



# SIERRA LEONE

## SELECTED ISSUES

July 2016

This Selected Issues paper on Sierra Leone was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on June 16, 2016.

Copies of this report are available to the public from

International Monetary Fund • Publication Services  
PO Box 92780 • Washington, D.C. 20090  
Telephone: (202) 623-7430 • Fax: (202) 623-7201  
E-mail: [publications@imf.org](mailto:publications@imf.org) Web: <http://www.imf.org>  
Price: \$18.00 per printed copy

**International Monetary Fund**  
**Washington, D.C.**



# SIERRA LEONE

## SELECTED ISSUES

June 16, 2016

Approved By

**AFR Department**

Prepared By Mehmet Cangul and Chu Wang; Iyabo Masha and Friska Parulian (all AFR) and Botir Baltabaev (SPR).

## CONTENTS

### MEASURING THE IMPACT OF THE EBOLA VIRUS DISEASE (EVD) EPIDEMIC ON ECONOMIC GROWTH IN SIERRA LEONE \_\_\_\_\_ 4

A. Introduction _____	4
B. How to Measure the Growth Impact of Ebola _____	5
C. Synthetic Control Method (SCM) _____	6
D. Advantages of SCM _____	7
E. Terminology _____	7
F. The Model _____	8
G. Results and Interpretation _____	9
H. Conclusion _____	12
References _____	13

### FIGURES

1. Real Growth Rate Excluding Iron Ore: Sierra Leone vs. the Synthetic Control _____	9
2. SCM Applied to Non-Ebola Countries _____	11
3. Largest Differences Observed Between the Synthetic Control and the Actual Growth Paths in the Post-Ebola Period _____	11

### TABLES

1. Weights Used to Construct the Synthetic Control _____	9
2. Pre-Treatment Y and X Comparison Between Sierra Leone and the Synthetic Control _____	10
3. Post-Treatment Growth Comparison Between Sierra Leone and the Synthetic Control _____	10

<b>ASSESSING AND MANAGING FISCAL RISKS IN SIERRA LEONE</b>	<b>14</b>
A. Introduction	14
B. Assessing Fiscal Risks	15
C. Risk Monitoring and Management	26
D. Conclusion	28
References	29

## FIGURES

1. Indicators of Macro Fiscal Risks in Selected African Countries, 2005–15	16
2. Fan Chart on Evolution of Debt-to-GDP Ratio, 2014–21	17
3. Sierra Leone PEFA Scores 2007, 2012 and 2014	24
4. Forecast Errors of Total Expenditure and Net Lending	25
5. Forecast Errors of Total Revenue	26

## TABLES

1. Risk Indicators of Domestic and External Debt, 2015	18
2. Advanced Economies and Emerging Market Economies' Episodes and Fiscal Cost of Contingent Liability Realizations	19
3. Contingent Liabilities of SOEs, 2013–15	21
4. Membership, Contribution, Income, Expense and Returns of NASSIT	22

## APPENDIX

1. Indicative Structure of a Fiscal Risk Statement	30
--	----

## EXPORT DIVERSIFICATION IN SIERRA LEONE

A. Introduction	32
B. Export Diversification in Sierra Leone	32
C. Determinants of Export Diversification	36
D. Conclusions	39
References	40

## FIGURES

1. Export Dynamics	32
2. Export Diversification	34
3. Evolution of Export Diversification	34
4. Export Diversification Relative to Peers (Overall Theil Index in 2010)	34
5. Export Diversification Relative to Peers (Overall Theil Index)	34
6. Share of Top Five Exports	35

7. Evolution of Top Five 2003 Export Products	35
8. Evolution of Top Export Products	36

**TABLES**

1. Data Sources and Definitions	38
2. OLS Regression: Overall Theil Index	38

# MEASURING THE IMPACT OF THE EBOLA VIRUS DISEASE (EVD) EPIDEMIC ON ECONOMIC GROWTH IN SIERRA LEONE<sup>1</sup>

*This paper aims to measure the impact of the Ebola Virus Disease (EVD) Epidemic on economic growth in Sierra Leone. The paper uses a novel empirical approach based on a Difference in Differences (DID) setup, called the Synthetic Control Method (SCM). The model suggests EVD had a severe impact on growth. In 2014, the first year EVD hit the country, the impact on real growth excluding iron ore is estimated to be more than 5 percentage points. In outer years, the severity of the impact lessens, and growth converges to its normal path by 2018.*

## A. Introduction

**1. Although EVD was first identified in 1976 with intermittent cases between its inception and 2013, an epidemic of unprecedented proportions hit three Western African nations, Guinea, Liberia and Sierra Leone beginning in the summer of 2014.** At the peak of the virus' spread in December 2014, Sierra Leone was registering more than 500 new cases per week.<sup>2</sup> Close to 4,000 people lost their lives with many children orphaned and families devastated. The spread of the virus reversed, and was significantly contained toward the second half of 2015. Sierra Leone was first declared Ebola-free in early November 2015. Since then, cases have emerged sporadically, but the country was declared Ebola-free again in mid-March, underlining the fear that even after the completion of the 42-day incubation cycle, the virus could resurge. Although the likelihood of a major outbreak remains low, the road to a complete recovery, both physically and in economic impact, remains long and challenging.

**2. The virus touched many facets of life, disrupting agriculture, trade and most importantly education. Livelihoods were interrupted with consequences for human capital.** Sierra Leone authorities estimate that there was a 50 percent job loss in the private sector while the agricultural and manufacturing outputs declined 30 and 60 percent respectively.<sup>3</sup> This of course took an enormous toll on economic growth, which is estimated to have declined to 4.6 percent in 2014 and negative 21 percent in 2015 from more than 20 percent in 2013, prior to the occurrence of EVD.<sup>4</sup> At the same time, the country was hit by a parallel crisis in the iron ore sector, which came to a complete halt by early 2015 due to a precipitous decline in iron ore prices and recurrent

<sup>1</sup> Prepared by Mehmet Cangul and Chu Wang.

<sup>2</sup> Based on patient data from the World Health Organization.

<sup>3</sup> Sierra Leone Post-Ebola Economic Recovery Plan.

<sup>4</sup> IMF Staff estimates.

administrative problems. Therefore, an important part of the decline in economic output related to the loss in iron ore production. However, staff estimates real growth excluding iron ore dropped severely as well, to 0.8 percent in 2014 and 1.4 percent in 2015 from 5.5 percent in 2013. One should note however that even though this rate excludes iron ore, there were sectors such as transportation that were likely impacted through their connection to iron ore.

**3. This paper aims to measure the distinct impact of the EVD epidemic on economic growth excluding iron ore in Sierra Leone.** The paper is organized as follows. Section B elaborates on the conceptual challenges surrounding the topic and potential empirical methods that can be employed. Sections C and D introduce the Synthetic Control Method (SCM), and discuss its advantages. Section E defines the terminology. Section F explains the model and the estimation process. Sections G and H explain the results, and conclude.

## B. How to Measure the Growth Impact of Ebola

**4. Measuring the macroeconomic impact of a phenomenon that has affected individual units on an aggregate level is not straightforward.** There is no obvious way of extrapolating from the individual units to aggregate phenomenon such as economic growth.

**5. An obvious candidate might be estimation through proxies.** If one thinks that the primary channel through which the virus impacted economic growth was through human capital, then measuring first the impact of EVD on human capital, and then measuring the share of human capital in economic growth would be one way. However, given the data challenges, the measurement of the EVD impact on human capital is also not straightforward. Further, even if such a measurement could be done, it would most likely be biased due to the absence of a reliable counterfactual. In other words, how would human capital have evolved in the absence of Ebola? Due to the enormous impact of EVD on all aspects of life, it would be near to impossible to measure what would have happened to the economy but for Ebola if the analysis was self-contained to Sierra Leone.

**6. One simple method would of course be to look at estimations of growth in the future before the EVD and compare that to actual growth.** However, this does not necessarily take into account simultaneous developments other than EVD that would impact growth, like the lost iron ore production, not necessarily fully considered by the forecasts prior to the twin shocks.

**7. Another candidate for such an analysis would be a Vector Autoregression (VAR) approach.** However, as in all time series analyses, the de-facto assumption would be a linear evolution of so called control variables in an environment where we know the evolution of EVD and its impact was non-linear. Of course, one could always add non-linear factors to such a model, but that would risk over-fitting and excessive manipulation of data, imposing an element of arbitrariness. Finally, the problem with a reliable counterfactual would persist, and the addition of so called "control" variables could not effectively isolate the impact of Ebola. There are of course other problems with time series analyses such as structural breaks, (which is most certainly the case with the onset of Ebola), nonstationarity and autocorrelation of error terms for which one could apply

certain corrections such as the transformation of the OLS structure to obtain more efficient parameter estimates. However these corrections suffer from problems of their own, and often add costly complexity to the model in terms of reducing its robustness.<sup>5</sup>

**8. Finally, a simple OLS model that would look at the growth path of other countries controlling for certain common variables would run into similar problems of bias and an unwarranted assumption of linearity.** A comparative Ordinary Least Squares (OLS) model with dummy variables for Ebola or similar epidemics could not reliably replicate unbiased counterfactuals simply because it would compare dissimilar countries with explanatory variables that would not share common distributional factors. The OLS set up would impose the assumption of similar distributional characteristics of these so called control variables between Sierra Leone and other countries not impacted by Ebola. It would also make the unwarranted assumption of linear extrapolation between Sierra Leone and other countries for these variables across a space where there might be regional nonlinearities.<sup>6</sup>

### C. Synthetic Control Method (SCM)

**9. The Synthetic Control Method (SCM) was first introduced in 2010 by Alberto Abadie.** The method was developed in a paper entitled “Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California’s Tobacco Control Program.”; its method aims to estimate the impact of a tobacco control program on smoking rates in California. Usually, a Difference in Differences (DID) approach would be ideal in such a case where one would compare similar unit behaviors between treated and non-treated spaces.<sup>7</sup> The similarity would be established through a standard matching procedure that would match units based on a variety of relevant background characteristics such as gender, age, socio-economic background and other variables.<sup>8</sup> However, because such granular data do not exist, the challenge, similar to the one in this paper, was to extrapolate from the individual impact to a macro impact of an exogenous intervention, in our case, the EVD epidemic, in the case of the paper in question, the Tobacco Control Program (TCB).

**10. The empirical challenge under consideration is to select a “space” that has not been exposed to the treatment (TCB or the EVD crisis in our case), but nonetheless has similar background characteristics.** Since there is not a reliable way to select or “match” comparable units across treated and non-treated spaces (that is across units exposed to the TCB or in our case EVD in

<sup>5</sup> Maeshiro, A. (2000) “An Illustration of the Bias of OLS for  $Y_t = \lambda Y_{t-1} + U_t$ .” *Journal of Economic Education*. Vol. 31, 2000, pp. 76–80.

<sup>6</sup> Rubin, Donald (2005). “Causal Inference Using Potential Outcomes.” *J. Amer. Statist. Assoc.*

<sup>7</sup> Imbens, Guido and Athey, Susan (2006). “Identification and Indifference in Nonlinear Difference-In-Difference Models.” *Econometrica*.

<sup>8</sup> The reason would be that the impact of the program on a 60 year old retired female would not be same as the impact on a 20 year old male just out of college. Usually a standard OLS approach would aim to control for these variables, but it would mix them into the same “average” comparison for one uniform impact across all units.

a particular space, that is Sierra Leone) precisely because we do not have the micro data, the goal becomes to select a space that has not been exposed to the treatment, but nonetheless has similar background characteristics, what the paper calls a Synthetic Control. Of course, it would be difficult to pick a single space, country or a state that, in all its attributes, is similar to the exposed space. So the authors came up with a method to select and weight a combination of states or spaces that yield the closest approximation to the space exposed to the exogenous intervention prior to the intervention in terms of two factors: selected background variables and the outcome variable.

## D. Advantages of SCM

**11. There are several advantages to using the SCM in this context. First, the method operates on the basis of outcome blindness.** In other words, one cannot choose a certain combination of variables and their incorporation to the model to yield a result that conforms to a certain hypothesis, “makes sense” or yields the highest explanatory power for the model. The only sense in which one can “play” with the model would be to choose a set of explanatory variables that would yield the best estimation for the treated space in the pre-treatment period. However, that is not the actual estimation itself, as it is the step before the estimation in choosing the relevant comparators, and therefore does not suffer from the same analyst bias; it is not driven by the outcome the model is trying to estimate.

**12. Second, the model does not suffer from bias usually encountered in typical OLS setups that attempt to “control” for certain background variables.** As explained in paragraph 8, these controls often suffer from linear extrapolations across distributions that are far apart in space or are too dissimilar in their distributions across treated and control units.

## E. Terminology

**13. Treatment,  $T$ , refers to the exogenous shock or the intervention whose effect we are trying to estimate.** In our case, the treatment is the EVD epidemic.  $T_{t+1}$  would be the treatment or EVD in the year following the first occurrence of EVD. Similarly  $T_{t-1}$  would refer to the treatment in year prior to the first occurrence of the EVD.

**14. The treated units are humans in Sierra Leone who have been impacted by the EVD,  $T(1)$ .** The non-treated units are humans in other countries that have not been impacted by EVD,  $T(0)$ . The treated space is the country that has been impacted by the EVD epidemic, Sierra Leone. Since we are extrapolating from the units to the country,  $T(1)$  will refer to the treated space. Similarly,  $T(0)$  will refer to the non-treated space, in this case, the Synthetic Sierra Leone whose construction will be explained in detail later.

**15. The background variables  $X$ ,** are variables that we deem relevant in the estimation of the outcome variable, real growth excluding iron ore, for which we think it would be important to have a common space between  $T(1)$  and  $T(0)$  to reliably compare the two in order to estimate the impact of  $T$ . In this case, our background variables are: investment, government balance, grants, foreign



direct investment, inflation and selected lagged growth rates in the pre-treatment period, specifically for 2007, 2009, 2011 and 2013 to further enhance the strength of estimation in the pre-treatment period.

**16. The outcome variable Y** is non-iron ore real economic growth. Of course, to refer to for example the background variables in the treated space, we would use  $X_{T(1)}$ . Similarly, to refer to the outcome variable in the non-treated space, that is the Synthetic Sierra Leone, we would use  $Y_{T(0)}$ .

## F. The Model

**17. There are two general steps in the ECM method.** The first step involves the construction of a so called artificial Sierra Leone  $T(0)$  that replicates Sierra Leone,  $T(1)$  as best as possible in background ( $X$ ) and outcome variables ( $Y$ ) prior to the occurrence of EVD,  $T$ . The result is a  $T(0)$  such that when compared to  $T(1)$  prior to the occurrence of  $T$ , they are as close as possible to each other in terms of the evolution of background ( $X$ ) and outcome ( $Y$ ) variables in time. Once we have a  $T(0)$ , which we think reasonably approximates  $T(1)$  in the period prior to  $T$  (EVD), then the growth impact of  $T$  on  $T(1)$  at a given year  $t$  is simply:  $\alpha_t = Y_{T(0)t} - Y_{T(1)t}$ .

**18. The goal of this exercise is to construct a space that most closely approximates Sierra Leone in growth and relevant economic variables in years prior to T.** For this, we first define a pre-Ebola period. In our case, for optimizing the usage of the available data and to avoid any structural shifts due to the Civil War, we go back to 2005. Therefore our pre-Ebola period is between 2005 and 2013, the latter being the last year before Ebola hits. 2014 is the year in which Ebola hits, specifically, the summer of 2014. However since we do not have the granularity of data that could reflect that timing, for the purposes of estimation, we will assume that Ebola starts in the beginning of 2014. As the most outer year of estimation, we pick 2018 to have a sense in which not only how the actual outcomes have been affected but also how our projections have been affected. Therefore, our post-Ebola period is 2014-2018, including the year in which Ebola has hit the country.

**19. In order to construct the artificial Sierra Leone, we first define a general pool that has potential countries that we could use to build the artificial counterfactual.** In this paper, this is initially represented by all the countries in Sub-Saharan Africa (SSA). From this general pool, we obviously outright eliminate countries that had the EVD epidemic other than Sierra Leone, that is Guinea and Liberia. Additionally we outright eliminate countries that were impacted by the EVD through channels such as tourism and trade, to prevent possible bias from interference.<sup>9</sup>

**20. Next, we run an iterative algorithm where we minimize the distance between  $Z(1)$ , the actual treated space in background variables ( $X$ ) and outcome variable ( $Y$ ) in the pre-treatment period, and  $W*Z(0)$ , the potential control in  $Y$  and  $X$  in the pre-treatment period**

<sup>9</sup> Therefore our assumption is that the units in the non-treated space will not have been impacted by EVD. The excluded countries for this purpose are Burkina Faso, Cote D'Ivoire, Nigeria and Togo.

**chosen through weights,  $W$ , that minimize the distance between the treated space and the potential control.**  $Z(1)$  is denoted by a  $k$  by 1 vector of pre-treatment characteristics such that  $Z(1) = \{X(1), Y1(K1), \dots, Y1(K(M))\}$  where  $k = r + M$ .  $Z(0)$  is similarly defined for the untreated SSA countries in the sub-pool defined above. Each  $K$  represents a linear combination of background and outcome variables. Next, a set of  $W$  is picked such that the distance between  $Z(1)$  and  $Z(0)W$  is minimized. The inclusion of the background variables  $X$  ensures that the constructed counterfactual space is similar not only in the outcome variable prior to  $T$  but also similar in background variables, ensuring that the comparison to the actual growth path is made while minimizing potential bias due to potential dissimilarity in the background variables. In other words, Sierra Leone is compared to a counterfactual not only similar in its growth path prior to the EVD crisis, but also similar in macroeconomic characteristics

**21. The set of  $W$  determines a weight assigned to each potential country in the SSA pool.**

With these weights that minimize the distance defined above and applied to  $Y_i$  where  $i$  represents a given country in the SSA pool, we build an artificial Sierra Leone that most closely resembles actual Sierra Leone prior to the EVD epidemic. In our case, using the algorithm described above, the following weights were used for the

**Table 1. Weights Used to Construct the Synthetic Control<sup>1</sup>**

DRC	Eritrea	Ethiopia	Madagascar	Malawi	Mauritius	Mozambique
0.18	0.12	0.09	0.19	0.20	0.12	0.11

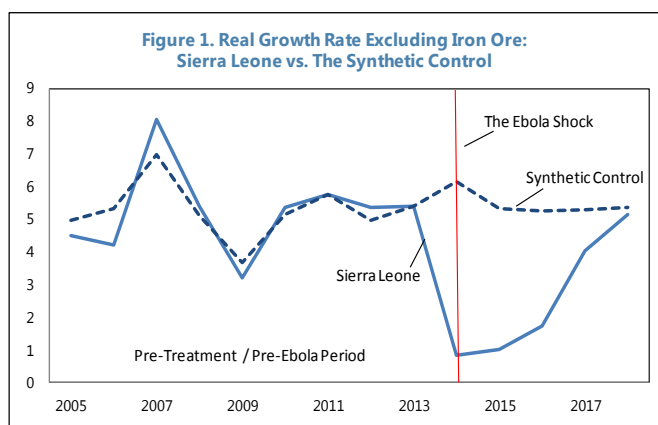
<sup>1/</sup> Other SSA countries in the filtered pool have a weight of zero.

respective countries to define the artificial counterfactual, Table 1. As can be seen, the weights are also fairly uniformly distributed, avoiding the situation where one country or a set of countries drive the estimation disproportionately.

**22. To estimate the impact of EVD on non-iron ore growth, we simply take the difference between  $Y^*T(0)t$  and  $YT(1)t$  where  $Y^*T(0)t$  is the outcome variable of the artificial Sierra Leone at a given time  $t$  in the post-Ebola period.**

## G. Results and Interpretation

**23. Figure 1 demonstrates how well the artificial Sierra Leone estimates actual Sierra Leone prior to the EVD.** The solid line represents the actual growth path of Sierra Leone including projections, beginning in year 2016, taking into account the Ebola shock. The dotted line represents the estimated Synthetic Control growth path. As can be seen, prior to the EVD shock, the dotted and solid lines are fairly close to each other. The Synthetic Control



estimates the actual Sierra Leone growth path, at least in major trends, fairly well as can also be seen in Table 2.

**24. Table 2 summarizes the Pre-Treatment growth (Y) and macroeconomic background (X) variables for Sierra Leone, the Synthetic Control and a simple average of all countries in the potential SSA pool.** As one can see, not only are the model estimates close to the actual values for Sierra Leone in the pre-treatment period, they also, in most cases, estimate actual pre-treatment Sierra Leone better than a simple average except in the case of Government Balance, Grants and Terms of Trade where there could be potential bias.

**Table 2. Pre-Treatment Y and X Comparison Between Sierra Leone and the Synthetic Control**

	Sierra Leone	Synthetic Control	Simple Average of all SSA Countries
2005 Growth	4.5	4.9	5.6
2006 Growth	4.2	5.3	5.4
2007 Growth	8.1	7.0	6.2
2008 Growth	5.4	5.1	4.4
2009 Growth	3.2	3.7	2.8
2010 Growth	5.3	5.1	5.6
2011 Growth	5.8	5.8	5.2
2012 Growth	5.3	5.0	5.1
2013 Growth	5.4	5.4	3.3
Investment	18.3	20.8	24.4
Government Balance	-0.7	-3.7	-0.3
Grants	7.2	4.5	4.6
FDI	-9.8	-6.8	-5.2
Inflation	12.7	12.7	8.3
Terms of Trade	93.8	133.4	115.9
Exports	20.0	26.8	36.1
Ease of Doing Business	0.2	0.2	0.3

**25. The model estimates that in 2014, the first year where the EVD hits, all of the drop in the non-iron ore GDP growth from the previous year can be attributed to the EVD epidemic, Table 3 and Figure 1.**

In fact, if one considers that but for Ebola, growth would be

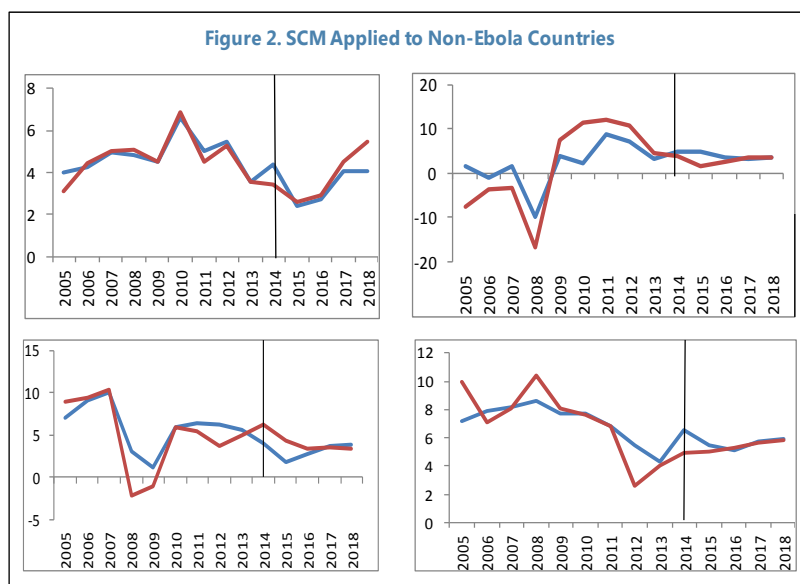
**Table 3. Post-Treatment Growth Comparison Between Sierra Leone and the Synthetic Control**

	Sierra Leone	Synthetic Control	Estimated Impact of Ebola
2014 Growth	0.8	6.1	-5.3
2015 Growth	1.0	5.3	-4.3
2016 Growth	1.7	5.3	-3.5
2017 Growth	4.0	5.3	-1.3
2018 Growth	5.2	5.4	-0.2

higher, the impact is more severe, more than 5 percentage growth points, and higher than the actual drop in growth from the previous year. In 2015, the impact lessens to 4.3 percentage points, and as Figure 1 demonstrates, this impact thins out in outer projection years, converging toward the actual Sierra Leone growth path by 2018, implying that the impact of the EVD on growth is temporary. This implies that while the impact on growth would be temporary, the impact on GDP would be permanent unless in outer years beyond 2018 growth in the Ebola scenario could overtake the non-Ebola scenario. Therefore this implication needs to be taken with a grain of salt as there are uncertainties not only relating to the estimation of the non-Ebola growth path but also to the post-Ebola growth as it is a projection into the future. However, if the impact on the GDP were to be permanent as it is implied by these results up to 2018, then one intuition behind that would be that while in a physical sense, the recovery from Ebola would be complete at a certain point in time, in perception, as it relates to investment climate or tourism, the recovery could last well into the long-term horizon.

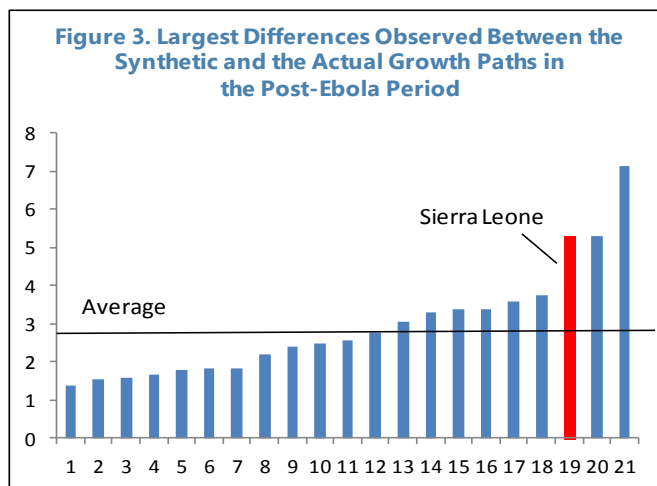
**26. If we take the same approach, and apply it to other non-Ebola countries, we should expect to see that there is not a significant divergence between the artificial line and the actual line in all years.** Below figures (Figure 2) demonstrate a few examples that indeed display this expectation, implying that

non-Ebola countries for which the model is able to estimate the pre-treatment trends fairly well, but for which the post-treatment divergence is either non-existent or very small compared to Sierra Leone. In the examples below, the red line represents actual growth and the blue line represents the synthetic estimate. The vertical black line represents the point at which the EVD epidemic begins.



**27. Countries that have a reasonable path of estimation in the same pre-treatment period between 2005–13 do imply a statistical significance for the estimated impact of EVD in Sierra Leone with a confidence level of at least 90 percent.** Out of 33 countries in the selected

potential SSA sub-pool, 20 can be said to have a reasonable pre-treatment period estimation. By reasonable, we mean, a line that at least predicts the major trends. Of these 20, to be most conservative, we look at the highest difference between the predicted line of the Synthetic Control and the actual line in the post-treatment period. Of these 20 differences, there were only two cases that were equal or higher than the highest difference observed in Sierra Leone in the post-treatment period. Without making any distributional assumptions on



this result, we could say that if Sierra Leone's estimated growth impact from Ebola were accidental, there would only be a 10 percent probability of observing a value equal or greater than the value observed for Sierra Leone (Figure 3). The average difference among the 20 countries for this highest impact in the post-treatment period is 2.8 with a standard deviation of 1.4. If we assume that these differences are distributed normally, comparing this 2.8 to the Sierra Leone's impact of 5.3, there would only be a 4 percent probability of observing a value at 5.3 or above if the result were purely accidental rather than significant, implying a statistical significance level of 96 percent. Figure 3 displays the highest absolute differences observed between the synthetic estimate and the actual

growth path in the post-treatment or the post-Ebola period. The difference observed for Sierra Leone is at the far end of the right tail.

## H. Conclusion

**28. The SCM Method, applied to Sierra Leone, concludes that in the first year of Ebola, the impact on growth was severe, more than 5 points of percentage.** In outer years, the severity of the impact lessens, and eventually converges to a normal growth path by 2018. However, the model implies that while the impact on growth would be temporary, the impact on GDP would be permanent assuming that in outer years, the non-Ebola growth path would not perform better than staff estimates. The damage to the perception of the country in terms of the investment climate and tourism (which may be much harder to reverse than the physical impact in the long-run) could be one intuitive reason behind this result.

**29. How well the method replicates Sierra Leone for the synthetic counterpart in the pre-treatment period and how the actual growth path diverges significantly from the synthetic estimate thereafter is a strong indication of the explanatory power of the model.** Meanwhile, the robustness of the model is confirmed when we look at other SSA countries that did not have the Ebola shock for which the model estimates the pre-treatment period well, but after which we do not see, on average a deviation as large as Sierra Leone. Assuming that these estimates are normally distributed, there is only a 4 percent probability of obtaining an impact larger than the estimate for Sierra Leone in the post-treatment period if it was just pure chance rather than being a result of the EVD epidemic.

## References

1. Alberto Abadie, Alexis Diamond and Jens Hainmueller (2010), *Journal of the American Statistical Association*: Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program.
2. Donald Rubin (2005), *Journal of the American Statistical Association*: Causal Inference Using Potential Outcomes.
3. Donald Rubin (1974), *Journal of Educational Psychology*: Estimating Causal Effects of Treatments in Randomized and Nonrandomized Studies.
4. A Maeshino (2000), *Journal of Economic Education*: An Illustration of the Bias of OLS for  $Y_t = \lambda Y_{t-1} + U_t$ .
5. Susan Athey and Guido W. Imbens (2006), *Econometrica*: Identification and Inference in Nonlinear Difference-In-Difference Models.

# ASSESSING AND MANAGING FISCAL RISKS IN SIERRA LEONE<sup>1</sup>

*Sierra Leone faces fiscal risks from three broad sources. Risks arise from shocks to, or uncertainty about, the evolution of macroeconomic variables; from contingent liabilities, including those of state-owned banks and enterprises; and from institutional weaknesses in public finance management. Mitigating and managing these risks will require improvements to forecasting of fiscal aggregates and other macroeconomic variables; transparent fiscal reporting; and accelerated reforms of the public finance management framework.*

## A. Introduction

**1. Fiscal risks are factors that cause revenue, expenditure and government financing outcomes to differ from what was expected at the time of budgeting or forecast, thereby jeopardizing the achievement of fiscal objectives.** They include uncertainty about the evolution of fiscally-important macroeconomic variables such as growth, inflation, commodity prices and exchange rate. They can also arise from calls on several types of contingent liabilities. Some of these are explicit, while others are implicit. Risks can also be driven by structural factors, especially weak public finance management (PFM) institutions, laws or capacity. A government's ability to cope with fiscal risk depends on the quality of its information about risks, its powers to limit its exposure to those risks that can be mitigated, and its financial capacity to absorb the fiscal consequences of those risks that cannot be mitigated.

**2. Debt relief in the early 2000s provided fiscal space but in recent times fiscal vulnerabilities have heightened.** Government revenue has become increasingly reliant on natural resources, with adverse movements in the global environment leading to downside pressures. Government obligations on a variety of contingent liabilities both implicit and explicit also make public finances vulnerable to risky outcomes. Finally, delays in implementing the structural reform agenda and building institutions that support PFM best practices, especially on expenditure control and cash management, are also key sources of risks.

**3. This chapter assesses the fiscal risks facing Sierra Leone.** The paper relies on the frameworks developed in an IMF Board Paper (2008) on the assessment and mitigation of risks. It attempts to highlight the risks that could materialize when exogenous shocks interact with existing fiscal and institutional vulnerabilities to affect macroeconomic and financial stability. Fiscal risks driven by macroeconomic uncertainty are fairly well known in Sierra Leone, therefore the main focus of the paper is on other sources of fiscal risks. Section II focuses on the assessment of both specific risks and risks from contingent liabilities. Risks from institutional gaps in public finance

---

<sup>1</sup> Prepared by Iyabo Masha and Friska Parulian.

management are examined in Section III. The study proposes recommendations for monitoring and mitigating risks in Section IV, and concludes in Section V.

**4. Effectively managing and mitigating risks requires improving macroeconomic forecasting and underlying analysis.** Institutional reforms, focused on enhancing timeliness, quality and coverage of fiscal data, revenue forecasting and administration, and expenditure allocation and control are important in risk mitigation. Improved operational efficiency of Ministries, Departments and Agencies (MDAs) and State Owned Enterprises (SOEs), including transitioning to a Treasury Single Account could strengthen their financial performance while reducing government's contingent liabilities and risks to the budget. For transparency, fiscal risks should be communicated effectively to the public to reduce uncertainties. In this connection, submitting an annual fiscal risk statement to Parliament along with the budget would be useful.

## B. Assessing Fiscal Risks

**5. In general, budgetary projections and forecasts are subject to risks from changes in the macroeconomic environment with important consequences for fiscal sustainability.** Some of these risks are due to economic and noneconomic shocks, and could be positive or negative. In many sub-Saharan Africa countries, these shocks have been known to impact on fiscally important aggregates, and Sierra Leone reports some of the largest variations in key macroeconomic variables during 2005–15 (Figure 1). Macroeconomic risks are compounded by weak forecasting capacity. Large swings in revenue and expenditure forecasts limit the effectiveness of the planning and budgetary process, and often create unanticipated financing pressures. The major sources of specific sources and contingent liabilities risks are examined below.

### Specific Risks

**6. Specific risks, both explicit and implicit, are often triggered by uncertain events, unlike macroeconomic risks, which can be anticipated over a short horizon.** Explicit risks are defined by laws or contracts, and implicit risks arise from expectations or pressures on government to “step-in” and bail out MDAs in financial difficulties. Most specific risks arise from debt sustainability and government financing operations.

### *Debt Sustainability*

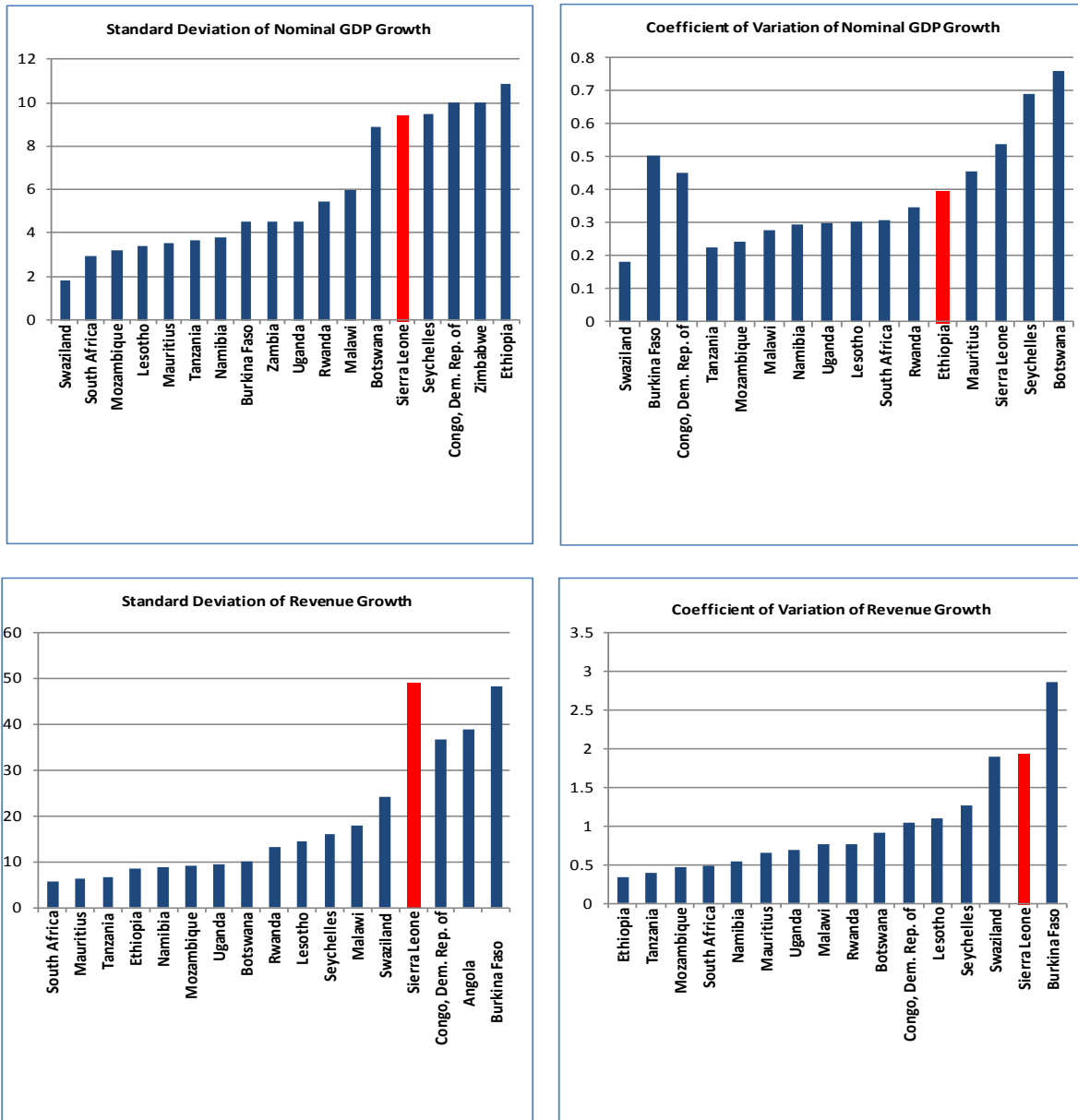
**7. Sierra Leone has maintained favorable debt dynamics, mostly due to HIPC and MDRI debt relief in the mid-2000s.** As discussed in the 2016 Debt Sustainability Analysis,<sup>2</sup> the nominal stock of public and publicly guaranteed external debt amounted to 32 percent of GDP in 2016, up from 26 percent at end-2013. The creditor profile is largely favorable: most is concessional debt

<sup>2</sup> See Sierra Leone 2016 Article IV Consultation Staff Report – Annex II – Debt Sustainability Analysis CR16/---



owed to multilaterals, while the remainder is nonconcessional debt at commercial and semi-commercial terms. Interest on external debt remains below 2 percent of GDP. Domestic debt, which is 14 percent of GDP, is mostly government securities, over 90 percent of which are held by commercial banks, other financial institutions and the pension fund.

**Figure 1. Indicators of Macro Fiscal Risks in Selected African Countries, 2005–15**

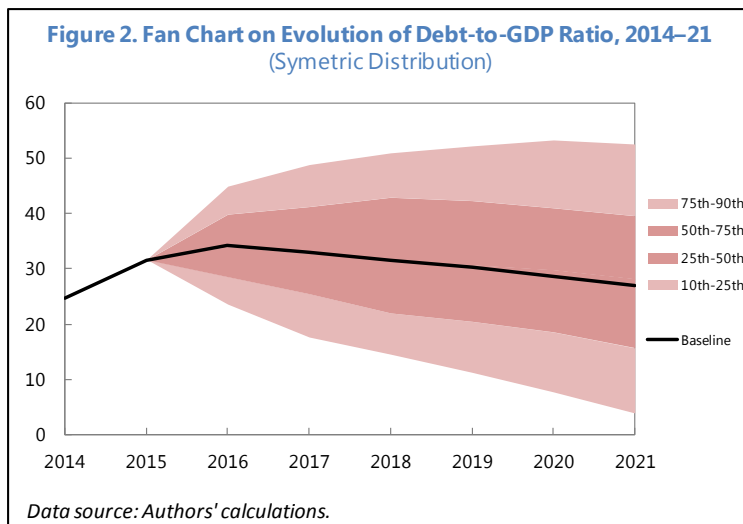


Source: IMF, World economic Outlook database, April 2016.

Note: The coefficient of variation is the standard deviation of a variable divided by its mean.

**8. The sustainability of a country's debt is a key source of or mitigating factor for fiscal risk.**

The most recent DSA found that the medium-to long-term debt outlook is vulnerable to adverse shocks to exports, foreign direct investment (FDI) inflows, and nominal currency depreciation.<sup>3</sup> In order to make a more explicit assessment of the risks and uncertainties in the evolution of the baseline debt to GDP ratio, a fan chart analysis is used to show the evolution of



predictive densities of the projected public debt-to-GDP ratio paths generated by shocks to key macroeconomic variables. Under this approach, we incorporate information on the likelihood that shocks would occur simultaneously or affect each other. As can be seen from Figure 2, the ranges of the predictions rise over time, indicating rising uncertainty. Considering the fact that DSAs do not normally include the impact of broader fiscal risks, such as from contingent liabilities, the outcome could be worse. This underscores the need for Sierra Leone to monitor closely the risks from debt sustainability.

**Financing Risks**

**9. Sierra Leone's budget often faces both anticipated and unanticipated financing risks.**

Higher than forecast revenue in some years has been more than offset by expenditures that exceeded budget appropriations due to spending pressures and poor cash flow planning, resulting in unplanned and unexpected financing needs. When exogenous factors, such as commodity price declines or the Ebola epidemic outbreak interact with these existing limitations, fiscal risks are magnified. In fiscal year 2016 for example, wage overruns and spending pressures from subvented agencies contributed to larger than anticipated financing gaps early in the fiscal year, which could not readily be filled because of the low market appetite for treasury instruments.

**10. Sierra Leone's budget is dependent on two main forms of financing, external and domestic financing; the latter is key source of financing risk.** External financing is projected based on prior agreements and disbursement schedules with foreign lenders, both concessional and semi-commercial. External financing is not usually a source of fiscal risk since projects are self financing, and they are executed only at the rate the funding comes in. Another form of external financing—budget support—is official aid from development partners, and it accounts for around

<sup>3</sup> See Sierra Leone 2016 Article IV Consultation Staff Report – Annex II – Debt Sustainability Analysis CR16/---

2 percent of GDP. Donor commitments are made ahead of budget preparations, minimizing uncertainty, but are often dependent on donors' concluding that certain conditions have been met. Thus fiscal risks often arise due to changes in the timing of receipts and delayed disbursements.

### 11. Domestic financing is the most important source of financing risks.

Ways and Means advances from Bank of Sierra Leone is, by law, set at a maximum of 5 percent of the past year's domestic revenue, and is repayable before the end of the first quarter of the next year. Treasury bills of 91, 182, and 364 days are held by commercial banks and the nonbank public. There are some longer term bonds, and some nonmarketable securities held

by BSL. Key indicators of interest rate risks such as the percentage of debt with interest rate that would be changed within one year is over 90 percent, compared with 3 percent for external debt (Table 1). Furthermore, debt with maturities of one year or less, as percent of total debt has increased due to recent lengthening of maturity, but most are of one year tenure. Rollover risks are high because of the large value of bills maturing on average in one year, compared to 11 years for external debt. MoFED's recent experiment to drive yields down and lengthen maturities magnified risks as the appetite for low tenure securities decreased, while that of long tenure/high yield increased. As interest rate and redemption risks materialize, fiscal excesses are shifted to arrears accumulation including to contractors, suppliers and the pension fund. These risks from the fiscal side create greater distortions in the domestic financial system via the impact on lending to the private sector and the financial health of banks.

### Risks from Contingent Liabilities

**12. Contingent liabilities are one of the biggest sources of fiscal risk in many countries, including Sierra Leone.** Some of these risks stem from explicit government guarantees, but they are amplified by weak budget constraints and processes. A recent IMF study found that failure to disclose and prepare for fiscal risks from contingent liabilities led to large increases in public debt and triggered fiscal crises in some countries (IMF 2012). Another study (Bova, et.al., 2014) found that, based on data from 80 countries between 1990–2014, the average fiscal cost of contingent liabilities was 6 percent of GDP. Contingent liability realizations were highest on liabilities from the financial sector, support to State-Owned Enterprises (SOEs), and natural disaster management (Table 2). In Sierra Leone, all these sources of risks from contingent liabilities abound, as discussed below.

**Table 1. Sierra Leone: Risk Indicators of Domestic and External Debt, 2015**

Risk Indicator	External debt (US\$ millions)	Domestic debt (Leones million)*
Nominal debt	1,504	2,248
In percent of GDP	34.2	14
<b>Refinancing risk</b>		
Average time to maturity (years)	10.8	0.96
Debt maturing in 1 year ( % of total)	3	94
<b>Interest rate risk</b>		
Average time for rate change (years)	10.8	0.95
Debt with rate change in 1 year (% of total)	3	94
Fixed rate debt (% of total)	100	100

Source: IMF staff estimates.

\* Calculation of risks excludes nonmarketable securities.

**Table 2. Advanced Economies and Emerging Market Economies’  
Episodes and Fiscal Cost of Contingent Liability Realizations**

Type of Contingent Liability	Number of Episodes	Number of Episodes with Identified Fiscal Cost	Avg. Fiscal Costs (% GDP)	Maximum Fiscal Costs (% of GDP)
Financial Sector	91	82	9.7	56.8
Legal	9	9	7.9	15.3
Subnational Government	13	9	3.7	12
SOEs	32	31	3	15.1
Natural Disaster (s)	65	29	1.6	6
Private Non-Financial Sector	7	6	1.7	4.5
PPs	8	5	1.2	2
Other	5	3	1.4	2.5
<b>Total</b>	<b>230</b>	<b>174</b>	<b>3.8</b>	<b>56.8</b>

Source: Bova, et. al. (2014).

### **Government Guarantees**

**13. Government guarantees pose material threats to fiscal sustainability, since they place a residual call on public finances.** Available information indicates that no loan guarantees have thus far been issued in Sierra Leone. Rather, government borrows directly and on-lends the borrowed funds to SOEs, with subsidiary agreements signed between the SOE and the government. Though the primary obligor fully provides for the debt service in the budget, government often incurs indirect costs and subsidies. For example, petroleum purchases for utility companies are often subsidized indirectly through exemption from excise duty and tax, and between 2011–14, government cost and subsidies to the energy sector alone stands at just under Le 200 billion.<sup>4</sup>

**14. In the recent past, there has been an upsurge in requests for commercial guarantees, as borrowing limits consistent with debt sustainability decline.**<sup>5</sup> Though not as binding as a full government guarantee, commercial guarantees do carry some risks. For example, on the basis of a commercial guarantee between the former National Power Authority and an independent power provider in 2009, an agreement was reached that converted a government contingent liability of US\$65 million to an actual liability of US\$12 million. This shows that, if not properly managed, commercial guarantees can crystallize into actual government obligations, with consequences for public debt sustainability. Considering the fact that the *Agenda for Prosperity* identifies public private partnerships as one of the priority means of project implementation, and most of these could require some form of guarantee, issuance of government guarantees are likely to be of significance in the period ahead, and the attendant risks need to be monitored and mitigated.

<sup>4</sup> World Bank 2013: Sierra Leone Diagnostic and Policy Note Public Investment Management.

<sup>5</sup> Some examples are public transport buses imported under a supplier finance scheme in 2014; a new 70 KM toll road under a PPP/BOT arrangement signed in 2016, and the Freetown Power Purchase Agreement, between the Ministry of Energy and an independent power supply company in 2016.

### **Activities of State-Owned Enterprises and Subvented Agencies**

**15. In general, public enterprises and SOEs are often significant sources of fiscal risks.** This is because of political interference, mismanagement, poor oversight, and unregulated borrowing. Often times, government is expected to bail out or subsidize the operations of non performing SOEs. Information about SOEs in Sierra Leone is not often available on a systematic and consistent manner. The National Commission on Privatization (NCP) was set up in 2002 and charged with the management and divestiture of government holdings in a total of 32 SOEs, but it identifies only 14 of these in its strategic plan. Most of them remain SOEs today, with the NCP holding government equity in the organizations. Some of the ones that the NCP has identified as potential privatization candidates include two banks, the Sierra Leone Commercial Bank (largest bank in terms of assets); and the Rokel Commercial Bank, (the 2<sup>nd</sup> largest bank); the National Insurance Company, and the National Development Bank.

**16. Financial oversights of SOEs, as well as internal control processes are important sources of fiscal risks to the central government budget.** According to the 2014 Auditor General report for Sierra Leone, more than Le200 billion was lost due to poor management of procurement transactions and withholding tax not deducted and paid to NRA in some SOEs.<sup>6</sup> The financial conditions of some of them are also not particularly strong. A recent government study of 14 of the SOEs found that, in over 70 percent of the cases studied, returns on investment were negative and 90 percent of them have had adverse cash flow problems, and are saddled with internal and external debt problems.<sup>7</sup> In the two banks, financial indicators show relatively high non-performing loans in percent of total loans, declining or negative return on average assets, and low capital adequacy ratios. The risks inherent in the operations of these SOEs materialized in late 2014, when government had to recapitalize the two banks.

**17. The Public Debt Management Act mandates government to record, measure, monitor and develop a database of contingent liabilities of the general government so as to better assess fiscal risks.** Since 2013, an annual analysis of SOE and subnational governments' liabilities has been undertaken, but it is only a partial one as it excludes major SOEs like NASSIT and government owned banks. The definition of contingent liabilities covers seven major areas, including contractor arrears and loans from the banking system (Table 3). In 2013, the exposure of SOEs alone amounted to Leone 734 billion, which was equivalent to 37 percent of the year's public domestic debt. Subnational governments reported smaller liabilities. From the point of view of fiscal risks, some of these liabilities, like tax liabilities, adversely impact on government revenue. While others, like loans, could crystallize into actual obligations with consequences for debt sustainability. Subvented agencies do not report liabilities, but they have some latitude to set salaries. Due to

<sup>6</sup> Audit Service Sierra Leone (2015) Auditor General's Annual Report for 2014.

<sup>7</sup> Argent Global (2014) Report on the Rationalization and Commercialization of State Owned Enterprises in Sierra Leone.

minimal oversight, they have been a significant source of increase in the wage bill in the recent past. A recent study of the wages of 69 subvented agencies indicates wide disparities.

**18. Some public enterprises reliably generate profits, depending on the economic environment.** These

enterprises, which could be an important means of risk mitigation, are sometimes overlooked in Sierra Leone due to weak PFM and governance laws. For example in fiscal year 2016, the liberalization of the telecoms gateway resulted in an increase in government revenue from the National Communications Commission by a projected Le 64 billion. This shows that fiscal risks could be magnified by the activities of public enterprises that fail to generate adequate profits despite having a privileged position, or that fail to remit profits to the treasury. Therefore, activities of SOEs and subvented agencies need to be subjected to close monitoring so as to ensure they do not become budgetary burdens, and are contributing to the budget if possible.

**Pensions**

**19. Pension obligations of the Sierra Leone government are a major source of fiscal pressures.** All workers, both private and public, are covered by the NASSIT, a contributory, defined benefit system which also includes invalidity and survivor benefits. Employers contribute 10 percent, employees contribute 5 percent, and self-employed contribute 15 percent. In addition, the budget also includes 2.5 percent government contribution for pre-NASSIT public sector workers. Between 2011 and 2014, public sector membership of NASSIT grew by 13 percent, but during the same period, the average public sector contribution more than doubled, (Table 4), mainly due to increases in the public sector wage bill, which rose by more in excess of 100 percent during the same period. In 2013, government arrears to NASSIT were securitized through the issuance of a 2 year bond, which matured in 2015 and was rolled over.

**Table 3. Sierra Leone: Contingent Liabilities of SOEs, 2013–15**  
(Millions of leone)

Liability Category	2013	2014	2015
Contractor arrears	11,755	2,729	4,576
Supplier arrears	31,801	32,688	80,374
Employee benefits	60,735	46,404	42,934
Bank overdrafts	4,606	2,624	2,631
Standard loans	174,926	180,077	178,145
Loans from governments	121,792	2,011	2,011
Corporate tax liability	22,514	22,633	22,629
PAYE	17,922	6,048	10,880
NASSIT Obligations	1,437	693	1,127
Other liabilities*	284,790	13,429	13,776
Total	734,290	311,351	361,099
Memo			
<i>In percent of domestic debt</i>	37.4	13.3	13.3
<i>In percent of total public debt**</i>	11.3	3.9	3.7

Data source: Sierra Leone authorities.  
\* Other liabilities include unstructured loans, deferred tax liabilities and accounting provisions.  
\*\* Including public external debt.

**Table 4. Sierra Leone: Membership, Contribution, Income, Expense and Returns of NASSIT**

	2011	2012	2013	2014
<b>Total membership</b>	<b>176,026</b>	<b>191,945</b>	<b>203,469</b>	<b>222,794</b>
Public Sector	76,194	81,146	80,607	86,284
Private sector	99,832	110,799	122,862	136,510
<b>Total income</b>	<b>176,653</b>	<b>228,566</b>	<b>251,765</b>	<b>300,568</b>
Contribution income	138,382	196,568	225,490	258,795
Investment income	20,557	31,275	25,614	21,368
Other income	17,714	723	661	20,405
<b>Total expenditure</b>	<b>85,409</b>	<b>106,701</b>	<b>125,559</b>	<b>163,372</b>
Benefits paid	26,860	37,254	48,910	74,570
General and administrative expenses	38,549	49,447	56,649	68,802
<i>in percent of contribution income</i>	28	25	25	27
<i>in percent of total expenditures</i>	45	46	45	42
<i>in percent of insurable earnings</i>	4	4	3	4
Provision for impairment	20,000	20,000	20,000	20,000
<b>Surplus</b>	<b>91,244</b>	<b>121,865</b>	<b>126,206</b>	<b>137,196</b>
Net assets	452,828,508	551,129,958	701,133,863	796,784,319
Nominal return on assets	5.1	5.6	4.5	3.9
Real return on assets	(13.4)	(7.8)	(9.3)	(4.4)

Data sources: Government of Sierra Leone; NASSIT; and staff estimates.

**20. The current actuarial viability of the system is unclear, but several developments point to emerging risks that could result in additional claims on government resources, such as an increase in the contribution rate.** Between 2011 and 2014, administrative expenses averaged 26 percent of contribution income and 45 percent of total expenditures. This contrasts with the recommendation of 15 percent for administrative expense in the actuarial analysis of 2007. The report also recommended that administrative expenses should be closely monitored in order to reduce them. The 2010 report found that annual expense in percent of insurable earnings, which currently stands at 4 percent, could gradually rise to 23.4 percent, which would call for an increase in the contribution rate to 19 percent. The report called for a regular and orderly mechanism for increasing the contribution rate. Indeed, since wage increases in the public sector have been well in excess of those in the private sector, this would have called for increases to the contribution rate for sustainability.

**21. Apart from risks to fiscal expenditure, additional issues with the pension system are that real rates of return have been negative for a long time, and the investment profile is becoming increasingly skewed toward property and equity investments.** Independent of these developments, demographic trends could drive up the number of retirees per year, with an impact on pension expenditures. Improvements in life expectancy would result in pensioners having longer retirement. All of these could also affect solvency if the contribution rates or benefits are not adjusted. Assuming coverage and benefit levels remain unchanged and taking account of an

expected rise in old-age dependency ratio, budgetary pension expenditures could double. All these point to the need to systematically assess the risks to the pension system on a regular basis.

### **Large Infrastructure Projects**

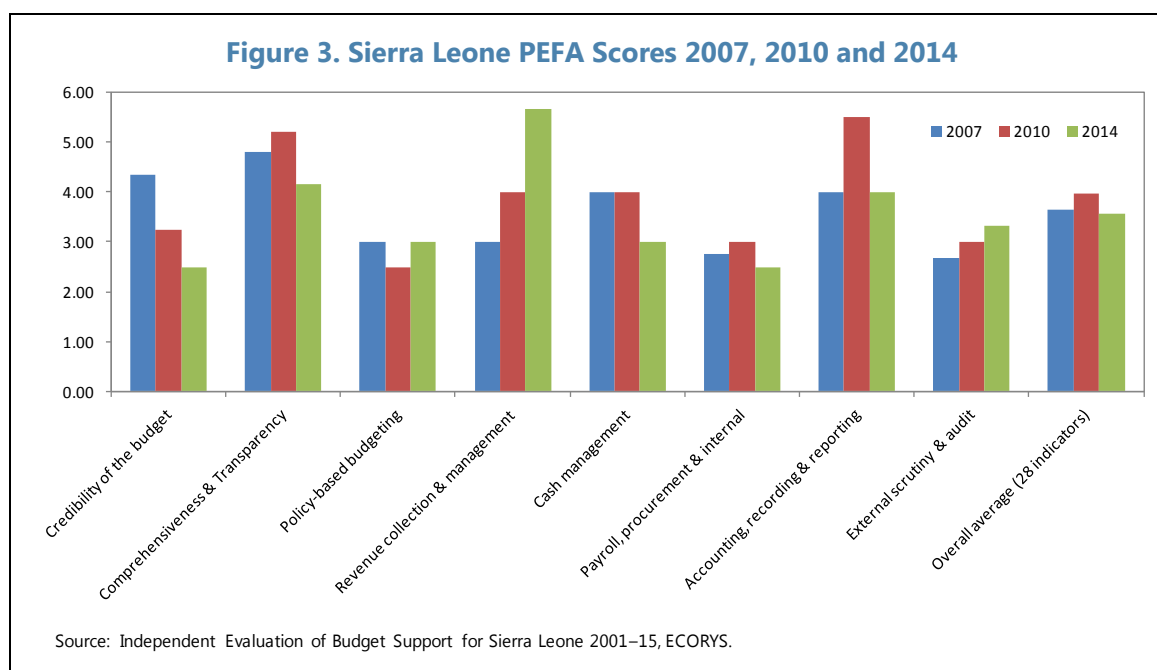
**22. The need to address infrastructure gaps and exploit natural resources requires major and multi-year contracts.** The authorities' aspiration plan laid out in the *Agenda for Prosperity (A4P)* is underpinned by eight strategic pillars which would serve as the foundation for achieving middle income country status. Through pillars 1 and 4, the authorities envision to implement a number of large-scale projects in agriculture, energy and transportation. The cost of the airport alone is estimated at US\$312 million (6.6 percent of 2013 GDP); significant related expenses—light rail linking the airport to the port, a port upgrade—are also planned. Energy related projects have been costed at over US\$1.2 billion. Coping with the resource implications of these will be challenging given limited domestic resource mobilization and expenditure pressures. The government plans to resort to external borrowing to fill the financing gap, and it is also favorably disposed toward public private partnership (PPP) arrangements. PPP arrangements could be less costly, both in terms of debt burden and debt service payments. But large non-transparent concessions for PPP operators could create fiscal risks that could outweigh the lower explicit fiscal cost.

**23. While these investment projects have the potential to address growth bottlenecks, they also carry large macroeconomic risks.** The government of Sierra Leone maintains a public investment project plan, and the expenditure projections of some of the large projects are already included in the fiscal framework (for example, the annual Project Implementation Plan (PIP), borrowing plan, the budget, the DSA). For these projects, fiscal risks would only be associated with cost overruns, project delays, and realization of contingencies that had not been included in the baseline. But some projects, such as the Post-Ebola Recovery Projects, are initiated outside the medium term plan or macroeconomic framework. Even if financing has been obtained, their large scale has the potential to significantly add to the fiscal deficits and debt burden. Other economic issues could arise, such as the risk of overheating the economy or running into absorption-capacity constraints. All of these create substantial fiscal risks.

### **Risks from Institutional Weaknesses in Public Finance Management**

**24. Sierra Leone has made substantial progress in improving its management of public sector finances, and while some Public Expenditure and Financial Accountability (PEFA) assessments and budget transparency scores have improved over the years, improvements are not always sustained.** In particular, scores on credibility of the budget have declined consistently during the last three assessments, (Figure 3). In the post-civil war period, institutional reforms focused on rebuilding the PFM regulatory framework and physical infrastructure (2002–07). As part of these efforts, the National Revenue Authority was established (2002); the Integrated Financial Management Information System (IFMIS) was introduced (2004); a new PFM legal framework, the Government Budgeting and Accountability Act (GBAA) was enacted (2005) and the Public Procurement Act (2004), introduced a decentralized procurement regime. Capacity building was enhanced in PFM functions, in particular within MoFED.





**25. In 2013, the Sierra Leone PFM Strategy 2014–17 launched a new phase of reforms.** The ultimate aim of the reform agenda is “to target improvements in the quality of public financial management which will have a positive impact on aggregate fiscal discipline, the strategic allocation of resources and the efficiency of public service delivery”.<sup>8</sup> The main priorities are Revenue Management (introduction of an Extractive Industries Revenue Bill, as well as new tax legislation combining inland revenue and customs); public investment planning (development of a Public Investment Program); the establishment of a Single Treasury Account, the completion of the IFMIS roll-out, and strengthening at local level.

**26. Notwithstanding these reforms, institutional weaknesses in capacity, law and regulations remain important sources of fiscal risks, and these amplify the impact of other risks when they materialize.** For example, weaknesses in cash management practices lead to greater than expected fiscal costs when financing risks materialize. Many of the identified weaknesses are driven by (1) quality, timeliness, and coverage of reported fiscal data; (2) expenditure allocation and control; (3) oversight of subnational and general governments; (4) revenue forecasting and administration. These weaknesses not only magnify fiscal risks, they represent structural barriers to economic growth and poverty reduction.

**27. Quality, timeliness, and coverage of reported fiscal data:** Low data quality often drives revenue and expenditure forecasts, magnifying fiscal risks. Data coverage is also restricted to the central government in many cases. The extent of unreported government operations is high, and

<sup>8</sup> Government of Sierra Leone, Ministry of Finance and Economic Development: *Sierra Leone PFM Reform Strategy 2014–17*.

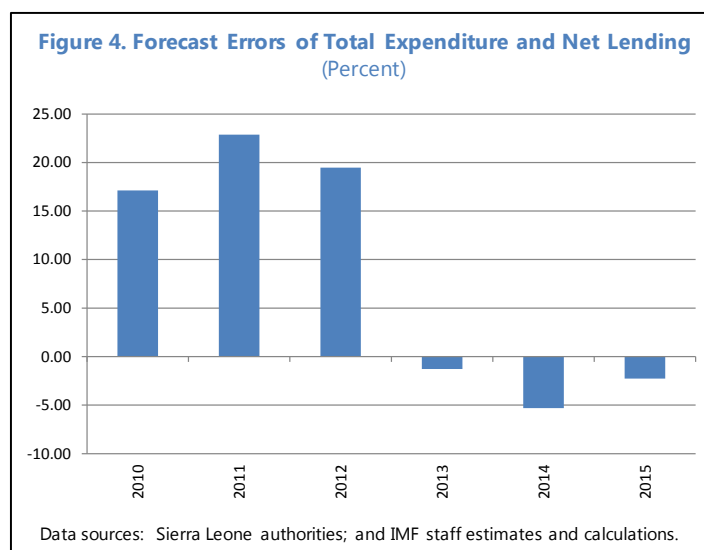
there are 130 off-budget Autonomous Government Agencies (AGAs). Coverage of MDAs has increased in recent years as a result of increased capacity and sanctions, but sanctions do not apply to self-financing MDAs, like Sierra Leone Roads Authority, which nonetheless incur contingent liabilities. A system for monitoring fiscal risk from SOEs is in place, but it does not consolidate overall fiscal risk, and risks are not updated or monitored regularly. As a result, risks often materialize at a time when the fiscal cost of mitigating them has become very high.

## 28. Expenditure Allocation and Control:

Expenditure overruns stem from not only exogenous shocks or weak forecasting capacity, but also from weak internal controls and cash management. MDAs are sometimes constrained by the resource envelope provided by the MTEF, and so resort to off-budget overspending financed by unreported revenue or the accumulation of arrears. Expenditure is often higher than forecast, and forecast errors—which measure the difference between forecast and outturn (Figure 4)—have often been positive.

Higher than programmed expenditure increases the risk that the deficit could be higher than programmed; and that financing risks would materialize or arrears would be accumulated. Challenges in the management of the payroll, which constitute the largest expenditure item in the budget, have remained for a long time, despite technical assistance provided by development partners. A payroll identification exercise initiated in January 2016 found that less than 75 percent of the names in payroll data matched the headcount data. Control and monitoring of some IFMIS accounts are weak, and not all off-budget agencies that are required to report to the Treasury and Other Government Accounts Service (TOGAS) do so.

**29. Oversight of local and general governments:** In principle, devolution of revenue and expenditure functions to sub-national and general governments allows public spending to better address needs. However, in the absence of systematic oversight, fiscal risks could be magnified. The Local Governments Equitable Grants Distribution Formula provides clear information on allocations to each of the 19 local councils for each of the devolved services. However, major weaknesses remain in timeliness and reliability of information to Sub National governments on their allocations from central government. There is also limited control over their expenditure and oversight of aggregate fiscal risk from other public sector entities. As one of the post-Ebola recovery strategies is to increase decentralization, especially in health and education, a more systematic monitoring of fiscal risks would become important. The coverage of SOEs was partial because 23 organizations either did not submit their accounts, or they submitted them late.



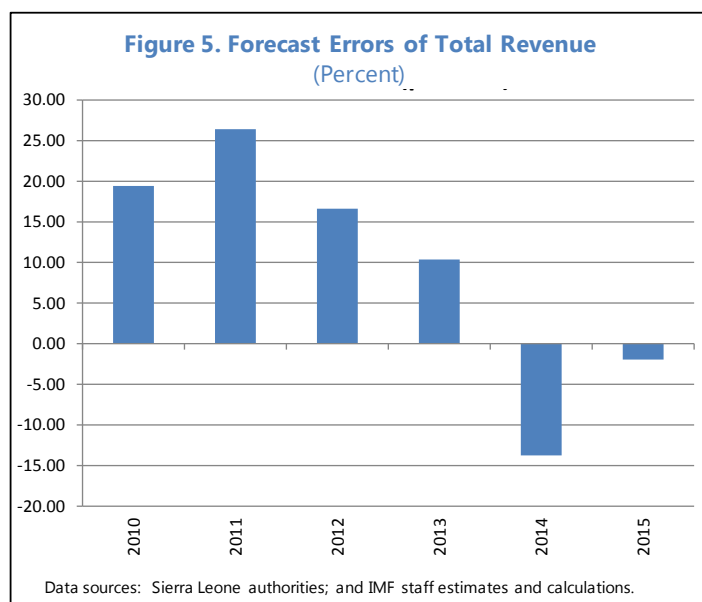
### 30. Revenue forecasting and administration:

Institutional weakness in revenue administration is a major source of fiscal risk. In Sierra Leone, revenue outturn is consistently higher than forecast (except during the exogenous shocks of 2014–15).

Revenues collected are nonetheless still lower-than-expected as a proportion of the tax base, when the tax rate for the individual category is applied to the specific tax base. While the former is due to forecasting capacity or macroeconomic shocks, the latter is due to weaknesses in revenue administration.

Revenue forecast errors

have been mainly positive, except for 2014 when there was an exogenous shock (Figure 5). Under-forecasting revenue to ward off pressures from line agencies limits the credibility of budget. Issues that undermine revenue collections and reduce the tax base include non-transparent discretionary exemptions and overly generous tax concessions. Though the 2014 PEFA assessment notes that “individual ministries have been granting waivers in their areas of responsibility, without the ratification of Parliament”, the government has, beginning from 2016, strengthened the process for granting duty exemptions.



## C. Risk Monitoring and Management

*As shown in the foregoing, Sierra Leone’s economic prospects are subject to fiscal risks. Risks need to be closely monitored, and many of them could be mitigated through the implementation of a variety of measures as follows.*

**31. Enhance macro-fiscal management:** Improving macroeconomic and fiscal synergies in the context of the annual budget would aid managing fiscal risks and increase the focus on their analysis, measurement, and monitoring. Risks need to be recognized or analyzed in official documents, with an accompanying strategy for managing them. In budget documents, it would be beneficial to analyze the sensitivity of the government’s fiscal forecast to different macroeconomic assumptions and produce alternative macro-fiscal scenarios that would help to illustrate the robustness of the government’s fiscal assumption to a range of plausible macroeconomic shocks. By so doing, the budget function is undertaken in the context of fiscal sustainability, which aids the identification of risks.

**32. Introducing Fiscal Responsibility Principles and a Fiscal Strategy Statement (FSS)** to guide fiscal planning and the medium-term budgetary framework would strengthen the macro-fiscal framework. Adhering to Fiscal Responsibility Principles would limit opportunities for spending

beyond approved appropriations, and it would also provide the flexibility to respond to urgent unforeseen expenditure needs. The Fiscal Strategy Statement would be similar to the Budget Framework Paper, which it replaces under the new PFM architecture, except that it is more focused on the strategic, rather than the annual fiscal vision. Therefore the objectives of fiscal policy, forecasts, policies and ceilings are based on a three to five year perspective. Furthermore, the expected discussion of fiscal risks to forecasts as well as those arising from guarantees would aid risk mitigation. Given that the new PFM Act prescribes the FSS as a non-discretionary requirement of the new PFM architecture, preparation on the 2017 FSS should commence without delay.

**33. Improve the disclosure of fiscal risks:** Disclosing risks ex ante allows for a more transparent management of public finance resources. Such disclosure could take the form of publishing a comprehensive statement of fiscal risks that sets out the specific risks to the budget, government's contingent liabilities, estimates of their magnitude and likelihood, and the government's strategy for managing them (Appendix I). In addition, information about the probability of their being called could form part of the annual budget.

**34. Mitigate specific risks:** Progress in the implementation of the remaining public finance reforms and enhanced capacity will mitigate specific sources of risks from debt and contingent liabilities. Debt sustainability will benefit from continued reliance on concessional financing for external debt. For domestic debt, a more proactive debt management that is well coordinated with treasury cash management and market liquidity conditions could minimize maturity and roll over risks, while providing much needed financing to the budget at reasonable cost. On contingent liabilities, it would be important to improve oversight control of SOEs and subnational governments in a comprehensive manner. Government should begin to design a framework for improving governance and financial control, while at the same time, minimizing costs and indirect subsidies. The objective should be, at a minimum, cost recovery in their operations. An annual report on the overall financial performance of SOEs, publicly owned corporations, and equity holdings by the state in private enterprises could also form part of the fiscal risk statement. Such reports should state direct and indirect support (e.g. implicit guarantees) between government and the public sector.

**35. Implement the PFM Act:** Many measures in the PFM Act are focused on addressing gaps and deficiencies in the PFM environment. The recent passage of the PFM Act provides an important opportunity to begin to address many of the identified weaknesses in the PFM environment in a comprehensive manner. In line with the provisions of the Act, coverage of reported fiscal operations should be based on the IMF's Government Finance Statistics framework (GFSM 2001) framework so that oversight of fiscal operations would be beyond budgetary central government. The GFSM framework ensures that the government takes account of revenues, spending and financing of all government entities in assessing its overall fiscal position, allowing for a more comprehensive assessment of risks that could derail the achievement of fiscal objectives. On expenditure control, the provision of the Act on commitment control would help contain expenditure allocation and control. Full roll out to all MDAs, SOEs and subnational governments would accelerate the pace of the reforms, since enforcement of many key provisions in the Act are critically dependent on the rapid deployment of a well-functioning IFMIS across government. Otherwise, implementation of

these provisions could be severely jeopardized. This would also assist to bring under central government ambit the operations of all constitutional bodies, sub-vented agencies, and semi-autonomous agencies, as well as some existing public enterprises and improve contingent liabilities risk mitigation. Revenue administration provisions of the Act, especially the introduction of a TSA will allow for better control over a major source of risks to revenue.

**36. Reform the pension system:** A comprehensive analysis of the pension system could provide information that would help moderate or prevent emerging fiscal risks in the long run. The goal should be not only for the purpose of ensuring the financial or actuarial soundness of the scheme, but also, from the perspective of government, for long run fiscal sustainability. This means that actuarial imbalances that are likely to necessitate budgetary support are avoided. To achieve this, key parameters of the system,—such as contribution rates, benefit levels, and retirement age—will need to be reviewed periodically as Sierra Leone’s demography changes. A good starting point is to conduct a new actuarial study, since the most recent one took place in 2010.

**37. In terms of priority, implementation of the PFM Act provisions should take precedent in the public finance reform agenda over the next year, as most of the regulations governing implementation have already been developed.** Progressive implementation of the Act will bring focus on priority issues relating to fiscal risks, contingent liabilities and the activities of SOEs. Government may however wish to fast track actions on policies that are likely to mitigate risks from domestic financing given its criticality to the success of the budget. These include implementation of the TSA, to improve revenue outcomes, and improved coordination between the cash management function and domestic debt market policies. While the risks are less imminent, the potential large magnitude of risks from pension obligations warrants immediate effort to identify and seek ways to mitigate those risks. Finally, a careful examination of regulations and laws related to PPPs, with an effort to minimize contingent liabilities, would be warranted before embarking on significant PPPs.

## D. Conclusion

**38. This paper found that several factors contribute to fiscal risks in Sierra Leone.** These include macroeconomic shocks, forecasting capacity, debt sustainability, activities of SOEs and subvented agencies, large infrastructure projects, the pension system and institutional weaknesses in public finance management. The study identifies policies that could help to improve the assessment and quantification of fiscal risks, while mitigating the probability of occurrence or magnitude. Key among these are reforms of public finance management practices, laws and capacity. Given that the government is at an advanced stage of implementing some of these reforms, faster progress on passing enabling regulations and laws; and determined implementation would assist to mitigate fiscal risks and enhance the achievement of macroeconomic objectives.

## References

Bova, E., M. Ruiz-Arranz, F. Toscani, and H.E Ture, 2014, "The Fiscal Cost of Contingent Liabilities: A New Dataset," IMF Working Paper 16/14 (Washington: International Monetary Fund).

Cebotari, A., 2008, "Contingent Liabilities: Issues and Practice," IMF Working Paper 08/245 (Washington: International Monetary Fund).

International Monetary Fund (IMF) 2013, John Gardner, Suzanne Flynn, Oana Luca and Lynne McKenzie, Improving the Legal Framework for Fiscal responsibility and Public Financial Management, FAD.

---, 2012, John Gardner, Suzanne Flynn, Oana Luca and Steve Gurr, Sierra Leone,

Determination and Implementation of a Fiscal Rule, IMF, October 2012.

--- 2004, "Public-Private Partnerships." Fiscal Affairs Departmental Paper, Washington.

<http://www.imf.org/external/np/fad/2004/pifp/eng/031204.pdf>

———. 2007–14. Country staff reports and debt sustainability analyses, various vintages, Washington.

———. 2008. "Fiscal Risks—Sources, Disclosure, and Management." Fiscal Affairs Departmental Paper, Washington. <http://www.imf.org/external/np/pp/eng/2008/05>.

———. 2012. "Fiscal Transparency, Accountability, and Risk."

--- IMF Board Paper. <http://www.imf.org/external/np/pp/eng/2012/080712.pdf>.

Joint IMF/World Bank Report, Debt Sustainability Analysis, Sierra Leone, November 2015.

## Appendix I. Indicative Structure of a Fiscal Risk Statement<sup>1</sup>

### 1. Macroeconomic risks and budget sensitivity

- Discussion of the macroeconomic forecasting record in recent years, comparing the assumptions used in budget forecasts against actual outcomes.
- Sensitivity of aggregate revenues and expenditures to variations in each of the key economic assumptions on which the budget is based (e.g., impact of exchange rates and interest rates on revenues and expenditures), with explanation of underlying mechanisms. Possible methods and presentational devices include alternative scenarios or fan charts. In conducting these exercises, it is desirable to take into account the correlations among different shocks.
- Unpredictability of official development aid / budget support. Recent outcome both in terms of commitments made and timing of receipt, and the impact of delay in disbursement on the cash management and planned mitigation of risks.

### 2. Public debt

- Sensitivity of public debt levels and debt servicing costs to variations in assumptions regarding, e.g., exchange rates and interest rates. Impact of debt management strategy on the government's risk exposure.
- Policy and institutional framework for government borrowing and on-lending: projected statement of inflows, outflows, and balances; disposition of loan repayments and nonperforming loans.

### 3. Contingent central government expenditure

#### a) Contingent Liabilities

- Expected value and government's gross exposure to contingent liabilities, especially central government guarantees (e.g., to public enterprises); reporting to include broad groups of guarantees but also any major individual guarantees.
- Rationale and criteria for the provision of guarantees.

---

<sup>1</sup> Source: IMF Fiscal Affairs Dept. (2016) Sierra Leone – Report on Macro-Fiscal and Cash Management under the New Legal Framework.

## b) Banking sector

- Deposit insurance scheme and—to the extent that the authorities feel this does not generate moral hazard—risks from the banking sector.
- Information on costs of past bailouts/recapitalizations/preemptive financial support.

## c) Legal action against the central government

- Past claims (including amounts) and the face value of current claims, including a disclaimer that reporting the risk does not indicate government acknowledgement of liability.
- Fiscal impact of disasters in recent years.
- Level and operation of possible contingency reserve for natural disasters (if applicable).

**4. Public private partnerships**

- Summary of the PPP program; infrastructure needs; public investment program; policy framework and rationale for PPPs.
- Cumulative overall exposure from government's current announced PPP program.
- Features of some signed PPPs, and gross exposure from guarantees and similar instruments.

**5. State-owned enterprises**

- Policy framework for SOEs (pricing policy, dividend policy).
- Financial performance and position of the SOE sector and the largest SOEs.
- Financial performance and position of state-owned banks.

**6. Subnational governments**

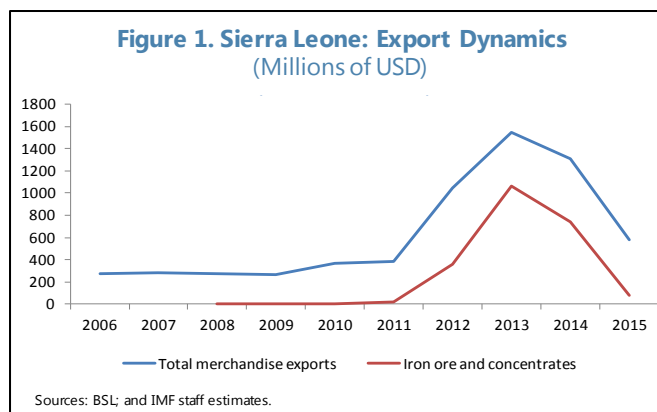
- Legal framework for intergovernmental fiscal relations, and summary of recent aggregate subnational government financial performance and financial position.



# EXPORT DIVERSIFICATION IN SIERRA LEONE<sup>1</sup>

## A. Introduction

**1. Sierra Leone experienced rapid growth in exports, fuelled by iron ore related expansion.** After the end of civil war, the country's exports grew steadily until 2011. Then large scale iron ore investment into the country significantly boosted total exports (Figure 1), while also contributing to higher growth and improved public finances. However, after peaking in 2013, exports collapsed in 2015, largely driven by the complete shutdown of



iron ore production and tumbling global commodity prices. This has reinvigorated the discussion, as in many other commodity exporting countries that suffered from a similar shock, regarding the need to diversify the economy and exports to maintain macroeconomic stability. Motivated by the ongoing debate, this paper investigates the state of export diversification in Sierra Leone and determinants of export diversification to formulate policy advice.

**2. The dominance of iron ore has deteriorated export diversification while the analysis identifies a number of factors that could boost it.** The results of the analysis indicate that, prior to 2010, Sierra Leone managed to increase the diversity of its exports over the past five decades and stood out among peers in the region. However, the commencement of iron ore operations since 2011 adversely affected export diversification both in products and export destinations. Empirical analysis of developing country data shows that export diversification can be enhanced by attracting more FDI, improving human capital and upgrading physical infrastructure. This highlights the need to mobilize fiscal resources to finance, especially, human capital and infrastructure development in Sierra Leone. The rest of the paper is organized as follows: Section II discusses the current state and evolution of export diversification in Sierra Leone; Section III reports the results of cross-country analysis on the determinants of export diversification; and Section IV concludes.

## B. Export Diversification in Sierra Leone

**3. In this part of the paper, we investigate the evolution of export diversification.** While it is a fact that iron ore exports have started to dominate Sierra Leone's exports recently, it is important to know the current state of export diversification. We compare the extent of

<sup>1</sup> Prepared by Botir Baltabaev.

Sierra Leone's export diversification to other major country groupings' in terms of income level, as well as to its regional peers'. Then, we examine the dynamics of major export products and export destinations.

**4. The analysis in this paper relies on the IMF diversification toolkit data along with UNCTAD data on exports.** The original data on export diversification was obtained from the IMF diversification toolkit, which covers 187 countries and provides indicators on export product diversification and export product quality from 1962–2010. The measure of export diversification is based on an updated version of the UN–NBER dataset that harmonizes COMTRADE bilateral trade flow data at the 4-digit SITC (Rev. 1) level. The export diversification index was developed by the IMF staff under IMF-DFID research collaboration (IMF, 2014). For years after 2010, UNCTAD trade data was used, available from the UNCTAD website (UNCTAD, 2015).

**5. Export Diversification is calculated as a Theil index.** To construct the index, first, dummy variables are created to define each product as "Traditional," "New," or "Non-traded." Traditional products are goods that were exported at the beginning of the sample, while non-traded goods have no exports for the entire sample. Products classified as "new" are defined as the ones to have been non-traded in at least the two prior years and then exported in the two following years. Hence, the dummy values for new products can change over time. The overall Theil index has two components: the Extensive Margin, and the Intensive Margin. The Extensive Margin of export diversification improves when either the number of products or export destinations increase. However, the Extensive Margin fails to account for the concentration problem, which is tackled by the Intensive Margin, which gets better when export products and markets are more evenly distributed. Higher values for the index imply lower level of diversification. The overall export diversification is measured as the sum of two Theil index subcomponents. The extensive Theil index is calculated for each country/year pair as:

$$T_B = \sum_k (N_k/N) (\mu_k/\mu) \ln(\mu_k/\mu),$$

where  $k$  represents each group (traditional, new, and non-traded),  $N_k$  is the total number of products exported in each group, and  $\mu_k/\mu$  is the relative mean of exports in each group. The intensive Theil index for each country/year pair is:

$$T_W = \sum_k (N_k/N) (\mu_k/\mu) \left\{ (1/N_k) \sum_{i \in k} (x_i/\mu_k) \ln(x_i/\mu_k) \right\}.$$

where  $x$  represents the export value.

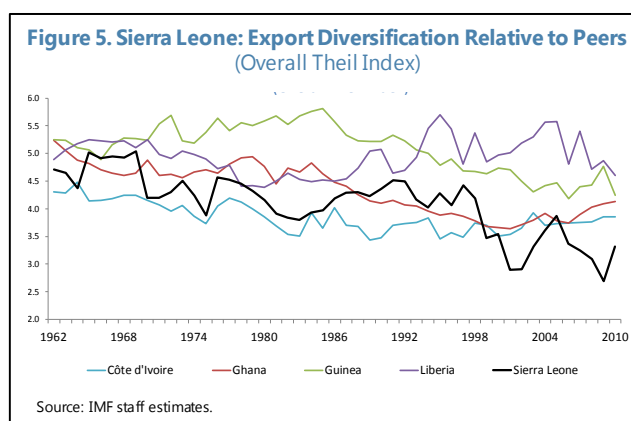
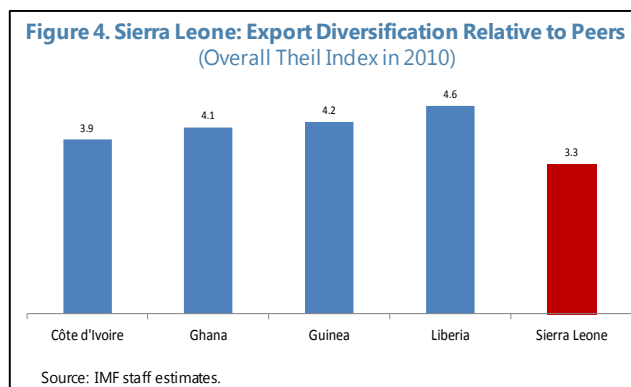
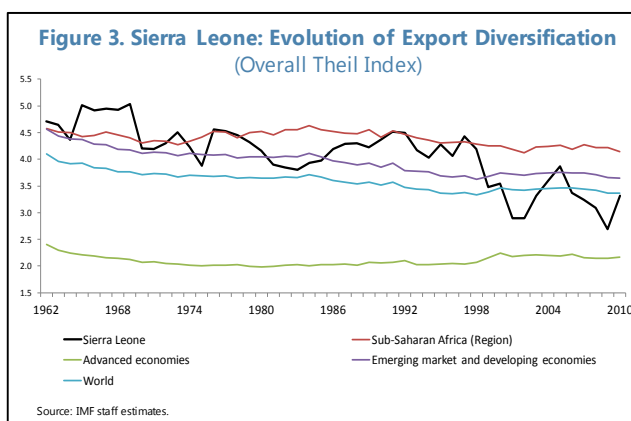
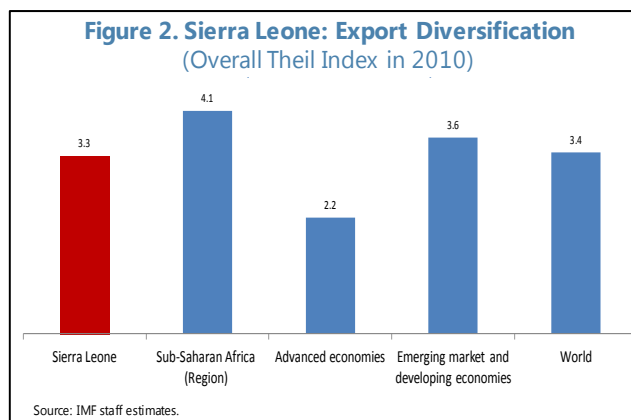
**6. In 2010, Sierra Leone's exports were well diversified when compared to comparator country sub-groupings.** The level of export diversification was better than that of the Sub-Saharan Africa, developing countries and the world average (Figure 2). It only underperformed advanced economies, which is expected. Since 1962, Sierra Leone's export diversification has also improved considerably (Figure 3).

## 7. Compared to its peers in the region, the country's export diversification stood out.

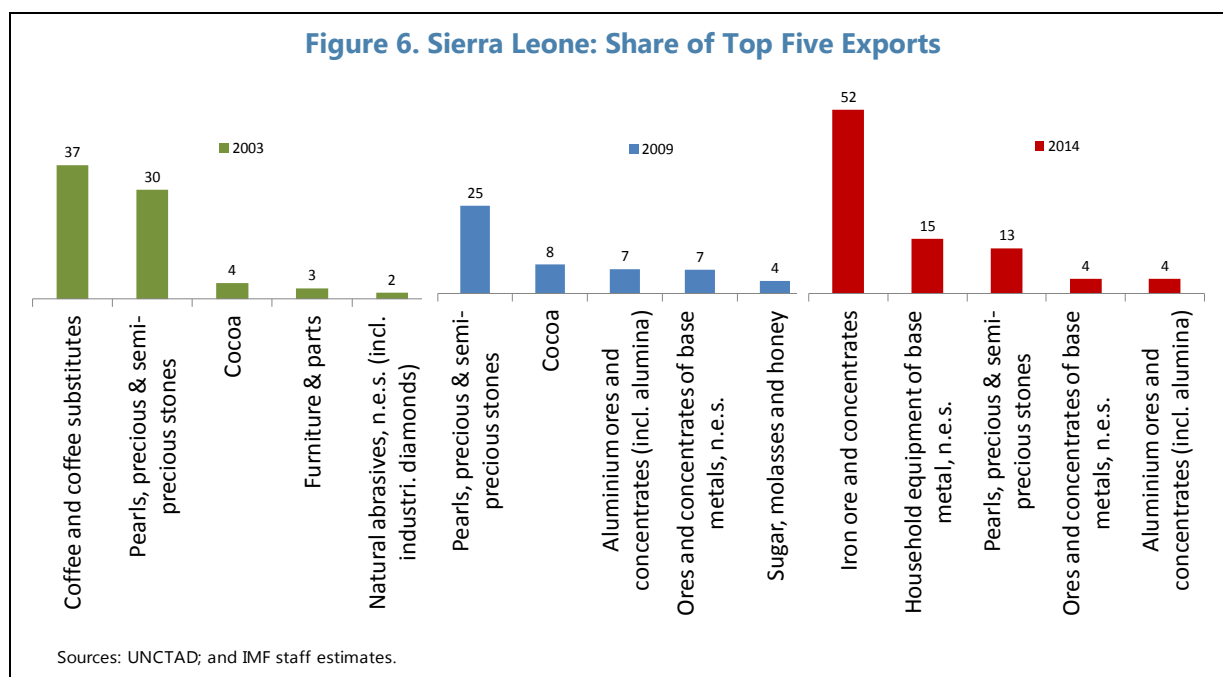
Among the countries in the immediate region, Sierra Leone's exports were the most diversified in 2010 (Figure 4). Moreover, the great strides made by Sierra Leone in diversifying the level of exports is also commendable as it outperformed most of its peers over the past five decades prior to 2010 (Figure 5). The results indicate progress in export diversification in Sierra Leone until 2010. However, given that the IMF data does not extend beyond 2010, when the economy received large scale iron ore FDI, which was followed by massive iron ore exports, a great deal of information is missed regarding the dynamics of export diversification afterwards. To analyze what happened later, we use the UNCTAD data to assess the evolution of export diversification both in products and export markets.

## 8. Iron ore exports have made export products less diversified (Figure 6).

In 2003, right after the end of the civil war, Sierra Leone's top three exports were coffee, precious stones (mostly diamonds) and cocoa, accounting together for about 71 percent of exports. In the best performing year of 2009, the top three products were precious stones, cocoa and aluminum ores (bauxite, a new addition). These three products together shared 40 percent of total exports and the distribution of top five exports was also more equal than 2003. However, in 2014, iron ore alone was responsible for more than half of all exports, while the top three products accounted for 80 percent of total exports. This made Sierra Leone vulnerable to a commodity price shock, and when it eventually struck in 2014–15, the economy suffered from a severe recession, which came

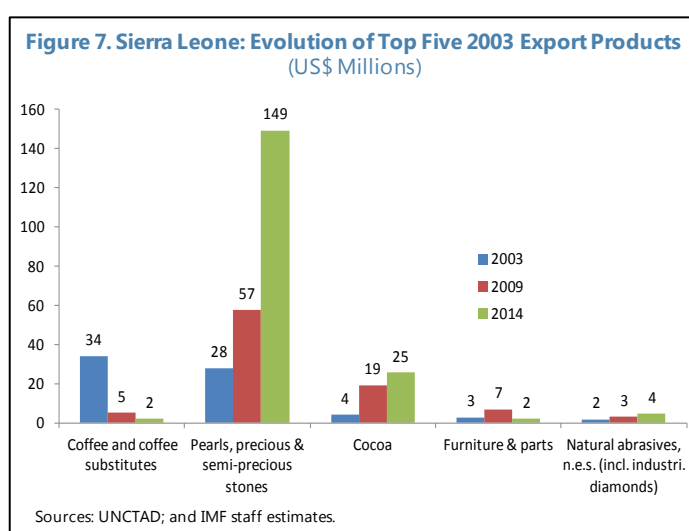


on top of another major shock—EVD. Also, it is concerning that Sierra Leone’s top five exports have predominantly been primary products, lacking any manufacturing goods, which deprives the economy from creating significant value addition.



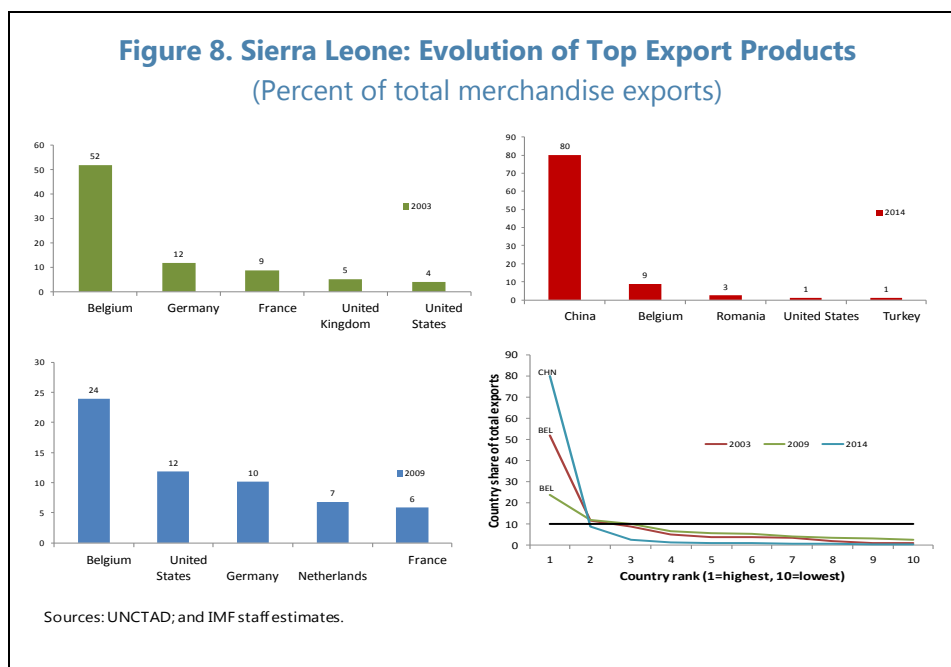
### 9. Most traditional exports have also failed to grow substantially

(Figure 7). Of the top five export products in 2003, only precious stones and cocoa could keep the growth momentum, despite the latter losing its top five export spot by 2014. Coffee and furniture and parts (mostly timber) have significantly declined, while the growth rate of natural abrasives was very slow, indicating that these products have been overshadowed by the rapid mining sector expansion, particularly, of the iron ore.



**10. The diversity of export destination also became more concentrated** (Figure 8). The geography of Sierra Leone’s exports has largely been driven by its export products. Early in the 2000s, when the major export product was diamonds, Belgium was the biggest trading partner, where over half of the goods were shipped. This was followed by Germany and France, accounting for 12 and 9 percent of exports, respectively. In 2009, Belgium was still the major export market, although the dependence on the country more than halved. Meanwhile, the United States took over

from Germany in second place. However, by 2014 China accounted for 80 percent of total goods exports originating from Sierra Leone, thanks to its burgeoning appetite for iron ore. There are not many countries in the world with such a level of export market dependence on a single country. Further analysis using top 10 export destinations also confirm that 2014 was the year of least export market diversification (see the right-bottom chart in Figure 8).



### C. Determinants of Export Diversification

**11. This section reports the results of empirical analysis on the macro-level determinants of export diversification.** While several studies have previously been conducted to study the topic, not many have concentrated on macroeconomic indicators that could be important for low income countries like Sierra Leone. For example, Cadot et. al., (2011) investigate the relationship between income level and export diversification, while Tadesse and Shukralla (2013) examine whether export diversification can be boosted by more FDI. We study the determinants of export diversification driven by fundamentals of an economy, such as the country size and income level, as well as several other macroeconomic variables that can change as a result of economic policies. However, microeconomic policies that can also be used to support export diversification are beyond the scope of this paper.

**12. Data used for regression are from 125 developing countries** (in the complete model) and cover the period 1991–2014. Given the limited availability of Sierra Leone-specific time series data, it was not feasible to carry out time series analysis of Sierra Leone, opting instead for the current cross-country analysis. Moreover, panel data allows us to control for country specific factors of export diversification, such as distance to markets. The dependant variable is export diversification, measured by the overall Theil index, which is available from the IMF Diversification Toolkit Database (Table 1). A number of explanatory variables are considered which are largely driven by previous

literature and come from the World Development Indicators (WDI). The country size and income level have traditionally been associated with the extent of export diversity (Krugman, 1979; Melitz 2003). The remaining explanatory variables are trade openness, real exchange rate, FDI, human capital and infrastructure (Table 1). The inclusion of the selected measures for the explanatory variables was largely driven by the availability of data.

**13. Pooled OLS regression is conducted using four different estimation models** (Table 2). Each model is a version of the complete model (4), where all explanatory variables are included along with the country dummies (to control for fixed country effects). Model (1) specifies only two explanatory variables impacting export diversification: the country size and income per capita or the so-called fundamentals. Model (2) includes two additional variables to model (1) with trade openness and the real exchange rate, while model (3) has the same specification as model (4), except for the country dummies. Model (3) is intended to check if the impact of explanatory variables even if the country specific factors are excluded. The estimated coefficients are reported along with the p-values of t-statistic in parentheses. Positive signs indicate detrimental impact on export diversification (since lower Theil index implies more diversification), while negative sign is associated with beneficial impact.

**14. The results indicate several policy variables can boost export diversification.** Of the two fundamental determinants of export diversification, the country size, measured in GDP, has the expected negative sign through models (1) to (3), which is significant at the 1 percent level. However, in the complete model (4) with fixed effects, the sign switches to positive implying that that country size reduces export diversification. Surprisingly, per capita income seems to reduce export diversification as indicated by the positive sign in all models. We also find trade openness to reduce export diversity, which is statistically significant and unexpected. This may happen if, as more goods are exported (suggesting greater openness to trade), the intensive margin of the Theil index worsens as exports may become too concentrated (in products and destinations), deteriorating the overall index.<sup>2</sup>

**15. Human capital, infrastructure and FDI can enhance export diversification.** The results strongly indicate that better human capital and infrastructure can contribute significantly to export diversification. The results in models (3) and (4) are highly significant, both in terms of coefficient size and statistical significance. In model (4) with country-specific effects factored in, FDI also has a beneficial impact on export diversification, suggesting the arrival of more multinational firms in developing countries can increase the diversity of exports. However, compared to human capital and infrastructure, the statistical significance for FDI is lower.

---

<sup>2</sup> Real exchange rate depreciation is likely to improve export diversity as implied by models (2) to (3). However, in model (4), it seems to harm diversification, albeit both the economic and statistical significance decline.

**Table 1. Data Sources and Definitions**

Variable	Measure	Unit	Source
Export diversification	Theil Index	Index	IMF
GDP	Nominal GDP	USD	World Development Indicators
GDP per capita	Per capita GDP	USD	World Development Indicators
Trade openness	(Exports+Imports)/GDP	Percent	World Development Indicators
Real ER	ERxP/P*	Index	World Development Indicators/IMF
FDI	Share of FDI flows in GDP	Percent	World Development Indicators
Human capital	Gross Enrollment ratio	Percent	World Development Indicators
Infrastructure	Telephones per 100 people	Count	World Development Indicators

**Table 2. OLS Regression: Overall Theil index**

	(1)	(2)	(3)	(4)
GDP (t)	-0.0010 <sup>***</sup> (0.0000)	-0.0009 <sup>***</sup> (0.0000)	-0.0006 <sup>***</sup> (0.0001)	0.0001 <sup>***</sup> (0.0088)
GDP per capita (t)	0.0134 <sup>***</sup> (0.0000)	0.0107 <sup>***</sup> (0.0006)	0.0547 <sup>***</sup> (0.0000)	0.0107 <sup>***</sup> (0.0008)
Trade openness (t-1)		0.0022 <sup>***</sup> (0.0036)	0.0037 <sup>***</sup> (0.0002)	0.0036 <sup>***</sup> (0.0009)
Real ER (t-1)		-0.0000 <sup>***</sup> (0.0007)	-0.0001 <sup>***</sup> (0.0000)	0.0000 <sup>*</sup> (0.0533)
FDI (t-1)			0.0075 (0.1464)	-0.0059 <sup>*</sup> (0.0670)
Human capital (t-1)			-0.0100 <sup>***</sup> (0.0000)	-0.0061 <sup>***</sup> (0.0034)
Infrastructure (t-5)			-0.0332 <sup>***</sup> (0.0000)	-0.0073 <sup>**</sup> (0.0496)
Country dummies	No	No	No	Yes
Observations	2779	2164	1205	1205
Adjusted R <sup>2</sup>	0.067	0.069	0.254	0.909
Countries	145	132	125	125

Standardized beta coefficients; The p-values of t-statistic in parentheses are based on robust standard errors. \*, \*\*, and \*\*\* indicate significance at the 10%, 5% and 1% levels, respectively. iii) Constant term and country dummies are not reported to save space.

## D. Conclusions

**16. To successfully diversify the export base, which has deteriorated recently, Sierra Leone will need to improve infrastructure, invest in human capital and attract more FDI.** Prior to 2010, Sierra Leone's exports were well diversified. However, the large-scale iron ore investment and associated exports have significantly reduced both export product and market diversification. At the same time, most of Sierra Leone's traditional export products have failed to sustain growth momentum. Based on the cross country experience, Sierra Leone can increase export, and hence economic, diversification by improving human capital, easing infrastructure bottleneck and attracting more FDI.

**17. Needs for investment in human capital and infrastructure are extensive, while available resources limited.** Increased electricity supply, improved roads and ports, enhanced water and sanitation systems, strengthened health and education systems all require significant investment over the next few years. However, the resources available to address these are extremely limited. Therefore, more domestic resources need to be mobilized and used more efficiently to enable the government to address more of these infrastructure challenges, while a strengthened financial sector would enable the private sector to expand and diversify.



## References

Cadot, O., C. Carrere, and V. Strauss-Kahn, 2011, "Export Diversification: What's Behind the Hump?" *Review of Economics and Statistics*, Vol. 93, pp. 590–605.

IMF, 2014, "Sustaining Long-Run Growth and Macroeconomic Stability in Low-Income Countries—The Role of Structural Transformation and Diversification," Policy Paper.  
<https://www.imf.org/external/np/res/dfidimf/diversification.htm>

Krugman, P. R. (1979). Increasing returns, monopolistic competition, and international trade. *Journal of International Economics*, 9(4):469.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6):1695–1725.

Tadesse, B. and E. K. Shukralla (2013). The impact of foreign direct investment on horizontal export diversification: empirical evidence. *Applied Economics* 45(2), 141–159.

UNCTAD, 2015, "International trade in goods and services".  
[http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?IF\\_ActivePath=P,15912&sCS\\_ChosenLang=en](http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?IF_ActivePath=P,15912&sCS_ChosenLang=en)