THE BUDGET INSTITUTIONS INDEXES	23
1.3.1 Centralization.....	23
1.3.2 Comprehensiveness	24
1.3.3 Fiscal and Procedural Rules and Controls.....	25
1.3.4 Sustainability and Credibility	25
1.3.5 Transparency.....	26
1.4 DATA AND METHODOLOGY	27
1.5.1 Sample and Data	27
1.5.2 Methodology.....	27
1.5 EMPIRICAL INVESTIGATION	30
1.5.1 Descriptive statistics	30
1.5.2 Graphical Analysis	31
1.5.3 Spearman Rank’s correlation.....	32
1.5.4 Regression analysis.....	34

1.5.5	Blinder-Oaxaca Decomposition.....	35
1.5.5.1	Public Debt.....	35
1.5.5.2	Primary Balance.....	36
1.5.6	Disaggregating the effects of Budget Institutions.....	37
1.5.6.1	Public Debt.....	38
1.5.6.2	Primary Balance.....	39
1.5.7	Robustness checks.....	39
1.6	DISCUSSION AND CONCLUSION.....	41
1.7	APPENDICES.....	43
CHAPTER 2: ASSESSING REVENUE AUTHORITY PERFORMANCE IN DEVELOPING COUNTRIES: A SYNTHETIC CONTROL APPROACH		49
2.1	INTRODUCTION.....	51
2.2	ORIGIN OF THE MODEL AND MOTIVATION FOR REFORM.....	52
2.3	LITERATURE REVIEW.....	54
2.3.1	Determinants of government revenue.....	54
2.3.2	Revenue Authority Performance.....	54
2.4	EMPIRICAL METHODOLOGY.....	56
2.5	DATA AND SAMPLE.....	58
2.6	RESULTS.....	60
2.6.1	Positive impacts in Argentina, Bolivia, Guyana, Malawi and South Africa.....	60
2.6.2	Negative impacts in Kenya, Mexico, Peru, Tanzania, Venezuela and Zambia.....	63
2.6.3	Ambiguous impacts in Colombia, Guatemala, Rwanda, Uganda and Zimbabwe.....	65
2.6.4	Statistically insignificant impacts.....	67
2.7	DISCUSSION AND CONCLUSION.....	69
2.8	APPENDICES.....	73
<u>PART 2: “DOWNSTREAM” PUBLIC SECTOR PERFORMANCE.....</u>		83
CHAPTER 3: BENCHMARKING DES PERFORMANCES INFRASTRUCTURELLES DE L’AFRIQUE		84
3.1	INTRODUCTION.....	86
3.2	REVUE DE LA LITTERATURE.....	87
3.3	METHODOLOGIE ET BASE DE DONNEES.....	89
3.3.1	Le Benchmarking.....	89
3.3.2	Construction de la base de données.....	91

3.4	ANALYSE SECTORIELLE DE LA PERFORMANCE DES PAYS AFRICAINS	92
3.4.1	ENERGIE.....	92
3.4.2	EAU ET ASSAINISSEMENT.....	95
3.4.3	TRANSPORTS	97
3.4.4	TECHNOLOGIES DE L'INFORMATION ET DE LA COMMUNICATION.....	99
3.5	DISCUSSION ET CONCLUSION	101
3.6	ANNEXES	104
	CHAPTER 4: PUBLIC UTILITY REGULATION IN DEVELOPING COUNTRIES AND EFFICIENCY: THE CASE OF ELECTRICITY SECTOR.....	110
4.1	INTRODUCTION	112
4.2	THEORETICAL AND CONCEPTUAL FOUNDATIONS	114
4.3	METHODOLOGY	116
4.3.1	The Propensity Score.....	118
4.3.2	The Matched Difference-in-Difference estimator	119
4.3.3	Impact Indicators	120
4.4	DATA	121
4.5	RESULTS AND ROBUSTNESS CHECKS	123
4.5.1	Descriptive Statistics.....	123
4.5.2	Probit Estimation.....	123
4.5.3	Electricity Power Transmission and Distribution Losses	124
4.5.4	Electricity Generation per capita	125
4.5.5	Energy Efficiency.....	125
4.5.6	Robustness Checks	126
4.6	DISCUSSION AND CONCLUSION.....	126
4.7	APPENDICES.....	128
	<u>GENERAL CONCLUSION.....</u>	<u>137</u>
	<u>BIBLIOGRAPHY.....</u>	<u>144</u>

SUMMARY

The public sector plays a major role in society. In most developing countries, public expenditure forms a significant part of gross domestic product (GDP) and public sector entities are substantial employers and major capital market participants. The public sector determines, usually through a political process, the outcomes it wants to achieve and the different types of intervention. How the public sector achieves results matters as its size and economic significance make it a major contributor to growth and social welfare. Its achievements emerge in the quality and nature of its financial management, the infrastructure it finances and the quality of its social and economic regulation. How well those public sector activities deliver their expected outcomes is a key development variable; yet explicit evidence base for understanding what works and why in the public sector remains strikingly limited compared with other policy areas. There are two main reasons for this situation: performance in these areas is difficult to analyze because the outputs of many such services are hard to measure or even to define, and the lack of quantitative and qualitative longitudinal data precludes rigorous econometric analysis.

Therefore the objective of this thesis is to document this literature and to propose different ways of measuring public sector performance in developing countries. The dissertation is divided into two Parts: the first Part – Chapters 1 and 2 – presents two essays on “upstream” public sector performance while the second Part – Chapters 3 and 4 – presents two essays on “downstream” public sector performance. The Chapter 1 makes use of the Blinder-Oaxaca Decomposition to examine how the quality of budget institutions affects fiscal performance – Primary Balance and Public Debt – in sub-Saharan Africa. In Chapter 2 we use a Synthetic Control Approach to investigate the impact of Semi-Autonomous Revenue Authorities (SARAs) on revenue mobilization in twenty developing countries. The chapter 3 provides a first systematic Benchmarking of Africa’s infrastructure performance on four major sectors: electricity, water and sanitation, information and communication technologies, and transportation. Finally we evaluate the effects of the establishment of an Independent Regulatory Authority (IRA) on electricity sector performance in developing countries in Chapter 4.

Keywords: *Evaluation, Public Sector, Public Financial Management, Infrastructure, Africa, Developing Countries, Benchmarking, Matching, Double-Difference, Synthetic Control Method, Blinder-Oaxaca Decomposition.*

RESUME

Le secteur public joue un rôle important dans la société. Dans la plupart des pays en développement, les dépenses publiques constituent une partie importante du PIB et les entités du secteur public sont les principaux pourvoyeurs d'emploi et les principaux acteurs du marché des capitaux. Le secteur public détermine, généralement par le biais d'un processus politique, les objectifs économiques et sociaux ainsi que les différents types d'intervention à mettre en place pour les atteindre. Comment le secteur public atteint ces objectifs constitue une question cruciale étant donné que sa taille et son importance économique en font un moteur principal de la croissance et du bien-être social. Ses résultats sont jugés à travers la qualité et la nature de sa gestion des finances publiques, les infrastructures qu'il finance ainsi que la qualité de sa régulation des activités économiques. La manière dont les activités du secteur public délivrent les résultats attendus est une variable clé du développement; pourtant les études empiriques pour comprendre ce qui fonctionne dans le secteur public et pourquoi restent remarquablement limitées. Deux principales raisons expliquent cette situation: les performances dans ce secteur sont difficiles à analyser car les outputs d'un tel nombre de services sont difficiles à mesurer et même à définir, et le manque de données quantitatives et qualitatives rend difficile une analyse économétrique rigoureuse.

Dès lors, l'objectif de cette thèse est de documenter cette littérature et de proposer différentes méthodes empiriques pour évaluer les performances du secteur public dans les pays en développement. Notre analyse est divisée en deux parties : la première partie - Chapitres 1 et 2 - présente deux essais sur l'évaluation des performances du secteur public «en amont» tandis que la seconde partie - Chapitres 3 et 4 - présente deux essais sur l'évaluation des performances du secteur public «en aval». Le Chapitre 1 fait usage de la technique de Blinder-Oaxaca pour examiner comment la qualité des institutions budgétaires affecte les performances budgétaires – déficit budgétaire et dette publique - en Afrique sub-Saharienne. Dans le Chapitre 2, nous utilisons une approche par le Synthetic Control pour étudier l'impact des Offices de recettes sur la mobilisation des ressources publiques dans une vingtaine de pays en développement. Le Chapitre 3 présente un Benchmarking systématique des performances infrastructurelles de l'Afrique dans les secteurs de l'électricité, de l'eau et de l'assainissement, des technologies de l'information et de la communication et des transports. Enfin nous évaluons, dans le Chapitre 4, les effets de la mise en place d'une autorité indépendante de régulation sur les performances du secteur de l'électricité dans les pays en développement.

Mots Clés: *Evaluation, Secteur Public, Gestion des Finances Publiques, Infrastructures, Afrique, Pays en Développement, Benchmarking, Matching, Double-Différence, Méthode du Synthetic Control, Décomposition de Blinder-Oaxaca.*