Effectiveness of SARA reform in sub-Saharan Africa

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Abstract

This paper identifies impact of semi-autonomous revenue authorities in sub-Saharan Africa tax revenues. Results show that reform of semi-autonomous revenue authorities got various effects on tax revenues in short term. However, in medium term, semi-autonomous revenue authorities didn't work better than traditional tax administration. These results leads to conclude that sub-Saharan African countries which have not yet adopted the SARA reform, can increase their tax effort and thus their level of taxation by improving quality of institutions and by modernizing traditional administrations.

Keywords : Reforms, Africa, Tax revenues, Synthetic control.

JEL Codes : H2; O23; O55; C1.

1 Introduction

African countries have embarked on trade liberalization path in order to facilitate their integration into the global economy. This change has resulted in revenue losses. This

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makes tax policy development and reforms that can contribute effectively to increasing tax revenues a priority in Africa.

In this context, tax administration is expected to play a decisive role, since effective management of internal taxes is essential to the growth of internal tax revenues as part of the tax transition that has begun. However, like many developing countries, African tax administration's low contributory capacity has been pointed out as one of the barriers to revenue mobilization. According to Von Haldenwang et al. (2014), some administrations lack infrastructure and human resources to carry out the basic revenue collection functions (tax records, tax filings, assessment of liabilities, collection of taxes and royalties) and even less to carry out more advanced tasks, such as auditing or processing appeals. Several authors, such as Baer and Silvani (1997) or Jenkins et al. (1993), have therefore supported the need for radical changes in tax administration in developing countries. For example, many governments have implemented semi-autonomous revenue authorities (SARA) in recent years.

Important hopes have been placed in this reform because, unlike traditional tax administrations, SARAs get a degree of operational and financial autonomy from the Ministry of Finance in terms of staff recruitment, salaries, budget allocation and internal organization. They sometimes work on the commission, keeping a percentage of funds raised to finance themselves (Von Haldenwang et al., 2014). Baer and Silvani (1997) or Jenkins et al. (1993) suggest that making tax administration more "like a private company" and without the funding and staffing rules governing the public sector would reduce corruption, with a focus on performance-based budgets and the compensation system. They also believe that traditional tax administration is ineffective because existing budget and personnel regulations prevent governments from providing appropriate incentives for tax collectors and limit decisions about how the administration's budget is delivered, and how it structures and organizes staff. In the same context, Taliercio Jr (2004) argues that entrusting tax administration to an independent body, allows the depoliticization of tax collection and minimizes the risks that politicians will cancel the reform at a later date. He believes that what drives politicians to initiate this reform is the need to make a credible commitment to taxpayers so that tax collection agency is more competent, efficient and fair.

However, in weak governance context which characterizes developing countries, Von Halden-

wang et al. (2014) admit that tax administrations do not have access to information they need (e.g. land registers), they are exposed to corruption and political interference. They assume that in such a context, even the best-intentioned reform may be short-lived or fail completely. For its part, Manasan (2003) points out the fact that Many countries which known success with semi-autonomous administration model have seen their revenue gains decrease after a while. This finding raise the question of effectiveness of SARAs.

The purpose of this study is therefore to assess effectiveness of SARAs. Certainly studies have analysed issue. But large part of previous studies used descriptive analyses sometimes with a lack of comparable data (Von Haldenwang et al., 2014). Moreover, few studies have concerned Sub-Saharan Africa. The few existing empirical studies have yielded divergent results. Dom (2018) and Sarr (2016) found no solid evidence that SARAs have increased tax revenues in Africa. In contrast, Ebeke et al. (2016) have found a positive effect of SARAs on the level of tax revenues. These discrepancies in results could result from both samples used and inference methods.

On the one hand, Dom (2018) and Sarr (2016) did not distinguish between natural resource revenues and non-resource tax revenues. However, resource revenues have been identified as key determinant of non-resource tax revenues (see Brun et al., 2015). In addition, resource revenues are heavily affected by volatile international commodity prices and responsibility for collecting them is frequently shared by several departments or agencies; excluding these revenues provides a better understanding of the impact of each reform studied on efforts to raise national tax revenues. In addition, the taxation of natural resources raises political economy problems that are fundamentally different from those raised by taxes whose impact is on individuals (Ebeke et al., 2016).

On the other hand, Ebeke et al. (2016) did not take into account the existence of unobserved common factors in their analysis. These factors can be global shocks such as the recent financial crisis, oil crises, falling commodity prices or local spin-offs through channels determined by cultural, historical or geographical links (Chudik et al., 2011). Unobserved common factors cause a significant bias in synthetic control estimator used by Ebeke et al. (2016). Indeed, the estimator is unable to reconstruct the weight of unobserved factors (Ferman and Pinto, 2016). This situation leads to a bias in the constitution of the counterfactual. In addition, inference procedure used by Ebeke et al. (2016) could

suffer from a bias that would affect its robustness. One of the consequences of this bias is that the impact analyzed is likely to be almost always significant (Ferman and Pinto, 2017).

In this paper, we use the synthetic control method created by Abadie and Gardeazabal (2003) and Abadie et al. (2010). Our study differs from previous studies based on recent developments in the estimator of synthetic control for small samples (see Ferman and Pinto, 2016, 2017 ; Firpo and Possebom, 2017). This allows us to achieve a robust effect of SARAs for each country concerned in Africa. We also use the recent tax revenue database built by Mansour (2014), which distinguishes between resource tax revenues and non-resource tax revenues.

2 Literature review

2.1 Theoretical framework

Numerous studies have shown that SARAs could raise more tax revenue than conventional tax administrations (see Mann, 2004 ; Taliercio Jr, 2004 ; Von Haldenwang et al., 2014). Their assertions are essentially based on two arguments. The first argument suggests that the particular[1] characteristics of SARAs should address inefficiency of traditional tax administrations. Taliercio Jr (2004) raised the fact that autonomy available to SARAs can solve administrative and corporate governance problems, and enable fair and efficient tax revenue administration. He shows that performance in terms of mobilization has been much better within the SARAs enjoying greater autonomy. For Mann (2004), autonomy of personnel management may be the most important element that SARAs bring to tax administration. He believes that the flexibility to hire, transfer internally and effectively sanction staff in SARAs is essential. Putting competent people in the right positions has a retroactive effect on all other processes that need to be reformed within the collection agency. In other words, changes will be implemented more effectively and implemented by motivated staff. In the same area, Von Haldenwang et al. (2014) suggest that a number of SARA characteristics could promote better tax revenue mobilization, namely:

- in terms of staffing and human resource development should lead to selection of

[1] To see Mann, 2004; Von Haldenwang et al., 2014 for a complete summary of SARA characteristics.

better qualified and better-paid staff.

- An internal organization that allows SARAs to deal with the most pressing issues flexibly at all times.
- Unlike many conventional tax administrations, SARAs follow a results-based business model that includes a goal and follow-up of revenue targets.
- A funding mechanism that allows SARAs to withhold a percentage of the funds raised to finance themselves (commission model) provides a greater incentive for them to collect revenue.

Von Haldenwang et al. (2014) notes also that SARA-based argument implicitly implies long-term improvements resulting from lasting changes in the incentive structure and expectations on the part of taxpayers and tax revenue collectors. With this in mind, tax revenues mobilized by SARAs are expected to grow positively over a long period of time. The second argument assumes that changes in the organization of the collection should allow SARAs to have a positive impact on tax revenue mobilization. This argument argues that the creation of a SARA breaks with ineffective or illegal routines and strengthens accountability and coercive collection. An increase in revenue in this context should therefore result from a change in risk assessments and expectations for taxpayers (Von Haldenwang et al., 2014). It is also possible to envisage at this level that the increase in tax revenues may be due to a surprise effect. Indeed, when creating a new SARA, individuals ignore the mechanisms of operation and are relatively more easily captured by the new structure. But despite all these arguments, SARAs may, contrary to expectations, be no different from traditional tax administrations in terms of efficiency. Arguments in favour of SARAs may have limitations that could shorten or even nullify the expected long-term positive effect. First, the costs of moving from a traditional administration to a SARA and the time required to properly operate the SARA could be significant. This could result in a significant share of revenue being drained. This could also lead to a decrease in collection efficiency with consequences for budgetary balance. Moreover, in a weak institutional environment, the reform of SARAs is unlikely to achieve the desired objectives. In fact, on this point, Mann (2004) admits that institutions are paramount to reforms and that

SARAs are not a panacea. Improvements may be temporary and old deficiencies may resurface after a temporary improvement. The case of Uganda referred to by Taliercio Jr (2004) is proof of this. Uganda's SARA, established between 1991 and 1992, has not been able to consolidate its taxpayer register. It has also not been able to strengthen its system of identifying[2] taxpayers by purging it from inactive entries due to corruption-related problems.

Regarding the specificities of SARAs, Mann (2004) also recongonizes that autonomy is by no means sufficient to guarantee their effectiveness compared to traditional tax administration. It acknowledges that inefficiencies can persist without a complete overhaul of internal procedures and processes and a strengthened regulatory and accountability framework that links SARA to other public sector institutions and the private sector (including the taxpayer). According to Mann (2004), personal conflicts between the Minister of Finance and the head of SARA and/or between the SARA Board of Directors and its head could also hinder the sustainability of the SARA model.

As for the effect of organizational change, it can also be called into question at least in the medium term if taxpayers lack tax compliance. This hypothesis can be strengthened, if the adaptive capacity of individuals is taken into account. Indeed, after a few years, corruption often becomes a serious problem again (Mann, 2004). Individuals could now adapt to it and be able to evade taxes. In this context, the argument based on the effect of organizational change should be rather short-lived.

2.2 empirical evidence

Von Haldenwang et al. (2014), based on a panel analysis of local tax collection in Peru between 1998 and 2011, find that municipalities collect more revenue with SARAs compared to traditional tax administrations. The results also indicate that local revenues are more stable in municipalities with SARAs, which is good for fiscal and planning policy.

Ahlerup et al. (2015) study the effect of VAT and SARAs on tax revenues in sub-Saharan Africa from a sample of 47 countries over the period 1980-2010. They find that VAT has no effect on total tax revenues, either in the short term or in the long term, and that SARAs lead to an increase in tax revenues in short and medium term, but the effect dissipates

[2]This system, known as "TIN," is designed to assign a unique identification number to each taxpayer.

over time.

Sarr (2016) uses synthetic control method on a panel of data sets covering 74 developing countries over the period 1980-2010 and finds divergent results. On 20 countries studied, five SARAs (Argentina, Bolivia, Guyana, Malawi, and South Africa) appear to have performed better compared to traditional Ministry of Finance administrations in terms of collection. In Colombia, Guatemala, Rwanda, Uganda and Zimbabwe, the effects of SARAs are ambiguous, while in six countries (Kenya, Mexico, Peru, Tanzania, Venezuela, Zambia), SARAs appear to have performed worse in terms of mobilization, suggesting that results would be better with traditional tax administrations.

Ebeke et al. (2016) analyzed the impact of three reforms in Sub-Saharan Africa: VAT, Large Business Units and SARAs. Based on a sample of 41 sub-Saharan African countries over the 1980-2010 period, the authors assess the impacts of these three reforms on non-resource tax revenues using the propensity score matching methodology (PSM) and the Synthetic Control Method (SCM). They conclude that VAT and SARA reforms have, without much ambiguity, a significant positive effect on non-resource tax revenues, while effect of corporate reform is insignificant. They also conclude that VAT and SARA have some synigergy, and that their positive effects are reinforced several years after their adoption. Finally, Dom (2018) in an analysis based on 46 subsaharan african countries over the period 1980-2015, finds no solid evidence that induces an improvement in revenue performance with SARAs.

3 Methodology

3.1 Synthetic control estimator

In this section, we present the methodology used in this study. Assessing impact of a reform requires comparing the output of this reform with output without reform. But since the output without the reform is unobservable, it is necessary to estimate a counterfactual situation that would have been measured in absence of the reform. This approach is part of classic analysis of Rubin (1974), which defines the effect of public policy as the difference between counterfactual and actual output observed for treated unit.

To estimate counterfactual situation, an approach has recently been implemented for com-

parative studies. This is synthetic control method developed by Abadie and Gardeazabal (2003) and extended by Abadie et al. (2010), and Abadie et al. (2015). This method has several advantages over many other comparative study methods. First, it allows for a weighted combination of control units, which provides a much better comparison with treated unit than a study in which a single control unit is used (Abadie et al., 2010). Second, the relative contribution of each unit in control group is clearly determined (Abadie et al., 2010). Third, this procedure determines whether there are differences in intervention variable and other predictors between treated unit and control group (Abadie et al., 2010). Because of these benefits, synthetic control procedure has been used in several studies examining effects of public policy, laws and external shocks on various outcome measures (Kreif et al., 2016 ; Abadie et al., 2015, 2010; Abadie and Gardeazabal, 2003). Specifically, synthetic control method consists to build a counterfactual through a weighted combination of units that share some similarities with the treated unit, but have not experienced the treatment of treated unit, so as to move closer to the most relevant characteristics of the treated unit. Effect of treatment is the difference in outcome between observed situation in the treated unit and its counterfactual (Abadie et al., 2015, 2010 ; Nonnemaker et al., 2011 ; Kreif et al., 2016). In the evaluation of SARAs, it is assumed that tax revenue equation is such that:

$$Tax_{it} = \beta X_{it} + \theta \mu_i + \tau_t + \epsilon_{it} \tag{1}$$

where i denote country and t is year. X_{it} is a vector of covariates observed by territory that vary over time, μ_i represents fixed unobserved features over time for a territory i but whose effect θ_i can vary over time, τ_t represents the common temporal effects of all territories and ϵ_{it} of unobserved transient shocks.

Assuming existence of $j(2, \ldots, j+1)$ control units, effect of the reform for treated unit i can be written:

$$\delta_{it} = Tax_{it}^{1} - \sum_{j=2}^{j+1} w_j^* Tax_{it}^{0} \tag{2}$$

where w_j^* is a non-negative weight set equal to 1 and minimizes distance, prior to reform, between treated unit and control units. Tax_{it}^{1} is pre-treatment tax revenue, and Tax_{it}^{0} is

post-treatment tax revenue. The weight w_j is chosen as:

$$w_j^* = argmin \left(X_{it}^1 - X_{it}^0 w\right)' V \left(X_{it}^1 - X_{it}^0\right) \tag{3}$$

Where X_{it}^1 refers to a $(k \times 1)$ vector of covariates for trated unit before the reform, which may include specific periods of tax revenue prior to reform, and X_{it}^0 refers to a $(k \times J)$ matrix of same variables for countries that did not implement reform. The symmetrical and defined positive V matrix weights the relative importance of various covariates included in X. Several methods can be used to determine w and V, but we follow recommendation of Abadie et al. (2010) which is to choose w and V as they minimize RMSPE (Root Mean Square Prediction Error) from the period prior to treatment.

Ferman and Pinto (2016) suggest an alternative measure of the normalized mean squared error index before treatment in order to assess the overall quality of fit before treatment. The use of this index rather than the RMSPE has the advantage of standardizing the RMSPE,which allows adjustment of the counterfactual between different outcome variables and the different countries compared. A second advantage is that this approach provides value that makes the quality assessment of fit very intuitive. Finally, the last advantage is that this index is temporally invariant. So we use this measure in analysis. In practical terms, it can be define as follows:

$$\tilde{R}^2 = 1 - \frac{\sum_1^{T_0} \left(Tax_{1t} - \widehat{Tax}_{1t}^N\right)^2}{\sum_1^{T_0} \left(Tax_{1t} - \overline{Tax}_{1t}\right)^2} \tag{4}$$

with $\widehat{Tax}_{1t}^N$ is the estimated placebo effect and $\overline{Tax}_{1t} = \frac{\sum_1^{T_0} Tax_{1t}}{T_0}$.

3.2 Inference

Given small number of countries in our sample and absence of randomization, it is not possible to use conventional statistical inference methods. Abadie et al. (2015) propose an inference procedure for small samples based on a placebo test. They seek to determine whether estimated effect of reform for treated unit is greater than that of units not exposed to reform, when the synthetic control method is applied to each units in control group. If estimated effect of reform for treated unit is less than the placebo effects, then reform has

no relevant effect (Abadie et al., 2015).

Formally, for each country $i \in 1, ..., N$ and $t \in T_0, ..., T$, Abadie et al. (2015) compare effect of intervention in the treated country, δ_{1t}, to effect of intervention in control group δ_{jt}. To detect whether estimated effect for δ_{1t} is more important than δ_{jt} for certain periods, they suggest using the distribution of following statistic:

$$RMSPE_i = \frac{\sum_{t=T_0+1}^{T} \left(Tax_{1t} - \widehat{Tax}_{it}^{N} \right)^2 / (T - T_0)}{\sum_{t=1}^{T_0} \left(Tax_{1t} - \widehat{Tax}_{it}^{N} \right)^2 / T_0} \tag{5}$$

In addition, they propose to calculate a P-value:

$$P = \frac{\sum_{i=1}^{N} D_i}{N} \tag{6}$$

Where D_i is equal to 1 if $RMSPE_j \geq RMSPE_1$. Abadie et al. (2015) recommend rejecting null hypothesis of no effect, at the 10% probability threshold.

Firpo and Possebom (2017) claim, however, that the way the P-value is conceived in the equation ((6)) implicitly assumes a uniform distribution of the probability of being treated. However, if true probabilities of assignment to reform for each unit of control group differ from the discrete uniform distribution assumed by Abadie et al. (2015), P-value is biased. Therefore, test based on uniform probability of assignment of reform will be biased (Firpo and Possebom, 2017). Firpo and Possebom (2017) propose therefore an extension of inference procedure based on a parametric form of treatment probabilities. They suggest distorting probability of treatment assignment by changing decision of test procedure, while preserving relative lack of knowledge about this distribution. It is therefore a sensitivity analysis that allows in an empirical analysis to measure robustness of its conclusions[3] to hypothesis of uniform distribution, by distorting the latter as little as possible.

In empirical section below, we use approach of Firpo and Possebom (2017). Given that $(N) = 18$ for each case treated in our study, we set significance threshold at $\frac{2}{18} = 0.11 \approx 0.1$ which corresponds to significance threshold recommended by Abadie et al. (2015). We also use confidence interval proposed by Firpo and Possebom (2017). Under assumption H_0

[3] i.e. test's decision to reject hypothesis of nullity of estimated effect

of a null effect, confidence interval contains estimated effects for which H_0 cannot be rejected. In this study we focus on time-linear effect of SARAs. We also believe that confidence intervals are useful because they will allow us to test two hypotheses from previous literature review :

H1 : SARAs promote better revenue mobilization than traditional tax administrations.

H2 : SARAs have a persistent impact on tax revenue mobilization.

4 Data

Tax revenues excluding natural resources are output variable. They come from work of Mansour (2014), and are expressed as percentage of GDP. Covariates that capture characteristics of pre-treatment period are drawn from the literature on tax revenue determinants. These include GDP per capita, value added of agricultural and industry sectors, share of natural resources in GDP that we measure by rents, exports, imports, foreign aid in % GNI and population size. A list of all variables used in analysis is provided in table 2, as well as their sources.

Our initial sample is a panel data set covering 40 subsaharan African countries for period 1980-2010. Among these countries, 17 have adopted SARA reform. The appendix table 3 presents the list of countries that have implemented a SARA and year of reform adoption. In order to build up our analysis sample, we need to take into account several considerations. The first consideration relates to conditions of inference. It is important that pre-treatment period is not short, to avoid risk of bias in the marginal distribution of statistics referred to by Ferman and Pinto (2017). Among countries treated, it appears that only Ghana has a low pre-treatment period (5 years). So we're taking Ghana out of the sample. We are also withdrawing Burundi from treated countries. We consider that Burundi can be integrated into control group since the reform adopted in the last available year of our sample. In addition, we are withdrawing Zimbabwe because of low reliability of Zimbabwe's data over the period under review.

The second consideration relates to observation period of reform effect. Sarr (2016) retained countries that implemented the reform before 2000 in order to have at least ten

years of post-treatment to assess not only short-term impact, but also medium-term impact of the reform. We believe that this methodology does test whether SARAs have a persistant effect. However, since our study is limited to sub-Saharan Africa, this approach leads to abandonment of some countries, resulting in significant loss of relevant information to test reform effect. So, we decide to keep all countries except Ghana and Zimbabwe. The final concern is related to synthetic control implementation. Synthetic control requires that the panel does not contain serious observation gaps for the different variables. If this condition is not met, the estimate cannot be executed. In our data, Democratic Congo, Namibia, Chad, Guinea, Seychelles and Swaziland record serious gaps. We are therefore removing these countries from control group used in the estimates. Finally, our treatment group includes 14 countries and our control group 17 countries.

The tables 4, 5 et 6 show tax revenue trends for low-income, lower- and upper-middle-income countries respectively. Yellow-highlighted figures mark the average level of tax revenue over five-year period during which SARA was established. It appears two facts. First, countries with SARAs did not have same experiences after the reform in short term[4] Ethiopia, Malawi, Rwanda and Uganda, for example, saw an increase respectively of 2.4%, 2.6%, 1.8% and 3% of GDP. In contrast, Tanzania, Kenya and South Africa experienced declines in tax revenues of -0.01%, -1.06% and -0.53% of GDP. Also compared to period of adoption of the reform, the level of tax revenues increased in the last period in countries with SARAs with exception of Ethiopia and Zambia. The latter two experienced respectively a decline in their tax revenues of -0.44% and -2.62% of GDP. These differences in results do not allow us to decide both on the short-term and medium-term effects of SARAs.

Second, some countries that do not have SARAs have results as well as those that have implemented the reform. This is easily apparent from the results highlighted in green. Indeed, statistics show that countries such as Burundi, Benin, Burkina Faso, Côte d'Ivoire, Cape Verde or even Namibia are able to raise tax revenues as large as those of countries with SARAs. These results suggest that SARAs would not be more effective than conven-

[4]We refer to the short term as the period directly following the five-year period in which the reform was implemented. However, it should be noted that the last period is six years, of the fourteen countries that have implemented SARA, five countries experienced an average increase in revenues relative to the average level of tax revenue when SARAs were implemented.

tional jurisdictions in terms of tax revenue mobilization. This hypothesis will be verified in our empirical analysis.

5 Results

5.1 Effect of the Reform

This section shows results of 14 analysed cases. First, we assume that synthetic control estimator is not biased. This hypothesis allows to apply classic estimator of synthetic control of Abadie et al. (2010, 2015). Secondly, we accept possibility of bias in synthetic control. Thus, for each variable, we remove average of pre-treatment in accordance with approach of Ferman and Pinto (2016). We then select results to be retained using adjustment quality criteria (RMSPE and $\tilde{R}^2$). Note that in addition to covariates, we used first and last year of pre-treatment tax revenues as predictors. Sarr (2016) used a similar methodology. This modelling is in line with recommendations of Kaul et al. (2015). In addition, this helps to control adjustment quality.

Results are summarized in tables 7, 8, 9 and 10. Mention "original" indicates that the use of classical synthetic control, and mention "demeaned" indicates modified synthetic control. Results can be categorized into 3 groups based on their level of satisfaction with the requirements of synthetic control, namely "balance" and "adjustment" of pre-treatment period. There is no clearly established threshold for meaningfulness to assist in assessment of pre-treatment adjustment. Therefore, our classification of results based on how they meet the requirements of synthetic control is inevitably subjective to some extent. We define 3 groups each associated with a degree of satisfaction from adjustment of the pre-treatment period. We classify in the first group countries whose $RSMPE$ is less than or equal to 0.2[5] and the $\tilde{R}^2$ greater than or equal to 0.5. It appears that only Tanzania can be ranked in the first group. In the second group, we consider those countries for which one of quality measures, i.e., $RSMPE$ or $\tilde{R}^2$, meets the criteria defined above. These are essentially Ethiopia, Gambia, Kenya, Mauritius, Mozambique, Malawi, South Africa and Zambia. All these countries have a $RSMPE$ less than 0.2 while their $\tilde{R}^2$ is above 0.5. Finally, the last group is constituted of countries that do not meet any of defined

[5](Olper et al., 2018) use similar classification.

criteria. These are essentially Botswana, Lesotho, Rwanda, Sierra Leone and Uganda. These countries have a $RSMPE$ greater than 0.2 and a $\tilde{R}^2$ less than 0.5.

In this study, only results of countries classified in the first and second groups are interpreted. The low predictive quality of the pre-treatment period for the third group countries suggests that the risk of error in identifying SARA impact should be increased for Botswana, Lesotho, Rwanda, Sierra Leone and Uganda.

To facilitate interpretation of results, we present actual variable, counterfactual and estimated effect. Figures 1, 2 and 3 graphically summarize the results of classic synthetic control. Vertical line represents year of reform. Solid line represents tax revenue collected while dash line represents the counterfactual. We examine significance of estimated effects using placebo test defined by Firpo and Possebom (2017) at the 10% threshold. This is in line with the threshold used by Abadie et al. (2015). The thresholds of significance are represented by the grey areas on the graphs of the estimated effects.

5.1.1 Positif impact

The results show that for Gambia, South Africa and Zambia, actual tax revenues are above the counterfactual, from year of reform. However, the significance test indicates that estimated positive effect is statistically significant only over a short period (see figure 1). In medium term, estimated effect is not significant. These results imply that adoption of SARAs has led to increased tax revenues in Gambia, South Africa, and Zambia, only in short term. In medium term, SARA reform not caused significant changes in the level of tax revenues compared to a traditional tax administration.

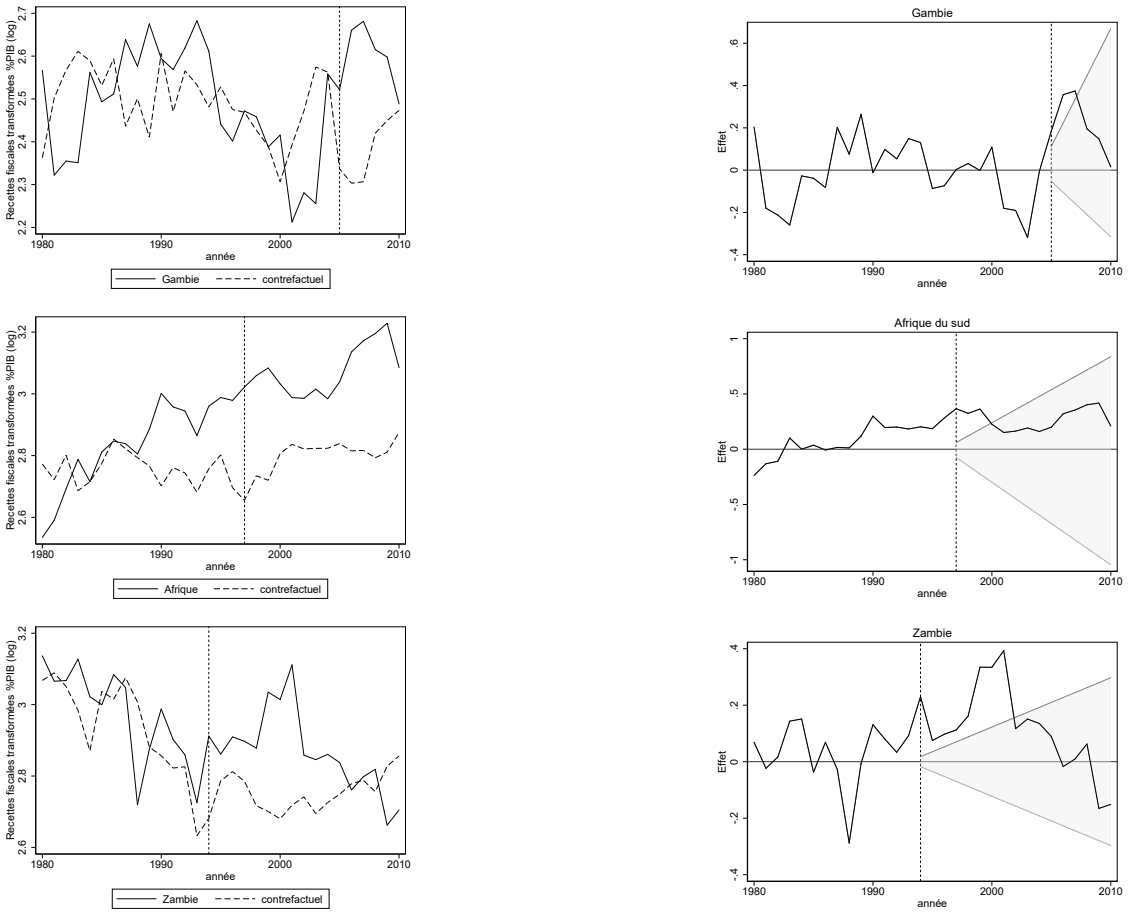

Figure 1: Baseline results for Gambia, South Africa and Zambia

5.1.2 Negative impact

For Malawi and Tanzania, results show that actual tax revenue is below the counterfactual, from year of reform (see figure 2). After a few years, actual tax revenue goes above the counterfactual. The significance test shows that only the decline in tax revenues is statistically significant. In the medium term, estimated effect is not significant. These results imply that adoption of SARAs has led to decrease tax revenues in Malawi and Tanzania, only in short term. In medium term, SARA reform not caused significant changes in the level of tax revenues compared to a traditional tax administration.

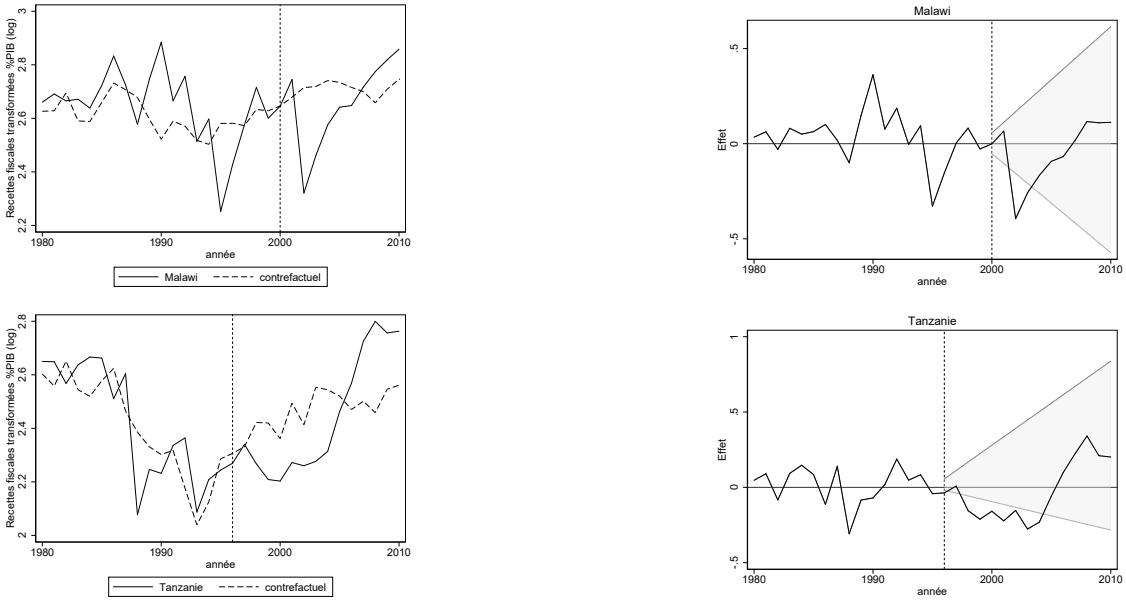

Figure 2: Baseline results for Malawi and Tanzania

5.1.3 Insignificant impact

The results show that the estimated effect is not significant for Ethiopia, Kenya, Mozambique and Mauritius (see figures 3). In other words, reform of SARAs has not caused significant changes in level of tax revenues in Ethiopia, Kenya, Mozambique and Mauritius, compared to countries that have not adopted the reform.

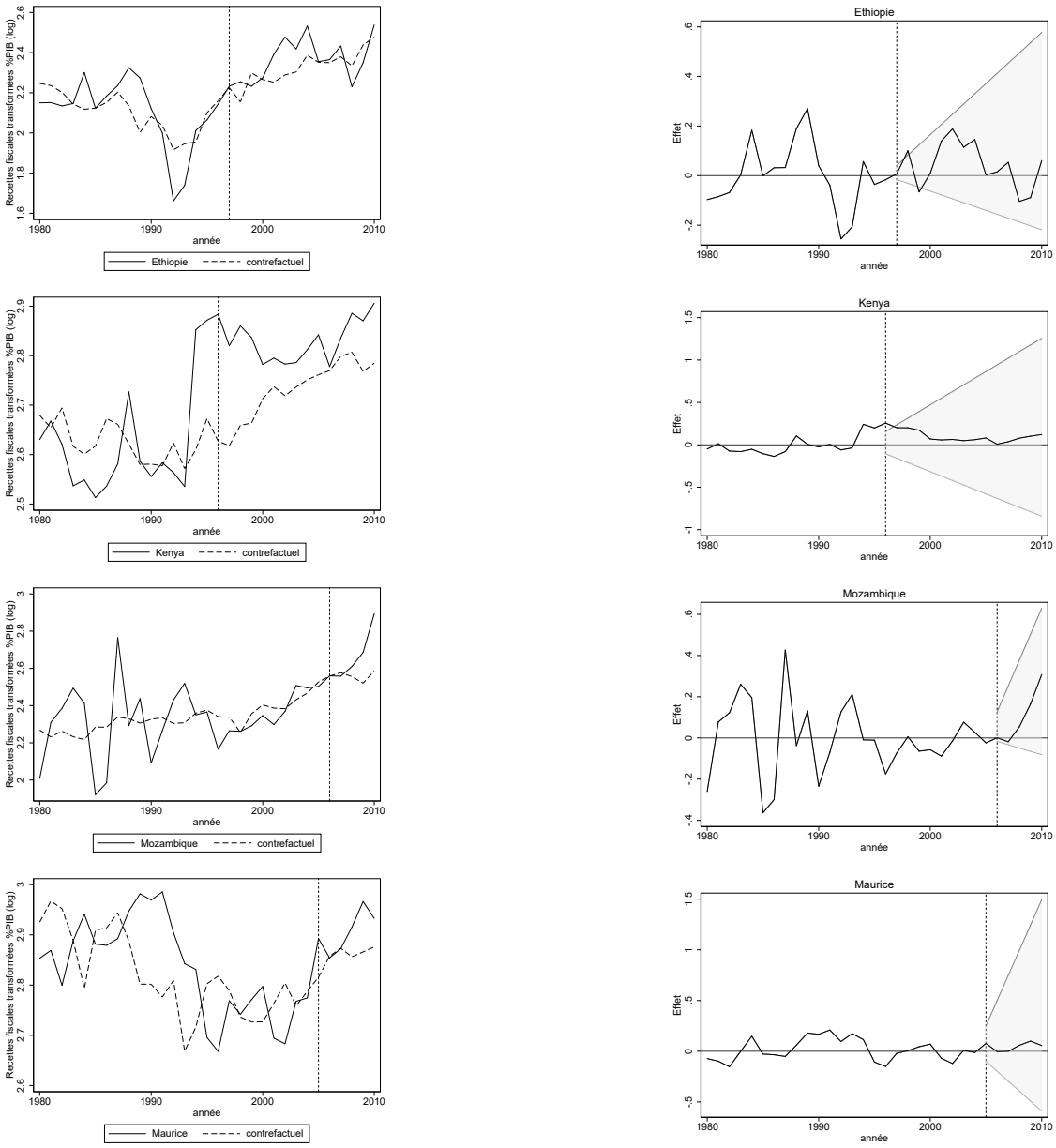

Figure 3: Baseline results for Ethiopia, Kenya, Mozambique and Mauritius

5.2 Sensitivity Analysis

In this section, we carry out additional tests to verify the robustness of our results. Ferman and Pinto (2016) have shown that synthetic control estimator can be biased. Indeed, estimator may not properly reconstruct weight of unobserved factors, even when number of pre-treatment periods goes to infinity. To correct this bias, they suggest, for the different variables of each unit, to subtract average from pre-treatment period. They demonstrate that this procedure produces results identical to classical synthetic control estimator, when

output after treatment is not correlated to common factors. However, when correlation of output and unobserved common factors is effective, this correction produces much better results, especially when number of control units is low. We believe that this procedure is adapted to our data. First, because our control group sample is 17 countries, which is relatively small.

Second, because Gbato (2017)[6]. has detected the presence of unobserved common factors in African tax variables. The results obtained are recorded in tables 7, 8, 9 and 10 with the mention "demeaned", as well as on Figures 4, 5 and 6. It appears that they are similar to the results of the previous section. Given the limited size of our study sample, we looked at whether the results vary when the control group sample is varied. In practical terms, various developing countries on different continents were included in the control group. This allowed us on the one hand to check whether the estimated effects are conditional on the sample. The results remained unchanged.

5.3 What explains the successes and failures of SARA reform within SSA countries?

This section attempts to explain these observed variations in the impact of SARA, in an effort to derive useful policy lessons for Sub-Saharan African countries. According Mann (2004), institutions can play a relevant role in SARA effect. Empirical evidence has shown that corruption reduces tax revenues (see Abed and Gupta (2002), for a summary of explanatory studies). According Ghura (1998), pervasive corruption in an economy is expected to lower investment and economic growth, and thus weaken the tax base. Aizenman and Jinjarak (2008) found that the efficiency of tax collection is affected by political instability. More precisely, a decrease in political stability determines a low efficiency of tax collection. Azzimonti (2011) emphasised that a rise in the level of political instability generate a decrease of tax revenue available to next period's policymaker. Furthermore, according to some authors (Acemoglu and Robinson, 2006; Boix, 2003)[7], democracy is important to redistribute income from the rich to the poor, to create an enlarged welfare state, and a stronger and more efficient tax system. In addition, an a priori assumption

[6]He used the Pesaran (2015)
[7]cited by Dioda (2012)

is that under a non-democratic regime the size of the public sector would be relatively small, because a large part of citizens is excluded from the decision-making process. Thus, a growth in democracy would coincide with increase in taxes and public spending in accordance with the theory of the median voter, moving in the direction of a better redistribution of wealth (Dioda, 2012). We capture institution with 4 variables. Quality of government is the mean value of the ICRG variables "Corruption", "Law and Order" and "Bureaucracy Quality", scaled 0-1. Higher values indicate higher quality of government. Democracy index drawn from Freedom House database, scale ranges from 0-10 where 0 is least democratic and 10 most democratic.

We control for level of development, economic structure and foreign aid as define in previous sections(see section 4)[8]. We also control for macroeconomic environment. A macroeconomic environment can be control with effective exchange rates, inflation and level of debt. Agbeyegbe et al. (2006) note that there is often an inverse relationship between a country's tax revenue and the real level of its official exchange rate. They argue that overvaluation has a direct effect by suppressing import and export bases measured in domestic currency terms. Overvaluation also has indirect effects by reducing the incentive to produce goods for export, encouraging capital flight and currency substitution, weakening the balance of payments, encouraging black markets. They note that even in heavily indebted countries, where it is generally assumed that devaluation weakens the fiscal balance through its effect on debt service, higher revenues may offset increases in debt service. We also control for financial development. Financial sector development may indirectly or directly influence tax revenue in several ways. First, financial sector development may lead to economic development. Hence, expansion of taxable economic activities, which in turn, increases direct tax revenue. Second, economic growth brings prosperity and boosts the demand for goods and services which raises new investments. As a result the income tax base will increase which contributes to direct tax revenues. Third, both financial development and economic growth might discourage the spread of shadow economy and boost tax revenues. Finally, financial development could directly increase tax revenues as it facilitates tracking and collection of taxes (Ebi, 2018). Sources

[8]We use "De facto" trade globalization index as proxy of trade, since data of trade are missing for several countries as Ethiopia. "De facto" trade globalization index is composed of Exports and imports of goods and services (% of GDP), and market concentration index for exports and imports of goods (inverted)

of data are defined in table (2).

We provide in this section a simple test to identify fundamental characteristics of countries which drive heterogeneity in SARAs effects. The goal is to better understand which of these factors are more important in explaining variations in SARAs impact after controlling for basic country characteristics. We control for fixed specific effect of countries that could determine tax revenue. We also included time-fixed effects to control for inobserved temporal factors across countries [9]. In order to mitigate possible endogeneity between controls variables and dependent variable, we use the first lag of all variables.

Table 1 presents results of fixed effect models using panel data for treated countries and covering the post-treatment years, since the interest is to explain variations in the estimated tax revenue gains. In columns 1-5, the dependent variable is SARA effect estimated by classic synthetic control. In columns 6-10, the dependent variable is SARA effect estimated by modified synthetic control.

The findings suggest quality of institutions explains much of variation in SARAs effects. Quality and stability of government have driven successes of SARAs. However, political corruption has led to failed of SARA. In other word, more quality of bureaucracy, rule of law and stability is important in government, and more SARA can be successful. However, more government is corrupted, an more SARA can failed. These results are not surprising and are in accordance with intuition of Mann (2004), implying that without strong institutions SARA reform cannot be successful. This provides useful insights in determining policy priorities in terms of tax reforms implementation as well as strengthening institutions in the effort to enhance tax revenue in subsaharan Africa.

[9]The Wald test reject null hypothesis that the coefficients for all times dummies are jointly equal to zero, therefore time fixed effects are needed.

Table 1: Determinants of SARA successes

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Quality of government$_{t-1}$	1.006***				0.755***	0.982***				0.781***
	(0.206)				(0.260)	(0.211)				(0.253)
Government stability$_{t-1}$		0.0308**			0.0273**		0.0283**			0.0287**
		(0.0123)			(0.0123)		(0.0127)			(0.0131)
Political corruption$_{t-1}$			-0.776***		-0.832**			-0.808***		-0.846**
			(0.290)		(0.341)			(0.284)		(0.345)
Democracy$_{t-1}$				0.0221	0.0170				0.0251	0.0154
				(0.0170)	(0.0156)				(0.0174)	(0.0137)
Inflation$_{t-1}$	-0.00540***	-0.00475*	-0.00465**	-0.00552**	-0.00460**	-0.00576***	-0.00516*	-0.00500**	-0.00593**	-0.00498**
	(0.00195)	(0.00262)	(0.00231)	(0.00234)	(0.00207)	(0.00207)	(0.00277)	(0.00242)	(0.00244)	(0.00230)
Financial development$_{t-1}$	-6.28e-05	-0.000663	0.00105	0.000538	0.00100	-0.000480	-0.00101	0.000706	0.000210	0.000688
	(0.00144)	(0.00199)	(0.00153)	(0.00184)	(0.00160)	(0.00145)	(0.00193)	(0.00149)	(0.00181)	(0.00162)
REER$_{t-1}$	-0.00401***	-0.00316***	-0.00396***	-0.00371***	-0.00459***	-0.00375***	-0.00292***	-0.00374***	-0.00351***	-0.00424***
	(0.000834)	(0.000900)	(0.000882)	(0.000887)	(0.000861)	(0.000854)	(0.000934)	(0.000898)	(0.000897)	(0.000872)
Debt$_{t-1}$	0.00150***	0.00110***	0.00174***	0.00114***	0.00182***	0.00160***	0.00120***	0.00186***	0.00122***	0.00185***
	(0.000426)	(0.000394)	(0.000435)	(0.000417)	(0.000484)	(0.000459)	(0.000418)	(0.000462)	(0.000442)	(0.000511)
GDP per capita$_{t-1}$ (log)	0.146	0.111	0.783***	0.693**	0.348	0.176	0.127	0.810***	0.727**	0.185
	(0.262)	(0.0959)	(0.253)	(0.276)	(0.310)	(0.273)	(0.101)	(0.259)	(0.282)	(0.163)
Agriculture$_{t-1}$	0.00617	-0.00366	-0.00771	-0.00116	-0.00516	0.00518	-0.00428	-0.00885	-0.00202	-0.00621
	(0.00747)	(0.00741)	(0.00751)	(0.00736)	(0.00941)	(0.00793)	(0.00783)	(0.00801)	(0.00780)	(0.00997)
Trade$_{t-1}$	0.00195	0.00447**	0.00291	0.00496**	0.00360	0.00228	0.00477**	0.00319	0.00548**	0.00413*
	(0.00207)	(0.00222)	(0.00213)	(0.00237)	(0.00217)	(0.00221)	(0.00237)	(0.00227)	(0.00247)	(0.00230)
Rents$_{t-1}$	-0.000849	-0.00308	-0.00349	-0.00363	-0.00483	-0.00136	-0.00361	-0.00407	-0.00438	-0.00591
	(0.00410)	(0.00458)	(0.00440)	(0.00480)	(0.00481)	(0.00432)	(0.00477)	(0.00463)	(0.00500)	(0.00499)
Aid$_{t-1}$	0.00629**	0.00475	0.00545*	0.00424	0.00639**	0.00622*	0.00466	0.00544	0.00411	0.00621**
	(0.00290)	(0.00391)	(0.00318)	(0.00378)	(0.00278)	(0.00314)	(0.00415)	(0.00340)	(0.00401)	(0.00296)
Observations	89	89	95	95	89	89	89	95	95	89
Number of countries	7	7	8	8	7	7	7	8	8	7
R-squared	0.776	0.799	0.729	0.721	0.805	0.769	0.795	0.727	0.720	0.849

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

All regressions include time fixed-effect

6 Conclusion

This chapter aimed to identify the impact of SARAs on tax revenues mobilization in sub-Saharan Africa. Overall, the results show that the estimated impact of the reform differs in both short and medium term between countries. Estimates indicate that SARA reform may not be achieving the desired results. Many of our findings confirm those of previous studies on the performance of SARA. For example, we find that SARAs had a positive and significant impact on South Africa's tax revenues such as Taliercio Jr (2004) and Sarr (2016). For Tanzania, our results suggest a significantly negative impact of SARA and this conclusion confirms that of Mann (2004) and Sarr (2016). Our results also confirm the negative effect of SARAs on tax revenues mobilization from Kenya and Zambia found by Sarr (2016). However, unlike Sarr (2016), we find a negative effect on Malawi's tax revenues. In addition, we clearly identify a positive impact of SARAs on Rwanda's tax revenues.

The negatively significant effects identified in the short and/or medium term for Lesotho, Malawi, Tanzania and Zambia mean that SARAs have resulted in significant tax revenues losses in these countries, compared to the lack of reform. These results may be due in the early post-reform years, to a difficult implementation due to the resistance of the losers of the reform. It is also possible that these losses are due to confusion in the roles and responsibilities of SARAs and other public services. In the second time, in the medium term, these losses could be the result of poor institutional quality or a lack of coordination of SARAs with other public services.

The significantly positive effects identified in the short and/or medium term for South Africa and The Gambia imply that SARAs have generated significant revenue gains in these countries, compared to the absence of reform. However, the downward trend in the estimated effect confirms the hypothesis of a short positive benefit of SARAs.

Otherwise, analysis showed that effectiveness of SARA depends largely on the quality of institutions. Indeed, the quality and the stability of government have played a positive role in SARA's performance. In contrast, the corruption, and precisely political corruption, has fostered the failure of SARA.

On the whole, these results mean that even when the reform allows for more efficient tax

revenue mobilization compared to traditional administration, this efficiency is momentary. Forced by a weak institutional environment or by the adaptation of taxpayers inclined to tax evasion, the effectiveness of SARAs ended up joining that of traditional administration. The non-significant effects estimated for other countries imply that SARAs have not resulted in significant tax revenue gains or losses in these countries, compared to the absence of reform.

Our results confirm the conclusions of Sarr (2016) and Dom (2018). But they lead to nuance results of Ebeke et al. (2016) and Ahlerup et al. (2015). To end, we conclude that SARA reform may have a variety of effects on non-resource tax revenues in the short term. However, in the medium term, SARAs do no better than traditional administration. Therefore, sub-Saharan African countries that have not yet adopted the SARA reform can increase their tax effort and thus their level of taxation by improving quality of institutions and by modernizing traditional administrations.

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Annexe

Table 2: Variables

variable	label	source
Non-resources tax revenues	ntax	FERDI
GDP per capita	GDPpercapita	World Bank database
Agriculture % GDP	agriculture	World Bank database
industry %GDP	industry	World Bank database
Resources rents %GDP	rents	World Bank database
Exports %GDP	export	World Bank database
Imports %GDP	import	World Bank database
Aid %GNI	aid	World Bank database
Total population	population	World Bank database
Domestic credit to private sector (% of GDP)	Financial Development	World Bank database
Inflation annual percentage change	Inflation	World Eonomic Outlook
Annual Debt of government percentage % GDP	Debt	IMF
Real effective exchange rate	REER	Darvas (2012)
De facto trade globalization index	Trade	KOF institute
Index of quality of government	Quality of Government	ICRG
Index of government stability	Government stability	ICRG
Index of corruption at political level	Political Corruption	Quality of Government database
Democracy index	Democracy	Freedom House database

Table 3: Year of adoption of the reform

country	Year of adoption (SARA)	pre-treatment	post-treatment
Botswana	2003	23 years	8 years
Burundi	2010	30 years	1 year
Ethiopia	1997	17 years	14 years
Gambia	2005	25 years	6 years
Ghana	1985	5 years	26 years
Kenya	1996	16 years	15 years
Lesotho	2001	21 years	10 years
Malawi	2000	20 years	11 years
Mauritius	2005	17 years	6 years
Mozambique	2006	18 years	8 years
Rwanda	1998	18 years	13 years
Sierra Leone	2003	23 years	8 years
South Africa	1997	17 years	14 years
Tanzania	1996	16 years	15 years
Uganda	1992	12 years	19 years
Zambia	1994	14 years	17 years
Zimbabwe	2001	21 years	10 years

Table 4: Tax revenues trend in low-income countries

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2010
Ethiopia	8.834	9.307	6.833	8.919	11.28	10.84
Malawi	14.38	15.24	14.76	12.51	12.94	15.59
Rwanda	9.074	10.56	8.05	9.161	10.99	11.77
Uganda	5.619	5.26	7.073	10.14	10.27	11.84
Tanzania	13.94	11.52	9.492	9.649	9.639	14.68
Burundi	12.4	13.9	14.9	14.78	18.4	17.38
Benin	12	9.239	9.333	12.31	14.41	16.22
Burkina Faso	8.345	8.775	8.686	11.35	11.07	11.97
Central Afrique Republic	11.68	9.227	8.125	7.874	7.743	7.252
Congo Dem. Rep			3.514	1.022	3.59	7.129
Comoros	10.63	10.94	12.28	10.99	11.21	9.34
Guinea	4.713	7.568	5.802	7.055	8.14	10.5
Guinea Bissau.	5.718	4.014	3.548	4.129	5.007	6.677
Madagascar	12.8	9.931	8.156	9.385	9.924	11.08
Mali	10.59	11.79	9.691	11.83	13.11	12.86
Niger	10.36	8.637	6.751	7.767	9.805	10.7
Senegal	14.96	13.27	14.19	14.56	16.71	18.37
Tchad	2.595	4.284	4.824	6.544	6.718	6.667
Togo	23.34	17.96	10.42	11.37	13.17	15.37

Table 5: Tax revenues trend in low middle-income countries

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2010
Kenya	13.49	13.35	13.81	17.37	16.31	17.36
Zambia	21.86	19.18	17.83	18.51	18.99	15.89
Côte d'Ivoire	20.67	20.54	16	15.87	15	16.26
Cameroon	11.59	7.679	8.206	9.467	11.17	11.55
Congo Rep.	15.44	13.58	11.89	9.281	7.993	6.71
Cabo Verde	12.05	11.5	15.02	16.65	19.68	22.32

Table 6: Tax revenues trend in upper middle-income countries

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2010
South Africa	14.42	17.08	19.04	20.64	20.11	23.21
Gabon	12.44	13.9	10.85	11.99	12.32	11.57
Mauritius	17.66	18.49	18.33	15.33	15.56	18.29
Namibia	19.19	21.86	23.86	24.97	25.76	23.68

Table 7: Results for Botswana, Ethiopia, Gambia and Kenya

country	Botswana(original)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&2002))	2,41	2,34	Congo Rep.	0,41
log(rents)	1,17	1,87	Cabo verde	0,45
log(industry)	3,78	3,53	Nigeria	0,15
log(export)	4,00	3,46		
log(import)	4,21	4,03		
log(aid)	2,25	1,91		
log(agriculture)	2,37	2,57		
log(population)	13,87	14,19		
log(GDPpercapita)	7,64	7,25		
RMSPE		0,22		
$\tilde{R}^2$		0,04		

country	Botswana(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&2002))	-0,003	-0,02	Congo Rep.	0,38
log(rents)	-1,45	-0,49	Cabo verd	0,51
log(industry)	0,87	0,43	Nigeria	0,11
log(export)	0,98	0,32		
log(import)	0,43	0,42		
log(aid)	-0,71	0,16		
log(agriculture)	-1,59	-0,71		
log(population)	-1,16	-1,16		
log(GDPpercapita)	1,35	0,58		
RMSPE		0,23		
$\tilde{R}^2$		0,03		

country	Ethiopia(original)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1996))	2,15	2,20	Burkina F.	0,37
log(rents)	2,39	1,86	Guinea bissau	0,12
log(industry)	2,23	2,91	Mali	0,18
log(export)			Niger	0,33
log(import)				
log(aid)	1,72	2,75		
log(agriculture)	3,94	3,57		
log(population)	17,54	15,59		
log(GDPpercapita)	5,36	6,01		
RMSPE		0,13		
$\tilde{R}^2$		0,44		

country	Ethiopia(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1996))	-0,21	-0,16	Burkina F.	0,37
log(rents)	0,50	-0,05	Guinea bissau	0,12
log(industry)	-0,82	-0,14	Mali	0,18
log(export)			Niger	0,33
log(import)				
log(aid)	-0,47	0,58		
log(agriculture)	0,64	0,26		
log(population)	2,38	0,43		
log(GDPpercapita)	-1,40	-0,75		
RMSPE		0,13		
$\tilde{R}^2$		0,26		

country	Gambia(original)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&2004))	2,56	2,51	Côte d'Ivoire	0,15
log(rents)	1,06	1,33	Congo	0,00
log(industry)	2,61	2,87	Comoros	0,57
log(export)	3,53	3,17	Gabon	0,22
log(import)	3,75	3,63	Madagascar	0,06
log(aid)	2,67	2,19		
log(agriculture)	3,19	3,21		
log(population)	13,74	13,84		
log(GDPpercapita)	6,25	7,34		
RMSPE		0,13		
$\tilde{R}^2$		-0,04		

country	Gambia(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&2004))	0,13	0,13	Côte d'Ivoire	0,19
log(rents)	-0,98	-0,77	Comoros	0,48
log(industry)	-0,44	-0,25	Gabon	0,13
log(export)	0,47	0,05	Madagascar	0,15
log(import)	0,29	0,11	Senegal	0,06
log(aid)	0,49	0,10		
log(agriculture)	-0,09	0,01		
log(population)	-1,59	-0,95		
log(GDPpercapita)	-0,48	0,36		
RMSPE		0,14		
$\tilde{R}^2$		0,52		

country	Kenya(original)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1995))	2,75	2,68	Burundi	0,24
log(rents)	1,39	1,39	Côte d'Ivoire	0,33
log(industry)	2,87	2,87	Cabo verde	0,24
log(export)	3,40	2,96	Gabon	0,03
log(import)	3,55	3,62	Madagascar	0,12
log(aid)	1,82	1,82	Nigeria	0,04
log(agriculture)	3,33	3,33		
log(population)	16,62	15,01		
log(GDPpercapita)	6,80	6,78		
RMSPE		0,10		
$\tilde{R}^2$		0,07		

country	Kenya(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1995))	0,38	0,30	Burundi	0,43
log(rents)	-0,54	-0,14	Côte d'Ivoire	0,21
log(industry)	-0,20	-0,14	Cabo verde	0,11
log(export)	0,29	-0,14	Gabon	0,15
log(import)	-0,13	-0,13	Madagascar	0,10
log(aid)	-0,05	-0,05		
log(agriculture)	0,09	0,05		
log(population)	1,61	-0,11		
log(GDPpercapita)	0,01	0,01		
RMSPE		0,10		
$\tilde{R}^2$		0,56		

Table 8: Results for Lesotho, Mauritius, Mozambique and Malawi

country	Lesotho(original)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&2000))	3,42	2,81	Burundi	0,19
log(rents)	1,63	1,62	Côte d'Ivoire	0,08
log(industry)	3,06	2,97	Cabo verde	0,04
log(export)	3,00	3,20	Senegal	0,42
log(import)	4,73	3,59	Togo	0,28
log(aid)	2,47	2,50		
log(agriculture)	2,48	3,30		
log(population)	14,27	15,48		
log(GDPpercapita)	6,51	6,49		
RMSPE		0,81		
$\tilde{R}^2$		-24,74		

country	Lesotho(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&2000))	1,02	0,48	Côte d'Ivoire	1,00
log(rents)	-0,12	-0,43		
log(industry)	0,05	0,04		
log(export)	-0,05	0,50		
log(import)	1,10	0,10		
log(aid)	0,71	-1,31		
log(agriculture)	-0,87	0,00		
log(population)	-0,93	0,93		
log(GDPpercapita)	-0,46	0,82		
RMSPE		0,64		
$\tilde{R}^2$		-7,91		

country	Mauritius(original)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&2004))	2,81	2,86	Côte d'Ivoire	0,78
log(rents)	-3,03	1,14	Cabo verde	0,22
log(industry)	3,18	2,99		
log(export)	3,97	3,48		
log(import)	4,02	3,70		
log(aid)	1,26	1,46		
log(agriculture)	2,55	3,14		
log(population)	13,82	15,33		
log(GDPpercapita)	7,89	7,28		
RMSPE		0,11		
$\tilde{R}^2$		-0,30		

country	Mauritius(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&2004))	0,38	0,42	Côte d'Ivoire	0,78
log(rents)	-5,09	-0,86	Cabo verde	0,22
log(industry)	0,18	0,02		
log(export)	1,00	0,41		
log(import)	0,59	0,15		
log(aid)	-1,05	-0,49		
log(agriculture)	-0,81	-0,11		
log(population)	-1,34	0,22		
log(GDPpercapita)	1,24	0,49		
RMSPE		0,11		
$\tilde{R}^2$		0,45		

country	Mozambique(original)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&2005))	2,26	2,42	Burundi	0,15
log(rents)	2,05	1,79	Burkina F.	0,32
log(industry)	3,11	2,83	Madagascar	0,24
log(export)	1,81	2,50	Mali	0,25
log(import)	3,15	3,26	Nigeria	0,05
log(aid)	2,34	2,34		
log(agriculture)	3,62	3,55		
log(population)	16,36	15,96		
log(GDPpercapita)	5,07	6,05		
RMSPE		0,19		
$\tilde{R}^2$		-0,14		

country	Mozambique(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&2005))	-0,16	0,003	Burundi	0,15
log(rents)	0,15	-0,11	Burkina F.	0,32
log(industry)	0,07	-0,22	Madagascar	0,24
log(export)	-1,22	-0,54	Mali	0,25
log(import)	-0,37	-0,27	Nigeria	0,05
log(aid)	0,22	0,22		
log(agriculture)	0,32	0,24		
log(population)	1,22	0,81		
log(GDPpercapita)	-1,70	-0,72		
RMSPE		0,19		
$\tilde{R}^2$		0,10		

country	Malawi(original)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1999))	2,63	2,63	Burundi	0,32
log(rents)	1,84	1,72	Côte d'Ivoire	0,33
log(industry)	2,96	2,78	Mali	0,26
log(export)	3,18	2,94	Niger	0,08
log(import)	3,39	3,40	Togo	0,00
log(aid)	2,52	2,04		
log(agriculture)	3,63	3,63		
log(population)	15,73	15,71		
log(GDPpercapita)	5,94	6,42		
RMSPE		0,14		
$\tilde{R}^2$		-0,04		

country	Malawi(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1999))	0,23	0,23	Burundi	0,23
log(rents)	-0,10	-0,32	Côte d'Ivoire	0,29
log(industry)	-0,04	-0,28	Mali	0,40
log(export)	0,18	-0,16	Senegal	0,04
log(import)	-0,07	-0,16	Togo	0,06
log(aid)	0,58	0,10		
log(agriculture)	0,34	0,34		
log(population)	0,62	0,62		
log(GDPpercapita)	-0,81	-0,30		
RMSPE		0,14		
$\tilde{R}^2$		0,16		

Table 9: Results for Rwanda, Sierra Leone, Tanzania and Uganda

country	Rwanda(original)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1997))	2,29	2,31	Burundi	0,14
log(rents)	1,87	1,83	Burkina F.	0,05
log(industry)	3,01	2,90	Niger	0,81
log(export)	2,08	2,81		
log(import)	3,08	3,23		
log(aid)	2,75	2,69		
log(agriculture)	3,67	3,67		
log(population)	15,64	15,78		
log(GDPpercapita)	5,90	5,93		
RMSPE		0,20		
$\tilde{R}^2$		0,32		

country	Rwanda(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1997))	-0,09	-0,06	Burundi	0,15
log(rents)	-0,20	-0,20	Burkina F.	0,06
log(industry)	-0,01	-0,12	Niger	0,79
log(export)	-0,87	-0,20	Nigeria	0,006
log(import)	-0,50	-0,25		
log(aid)	0,27	0,42		
log(agriculture)	0,33	0,37		
log(population)	0,46	0,57		
log(GDPpercapita)	-0,77	-0,77		
RMSPE		0,20		
$\bar{R}^2$		0,25		

	Sierra Leone(original)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&2002))	2,52	2,27	Burundi	0,26
log(rents)	2,43	2,43	Cameroon	0,30
log(industry)	2,68	3,42	Madagascar	0,02
log(export)	2,90	2,90	Niger	0,12
log(import)	3,04	3,04	Nigeria	0,30
log(aid)	2,14	0,83		
log(agriculture)	3,61	3,55		
log(population)	15,14	16,49		
log(GDPpercapita)	6,13	6,73		
RMSPE		0,42		
$\tilde{R}^2$		0,07		

country	Sierra Leone(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&2002))	0,11	-0,15	Burundi	0,28
log(rents)	0,53	0,64	Central Africa rep.	0,10
log(industry)	-0,37	0,38	Cameroon	0,30
log(export)	-0,14	-0,14	Nigeria	0,32
log(import)	-0,49	-0,48		
log(aid)	0,02	-1,35		
log(agriculture)	0,31	0,26		
log(population)	0,01	1,29		
log(GDPpercapita)	-0,63	-0,0004		
RMSPE		0,42		
$\bar{R}^2$		0,10		

	Tanzania(original)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1995))	2,45	2,44	Burundi	0,15
log(rents)	2,35	2,29	Mali	0,24
log(industry)	2,69	3,18	Nigeria	0,18
log(export)	2,75	3,11	Togo	0,42
log(import)	3,70	3,45		
log(aid)	3,13	2,29		
log(agriculture)	3,77	3,60		
log(population)	16,87	15,81		
log(GDPpercapita)	6,16	6,31		
RMSPE		0,12		
$\tilde{R}^2$		0,66		

country	Tanzania(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1995))	0,08	0,08	Burundi	0,15
log(rents)	0,36	0,30	Mali	0,24
log(industry)	-0,36	0,13	Nigeria	0,18
log(export)	-0,30	0,07	Togo	0,42
log(import)	0,29	0,05		
log(aid)	0,67	-0,16		
log(agriculture)	0,47	0,31		
log(population)	1,75	0,70		
log(GDPpercapita)	-0,55	-0,39		
RMSPE		0,12		
$\bar{R}^2$		0,30		

	Uganda(original)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1991))	1,50	1,70	Comoros	0,19
log(rents)	2,75	2,75	Nigeria	0,81
log(industry)	2,17	4,01		
log(export)	2,36	3,01		
log(import)	2,87	2,87		
log(aid)	1,94	-0,64		
log(agriculture)	4,00	3,52		
log(population)	16,50	17,23		
log(GDPpercapita)	5,68	7,13		
RMSPE		0,59		
$\tilde{R}^2$		-0,12		

country	Uganda(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1991))	-0,84	-0,61	Burundi	0,15
log(rents)	1,09	1,00	Guinea bissau	0,20
log(industry)	-0,99	0,76	Nigeria	0,64
log(export)	-0,54	-0,37		
log(import)	-0,72	-0,63		
log(aid)	-0,11	-2,42		
log(agriculture)	0,74	0,36		
log(population)	1,34	1,73		
log(GDPpercapita)	-1,07	0,06		
RMSPE		0,62		
$\bar{R}^2$		-0,12		

Table 10: Results for South Africa and Zambia

South Africa(original)				
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1996))	2,76	2,73	Burundi	0,56
log(rents)	2,09	1,84	Côte d'Ivoire	0,44
log(industry)	3,69	2,80		
log(export)	3,32	2,89		
log(import)	3,13	3,32		
log(aid)	-1,47	2,84		
log(agriculture)	1,61	3,67		
log(population)	17,32	15,69		
log(GDPpercapita)	8,73	6,48		
RMSPE	0,17			
$\bar{R}^2$	-0,54			

country	South Africa(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1996))	0,40	0,37	Burundi	0,56
log(rents)	0,45	-0,09	Côte d'Ivoire	0,44
log(industry)	0,72	-0,29		
log(export)	0,31	-0,23		
log(import)	-0,33	-0,22		
log(aid)	-3,99	0,32		
log(agriculture)	-1,53	0,40		
log(population)	2,20	0,53		
log(GDPpercapita)	2,00	-0,27		
RMSPE	0,17			
$\bar{R}^2$	0,40			

Zambia(original)				
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1993))	2,93	2,85	Côte d'Ivoire	0,96
log(rents)	2,29	1,69	Senegal	0,04
log(industry)	3,63	3,00		
log(export)				
log(import)				
log(aid)	2,03	0,77		
log(agriculture)	2,66	3,19		
log(population)	15,64	15,98		
log(GDPpercapita)	7,13	7,52		
RMSPE	0,11			
$\bar{R}^2$	0,29			

country	Zambia(demeaned)			
variables	Treated	Synthetic	Donors	Weight
log (ntax(1980&1993))	0,62	0,54	Côte d'Ivoire	0,95
log(rents)	0,52	-0,47	Senegal	0,04
log(industry)	0,69	0,03	Togo	0,02
log(export)				
log(import)				
log(aid)	0,46	-0,98		
log(agriculture)	-0,59	0,03		
log(population)	0,60	0,96		
log(GDPpercapita)	0,27	0,60		
RMSPE	0,11			
$\bar{R}^2$	-0,85			

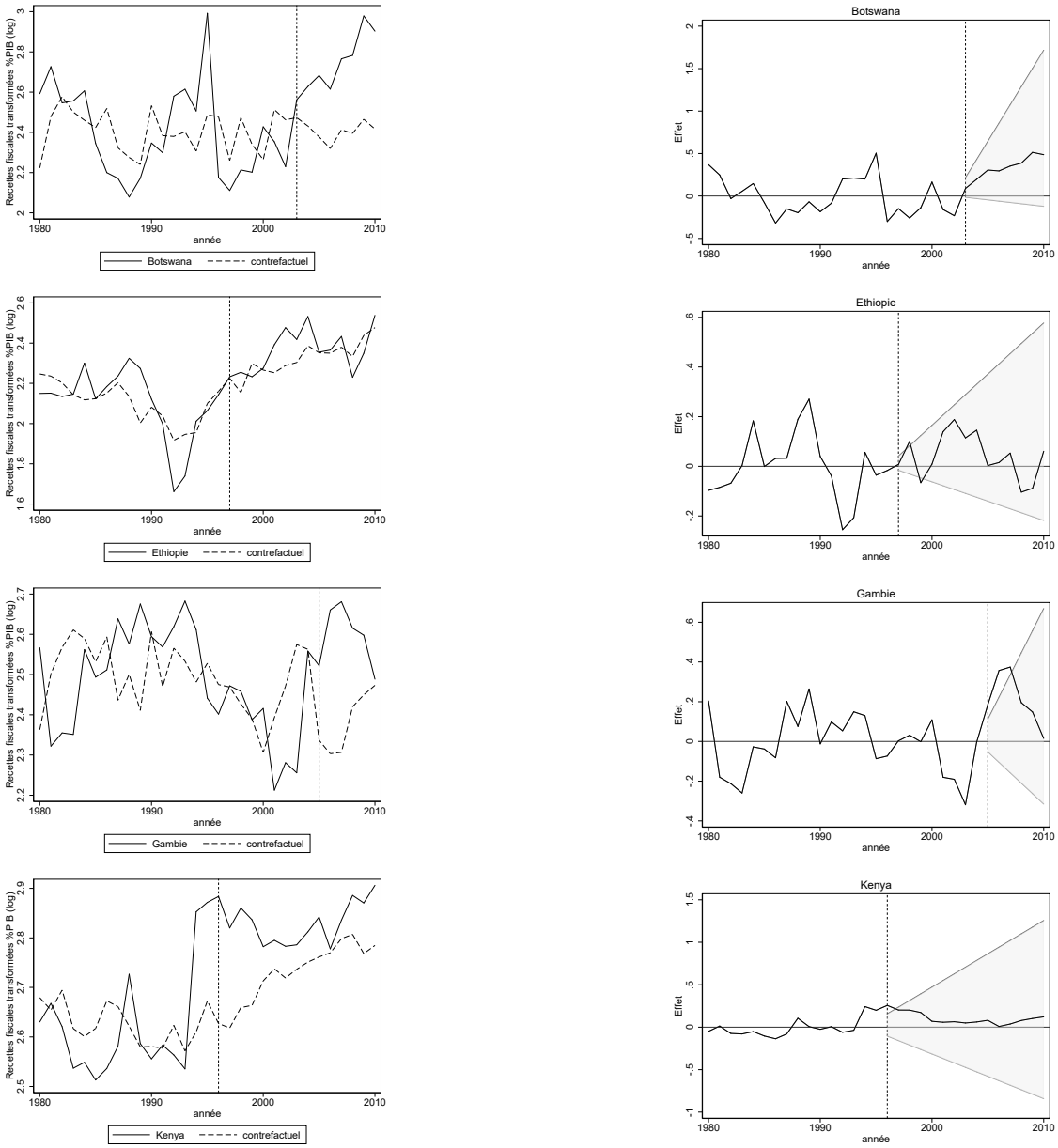

Figure 4: Synthetic control. vs Demeaned synthetic control (1)

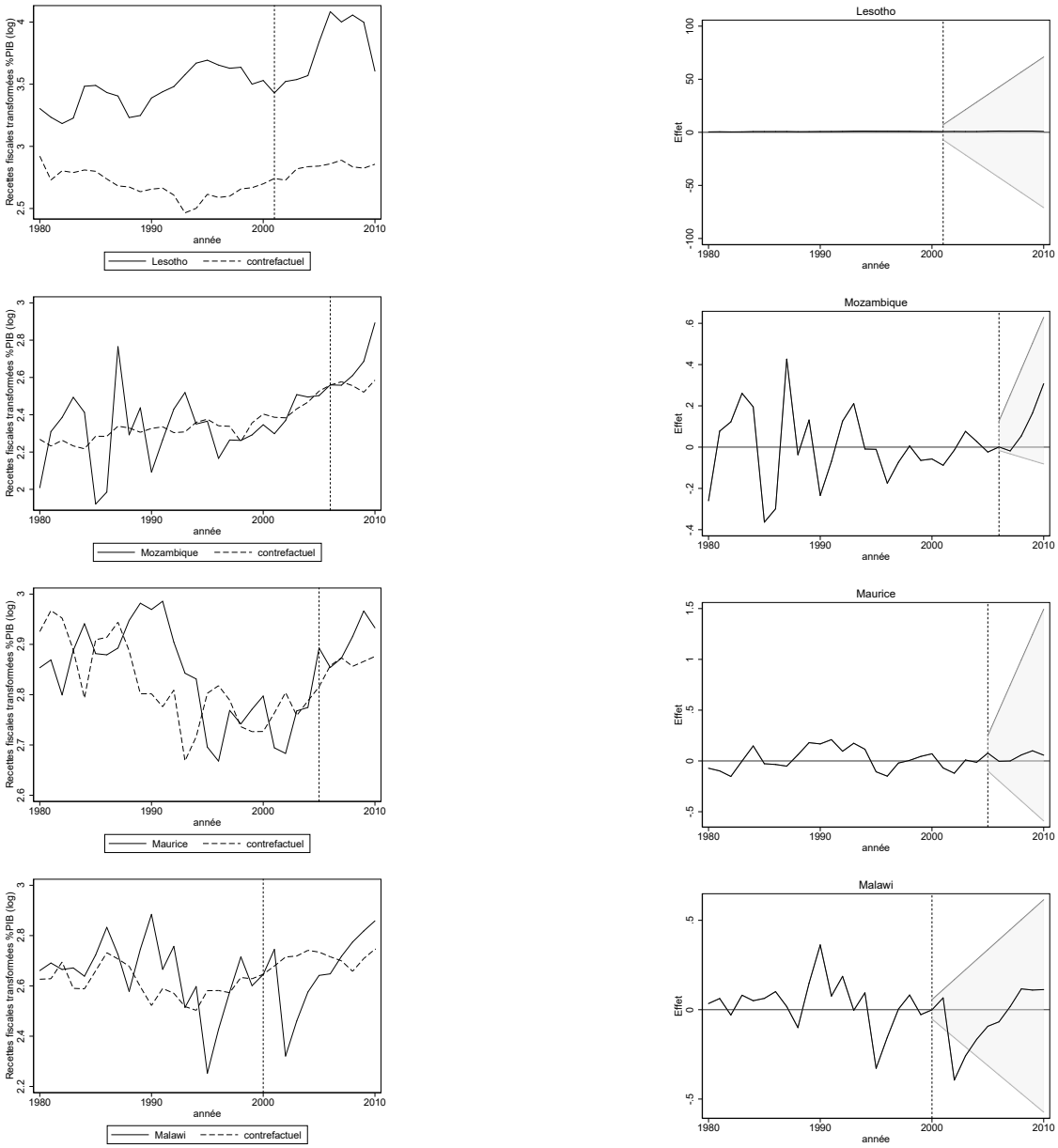

Figure 5: Synthetic control. vs Demeaned synthetic control (2)

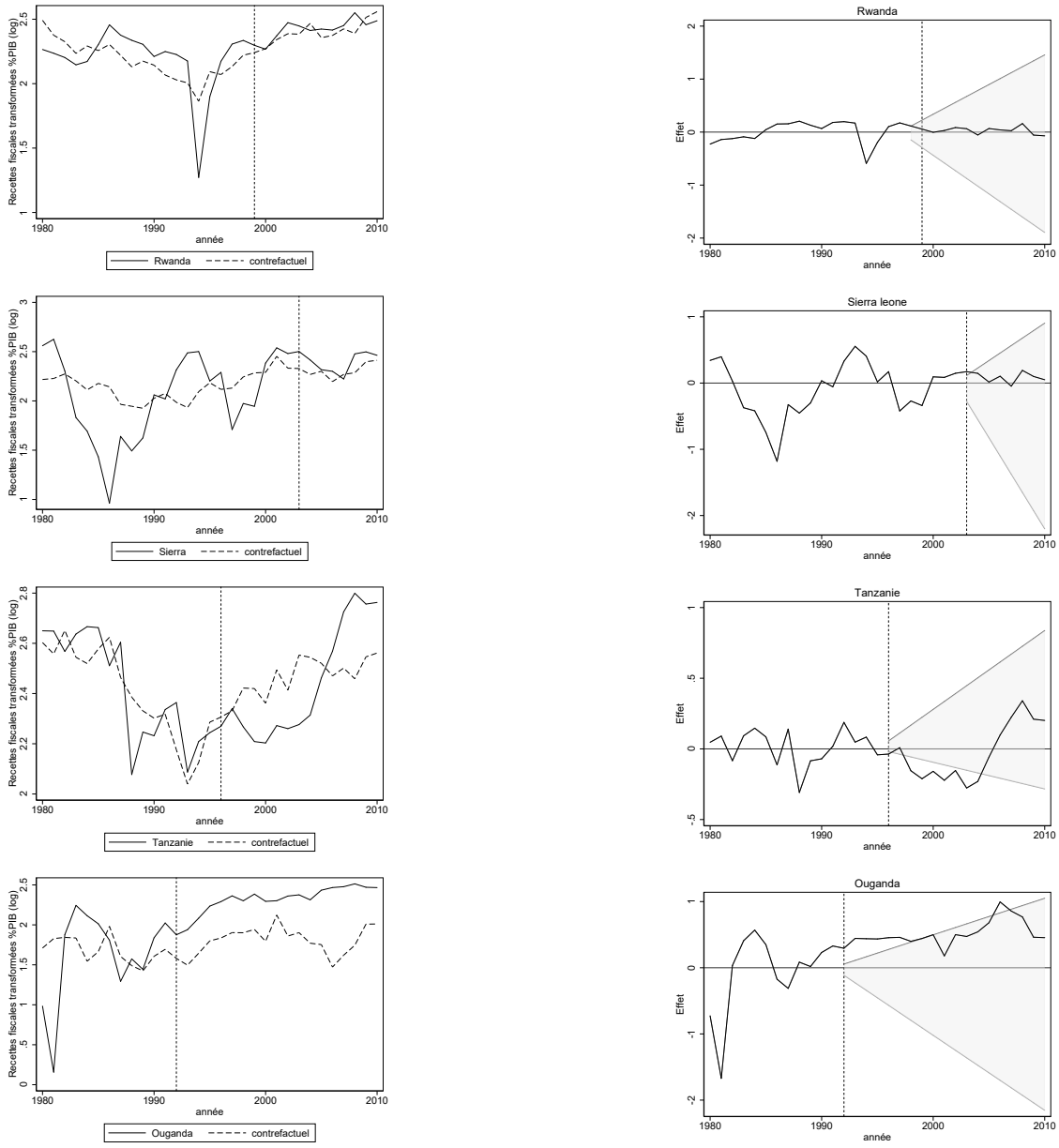

Figure 6: Synthetic control. vs Demeaned synthetic control (3)

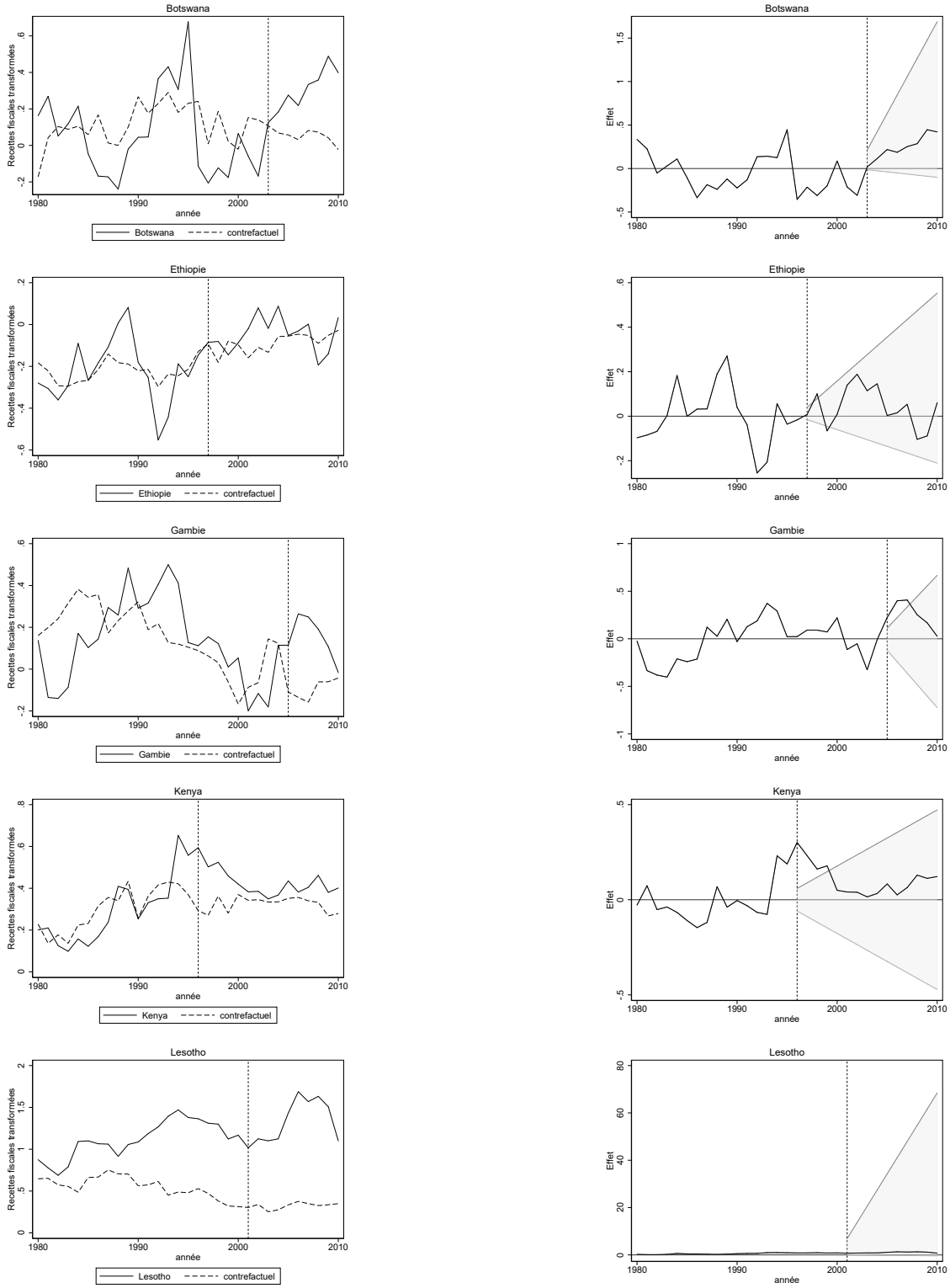

Figure 7: Synthetic control. vs Demeaned synthetic control (4)

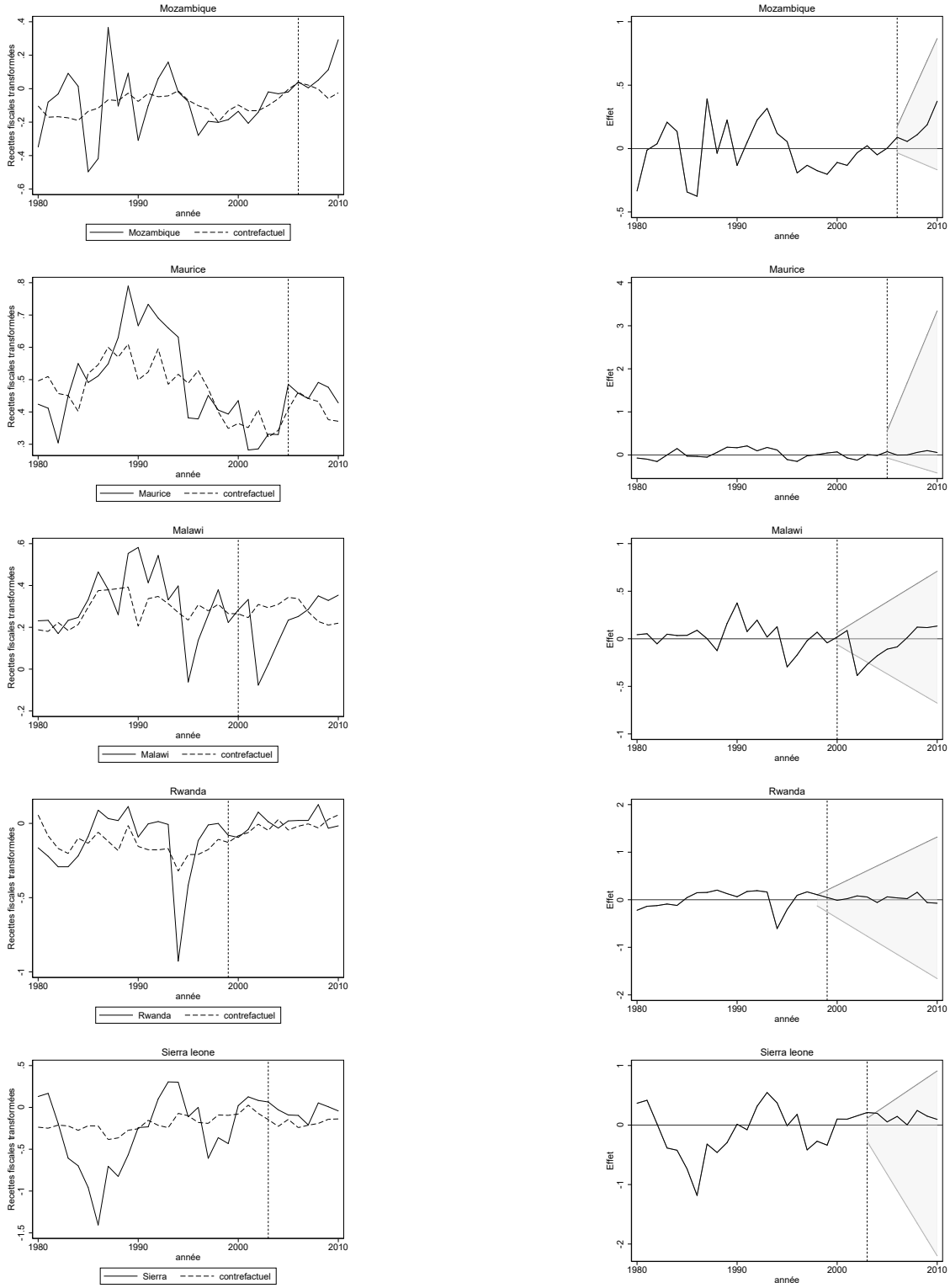

Figure 8: Synthetic control. vs Demeaned synthetic control (5)

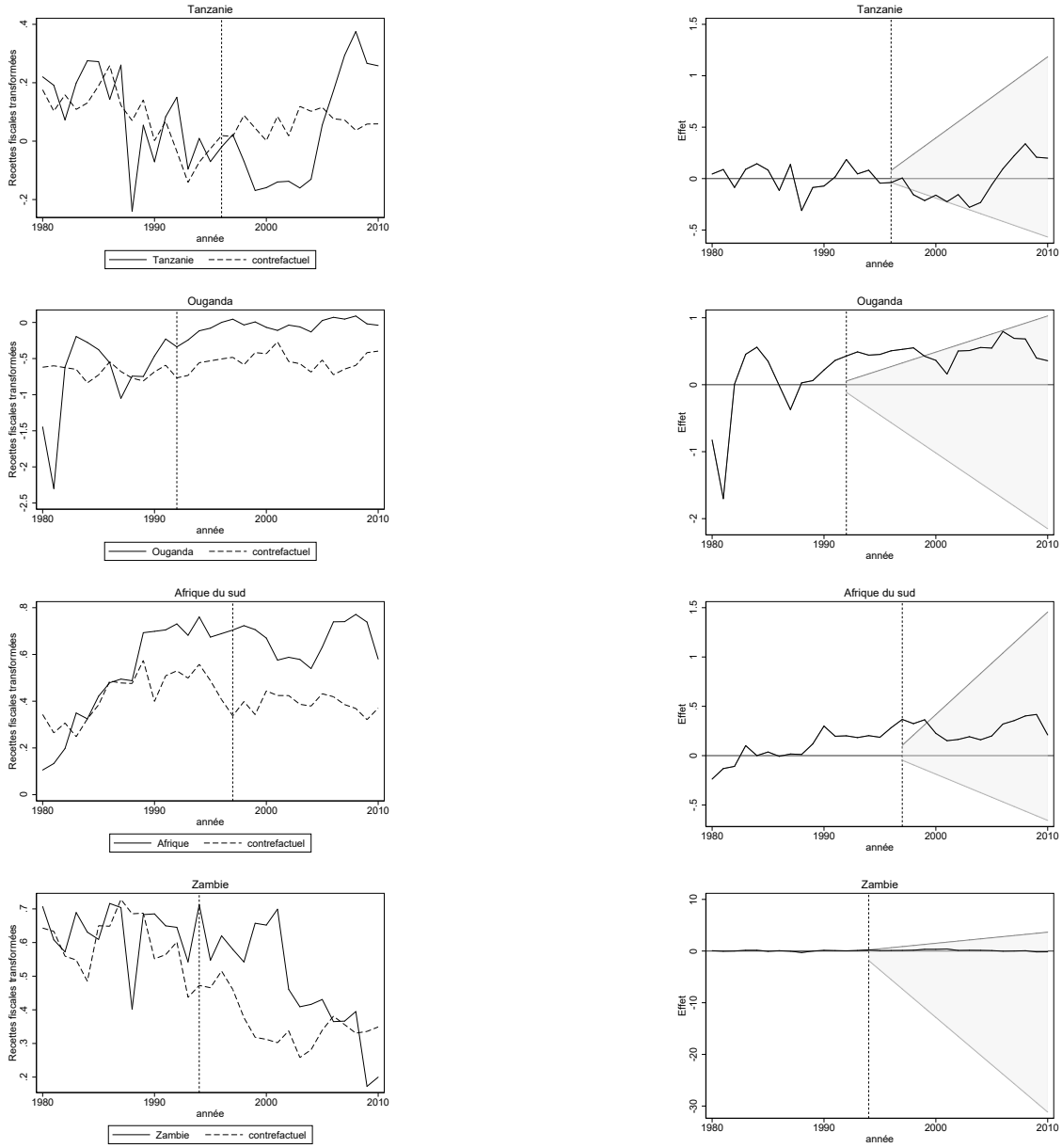

Figure 9: Synthetic control. vs Demeaned synthetic control (6)