



SIERRA LEONE

SELECTED ISSUES

July 2022

This paper on Sierra Leone was prepared by a staff team of the International Monetary Fund. It is based on the information available at the time it was completed on June 13, 2022

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International Monetary Fund
Washington, D.C.



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SELECTED ISSUES

June 13, 2022

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from storm surges along the coast, which take a toll on agricultural production, infrastructure, people's homes, public health and biodiversity along the coast. On August 14, 2017, a devastating flooding and a subsequent landslide disaster ripped through Sierra Leone's capital city, Freetown, and took over a thousand lives. The suffering was aggravated by the secondary health problems of water-borne diseases due to lack of safe drinking water after flooding. A damage and loss assessment by the World Bank estimated a total economic loss of over US\$31 million and recovery needs of over US\$82 million (or 0.8 percent of GDP in 2016). This highlighted the importance of investing in WASH infrastructure among other social services and infrastructure to reduce climate vulnerability.

3. Strong linkage between climate vulnerability and development calls for mainstreaming adaptation into national development agenda. Addressing development needs, such as developing the agricultural sector and tackling poverty, would also meet climate objectives.

- High dependence on agriculture and poor infrastructure exacerbates Sierra Leone's vulnerability to climate change. The agricultural sector employs 54 percent of total population and together with the fishing and forestry sector, constitutes 59 percent of GDP in 2020. Reliance on rain-fed farming methods increases the sector's vulnerability to rising temperature and extreme weather shocks. In Freetown in particular, deforestation due to clearing of land for human settlement has increased vulnerability to landslides and flooding, reduced opportunities for ecotourism, and has had a negative impact on the city's water supply.³ Farmers have limited access to finance and crop insurance is non-existent, making it more challenging to manage climate-related risks than in more developed markets. More extreme weather shocks can also cause significant damage to the country's infrastructure, which tends to be poorly maintained. Finally, warming oceans and acidification have impacted coral mortality, and thus fisheries, tourism, biodiversity and livelihoods (GoSL, 2021).
- The high poverty headcount ratio at national level amplifies the impacts of climate change, especially through deterioration in food security. About 56.8 percent of population in 2018 were living below US\$1.90 per day (World Bank, 2020) and almost half of the population are not consuming sufficiently nutritious diet to live a healthy life, including 4.6 percent of population in severely food insecurity. Climate-related disasters increase short-term hunger through the disruption of domestic production and elevated international food prices (WFP, 2020; FAO, 2017). The poor households are most adversely affected by food insecurity due to their higher percentage of income spent on food and lack of access to immediate financial and medical assistance (GoSL 2018, NDC 2021, IMF REO 2020). Literature also finds other channels through which climate change affect poor households, including disproportionate loss of

³ For example, the loss of 2,850 ha of protected forest in the watershed area appear to be a primary cause of the 40 percent drop in the water level of the Guma dam, Freetown's main water source, between 2015 and 2021 (WFP, 2022). Deforestation causes rain to drain down the hillside rather than seeping through the ground into soil and streams, increasing the risk of mudslides and flooding during the rainy season. <https://www.reuters.com/article/us-leone-water-feature/with-reservoirs-at-risk-sierra-leone-capital-confronts-water-crisis-idUSKCN1V9007>

assets from climate-related damage, less public resources due to limited political engagement, and adverse market prices (Islam and Windel, 2017).

4. Macro vulnerability requires fiscal policies to balance the needs of climate actions and debt sustainability, while weak institutions require strong PFM to plan and govern climate spending. The fiscal space remains tight with large contingent spending needs to mitigate and adapt to climate change,⁴ which significantly limits the capacity for risk transfer, post-disaster relief, and reconstruction expenditure. Competing development demand with investment in adaptation requires prioritizing projects that meet both development and adaptation purposes. Fragile fiscal frameworks and weak budget execution also undermine the effective response to natural hazards, and call for strong PFM to ensure efficient and transparent spending on climate actions

B. Climate Commitments and Actions

5. Nationally Determined Contributions (NDCs) submitted by countries under the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC) represent pledges to limit global warming. At the heart of the Paris Agreement, NDCs embody countries' mitigation and adaptation efforts to combat climate change.

6. Sierra Leone has developed a national strategy to combat climate change and adopted a framework for crisis response. Sierra Leone approved the first NDC in November 2016 and presented the updated version in 2021, which identified a broad range of sectors affected by climate change.⁵ It also envisions to achieve mitigation goals of reducing CO₂ emissions by 5 percent before 2025, 10 percent before 2030, and 25 percent before 2050, and sets adaptation goals of reducing vulnerability by half by 2030.

7. In 2021, Sierra Leone published the initial National Adaptation Plan (iNAP) to enable decisive and sustainable actions in adaptation identified in the updated NDC. It includes the four key blocks along the lines developed by UNFCCC, namely i) identifying climate impacts, vulnerabilities, and risks, ii) adaptation-related policies, plans and programs, iii) mainstreaming of adaptation, and iv) monitoring evaluation and reporting. The iNAP also identified five categories of adaptation programs (physical investments, human capacity development, institutional strengthening, regulatory modifications, research) for each vulnerable sector. Together with the National Adaptation Plan of Action (NAPA) developed in 2007, the authorities have prioritized 24 adaptation projects with detailed rationales, project objectives, inputs, outputs, institutional arrangements, risk and barriers, monitoring, and cost estimates (Irish Aid, 2015). However, selection criteria to prioritize these programs and projects were missing in the iNAP and NAPA.

⁴ The overall fiscal deficit excluding grants is estimated at 9.3 percent of GDP in 2021 and is projected to remain above 6 percent of GDP until 2024.

⁵ These include agriculture and food security, water resources and energy, coastal zone management, (including fisheries, coastal ecosystems), environment (including tourism, land, mineral resources, forestry), disaster management, gender and social inclusion, and hard and soft infrastructure.

8. Sierra Leone has established a regulatory strategy and framework to fulfil climate commitments, but challenges remain in implementing effective oversight. The Sierra Leone Environmental Protection Agency (EPA) was established in 2008 to sensitize the public to illegal logging, farming and mining in protected forest areas in order to stem deforestation and maintain biodiversity. In particular, the mining sector, which contributes an important portion to fiscal and export revenues, needs to adapt proactively to climate change (Box 1). A National Disaster Management Agency (NDMA) was set up under the Office of the President in 2020. A National Protected Area Authority (NPAA) was formed in 2012 to exercise oversight and authority over national parks and protected areas designated for conservation purposes and to promote sustainable land use practices and environmental management. However, Sierra Leone lost 1.82Mha of relative tree cover (equivalent to a 32 percent decrease since 2000) according to Global Forest Watch, partly due to fast urbanization, strong international demand of timber, and weak domestic regulatory oversight. This points to the low capacity as in many LICs and the weak oversight by regulatory agencies.

Box 1. Climate Change and Mining Activities

Climate change is expected to cause more frequent floods and droughts, altering the supply of water to mining sites and disrupting operations of mining companies. According to McKinsey's estimates, 50 percent of global iron ore production is exposed to high risks of flood occurrence. For example, early this year, heavy rainfall in southeastern Brazil has put 100 million tons of annualized iron ore supply at risk, roughly 7 percent of seaborne supply and about 30 percent of Brazilian supply.

A green recovery after the pandemic will likely shift commodity demands towards those needed for low-carbon technologies. More energy-efficient processing and widespread recycling would put pressure on the iron-ore and bauxite markets, particularly lower-grade products. Under the Paris Agreement to limit global warming by 2 degrees, iron ore and bauxite will see growth from new decarbonization technologies offset by increased recycling rates and focus on metal production from recycling versus virgin ore. In the case of Sierra Leone, low-grade ore (e.g. Tonkolili) will take a hit as it requires more carbon-intensive processing to meet market standards, while demand will shift towards high-grade ore (e.g. Marampa) as international communities decarbonize the industry.

9. Climate commitments generate significant financing needs while macro vulnerability implies limited domestic resources to meet such demand, which could incur large financing gaps that threaten debt sustainability. The next section will integrate climate costing into fiscal space analysis and provide advice on how to mainstream adaptation objectives into fiscal policies.

C. Fiscal Cost and Financing of Mitigation and Adaptation Actions

- 10. Financing climate actions is challenging for Sub-Saharan African countries constrained by limited fiscal space.** Many regional countries are actively pursuing reforms to mobilize more revenues (including through environmental taxes) and improve spending efficiency, but their scope is limited, and progress is slow. Using macroeconomic insurance products, such as climate funds and issuing state-contingent bonds, has so far also been difficult given large risk premiums (IMF 2020).
- 11. Quantification of fiscal costs provides clarity of the scope of mitigation and adaptation efforts and enhances transparency and accountability,** which will help attract critical external climate funding for African countries to achieve climate targets. In Sub-Saharan Africa, there is total quantified financing needs of US\$1,318 billion (79 percent of GDP in 2020) for climate commitments in the NDCs, including US\$571.6 and US\$407.2 billion (or 34 percent and 25 percent of regional GDP in 2020) for mitigation and adaptation actions respectively.⁶ While these actions will be expensive for the region, it is still more cost-effective than frequent disaster relief. Moreover, African countries can prioritize adaptation measures given their low contribution and high vulnerability to climate change (AfDB, 2019).
- 12. Sierra Leone's updated NDC illustrates an ambitious estimate of climate-related spending needs at US\$2.8 billion (66 percent of GDP in 2020) between 2021 and 2030,** significantly revised upward from US\$900 million in the previous version (NDC, 2021). The estimated costs for mitigation and adaptation are US\$1.7 billion and US\$1.1 billion respectively, which implies an ambitious annual fiscal cost (of about US\$276 million) at 6.6 percent of GDP or 43 percent of fiscal revenue in 2021. While the estimated mitigation and adaptation cost is high, it includes a large amount of spending for development purposes regardless of climate change.
- 13. The government estimates that climate spending will be financed by through various domestic and international vehicles, but progress in mobilizing these remain nascent.** The updated NDC indicates that Sierra Leone will allocate 10 percent of its annual budget to combat climate change and secure 40 percent of donor funding for adaptation priorities (Table A1). Nonetheless, there is no explicit financing plan to meet the expenditure needs or a realistic strategy to mobilize international resources.⁷
- 14. We develop three financing scenarios to illustrate fiscal deficits and debt trajectory generated by fulfilling the climate commitments, but we caution two caveats related to the analysis.** First, the estimated costs in the NDC are used to analyze fiscal deficits, but such estimated costs are not the actual financing needs for climate actions. Second, we assume that mitigation and

⁶ There are US\$339 billion unspecified financing needs in Sub-Saharan Africa.

⁷ This is common in the NDCs according to AfDB (2019). For example, while some NDCs refer to domestic resources as a source of support for adaptation, they do not specify whether these resources will come from private or public sources.

adaptation measures are additional to development spending, which requires extra resources to finance such spending. Thus, the results mainly serve for illustrative rather than factual purposes.

- Scenario 1: the government will allocate 10 percent of revenue and 40 percent of grants for mitigation and adaptation actions. The remaining balance will be financed by budget deficit.
- Scenario 2: the government will allocate 2.5 percent of revenue and 20 percent of grants for mitigation and adaptation actions.⁸ The remaining balance will be financed by budget deficit.
- Scenario 3: the government will allocate 2.5 percent of revenue and 20 percent of grants for adaptation actions only. The remaining balance will be financed by budget deficit.

	Scenario 1	Scenario 2	Scenario 3
Assumptions			
Coverage	Mitigation & Adaptation	Mitigation & Adaptation	Adaptation
Revenue for climate /1	10%	2.5%	2.5%
Grants for climate /2	40%	20%	20%
Estimates (US\$ billion)			
Total financing needs	2.76	2.76	1.08
Resource mobilized	1.43	0.53	0.53
-revenue	0.74	0.19	0.19
-grants	0.69	0.34	0.34
Annual deficit	1.33	2.23	0.55
percent of GDP annually	3 percent	4.9 percent	1.2 percent
Source: NDC (2021) and IMF staff calculations.			
1/ Share of revenue allocated for climate actions.			
2/ Share of grants allocated for climate actions.			

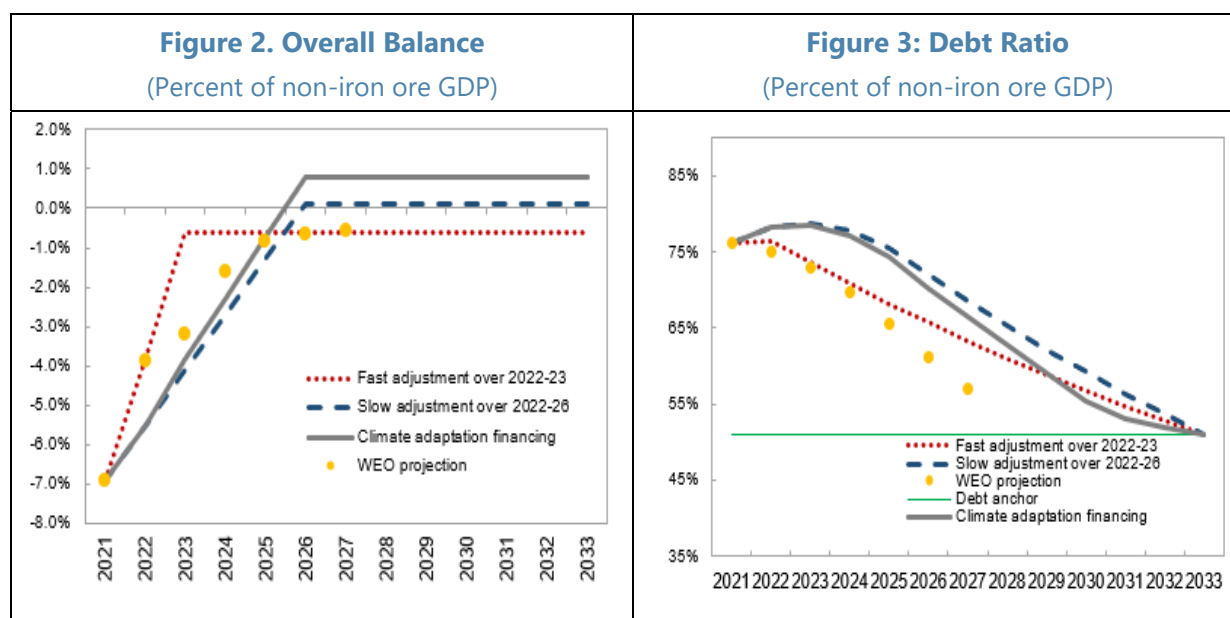
15. We present the results in Table 1. In the first scenario, the government will raise US\$1.4 billion (US\$0.7 and US\$0.7 billion from revenue and grants respectively) for climate actions between 2021 and 2030 with a budget deficit on average at 3 percent of GDP, thanks to the assumptions of strong resource mobilization from both domestic and external sources. However, public debt will become unsustainable in the medium term.

16. In the second scenario, we set more realistic but still optimistic assumptions on resource mobilization. The government will raise US\$530 million billion (US\$190 and US\$340 million from revenue and grants respectively) between 2021 and 2030 for climate actions with a budget deficit at 4.9 percent of GDP on average, which will jeopardize debt sustainability.

⁸ We draw experience from regional countries to analyze the optimal financing option for adaptive actions. Out of the total US\$7.4 billion spending needs in Africa, it is estimated that US\$2.7 billion will need to be contributed annually by African countries and US\$4.7 billion by international sources (AfDB 2019). 2.5 percent of revenue and 20 percent of grants is roughly consistent with the financing structure of regional peers.

17. In the third scenario, we maintain the assumptions in the second scenario on resource mobilization (US\$530 million annually) but limit the scope of climate actions to adaptation only (US\$1.076 billion). The total financing needs decrease by 60 percent and the annual deficit narrows to 1.2 percent of GDP between 2021 and 2030. While the fiscal deficit is significantly lower compared to 4.9 percent of GDP in scenario 2 that includes both mitigation and adaptation actions, public debt is still unsustainable.

18. Benefiting from simulations of the fiscal anchor SIP, we examine the feasibility of accommodating the nominal expansion of the deficit for climate spending. The analysis shows that an additional 0.6 percent of GDP can be spent on climate adaptation without derailing fiscal consolidation substantially and still hitting the medium-term debt anchor after 12 years. This means that the government needs to mobilize an additional 5.4 percent of GDP from revenue and grants to meet the mitigation and adaptation commitments, or 1.8 percent of GDP to meet the adaptation commitments. The additional financing needs can be smaller if the authorities can prioritize projects in the pipeline that meet both the development and adaptation purposes. The overall balance and debt to GDP ratio is presented below (Figure 2 and 3).



19. The calibrated overall balance ranges from -6.9 to -0.7 percent of non-iron ore GDP in 2025 before being set at a surplus level of +0.8 percent of non-iron ore GDP in the long-term. The implied debt to GDP increases from about 76.2 percent of non-iron ore GDP in 2021 to about 78.5 percent in 2023 (allowing for scale-up of climate adaptation projects) before converging to about 51 percent of non-iron ore GDP by 2033. As a result, to meet adaptation commitments in Scenario 3, authorities would require additional revenue mobilization of 0.6 percent of non-iron ore GDP (or additional debt). However, the analysis does not consider the catalytic role on private capital and the growth impact of climate spending because climate spending is too small relative to needs.

20. The above analysis suggests that

- **First, the NDC should carefully calibrate climate costing and prioritize climate projects.** The current scope of the climate actions in the NDC seems too broad to be sufficiently financed without jeopardizing debt sustainability and the financing plan lacks details of revenue and financing measures. The authorities should: i) incorporate the macro-fiscal implications of climate adaptation, including the costs of adaptation and residual risks, the benefit of adaptation such as potential loss recovery by preventing natural disasters; ii) publish climate-related investment projects with clear and transparent project appraisal criteria based on cost-benefit analysis and distributional analysis to prioritize climate-related projects; iii) develop a realistic financing plan based on the medium-term revenue and expenditure strategies, with an emphasis on securing external climate grants
- **Second, fiscal policies should focus on identifying and prioritizing adaptation measures given limited resources.** The three pillars approach to natural disaster can be extended to guide the identification of adaptation options, including i) preventing climate risk (e.g., infrastructure), and ii) alleviating residual climate risks (e.g., social safety nets), ensuring resilient finance (e.g., flooding insurance). The three criteria can be used to prioritize adaptation projects, including i) investing or subsidizing adaptations that have positive externalities, ii) removing barriers to efficient private adaptation, and iii) addressing equity issues within and between countries.
- **Third, the authorities should enhance the capacity to tap into external grants for adaptation actions.** As in many African countries, Sierra Leone should focus more on adaptation measures to build resilience to climate shocks given its limited contribution to GHG emissions yet large exposure to the severe consequences of climate change. However, common barriers and challenges remain for African countries to access international grants, including barriers related to funding modalities that require the involvement of domestic accredited institutions or existing implementing entities. As a result, only US\$65 billion have been committed to SSA for adaptation between 2015 and 2019, far from meeting the adaptation finance needs in the region. While many barriers are not solvable by African countries alone, Sierra Leone could enhance the capacity to access international grants by strengthening national systems, improving governance systems and other financial and administrative controls, and building the staff and expertise to manage such funding.
- **Fourth, the authorities should explore a package of measures that seek to boost social resilience and explore the possibility of carbon credits (Box 2) to finance these actions.** The package should include at least accelerating post-disasters reconstruction, improving capacities of delivering post-disaster supports, developing contingent finance and reserve funds, etc. Hallegatte et al. (2016) shows that by building the resilience of the poor, Sierra Leone could reduce the climate-related GDP losses by 23 percent.

21. To support the effective implementation of fiscal policies to combat climate change, the authorities could also consider the “green PFM” practices to help integrate climate objectives into the budget cycle (Box 3).

D. Conclusion and Recommendations

22. Macro-fiscal policies would benefit from being supported by frameworks that link climate risks to debt sustainability analysis. Our preliminary analysis shows that Sierra Leone’s current debt sustainability situation represents a serious constraint to meeting its climate commitments. The scope of climate actions in the NDC might be too broad to be sufficiently financed without jeopardizing debt sustainability.

23. The authorities should calibrate climate costs and adaptation benefits and integrate adaptation into fiscal policies. The three pillars (prevention, alleviation, macro-fiscal resilience) would help identify adaptation options while the three criteria (positive externality, private catalyst, equity) would help prioritize adaptation actions. Leveraging the discussion around development of a medium-term fiscal anchor (see the fiscal anchor SIP) there is scope to allow moderate expansion of the overall balance (by some 0.6 percent of non-iron ore GDP) for climate adaptation investment. This is achievable with little delay in the envisioned medium-term fiscal adjustment path while enabling authorities to make progress under their NDC commitments. It would, however, require proper targeting and effective implementation.

24. Tapping into external grants and concessional loans will be critical to fulfil the climate commitments while maintaining debt sustainability. Sierra Leone should enhance capacity to access international grants to implement selected climate actions while preserving debt sustainability. This also calls for the international community to make additional grant resources available for climate finance, to avoid exacerbating already precarious debt situations in many African countries. A positive development is that international climate funding for LIDCs is growing (such as WFP ARC REPLICA), but a significant funding gap remains according to AfDB. In addition, the IMF board has approved the establishment of the Resilience and Sustainability Trust (RST) to help countries address long-term structural challenges, including climate change and pandemic preparedness. About three quarters of the IMF’s membership, including all LICs, will be eligible for longer-term affordable financing from the RST.

25. Green PFM should gradually adapt the existing PFM practices to integrate climate targets within and beyond the budget cycle and help prioritize climate spending. Enhancing the existing PFM framework, summoning political support, and sequencing reforms will be key to a smooth transition to green PFM. Some non-infrastructure adaptation measures, such as information sharing and institutional reforms, are more affordable and could be implemented quickly.

Box 2. Financing for Forest Conservation and Reforestation

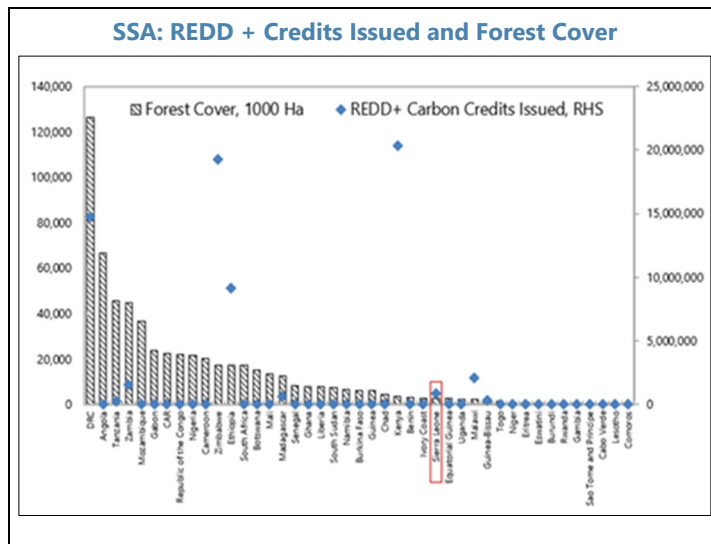
The strong link between development and climate vulnerability suggests that all countries would benefit from making adaptation to climate change as an integral part of development planning. Less climate vulnerability creates stable development for development, which in turn, builds stronger climate resilience. As for the case of timber, illegal timber trade not only gives rise to short-run revenue loss and environmental damage, but also perpetuates natural resources destruction and development constraints.

Thirty-eight percent of Sierra Leone is covered in forest, but forest cover has declined by 20 percent since 1990, and rates of deforestation have accelerated in the last decade. While export bans have been put in place intermittently, gaps in the legislative framework remain. International climate finance can help to protect forests and provide a substitute for livelihoods; however, meeting stringent transparency and verification prerequisites can require long lead times and significant capacity building. Projects also need to be designed so local communities benefit.

Grants: Sierra Leone has so far partnered with international accredited institutions like the UNDP to access grant funding, for example the GCF’s multi-country reforestation grant. Securing domestic GCF accreditation is required to access funding more directly, although there are hurdles due to complex requirements and lengthy processes. In the meantime, the authorities can continue to strengthen PFM capacity, develop a pipeline of viable projects and seek out areas where priorities align with partners.

Bilateral / multilateral results-based financing: While Sierra Leone undertook a REDD+ readiness project in 2013, it does not yet have the national strategy to tap into the available sources of finance, for example the World Bank’s Forest Carbon Partnership Facility. Other SSA countries have entered into bilateral financing arrangements for forest conservation and management, such as the 10-year US\$150 million deal between Gabon and Norway and 10-year US\$500 million deal between the UK and the Democratic Republic of Congo. Entering into such agreements requires demonstrating emissions reduction, monitoring deforestation, and halting forest degradation.

Voluntary Carbon Credit Markets: Sierra Leone has already issued 1 million carbon credits on the voluntary carbon credit market between 2016 and 2021, primarily through the GOLA Rainforest (the first REDD+ project in West Africa) and the Sierra Leone Safe Water projects.¹ However, these started in 2012 and 2017 respectively, and the pace of projects has since fallen off, except for the recent Miro Sustainable Plantation project, which would result in 128,000 credits. To fully activate the carbon market, Sierra Leone needs to take stock of its timber resources and intensify enforcement against illegal logging. Other potential projects that could generate credits include the Bumbuna Hydroelectric dam, the Western Area Peninsula National Park and reforestation projects including #FreetowntheTreeTown and the Ministry of Environment’s plan to plant 5 million trees. The Freetown reforestation initiative has already taken steps to geotag each tree planted, helping it to meet the transparency prerequisites needed to issue carbon credits.



Box 3. Green Public Financial Management (Green PFM)

In response to the growing urgency to fight climate change, green PFM aims to gradually mainstream climate objectives into PFM practices, with an objective to promote fiscal policies that are responsive to environmental and climate concerns. **Results obtained in pioneering countries have** shown that green PFM reforms can foster better access to climate finance, especially for climate vulnerable Low Income Developing Countries (IMF 2016, 2019; Novta et al. forthcoming).

Green PFM can fit into the traditional four stages of the budgeting cycle in Sierra Leone’s context.

The IMF is planning for a Medium-Term Expenditure Framework review during FY23 and could assist the authorities to integrate climate objectives into the framework. Budget preparation. Climate considerations could enter the Public Investment Management appraisal template and the economic forecast, which are being developed and reviewed with the assistance from the IMF.

Budget execution, accounting, and reporting. The budget performance monitoring framework and SOE performance monitoring framework could be enhanced to include climate change considerations.

Control and audit. Control and audit mechanisms should be used to examine, measure, and monitor the efficiency and effectiveness of climate policies.

A realistic strategy is necessary to successfully implement green PFM reforms in LIDCs facing tight capacity constraints. It is critical for countries to have basic elements of a functional PFM system, strong political support, some degree of “green” expertise, and an appropriate sequencing of green PFM reforms. Existing diagnostic tools, such as IMF’s Climate Macroeconomic Assessment Program can help government identify green PFM reform priorities and design a realistic strategy.

Table 2. Sierra Leone: Potential Vehicles and Sources of Climate Financing

Vehicles	Potential sources	Mobilisation strategy
Domestic budget	Government of Sierra Leone	Annual allocations New tax levies
Private sector	Africa, Latin America and the Caribbean Fund (AFLAC) Africa Capitalization Fund, which invests in banks in Africa Green for Growth Fund (GGF) Climate Catalyst Fund Africa Climate Change Fund hosted by AfDB EU’s Emissions Trading Scheme and World Bank’s Community Development Carbon Fund (CDCF).	Partnership agreements Loan agreements Grant proposals
International climate finance	AFD French Development Agency Australia AID (AUSAID) Canadian International Development Agency (CIDA), CCCCFL China Climate Change Framework Loan (of EIB) CCPL Climate Change Program Loan (of AFD and JICA) DANIDA DFID European Investment Bank (EIB), European Union Emission Trading Scheme European Commission Global Climate Change Alliance FGEF French Global Environment Facility (of AFD) GEEREF Global Energy Efficiency and Renewable Energy Fund (advised by EIB) German International Climate Initiative Green Climate Fund Adaptation Fund	Grant proposals Loan agreements Technical support frameworks

Source: NDC 2021

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REAPING THE DEMOGRAPHIC DIVIDEND IN SIERRA LEONE - THE ROLE OF EDUCATION¹

This paper highlights Sierra Leone's potential to reap the demographic dividend as many young people will enter the labor market in the coming decades. Human capital accumulation is a prerequisite for workers to find decent employment. Reforms under the Government's Free Quality School Education program are showing the first measurable results and support this goal. Going forward, further optimizing spending, supporting education for disadvantaged groups, linking school subsidies to school performance and outcomes, and improving teacher quality are important policy priorities.

A. Motivation and Background

1. Policies to support the demographic transition are critical to reaping the demographic dividend and achieving macroeconomic and development objectives (World Bank, 2016; Bloom, 2020). A growing workforce presents opportunities for development: many countries that experienced episodes in which the workforce has grown more rapidly than the rest of the population—i.e., a declining dependency ratio—saw a boost to growth through a "demographic dividend". Some studies estimate that the demographic transition has driven 40-50 percent of India's per capita income growth since the 1970s (Aiyar and Mody 2011). Changes in the age structure can turn into "demographic gift" if the young population has access to quality education. Historically, policies to boost human capital, such as investments in education and health to ensure workers enter the labor market productively and at higher wages, have accompanied a successful demographic transition (IMF 2013). Looking forward, Africa will contribute 80 percent of the projected increase in global population by 2100, which carries opportunities for industrialization and development.

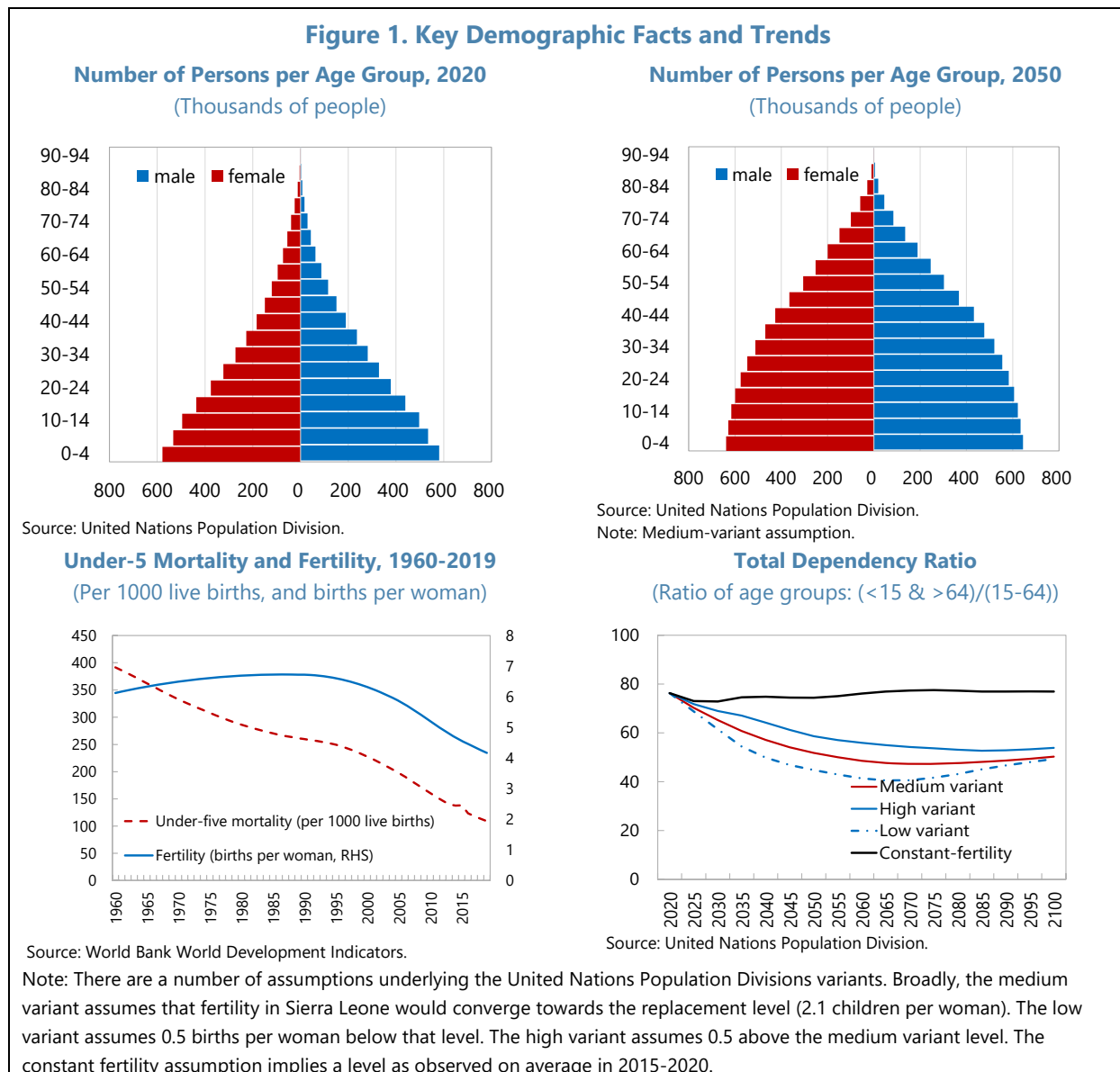
2. With its fast-growing and young population, Sierra Leone has the potential to enjoy the demographic dividend in the coming decades.

- Sierra Leone's population is young. In 2020, more than 40 percent of Sierra Leoneans were younger than 15, and more than half were younger than 20 (Figure 1, panel 1). The number of people of working age is therefore expected to increase significantly in the next decades. Under the United Nations medium-variant assumption on fertility and mortality, the working age population is projected to increase from 4.5 million in 2020 to 8.5 million people by 2050 (Figure 1, panel 2).
- As young adults enter the labor market, the dependency ratio would decline (Figure 1, panel 3) as both fertility and mortality rates continue to drop in line with the trend over the past decades

¹ Prepared by Carolina Bloch, Fernanda Brollo, and Yue Zhou (all FAD), Monique Newiak and Michael Saffa (both AFR) and Yakama Jones (Ministry of Finance). This paper also leverages work of the World Bank's Public Expenditure Review on Education.

(Figure 1, panel 4).² Per capita income could rise during the demographic transition period, especially if they do so with favorable employment conditions.

- The shift in the proportion of working vs. non-working population could then enable higher per capita investment in schooling and health care, improving human capital, with long-term returns that translate into economic growth. National savings and fiscal revenue could also increase as young workers typically save for the future and pay taxes when they enter the labor market, creating opportunities to finance stronger investment in priority areas.



² Voluntary family planning, based on individual choice, e.g., through addressing unmet needs for contraception, can support demographic dividend through impacting the fertility rate (Bongaarts and others 1990). The provision of voluntary family planning programs enables women to exercise more choice and control over their reproductive health, while being associated with better education outcomes and a faster demographic dividend.

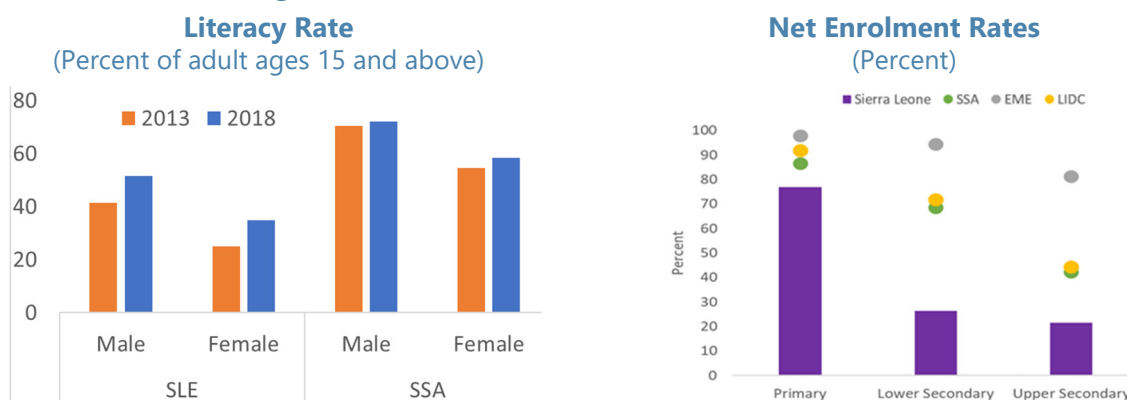
3. However, reaping the demographic dividend is not automatic, and Sierra Leone’s policies will need to be conducive to young adults finding decent employment. To prepare the young for productive employment requires education, training, and investments in health. Absent such policies, the economic losses could be significant. In addition, the youth bulge could become a risk as mass youth unemployment could turn into a source of social unrest and political instability (Lin 2012). In Sierra Leone, the youth has been at the center of social and political unrest and are often being used as thugs to perpetuate political violence and other forms of violence. The war in Sierra Leone was a manifestation of the exclusion of youths that were alienated and lacked opportunities (Richards 1996). Youth unemployment due to insufficient job creation is a major cause of social unrest, as highlighted during the Arab Spring and recent mass protests in Chile (ILO, 2011). Investing in health, educating the youth, and creating enough quality jobs to absorb the growing working-age population will therefore be critical. In particular, the COVID pandemic and previous health crises have highlighted the need to increase investments in expanded vaccine coverage and a well-provisioned and appropriately staffed primary health care system.

4. Against this background, this paper focuses on the role of education in the demographic transition. It takes stock of current policies and provides selected recommendations.

B. The Baseline: 2018 Outcomes and Gaps

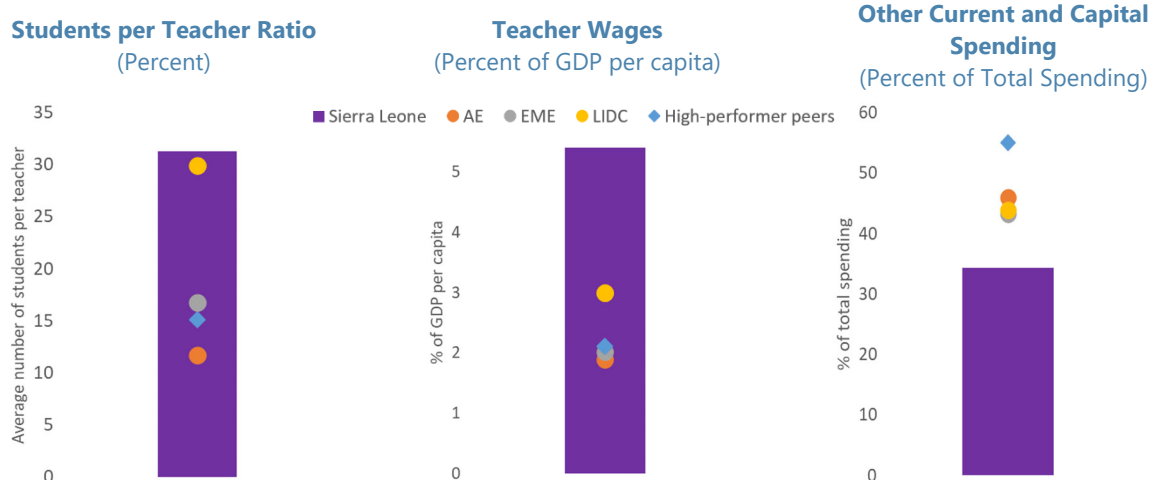
5. Outcomes in 2018 highlighted improvements over the past but also gaps that required higher and better spending on education. According to the World Development Indicators, the adult literacy rate for both genders had been on the rise since 2013 but was lagging behind the regional average, while enrolment rates for Sierra Leone were well below the median for the sub-Saharan African region and other developing countries (Figure 2, panels 1-2). The student per teacher ratio in Sierra Leone was higher than in regional peers, suggesting that the number of teachers would have to increase relative to the number of students. Spending on school infrastructure and items other than teacher wages could have a greater weight in the public education budget, as the median other current and capital spending for all income groups and for the high-performer peers were higher than in Sierra Leone (Figure 3, panels 1-3). However, learning outcomes have not been satisfied due to insufficient and poor-quality teachers, weak teacher management that leads to teacher absenteeism. Weak sector management and governance remain, including (i) a weak policy and regulatory environment; (ii) inadequate quality assurance systems across sub-sectors; and (iii) an education management information system (EMIS) which is fragmented and under-used (World Bank, 2021). In addition, almost all of the public expenditure in the sector goes towards covering recurrent costs. Under-investment in the capital budget has negative consequences for the performance of the education system (World Bank 2021).

6. Benefit incidence analysis (BIA) based on the 2018 household data points to an increase in progressivity of public expenditure on education. For primary education, the share of spending going to the poorest quintile increased between 2003 and 2018, while the share going to the richest quintile decreased; for secondary education, there were also significant changes in the distribution of public spending on both levels of secondary education, but the distribution remains regressive (Figure 4a, panels 1-3).

Figure 2. Recent Outcomes in the Education Sector

Source: World Development Indicators.

Source: 2018 SLIHS, UNESCO Institute for Statistics.

Figure 3. Education Inputs and Outputs

Source: UNESCO Institute for Statistics.

Source: UNESCO Institute for Statistics.

Source: UNESCO Institute for Statistics.

7. Changing enrolment rates at different income quintiles are driving the progressivity of public spending on education, but this does not necessarily reflect higher access to education or improvements in education quality. Gross enrolment rates in public primary schools decreased significantly for richer quintiles. However, there was no change in enrolment rates for poorer quintiles, which reflects little expansion of enrolment rates in poorer quintiles at the primary school level. On the other hand, for lower secondary, gross enrolment rates in public schools increased relatively more for the poorest quintiles and decreased for richer quintiles, which means that changes in household behavior actually reflect greater access for the poorer. For upper secondary, changes are driven by a higher enrolment for middle quintiles, but not so much for the poorest (Figure 4b, panels 1-3). Large gaps between gross and net enrolment rates suggest that the quality of education needs to be improved. For primary education, the gap between the gross and net enrolment rates decreased for poorer quintiles, suggesting a slight improvement in education quality for them. For secondary education, however, the enlarging gap between the gross and net enrolment rates is driven by the high inflow of individuals outside the school age and probably high repetition rates, implying deteriorating education quality of secondary education (Figure 4c).

Figure 4a. Distribution of Public Spending on Education by Income Quintile

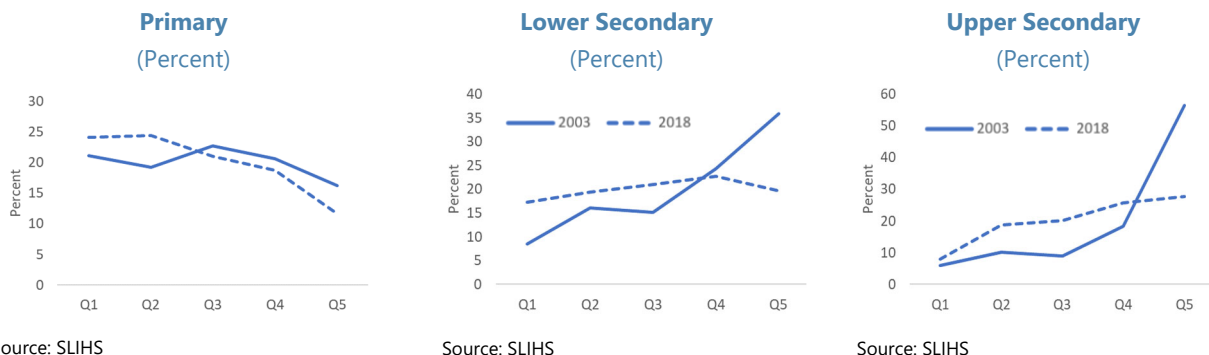


Figure 4b. Gross Enrolment Rates in Public Institutions

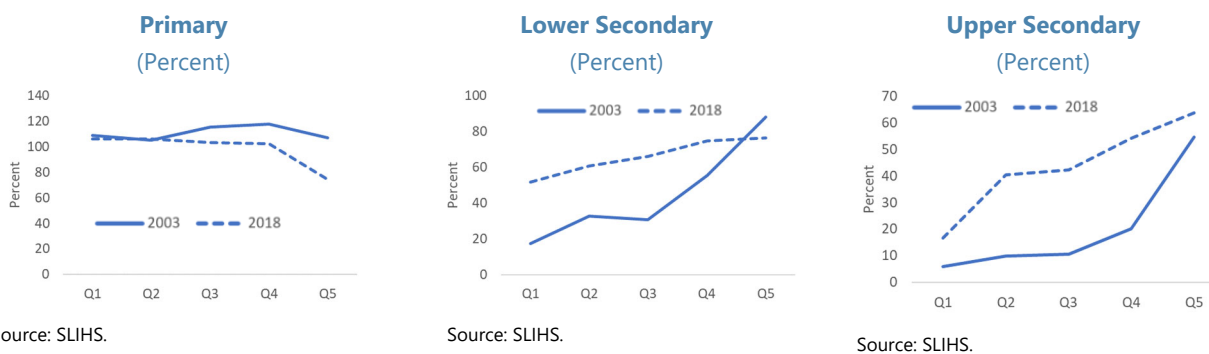
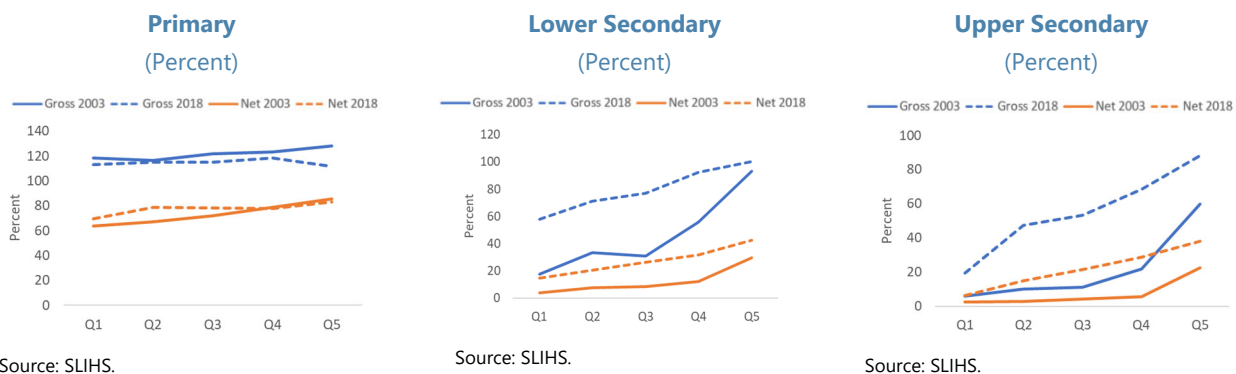
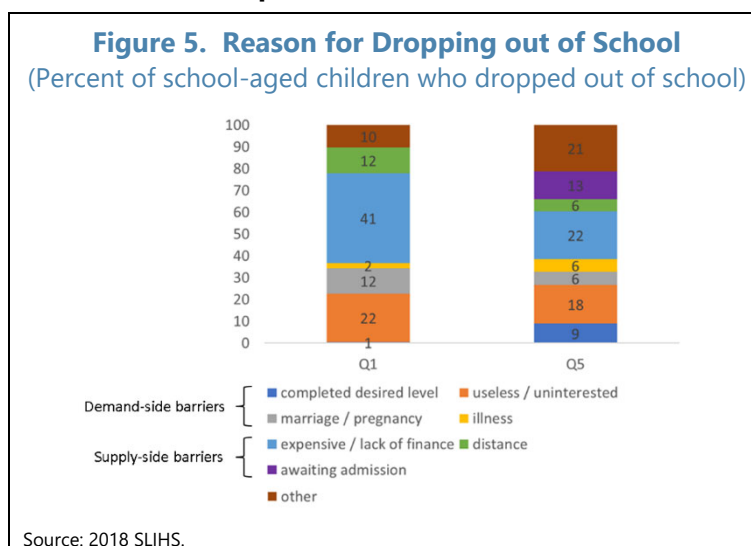


Figure 4c. Gross vs. Net Enrolment Rates in Public Institutions



8. Lack of finance is by far the main barrier for the poorest to access education and is also important for the richest

(Figure 5). 41 percent of the bottom income quintile and 22 percent of the top quintile reported expensive education and lack of finance as the primary reason for dropping out of school (primary and secondary). Other demand-side barriers, including lack of interest, marriage/pregnancy, and having completed the desired level, are relevant for both lower and higher income groups. In addition, distance to schools is also a significant barrier for the poorest.



C. Recent Education Policies and Trends in Sierra Leone

9. Sierra Leone's ambitious Free Quality School Education (FQSE) aims at increasing both access to and the quality of pre-primary, primary, secondary, and technical and vocational education. Enshrined as a critical component in the National Development Plan (NDP) 2019-2023 *"Education for Development"*, it aims to build an inclusive education system that enhances the productivity of the labor force, reduces the cycle of poverty and inequality, and boosts Sierra Leone's economy. Within the FQSE, the government assumes the resource burden of paying tuition fees, providing core textbooks, furniture and learning materials, infrastructure, and training and recruitment of teachers. Indeed, these goals aligned well with the gaps as of 2018 as identified in the past section that highlighted that additional public spending on education was necessary.

10. In line with these goals, the resource allocation into the sector has increased significantly over the past years.

- Sierra Leone, Burkina Faso, Sao Tome and Principe, Senegal and Togo are the only West and Central Africa countries that meet the Dakar target of allocating at least 20 percent of government resources to education (UNICEF, 2021). Sierra Leone's government dedicated a sizable proportion of its national budget to the FQSE program since its inception in 2018, with public spending on education reaching 21.4 percent in 2022, despite a tight financing situation, and is implementing a range of reforms (Box 1). However, World Bank (2021) estimates a significant financing gap to fully deliver the FQSE Program in the next four years, mainly reflecting an infrastructure gap and salaries for additional teachers.
- Support by development partners has also been forthcoming. For instance, Sierra Leone's Free Quality School Education Project multi-donor trust fund received US\$50 million from the World Bank and US\$15.9 million from Irish Aid, European Union and FCDO in October 2020 (World Bank

2020). The Global Partnership for Education (GPE) also provided a US\$17.2 million grant in 2019 to increase equitable access and improve education outcomes for approximately 1 million boys and girls in pre-primary and primary schools. The GPE announced in 2021 Sierra Leone's eligibility for a US\$38 million funding in support of the government's education program, of which US\$22.47 is a system transformation grant, a US\$15 million multiplier grant and an additional US\$2 million capacity grant.

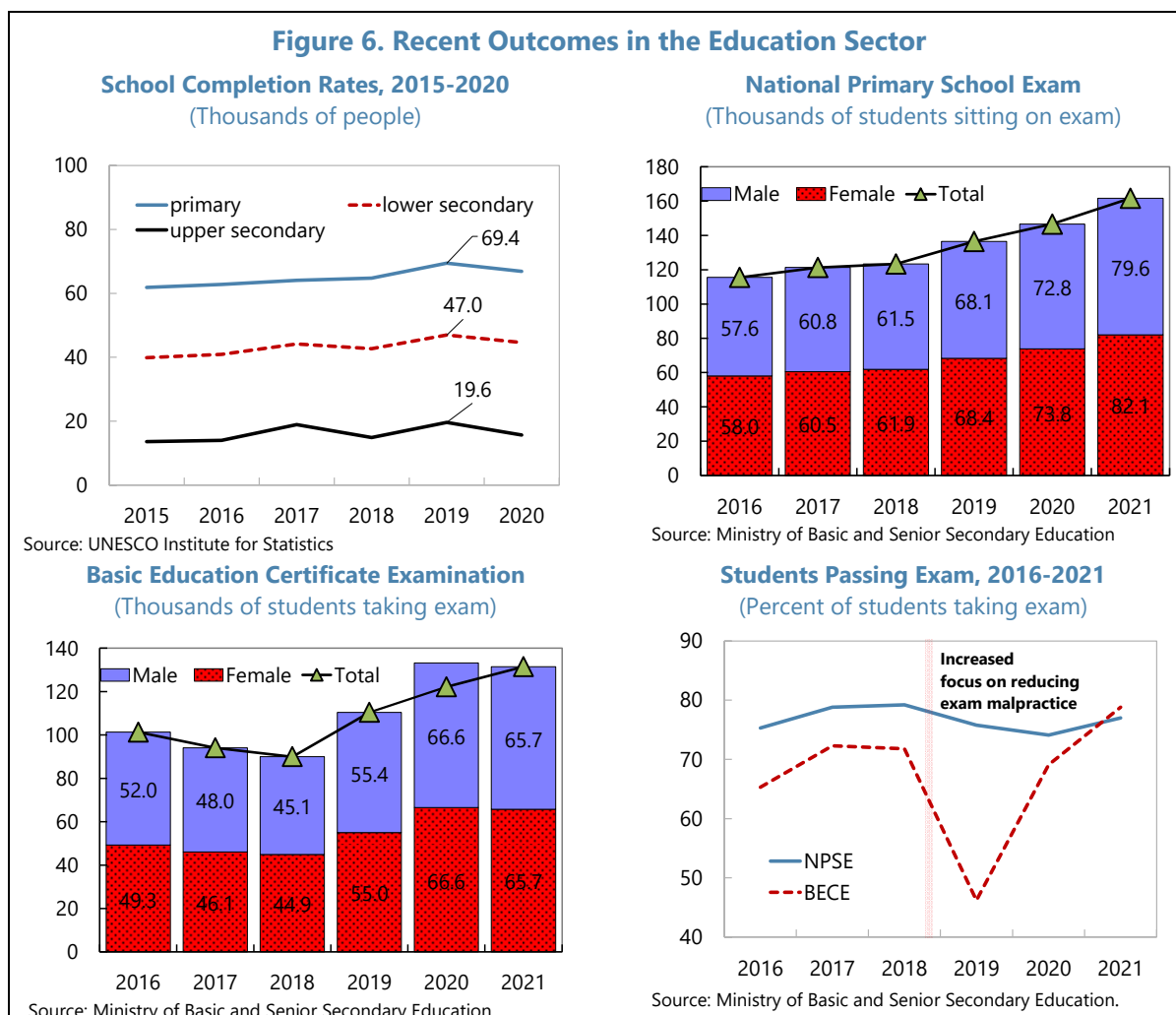
Box 1. Selected Government Measures

- Expand the provision of accelerated learning to out-of-school girls
- Scale-up efforts for their reintegration into school as well as teenage mothers
- Provision of sanitary hygiene kits for girls to reduce period poverty
- Rollout of a comprehensive safety policy and comprehensive sexuality education
- Establishment of digital learning hubs
- Use of [data](#) to guide site selection for construction of schools or classrooms and planning for other interventions like distributions of learning materials
- Use of satellite imagery to monitor the impact of weather conditions on schools
- Establishment of the Youth Advisory Group (YAG) for Education to ensure that decision making at all levels of education happens with children and young people at the center.

11. The National Policy on Radical Inclusion, the National School Feeding Policy, and Integrated Early Childhood Policy aim to transform the education sector. The [Radical inclusion](#) policy, approved by the cabinet in April 2021, targets accessibility and inclusion for all children, especially marginalized and excluded groups, such as children with disabilities, from low-income families or rural areas, and pregnant girls and parent learners. In March 2020, the Government overturned the ban that prevented pregnant girls from attending school. The [school feeding policy](#) focuses on transitioning to a home-grown school feeding scheme to promote agriculture and local production. The [early childhood policy](#) aims to provide equitable and quality Early Childhood Development services for children 0-8 years. A new Education Sector Plan is currently being developed, which when finalized, will guide the planning, management, and delivery of quality education services. In addition, Sierra Leone's new constitution reaffirms the provision of free, quality, and compulsory education at the primary and secondary levels (Government White Paper on the Review of the 1991 Constitution of Sierra Leone, 2021). Subject to its approval, education in Sierra Leone would become a fundamental right, which would support progress towards achieving Sustainable Development Goal (SDG) 4 and the NDP in the future.

12. Indeed, first evidence is emerging that enrolment rates and learning outcomes have been improving, despite the setbacks during the COVID-19 pandemic. Before the pandemic, completion rates had been generally on an upward trend. From 2016 to 2019, primary completion rates increased from 62.8 to 69.4 percent. Lower and upper completion rates increased from 40.9 to 47.0 and 14 to 19.6 percent, respectively (Figure 6, chart 1). However, in 2020, these numbers reversed as COVID-19 posed additional challenges to learning. The number of children taking and completing the National Primary School Exam (NPSE) and the Basic Education Certificate Examination (BECE) also increased, though 2018-19 numbers saw a dip as the government's focus

on reducing exam malpractice increased (Figure 6, panels 2-4). Sierra Leone's National Early Grade Reading and Mathematics Assessment Baseline Study (2021) noted that there has been significant improvement in early grade reading and math in 2021 compared to a similar study conducted in 2014.



13. While the Covid-19 pandemic brought schools to an early close in April 2020, alternative sources of learning compensated for in-person learning. The Government closed schools for 14 weeks as part of its containment measures. However, learning continued at home with EdTech solutions delivering services to avoid disruptions. The Ministry of Basic and Senior Secondary Education (MBSSE) and the Teaching Service Commission (TSC) convened an Education Emergency Taskforce, building on the lessons of the 2014 Ebola experience, and introduced a Hybrid EdTech solution that offered continuous learning and teaching through radio, television, mobile phone, the web, and print media. The radio teaching program comprised 30 minutes of lectures and 30 minutes of interaction with teachers by toll free phone line. The authorities also developed and deployed mobile based learning technologies, including USSD/SMS Results Checker, Dictionary, and Placement Checker (at zero cost for students). Students used these digital tools

millions of times. Recently, the Ministry launched the Learning Passport that gives students access to past exam papers and was downloaded 4,000 times on the first day. The Government of Sierra Leone, through Giga and partners, has an ongoing project to expand school connectivity to approximately 11,000 schools. Currently, 205 schools have been connected to the internet³ (see Digitalization SIP).⁴ For everyone school that is connected to the internet, it is projected that about 194 students and teachers and 273 local community members within 1 kilometer will benefit.

D. Conclusions and Recommendations

14. Given the demographic trends in Sierra Leone, investments in human capital will have high returns, and policies should therefore prioritize improving access to quality education and health. Investment in education for the youth will be critical to accumulating human capital, a prerequisite for a favorable demographic transition. Investment is necessary at primary and secondary levels, as well as developing tertiary education to meet the demand for high-skill labor. Technical-Vocational training can create invaluable skills for youths who dropped out of school because of early pregnancies and other factors, thereby increasing their employability or ability to create jobs. Supporting policies, such as the school feeding policy, will increase the return to education spending and serve as an important safeguard against shocks.

15. The World Bank's 2021 public expenditure review points to key policy priorities in the sector. Selected recommendations include:

- *Optimizing spending.* The sizable budget allocation to education is welcome, and further prioritizing between salary and non-salary expenditures could improve learning outcomes through the availability of adequate learning materials and a favorable learning environment.
- *Supporting disadvantaged groups.* Weak infrastructure and teacher quality, shortage of learning materials and crowded classrooms are posing constraints on the supply side. On the demand side, the opportunity cost of schooling, distance to school, teenage pregnancy and (forced) marriage, and gender-based violence and sexual harassment are constraining learning for disadvantaged groups of children. The Government should continue to enforce its efforts of radical inclusion to remove this barrier and further develop policies to target disadvantaged groups.
- *Linking school subsidies from the FQSE to school performance and outcomes* (pupil and teacher attendance, pass rate in exams etc.). These measures will maximize incentives for schools.
- *Improving the quality of teachers.* The Teaching Service Commission should only add teachers to the payroll if they meet the minimum standards. It should also strengthen the teacher registration and licensing process. As education provision and the number of teachers increase, infrastructure to support the increase would also need to expand (e.g., teachers' colleges).

³ Minister of Education's Address to the US House of Representatives on the hearing "Improving Access to Quality Public Education in Africa"

⁴ [gigaconnect.org/Sierra Leone/](http://gigaconnect.org/Sierra%20Leone/)

- *Strengthening quality assurance.* This includes monitoring quality beyond government schools and strengthening the capacity of local agencies at the district level.

16. Macroeconomic policies and a strong fiscal framework will also be important to further increase education spending and spending efficiency. While the fiscal space remains tight, a strong fiscal framework with a debt anchor (see SIP on the topic) could help the government allocate necessary resources to promote education without jeopardizing macro stability. A medium-term revenue mobilization strategy and efficient revenue administration could raise revenue, providing additional resources for education and structural reforms, such as promoting flexible employment and attracting foreign investment. Following up on the PIMA and PEFA recommendations will help improve spending efficiency.

17. Strengthening human capital should continue to be a collaborative effort involving a range of agencies. The Government continues to strengthen the whole-of-government approach to human capital development. This 'systems' approach aims to fully leverage Sierra Leone's demographic dividend potential. Given the linkages shared by basic, higher and technical education, the two education ministries and the Ministry of Youth Affairs should continue to strengthen their collaboration. In addition, increased but efficient investments in cross-sectoral interventions are needed to complement the role of education. Critical interventions are those that target to improve health, food security, and social protection outcomes. Government continues to invest in these and is encouraging development partners and the private sector to do the same.

18. Realizing the potential benefits of favorable demographics will also require policies to create high-quality jobs. Such policies include support for the operation of competitive labor and capital markets, equipping workers with human capital, building infrastructure, sound macroeconomic management, carefully designed trade policies, and good governance. Such policies are always desirable, but a large working-age population share raises the stakes.

19. The design of interventions to increase the productivity of future workers must consider the relationship between the education sector and the labor market. Higher education, technical and vocational education, and the public and private sector labor market are off-takers of talent that have completed basic education. Thus, the skills desired by the job market should guide curriculum design and training programs across all levels of learning. These should also be inclusive, especially for women, girls and persons living with disabilities. Furthermore, as the world experiences the fourth industrial revolution, the provision of formal education and skills development should leverage offerings of the digital age and nurture entrepreneurial spirit and innovation. Additionally, Government and international partners must consider the development of internationally recognized frameworks for the certification of technical and vocational skills. This is essential as Sierra Leone prepares to implement the African Continental Free Trade Agreement (AfCFTA). Finally, data systems must be strengthened to capture the changes across the education and labor landscape at regular intervals (higher frequencies). This is essential to monitor intermediate outcomes, for impact analysis, and guide the design and implementation of future policies, projects, and programs.

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THE LONGER-TERM IMPACT OF THE COVID-19 CRISIS AND MITIGATING POLICIES FOR SIERRA LEONE¹

While surveys and recent national accounts data provide insights about the short-term impact of COVID-19, including for Sierra Leone, the longer-term impact on individual countries is less understood. Using a range of data sources, this paper calibrates a general equilibrium model with heterogenous agents to capture the main features of Sierra Leone's economy. It analyzes the impact of school closures and declines in sectoral productivity on macroeconomic and distributional outcomes. The results suggest that, everything else equal, the impact of the crisis has likely dampened households' income and long-term real GDP. While the shock to human capital alone would exacerbate income inequality somewhat, the more broad-based decline in incomes across population groups, suggest that long-term income inequality could modestly decrease. Policies can mitigate these losses. In particular, investments in human capital, such as through the Free Quality School Education program, can more than compensate for the loss of income. Social transfers can help reduce poverty and income inequality but would need to be carefully calibrated and sized.

A. Introduction

1. The COVID-19 pandemic has had severe health and economic impacts globally, and the recovery will be unequal across regions. Annual per capita losses for emerging market and developing economies (excluding China) in 2020-2022 amounted to 6.3 percent (IMF 2021). The recession will leave long-lived scars, with EMDEs and LICs likely to struggle most as constrained policy space limits their room for maneuver. In Sierra Leone, per capita incomes are expected to return to 2019 levels only by 2022, and a still low revenue base, high debt and large development spending needs create a fiscal trilemma that inhibits the recovery (see staff report).

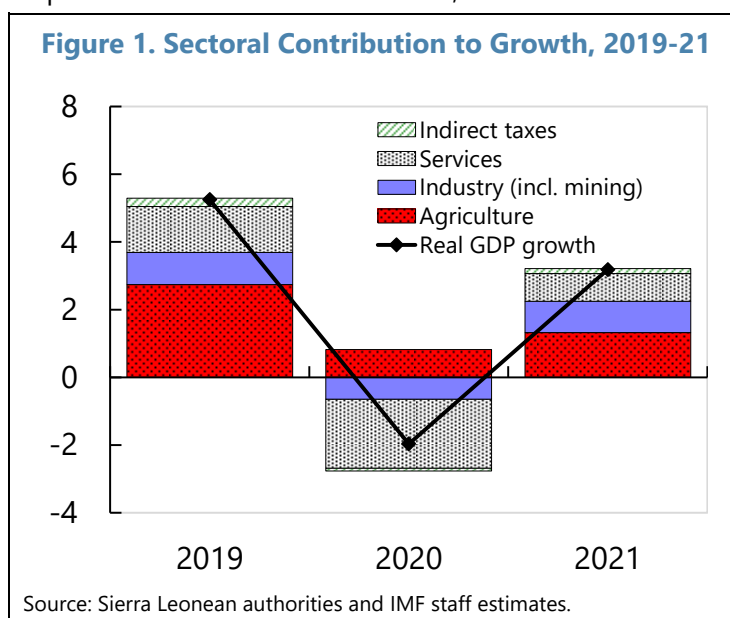
2. The COVID-19 crisis has hit economies through various channels.

- On the supply side, lockdowns and restriction measures halted activity in some sectors, delayed deliveries, reduced production capacities, and complicated the implementation of public investment projects. On the demand side, the reduction in mobility and the rise in precautionary domestic savings decreased the demand for goods and services, exacerbated by households and firms' liquidity constraints and layoffs. In Sierra Leone, temporary lockdowns led to a rush to secure water supply and an increase in the demand for essential goods. Policies focused on alleviating potential shortages of essential goods amidst global supply chain disruptions and the expansion of social safety nets with development partner support. The government also paid a sizable portion of domestic arrears to support firms and the banking sector.
- Revenues declined substantially as economic activity contracted, countries implemented tax policy and administration measures, and social distancing impacted the tax base, administration, and

¹ Prepared by Céline Bteish, Saanya Jain, Rosalind Mowatt, Monique Newiak, and Michael Saffa. The authors are grateful for continuous support by Ashique Habib and Adrian Peralta Alva. All mistakes are our own.

compliance. In Sierra Leone, tax revenues decreased from 12.3 percent in 2019 to 11.2 percent in 2020 on the back of temporary import tax deferrals to help secure imports of essential goods, deferrals on corporate and income tax, and suspension of in-person tax enforcement efforts.

- The COVID-19 crisis has also had a differentiated impact on economic sectors. High-contact sectors such as tourism, restaurants, transportation have suffered the most, whereas low contact sectors—such as financial services and tech companies—were often able to shift their business models from in-person to virtual. Despite signs of a global recovery, travel is picking up more slowly, and tourist inflows into Africa are not expected to return to 2019 levels until 2023 (IMF 2021b). In Sierra Leone, the pandemic also hit the service sector particularly hard in 2020 (Figure 1). In a survey conducted by the Ministry of Finance, eight out of ten businesses in the tourism were running a loss compared to the period before COVID-19 (Komeh and Sesay 2021).



- The differential impact across sectors translated into uneven effects on worker and firms. Employment has disproportionately declined among lower-skilled workers. In Sierra Leone, with high levels of informality, the COVID-19 shock reduced household incomes in particular from self-employment and from private sector jobs (World Bank 2021)

3. In addition to these short-term macroeconomic impacts, the rise in poverty and inequality of outcomes and opportunities as a result of the pandemic is worrisome.

- Global estimates point to an increase of 95 million people in extreme poverty in 2020 relative to the pre-COVID-19 projections. In sub-Saharan Africa alone, 32 million people were thrown into poverty. In Sierra Leone, the shock to household incomes implies that poverty rates have likely risen, from already high pre-crisis levels (56.8 percent in 2018).
- School closures have prevented many children around the world from attending schools and in the less fortunate areas. In Sierra Leone, schools were closed for 14 weeks (compared to 31 weeks for the LIC average). Although EdTech solutions were used to compensate, primary and secondary completion rates still saw a dip (see paper on digitalization).

- Many vulnerable groups—e.g. women, the youth, poor people, ethnic minorities—have been disproportionately affected. In Sierra Leone, female-headed households experienced a larger economic shock and bought less food during the initial months of the pandemic (IGC 2020).
- Survey data also suggest that the pandemic substantially worsened food insecurity. In Sierra Leone, the share of people who are food insecure had increased significantly to about 60 percent of the population in June 2020, due largely to reduced incomes and higher food prices.

4. The preceding paragraphs highlight the immediate impact of the crisis, but the longer-term effects for Sierra Leone—the focus of this paper—deserve more analytical attention. Against this background, the aim of this paper is to analyze the longer-term economic and distributional effects of COVID-19 in Sierra Leone. To this end, it uses a model (Habib and others 2021) to mirror the main features of Sierra Leone’s economy to then estimate the impact of both shocks and mitigating policies. The paper thus contributes to the limited literature on the medium-term impact of Covid-19 in Africa, particularly on inequality.

5. Roadmap. Section B draws the main features of the model and explains data sources and particularities of the calibration to Sierra Leone. Sections C and D analyze the impact of shocks and mitigating policies. Section E concludes.

B. Model Description and Baseline Calibration

6. A dynamic multi-sector heterogeneous agent general equilibrium model helps model the economy of Sierra Leone and has the following main elements:

- **Households** are divided between urban and rural residents. Rural residents are small and large farmers. Urban households are of three types: private sector workers, public sector workers, and entrepreneurs. Entrepreneurs own the large-scale, formal businesses. Private sector workers are either high- or low-skilled. Alongside these exogenous differences between households, they also experience idiosyncratic and transitory shocks that affect their incomes. Households can receive income through international remittances, as well as government transfers. Households consume different types of goods (domestic and imported) and services; save using a simple one-period bond but face borrowing limits; and pay taxes.
- **Four sectors** determine the production side of the economy: agriculture (for both domestic consumption and exports), manufacturing, services, and mining. Sectors require different inputs, with agriculture relying on labor, land and intermediate goods, manufacturing and services requiring capital, energy and labor, and capital feeding into energy/minerals production. Mirroring the informal economy, households can also produce services which only require labor. Sectors also differ in terms of the degree of contacts individuals are exposed to when working. This paper later captures that through the degree of the vulnerability of sectoral productivity to shocks.

- **The government** collects taxes (consumption tax, labor and corporate income tax, energy sector taxes, taxes on agricultural exports, among others) and tariffs on imports. Government expenditures cover wages and other recurrent expenditures, social transfers to different income groups within the population, and public investment.

7. The baseline calibration aims to capture the main structure of Sierra Leone’s economy by using a range of data sources. Using 2019 as the baseline year allows the matching of the

calibration to a recent year, without possible distortions of the structure from past shocks (e.g., Ebola health crisis, commodity price shock) that would feature in historical averages. In particular, the following datasets guide the calibration of target moments through the choice of parameters and variables in the model (see Table 1 for a summary of the main comparison of data and model outcome):

- *National account statistics* guide the calibration of the shares of the five sectors in overall production, while the *consumer price index* (CPI)—through the CPI weights—allows the determination of the consumption profile of households. *Balance of payments statistics* add information on the share of imports in consumption.

- *The 2018 Sierra Leone Integrated Household Survey* serves as the main reference to inform distributional target moments, including the overall, rural and urban Gini coefficient.

- *Fiscal statements* help targeting the detailed expenditure and revenue categories in general, while the *World Bank’s public expenditure review on social spending* provides more information about the nature and distribution of social transfers.

- The *2014/2015 Labor force survey* provide insights into shares of employments, shares of rural vs. urban population, and some indications on wage and productivity differentials, with estimates from comparator countries providing an additional robustness check.

- The *2013/2019 Demographic and Health Surveys* complement the information with data on educational attainment that allows to target the shares of the skilled and unskilled population in the model.

Table 1. Sierra Leone: 2019 Statistics vs. Model Calibration

Data targets	Data 1/	Model
Sectors		
Agriculture share of GDP	0.53	0.54
Agriculture sector share in GDP (domestic)	0.40	0.46
Agriculture export sector share in GDP	0.14	0.08
Manufacturing sector share in GDP	0.02	0.06
Service sector share in GDP	0.41	0.34
Mining sector share in GDP	0.05	0.06
Government		
Tax revenues to GDP 2/	0.12	0.28
Labor income tax	0.04	0.04
GST	0.03	0.03
Non-tax revenues to GDP	0.02	0
Government spending to GDP	0.15	0.15
Income Distribution		
Gini national	0.37	0.39
Gini urban	0.33	0.31
Gini rural	0.27	0.27
External		
External grants to government to GDP	0.03	0.03
Trade balance to GDP	-0.26	-0.33

1/ Based on 2019 data

2/ The deviation between actual data and the model is due to the external and fiscal balance condition needing to hold (no debt creating flows)

8. Using the calibrated model for policy analysis comes with several caveats on model assumptions and data quality.

- As in every model, several *simplifying assumptions* keep the model tractable and tailored to the focus of the analysis. With the focus on medium to long-term distributional outcomes, the model does not allow statements about the short-term impact of different shocks, such as lockdowns and short-term policies to ameliorate the effects. With both the government's budget and the current account remaining balanced, the model abstracts from implications of government spending and other policy decisions on debt accumulations and external stability. Similarly, the labor market clears, so that shocks and policies do not impact the level of unemployment.
- Obtaining *high quality data* on which to base the model calibration proved difficult in Sierra Leone's case. National accounts and BOP statistics have methodological deficiencies. The baseline calibration of the model revealed some apparent inconsistencies across some of the datasets which the model struggled to reconcile, such as the weight of food in the consumption basket with the share of the agricultural sector in GDP. Further, the fiscal and external sectors are assumed to balance in the model, requiring that the calibrated baseline deviates somewhat from actual data (for example, while remittances are only 2 percent of GDP of Sierra Leone, the model requires additional private inflows for the external sector to balance). These assumptions do not affect the economic predictions of the model.

C. Impact of the COVID-19 Shock

In this section, we apply the model to quantify the medium-term macro and distributional effects of the Covid-19 pandemic through two main channels, human capital and the impact on total factor productivity in individual sectors.

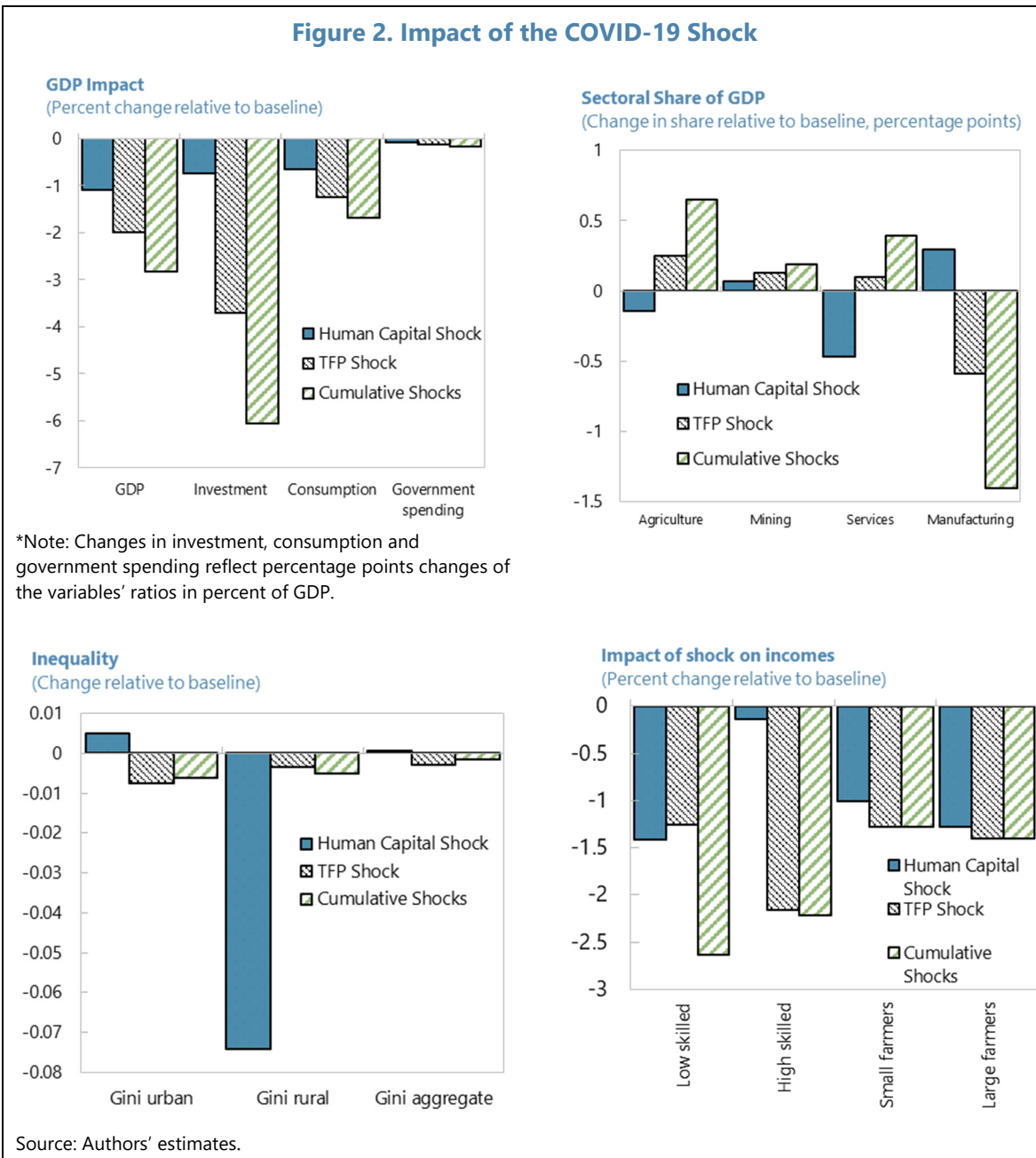
A Shock to Human Capital

9. The primary channel is the crisis' impact on human capital. This is both through the direct impact of the health crisis and through preventative measures, such as the closure of schools and increase in food insecurity. For the former, World Bank estimates for Sierra Leone suggest a 1.32 percentage point increase in dropouts and 20 percentage points in students repeating grades (World Bank 2021a). There is also a differential impact of disrupted schooling on poor children and those living in rural areas (World Bank 2020). For food insecurity, there was a 6-percentage point increase in the proportion of the food insecure population between end-2019 and end-2020. We capture these estimates with a drop in productivity of 1.8 percent for low skilled workers and 0.06 percent for high skilled workers. The drop for high skilled workers is lower, as evidence suggests that the pandemic affected informal workers and more vulnerable populations more significantly. We also increase the percentage of private unskilled households in urban areas by 1.32 percent to reflect the increase in dropouts.

10. This shock to human capital results in a significant loss in long-term GDP, and higher income inequality. The drop in productivity of households due to school closures results in

efficiency losses, and lowers long-term GDP (-1.1 percent) (Figure 2, panel 1). With low-skilled workers disproportionately impacted, the relative weight of services declines, while the ratio of manufacturing-to-GDP increases marginally (+0.5 percentage points) due to shifts in relative worker productivity (Figure 2, panel 2). Agriculture-to-GDP declines, despite no change in farmer productivity, as demand for food falls due to lower incomes. While income inequality in rural areas declines as a result of (larger scale) farmers’ loss of income, urban income inequality increases due to higher income losses for urban low-skilled workers relative to their high-skilled peers (Figure 2, panels 3 and 4). Overall, income inequality increases slightly (Figure 2, panel 4). Overall, income inequality increases slightly (Figure 2, panel 4).

Figure 2. Impact of the COVID-19 Shock



A shock to total factor productivity

11. The second channel is the lasting impact of the crisis on total factor productivity (TFP) for agriculture, manufacturing, and services. Barret and others (2021) suggest that emerging and developing economy output could shrink permanently by around 6 percent in the medium-term and that total factor productivity could decline by 3 percent. In Sierra Leone, as suggested by 2020 GDP outcomes, the services sector was most affected by COVID, including as social distancing is less feasible in the hospitality and tourism sector. At the same time, rural areas and thus agricultural output appeared to be less impacted (Figure 1). We reflect this shock in lower TFP for small farmers (1 percent), large farmers (1 percent), manufacturing (2 percent), and services (3 percent).

12. The results from the shock to TFP suggest lower incomes across the board, significant GDP losses, but somewhat lower income inequality as incomes converge to a lower level. Owing to lower TFP in most sectors, long-term GDP declines significantly (-2 percent) (Figure 2, panel 1), with the relative share in GDP of a still nascent manufacturing sector declining (-0.5 percentage points) (Figure 2, panel 2). The resulting income loss is higher for higher-earning individuals (large farmers, entrepreneurs), such that income inequality declines modestly in both rural and urban areas, and on aggregate (Figure 2, panel 3 and 4).

13. Combining the shock to human capital and TFP, amplifies the loss to human capital, though income inequality decreases modestly due to generally lower incomes.

D. The Impact of mitigating policies

This section explores how increases in social assistance programs and structural measures to support sectoral activity could mitigate or over-compensate for the impact of the shock to human capital and total factor productivity in different sectors. Modeling these policy responses allows us to compare the impact of different policy responses and shed light on any policy trade-offs.

Boosting Social Safety Nets

14. Boosting social transfers could be a means of reducing the impact of the shock for lower-income households. At the onset of the crisis, the government, with support from development partners, expanded existing efforts to enroll 71,000 households into the social safety net. It implemented a one-time transfer to 29,000 households with informal workers in urban areas considered most vulnerable to the crisis, building on the targeting process developed during the Ebola outbreak (Table 2). It also provided cash and in-kind support for people with disability during the lockdown as well as farmers. In general, however, social safety nets are still at a nascent stage, fragmented and largely financed from external resources (World Bank 2021g).

15. For the policy scenario, we therefore simulate the impact of scaling up and expanding social safety nets to a wider population.

- In line with the goal of the NDP, we expand transfers to 30 percent of the vulnerable population through an increase in transfers to the first tercile of both skilled and unskilled population, with an

overall package size of 1 percent of GDP, broadly in line with boosting social assistance spending in Sierra Leone to the levels of peer countries such as Liberia and Rwanda.³ Accordingly, we boost income of the bottom tercile of the income distribution in both groups by ½ percent of GDP, while increasing external aid accordingly.

- In a second step, we account for the fact that the increase in household consumption because of the transfer could have second round effects via expenditures that boosts human capital. We assume a proportionate increase in household spending on education, food and health by households who received the transfer, and a proportionate increase in skills by one third of low and high-skilled workers, respectively.

16. The results suggest that this policy successfully targets the poor and also has spillover effects for farmers by increasing demand for agricultural goods.

While the simulated increase in transfers to lower-income households increases long-term GDP, it does not result in an increase in consumption that sufficiently increases spending on health and education to make a dent in increasing productivity to an extent that it would impact the structure of the economy (Figure 3, panel 1 and 2). Incomes for urban workers are boosted by 4 percent, slightly decreasing income inequality (Figure 3, panels 3 and 4). While the small overall impact suggests that size of the transfer package may not substantially change longer-term outcomes, our assumptions likely underestimate the impact on human capital as they do not account for a possible switch from low to high skilled households which would increase GDP and further lower income inequality.

Increasing Investment in Human Capital

17. Measures to boost human capital, consistent with the NDP, may help offset the impact of the human capital shock and foster longer-terms shifts of the economy. Indeed, in response to the crisis, the government increased spending on health (from 7.5 to 11 percent of GDP), provided EdTech solutions to compensate for in-person learning, and engaged in some food assistance. In this scenario, we therefore follow the stated intention under the government's NDP to increase the share of skilled workers in the medium term. We capture this by increasing the share of

Table 2. Sierra Leone: Government Covid-19 Response in 2020

Particulars	2020 Total
Containment and Social Response Implemented Via Budget	144
Initial Containment and Social Response	144
Health Sector Response Implemented Via Budget 1/	410
Health Sector Response Plan	375
Other Health Sector Spending	35
Social and Economic Response	889
QAERP: Budget Expenditure	737
Establish and maintain a stock and price monitoring system for essential commodities	-
Special loan facility (local and foreign currency) to businesses at concessional rates	-
Commence national micro credit scheme	4
Social Safety Net	48
o/w Cash Transfers and Food Assistance	13
Bailout to SOE's	30
Support to Tourism Sector (Hotels)	5
Rehabilitate unpaved trunk and feeder roads	164
Minor repairs on township roads	332
Provide farm inputs including chemicals and seedlings to farmers	45
Support farmers' access to tractors and other farmer machinery	89
Provide extension services to farmers	56
Other economic and social response	152
Tree Planting and Re-afforestation	24
Districts Electrification Project	40
Support to Agriculture/COVID-19 Response	7
Water Supply Projects	82
Total COVID19-Related Budgetary Expenditure	1,443

1/ Some health sector initiatives are being implemented directly by health sector and development partners.

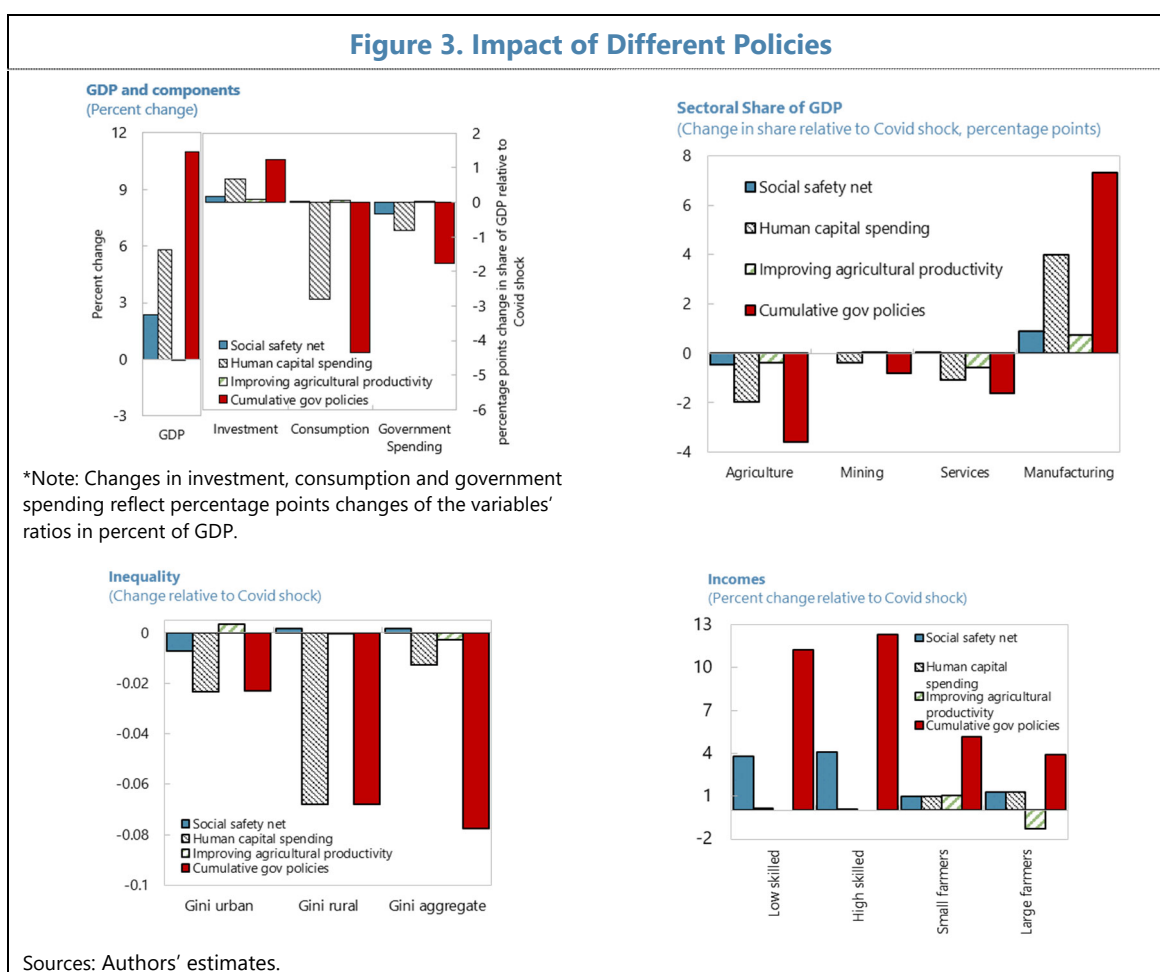
³ See Figure 6 in World Bank (2021g).

the skilled population by 7 percentage points, consistent with the increase in lower-secondary completion rates observed between 2015 and 2019 (see paper on demographic dividend).

18. The gains from boosting education are massive. The substantial boost to the share of the skilled population increases the economy's overall productivity significantly, and GDP increases (+6 percent), while the share of private sector investment increases disproportionately (Figure 3, panel 1). The manufacturing sector absorbs a large part of skilled workers and increases its weight in overall production (+4 percentage points) (Figure 3, panel 2). The increase in the share of the more educated population implies more equal incomes in both rural and urban areas, and the rural Gini coefficient in particular declines significantly (Figure 3, panel 3).

Boosting Agricultural Productivity

19. Measures to boost agricultural productivity may also help to address the differential impact of the crisis on rural communities. Indeed, the government employed people in building rural road networks and road maintenance and implemented direct transfers of cash and farming inputs worth 0.1 percent of GDP (Table 2). We capture this as transfers to small farmers but expand the size of the program to about 0.5 percent of GDP to the poorest tercile of farmers.



20. Increasing agricultural productivity supports small farmers and reduces food prices.

While the size of the package is too small to increase long-term GDP or change the structure of the economy substantially (Figure 3, panels 1 and 2), the policy succeeds in lowering food prices by 0.5 percent relative to the Covid shock. The policy also redistributes agricultural income towards small farmers, reducing aggregate inequality (Figure 3, panels 3 and 4).

21. Together, these policies more than make up for the impact of the Covid shock. They boost GDP by 11 percent and accelerate the transition to a manufacturing base away from agriculture thanks to increased formalization (Figure 3, panels 1 and 2). Incomes are boosted across the board, significantly decreasing inequality.

E. Conclusion

22. This paper provided an overview of the impact of main shocks from the COVID crisis on Sierra Leone's long-term economic and distributional outcomes. To that end, the paper used a general equilibrium model with heterogeneous agents and a range of Sierra Leone-specific data sources to capture the main feature of the country's economy. Simulations of shocks to human capital and sectoral productivity resulting from the crisis reveal that the long-term impact from the crisis, absent other policy measures, is significant, with long-term GDP being lower by 3 percent permanently and the manufacturing sector being less developed. While a negative shock to human capital alone leads to an increase in income inequality, income inequality decreases slightly when taking into account a TFP shock as it leads to a more broad-based decline in incomes across the population.

23. A number of policy options are available to mitigate that impact. In line with the Government's initial response to the crisis, this paper explores measures to increase human capital, to boost agricultural productivity and to expand social safety nets as options. However, in contrast to the initial response, we assume that policies are permanent. Encouragingly, the paper shows that all three policies have the potential to mitigate the long-term impact of the crisis or even over-compensate it, with particularly large gains from building human capital and thus boosting worker productivity.

24. While the results give an idea of how the shocks and policies transmit, a range of other shocks and possible and could be tested for their impact in the future. In particular, the model allows to simulate a range of individual and combined shocks and policy packages. For instance, it allows to look into the impact of structural changes in remittances flows, and the impact in changes in food, energy and other commodity prices. In terms of policies, it allows to assess the distributional impact of other measures and structural reforms—such as relating to, e.g., different sectors, digitization, the wage bill (wage premium)—other measures to increase human capital (health measures) and social transfer packages.

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ACCELERATING DIGITALIZATION FOR IMPROVED PUBLIC SERVICE DELIVERY AND FINANCIAL INCLUSION IN SIERRA LEONE¹

This paper takes stock of digitalization in Sierra Leone and identifies several factors requiring attention to accelerate digitalization. These factors range from relatively higher cost of the internet, low quality of service, legal and regulatory challenges, low private sector participation, lack of adequate IT skills, and lack of supportive infrastructure gaps. Notwithstanding some challenges, it finds that adoption of digitalization has picked-up in government operations, providing a solid platform for efficient, transparent and effective PFM and improved service delivery in priority sectors such as health, education and agriculture. A wider adoption of Digital Financial Services (DFS) could increase the ease and speed of payments as well as enhancing financial inclusion in Sierra Leone.

A. Motivation

1. **The COVID-19 pandemic has forced firms and governments globally to adapt their processes, accelerating the pace of digitalization.** The rapid switch to working from home has permanently altered where and how employees execute their tasks in many countries, including Sierra Leone. Even before COVID-19, Sierra Leone was among the first countries to deploy mobile technology during the Ebola Epidemic in tracking, monitoring and managing infections, as well as providing cash assistance to support livelihoods. COVID-19 has further accelerated digitalization including use of mobile apps to trace, monitor, and manage the outbreak. This has helped to provide more resilience and allowed for a rapid and flexible response to pandemic.²
2. **In this paper we ask, how can Sierra Leone build on this momentum to enhance digitalization and improve public service delivery?** Digitalization is creating new opportunities for improved public service delivery and strengthened public financial management systems in Sierra Leone. Digital provision of government services enables inclusion for the previously unserved. To digitally administer taxes, file, and make payments reduces the cost of compliance and save on time, while reducing face to face contact with tax officials, thereby minimizing risks of rent-seeking behavior. With continued adoption, addressing the challenges of leaving no one behind is central, such that all citizens benefit from digitalization. This would in turn require continued investment into the government's human capital development agenda and skills. Sierra Leone has also made good progress in extending IT systems to support budget execution, targeting of subsidies, and payments for government and utility services (water and electricity).
3. **To digitally administer taxes and payments of government services, Sierra Leoneans will need access to bank accounts and the digital world.** Access to digital financial services (DFS)

¹ Prepared by Michael Saffa, Peter Wankuru, Rosalind Mowatt, Saanya Jain (all AFR). We are extremely grateful to comments and guidance provided by Sukhwinder Singh (MC) and Veronica Trujillo (World Bank).

² See IMF, Regional Economic Outlook (REO) on digitalization in Sub-Saharan Africa, Spring 2020.

enables people and businesses to complete economic transactions in an efficient manner and promote financial inclusion. Sierra Leone has made steady progress in advancing financial inclusion. The percentage of the adult population with an account at a financial institution or mobile money provider has increased from about 20 percent in 2017 to about 24 percent in 2019. The percentage of adults with an account at a formal financial institution is much lower (12 percent in 2017, the latest year available). Women and people in rural areas continue to lag in terms of financial access. Given the business models and lack of geographic reach of the banking system, DFS offer significant opportunities for increasing financial inclusion.

4. The rest of this paper is organized as follows: Section B highlights on the pace of digitalization in Sierra Leone and constraining factors. Section C covers tangible examples of how authorities in Sierra Leone are leveraging digitalization to strengthen PFM (expenditure controls, targeting subsidies, and revenue mobilization) and to improve public service delivery in key sectors. Section D provides the recent developments on the DFS front and existing potential, while section E concludes with policy discussions.

B. The Pace of Digitalization and Remaining Gaps

5. The rate of connectivity and integration of digital technology into everyday life amongst Sierra Leoneans is expanding. Internet penetration increased from about 13 percent in 2014 to about 27 percent of total population in 2019 (GSMA, 2020) and is estimated to have reached 30 percent in 2021 (Figure 3). The latest data shows Sierra Leone's continued expansion in the number of internet users (2.4 million persons in 2021), the number of persons using social media platforms (850,000 people), and the number of mobile connections (100 percent of the population) and increasing number of secure internet servers per one million persons (Figure 1). The adoption rates of digital financial services (henceforth DFS) is estimated at 30 percent of adult population in 2019 (UNCDF, 2021). Sierra Leone has one of the fastest growing technology adoption trends in DFS, expanding from about 9 percent of adults using a DFS account in 2017 to about 30 percent in 2019.

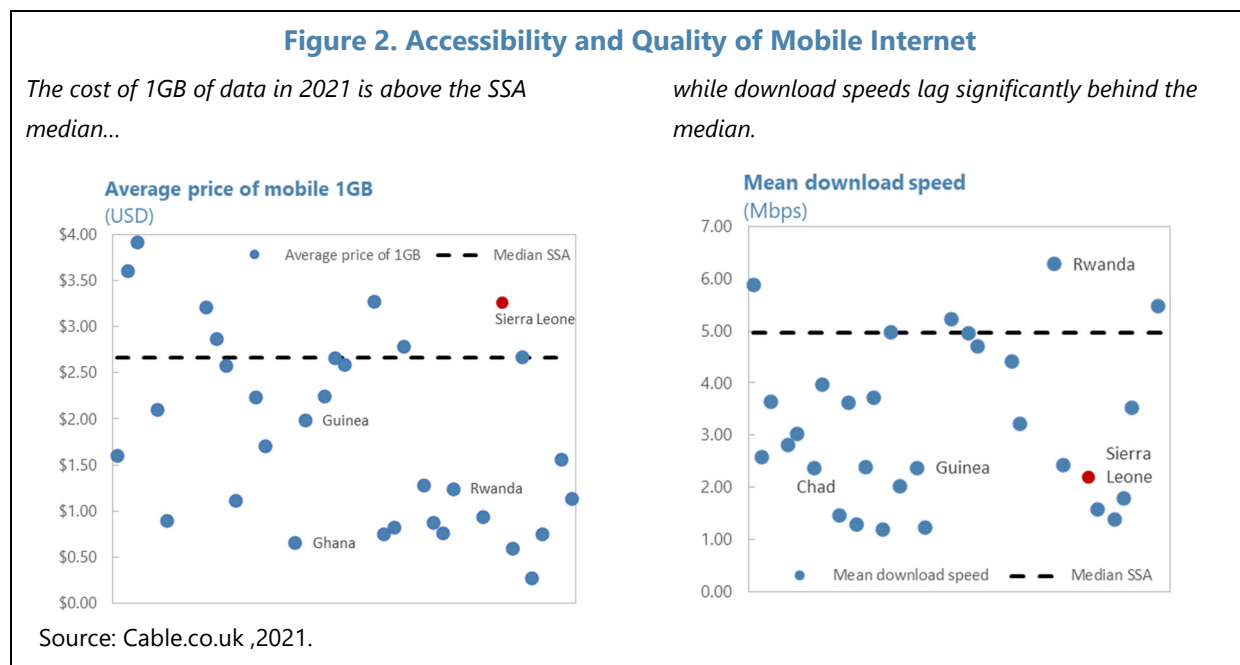
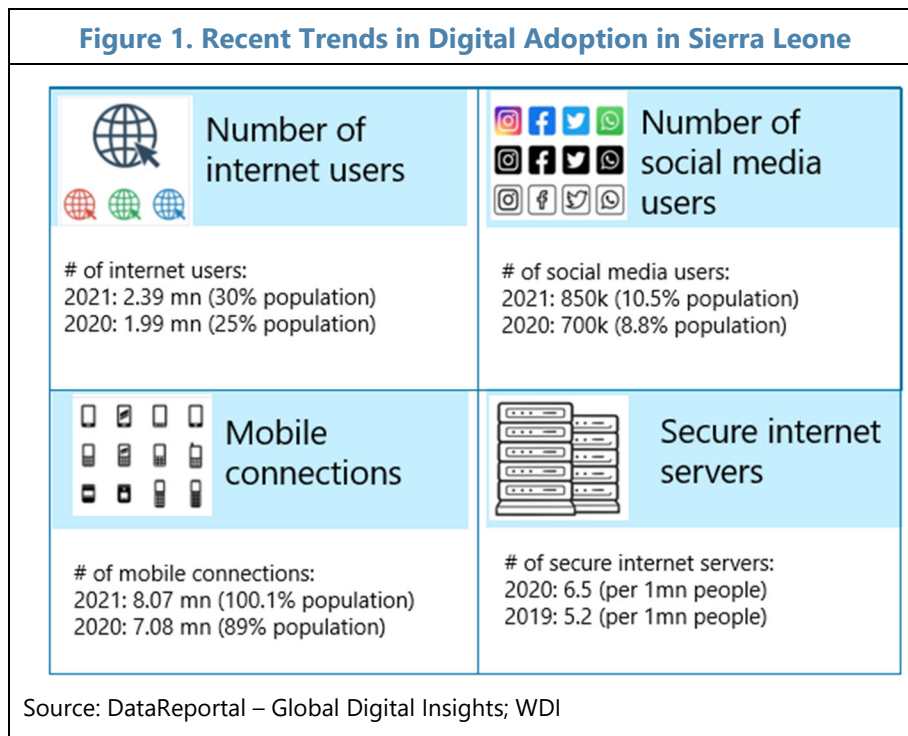
6. The government of Sierra Leone has underscored the importance of digitalization to its development strategy. Sierra Leone was one of the first countries in West Africa to set out a "Mobile First" digital strategy in 2019. Digitalization is core to the government's development strategy, with a clear path laid out in its ICT development strategy (2019-2029) for an inclusive digital ecosystem. The strategy has three pillars: digital identity, digital economy, and digital governance (DSTI). Priority projects includes the ease of doing business, education data hub, integrated geographic information system, financial data mapping, GoSL appointment app, and environment. The government is advancing legal and regulatory reforms, including enacting the Cyber Security and Crime Act in 2021 to create a thriving environment for digitalization. It is also prioritizing infrastructure investments, including the rollout of the fibre optic cable, which is expected to increase access to internet connectivity, and raise quality and speed. Sierra Leone is also tapping into innovative global initiatives with development partners. In 2021, Sierra Leone joined Giga, an initiative with the International Telecommunication Union (ITU) and UNICEF to connect approximately 10,387 schools in the country to the internet. This initiative will eventually reach over

3 million people around the schools in addition to the students (Giga, 2021).

7. While Sierra Leone has made great strides with its digitalization strategy, several barriers limit the pace of progress.

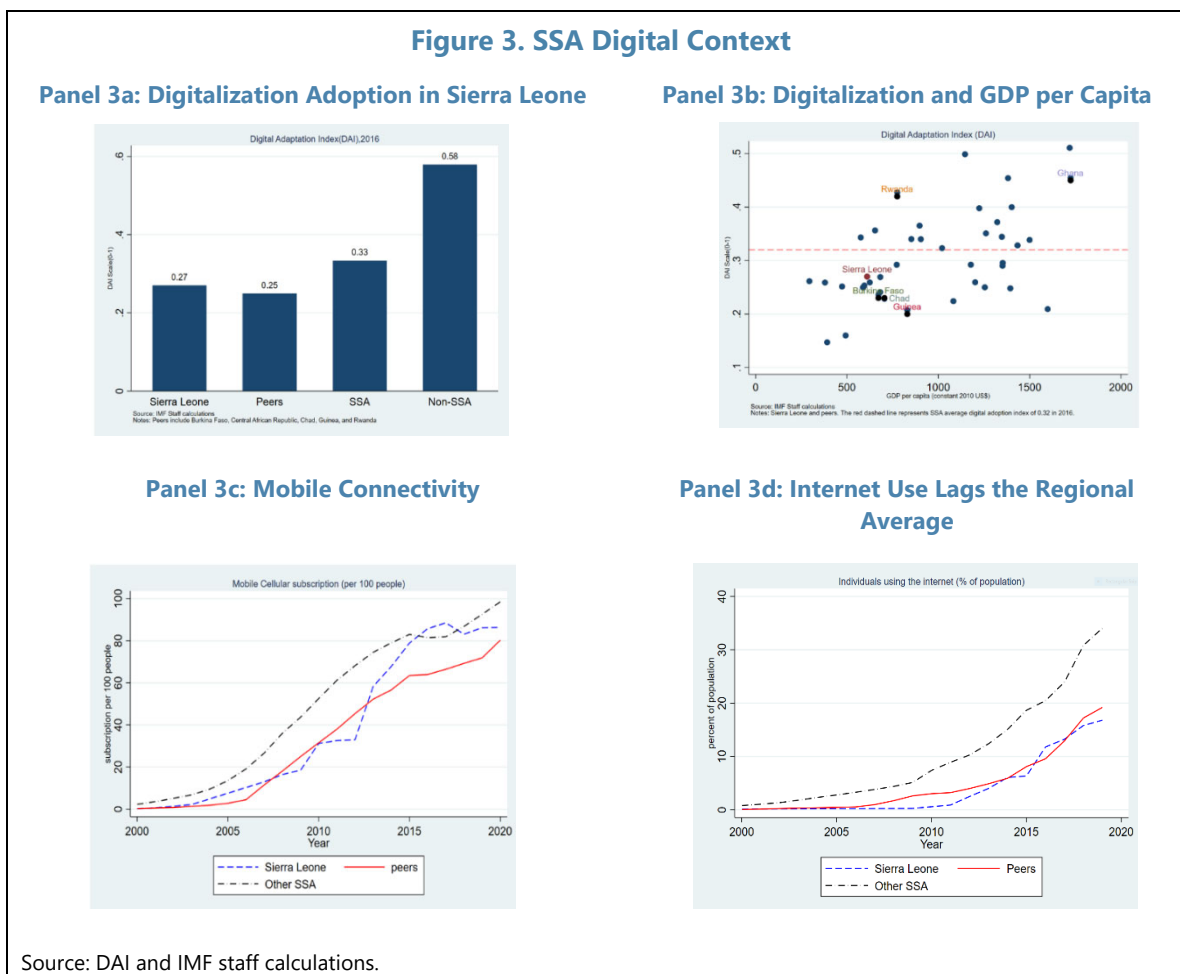
Coverage is limited, with 15 percent of the population having no mobile phone signal. Affordability and quality of service remains relatively poor. Although 60 percent of the country has at least a 3G

network coverage, only 20 percent have active mobile broadband subscriptions (ITU, 2020). One GB of internet data costs US\$3.26 in 2021, which ranks Sierra Leone 152nd out of 230 countries for cost of mobile data (Figure 2). In addition, network quality is relatively weak, with Sierra Leone ranking 168 out of 173 countries for quality and speed (Speedtest, 2021).



9. There is room for continued progress in digital adoption measured more broadly.

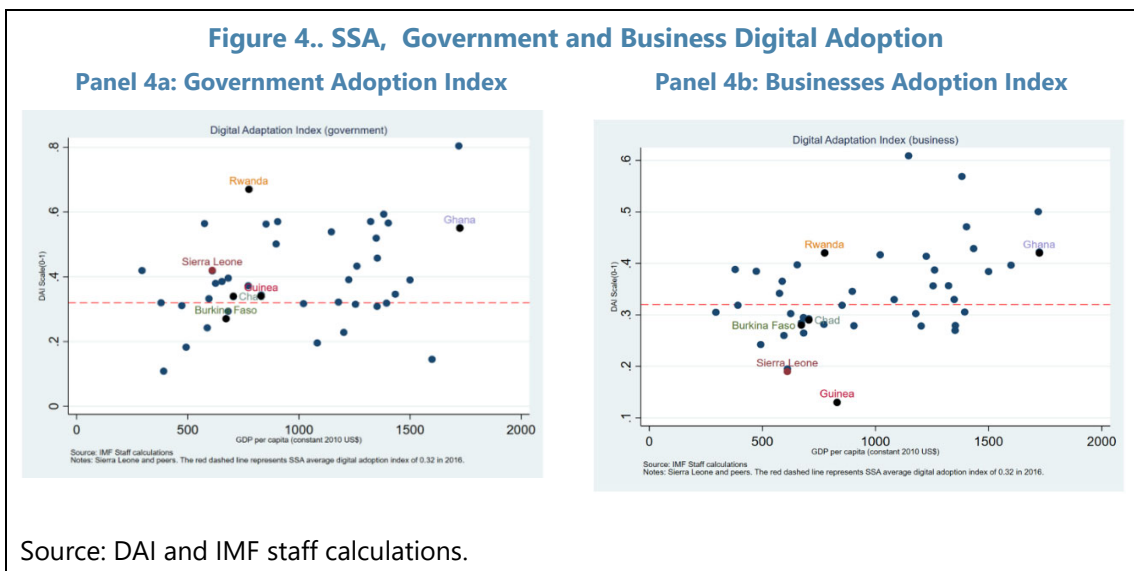
Sierra Leone ranks low compared to her peers in various digital adoption measures: digital adoption index (DAI), internet use, and mobile connectivity.³ On a scale of 0-1, Sierra Leone lags the SSA average on digital adoption (Panel 3a). This is the case even after controlling for per capita GDP (Panel 3b). Mobile connectivity is broadly in line with the regional average (Panel 3c) but below the regional average in terms of individuals' use the internet (Panel 3d). These broad measures suggest scope for further improvement in digital adoption across different user groups in order to reap the maximum gains that comes with technology adoption.



10. Internet connectivity is particularly low amongst businesses, although this is not unique to Sierra Leone. There is a gap in digital adoption between the public and private sector (Figure 4). Yet, to fully realize the benefit of digitalization, both public and private sector must get connected. Beyond the DAI, Sierra Leone ranks 126 out of 137 on firm-level technology absorption (WEF Global Competitive Report 2017-18). The private sector has raised several challenges that constrain adoption of digitalization in Sierra Leone. These includes the lack of supportive policy and

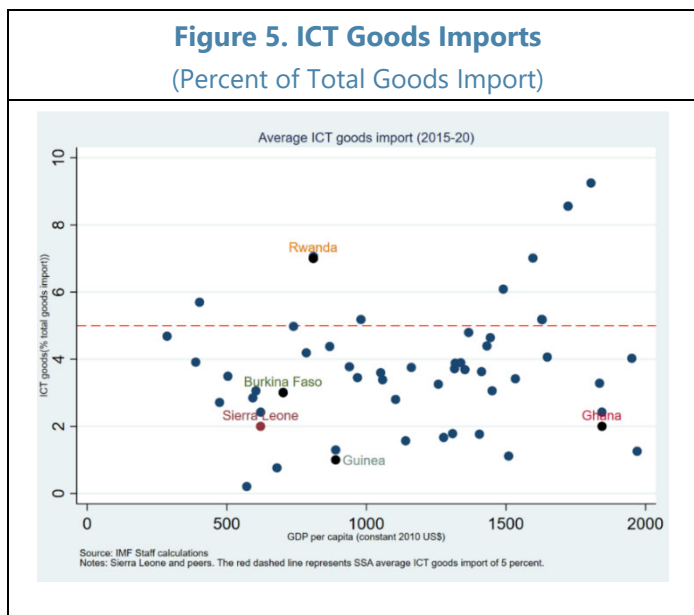
³ The DAI measures countries digital adoption across people, government, and business ([Digital Adoption Index - worldbank.org](https://www.worldbank.org))

legal environment (i.e. intellectual property rights), limited access to finance, insufficient electricity connectivity, and limited e-business skills (World Bank, 2020). Addressing legal and regulatory reforms will further improve private sector participation in the digital space, reduce cybercrime, expand access, and reduce the cost of internet connectivity. Initiatives such as the recent unbundling of SALCAB to a private sector entity (Zoodlabs) is expected to increase operational efficiency, improve wireless access and reduce the cost of internet connectivity for the private sector.



10. Access to IT equipment and related accessories is also low, yet these provides the hardware for digitalization.

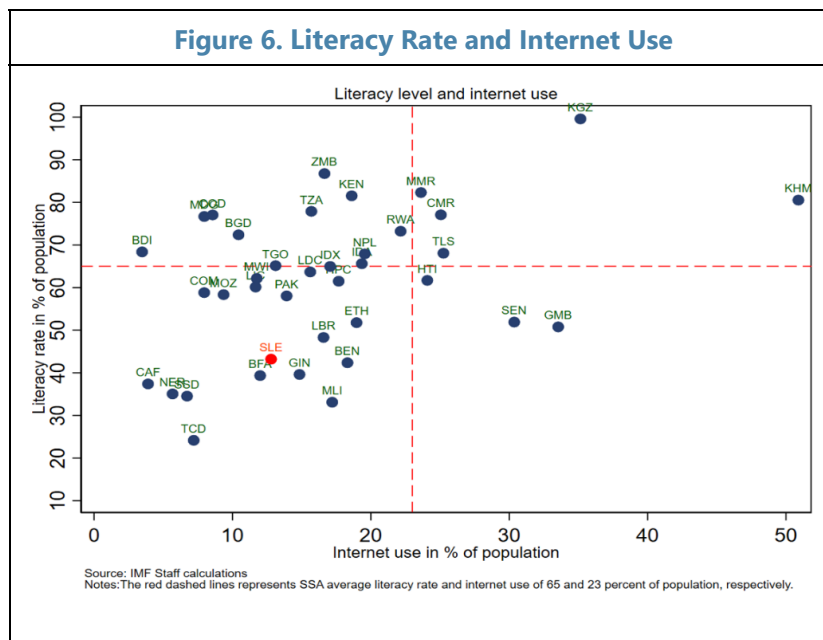
Importation of IT equipment is a proxy for technology adoption amongst a country’s private sector. Figure 5 plots the percent of IT equipment imported as a ratio of total goods imports and also controls for the per capita income. In Sierra Leone, over the period 2015-20, this stood at about 2 percent compared to the regional average of about 5 percent. Nonetheless, there are concerns for measurement errors and the scope for definition of classes of IT products, which might understate this for Sierra Leone while overstating it for other countries, including for peers at the same level of income per capita. As such, these comparative analyses should be interpreted cautiously.



11. Increasing literacy level and skills development are core foundations for digitalization.

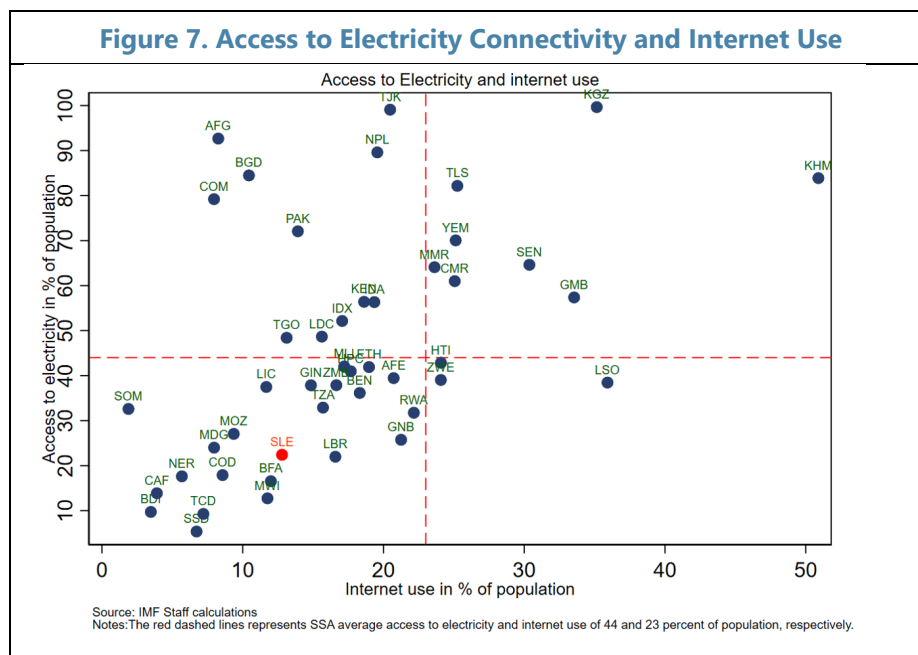
To benefit from digitalization will require continued investment in human capital developments.

Sierra Leone lags in both the average literacy rate and internet penetration compared to the regional average (Figure 6). The average literacy rate in SSA is about 65 percent (over 2015-20), while the countries that have made impressive gains are those that have laid foundations for continued learning as well as investment in digital skills. Education will need to integrate information technology into student's learning, while still young. In addition, creating a conducive business environment and basic social amenities, are also key in attracting and retaining technical IT skills.



12. Reliable electricity connectivity and increased power supply could enhance digitalization.

Unreliable electricity supply is one of the key impediments to digitalization in Sierra Leone (Figure 7). The country's installed power capacity as of 2018 is about 105 MW for a population of over 7 million. Sierra Leone is in the lower left quadrant,



indicating that lower access to electricity is also associated with lower access to the internet use. Plugging this gap is critical to fully benefit from digitalization and accelerate the growth of the sector.

C. Digital Technologies and Public Service Delivery

13. The government of Sierra Leone is extending digital technologies in support of its public financial management reforms (PFM) and improved service delivery. It has expanded the coverage of the Integrated Financial Management Information System (IFMIS) to approximately 61 ministries, departments, and agencies, from about 30 in 2020.⁴ The system is being upgraded to a web-based version and will be connected to the T24 system at the Bank of Sierra Leone to allow electronic files to be transmitted from IFMIS to the Bank of Sierra Leone. This is expected to replace the manual system of issuance of checks, shortening the processing time and helping to strengthen cash management and planning.

14. Use of digital technology is expected to help improve spending efficiency and targeting of priority spending. Wage and salary management has improved through the use of biometric vetting of government employees, helping to reduce ghost worker problems. In education, teacher assignments are being managed through an automated digital system which assigns teachers and evaluates student progress. There is scope to further scale-up these applications to monitor both teacher and health workers' absenteeism. In agriculture, the authorities are providing small holder farmers with an e-voucher based subsidy for acquiring farm inputs such as seeds, fertilizers, tractor services, and chemicals.⁵ Arising from the Ebola crisis, the use of mobile phones to make salary payments to healthcare workers and targeting of cash assistance has been very effective. Mobile technology has also been widely used during the COVID-19 outbreak to monitor, track and manage infections. In 2019, the government of Sierra Leone and UNICEF launched the Drone Corridor to deliver medical supplies to health centres in rural communities. Further in 2021, the Directorate of Science and Technology (DST) in collaboration with UAVaid (a UK based drone specialist) and with support from the Bill and Melinda Gates Foundation launched a medical drone delivery service (MDDS) for delivery of medicines in remote parts of Sierra Leone thereby overcoming numerous transport challenges to access rural community health centres and hospitals.

15. Publishing contracts online has improved transparency of spending. Sierra Leone has continued with the practice of publishing unaudited financial statements for its emergency financing response⁶ and key details of large procurement contracts related to crisis mitigation. They are also reporting on their broader social and economic response.⁷ The National Public Procurement Authority (NPPA) launched the electronic procurement system in March 2021 that will improve efficiency, mitigate corruption, transparency and accountability in procurement processing at public institutions. The publication of procurement and tender award information on the NPPA website is expected to bolster transparency and accountability in public spending. The Ministry of Finance is

⁴ AFRW02 TA report on strengthening Budget Execution systems, July 2021.

⁵ There are typically three channels via which digitization can help improve with targeting anti-poverty programs: (i) ease of paying cash; (ii) biometric identification; and (iii) keeping track of payments in government accounts.

⁶ [FINAL-Q1-Report-NACOVERC-UNAUDITED-FINANCIAL-REPORT-Q1-2021.pdf \(mof.gov.sl\)](#)

⁷ [UPDATED-FY-2020-QAERP-TABLES.xlsx \(live.com\)](#)

rolling out an electronic contract profiling system (ECOPS) that will track all outstanding payments for contracts and capture upcoming procurement expenditure from planning to payment stage. This is expected to improve the efficiency and transparency of public procurement transactions.

16. The National Revenue Authority (NRA) is making use of information technology to strengthen its tax administration and minimize risks for rent-seeking. A new web-based Integrated Tax Administration System (ITAS) has been developed and is under implementation. The system digitalizes taxpayer registration, returns filing, payment of taxes, compliance management and other domestic tax management functions. This is expected to reduce costs for compliance amongst taxpayers and lower administration costs for the NRA. This also has the potential to improve on governance and reducing corruption. For example, if tax filing is digital, it reduces the need for face-to-face engagement between tax official and taxpayer, minimizing opportunity for rent seeking behavior (Gupta et al. 2017). The integration of ITAS with third-party data is expected to provide adequate data and information to help monitor tax compliance. Its interface with the Automated System for Customs Data (ASYCUDA) World will enable both Customs and domestic tax department (DTD) to share information relating to importer Tax Identifier Number (TINs), import GST declarations and withholding income tax paid at customs, thus making taxpayer profiling, assessment and reconciliation easier and faster.

17. The Freetown City Council (FCC) is leveraging digitalization to boost revenue collection from property levies, providing a best practice on property taxation in the region. Revenue collection has been central to the current Mayor's Transform Freetown agenda.⁸ With the support of International Growth Centre and International Centre for Tax and Development, FCC has developed a new IT system that leverages satellite imaging to manage property taxation from data collection, valuation, billing, payments, appeals, all the way to enforcement. The results have been a resounding success with revenue increasing 10-fold from about Le 7 billion in 2019, enabling the city budget to be self-sufficient and boosting service delivery. This innovative use of digital technology will serve as a best practice for other countries in SSA on taxation of property and real-estate.

18. To summarize, this section provides tangible examples of how authorities in Sierra Leone are making use of digital technology to enhance public financial management (expenditure and cash management controls, targeting of subsidies) and enhanced revenue mobilization. Within the health sector, the use of the mobile and drone technology is helping reach the previously excluded population, while in agriculture use of e-vouchers ensures that input subsidy is well targeted. These aspects indicate numerous opportunities for applying digital technology to improve the allocation of scarce public resources to provide public service delivery.

D. Digitalization and Financial Inclusion in Sierra Leone

19. Traditional banking services are challenging to access for ordinary Sierra Leoneans. Sierra Leone has made slight progress in advancing financial inclusion but access to finance remains

⁸ <https://www.theigc.org/wp-content/uploads/2019/11/Grieco-et-al-Policy-Brief-2019.pdf>

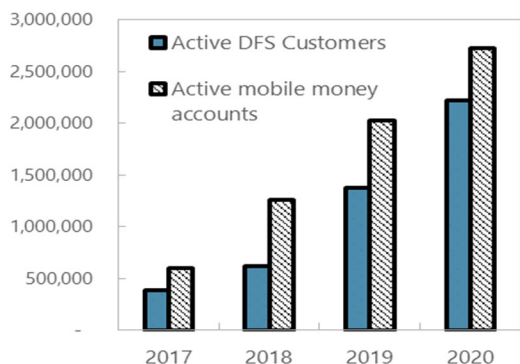
low—less than the Sub-Saharan Africa average. The percentage of the adult population with an account at a financial institution or mobile money provider has increased to 24 percent in 2019 from 20 percent in 2017 (Figure 8). The percentage of adults with an account at a formal financial institution is much lower (12 percent in 2017, the latest year available). Women and people in rural areas continue to lag behind in terms of financial access. Given the business models and lack of geographic reach of the banking system, Digital Financial Services (DFS) offer significant opportunities for increasing financial inclusion. DFS can provide households with convenient payment and withdrawal channels as well as savings and borrowing channels that improve economic activities and can spur growth, entrepreneurship, and reduce poverty.

Figure 8. Financial Inclusion (2011-2021) 1/

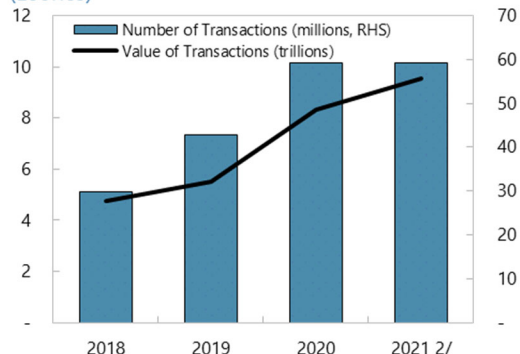
DFS users grew at an average of 82 percent every year, thanks in part to growth in mobile money...

which has grown both in number and value of transactions.

Active DFS users



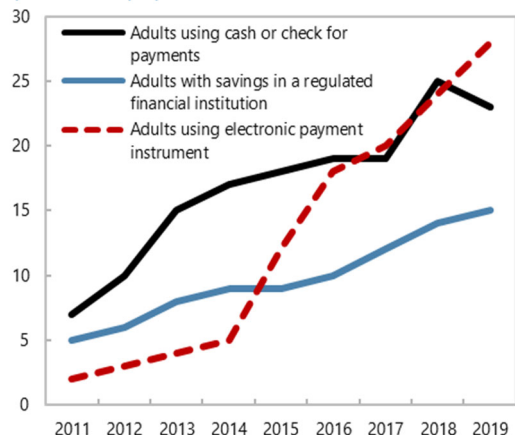
Mobile Money Volume and Value of Transactions (Leones)



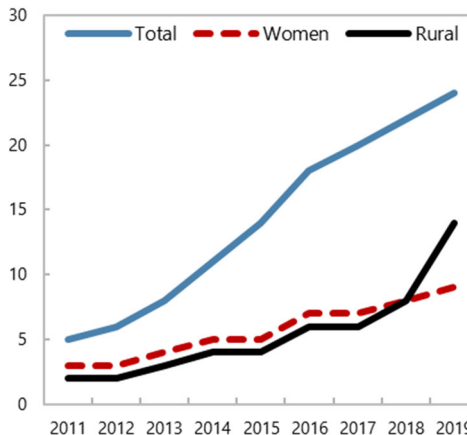
Electronic payment has surpassed usage of traditional financial institutions and cash and check payments...

but women and rural residents lag behind.

Access to financial services (percent of population)



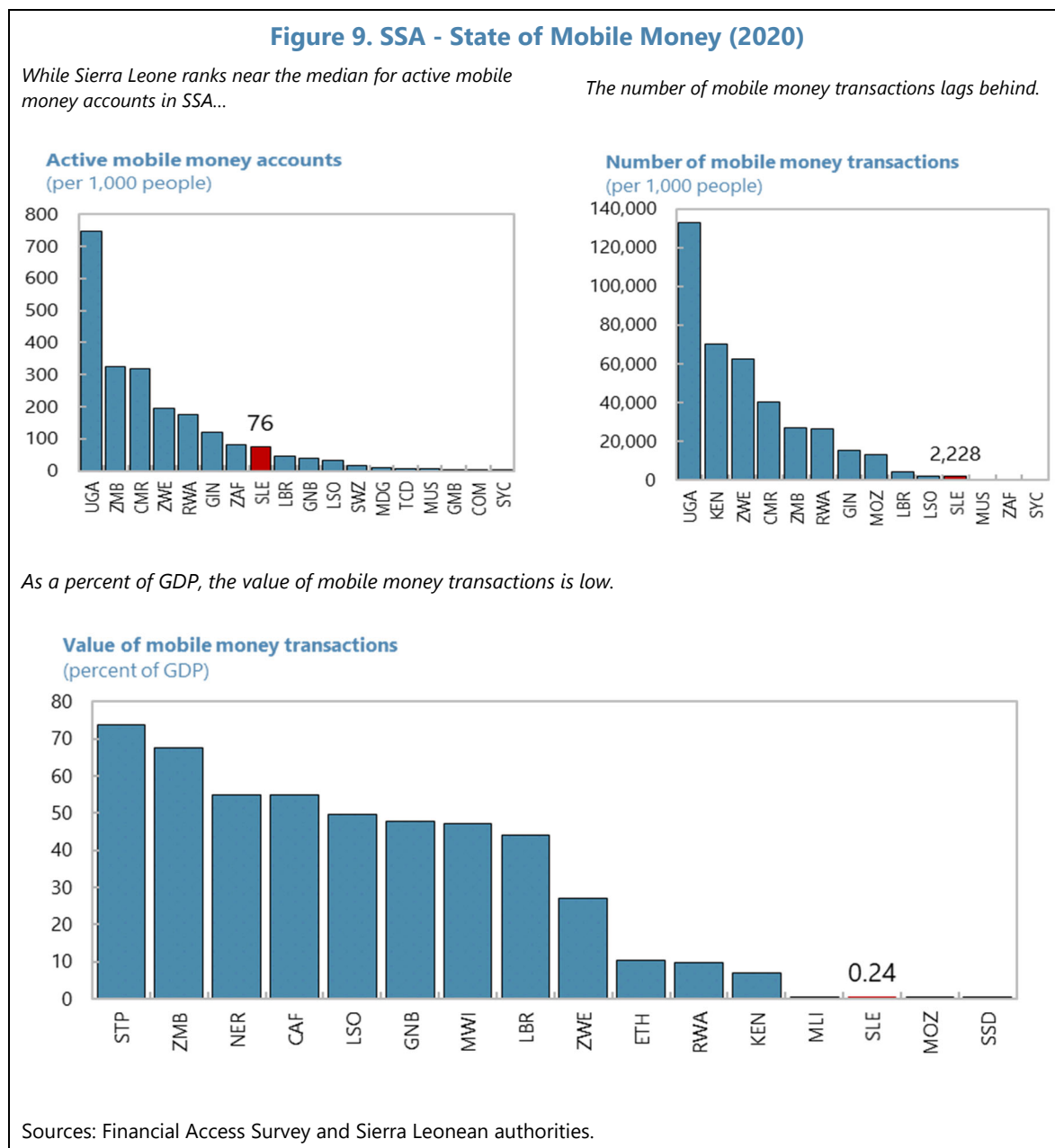
Adults with savings accounts (percent of population)



1/ Source: BSL; staff calculations.

2/ Data is through September 2021.

20. Mobile money operators (MNOs) have so far been the main drivers of financial inclusion in Sierra Leone. Sierra Leone currently has three MNOs with about 35,000 agents in operation. Since Covid-19, the value of transactions has grown by 73.8 percent in September 2021 to Le 9.6 trillion from Le 5.5 trillion in 2019. Although the number of registered customer accounts fell in 2020 (to 4.7 million down from 6.2 million in 2019) due to a clean-up of accounts, the number of active users increased (2.2 million vs. 1.4 million), which indicates improved usage of DFS during the Covid-19 pandemic. The volume and value of transaction of DFS also accelerated in 2020 amidst Covid-19 lockdown and restrictions and has been sustained in 2021 (Figure 9).



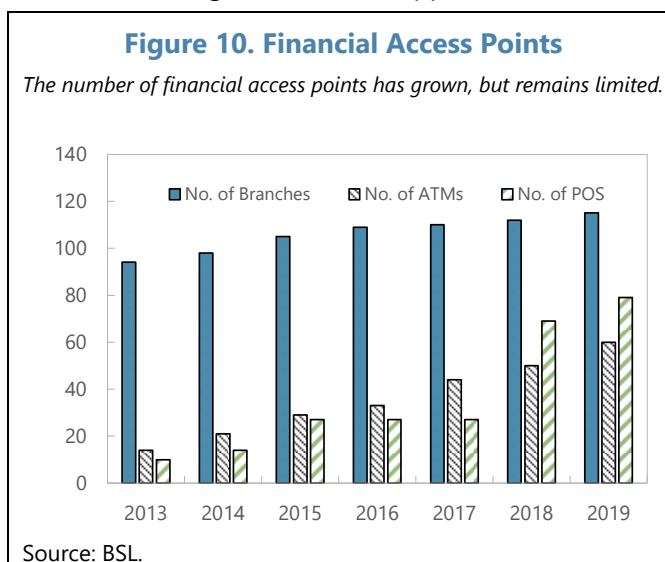
21. The most popular services offered by MNOs are cash-in, cash-out and domestic peer-to-peer transfers. However, DFS could also be used effectively for bill payments, international remittances, and government payments, among other use cases. The 2021 FSSR recommends providing incentives to encourage providers and customers to broaden their service offers and usage. Further, digitalization can also promote access to credit. In Sierra Leone, bank lending is typically highly concentrated in certain businesses (notably trade finance and construction) and access to credit is highly constrained.⁹ However, in 2020 only 0.2 percent of total DFS transaction volumes were for digital loans in Sierra Leone (UNCDF, 2021).

22. Commercial banks are taking advantage of digitalization to expand their customer base. Banks are expanding ATM access points, internet banking, mobile bank applications and USSD¹⁰ to grow their customer base and complement the traditional brick and mortar banking services (Figure 10). Microfinance institutions are also beginning to roll out some digital services (UNCDF, 2021).

23. The impact of digitalization on financial inclusion may have implications for monetary policy. As noted in IMF (2021), central banks that target reserve money, as Sierra Leone does, may have more challenges in forecasting velocity due to changing financial inclusion and depth.

There has been some speculation, for example, that the rapid growth in DFS in 2020 was partly responsible for the unusually high demand for cash that year, which in turn created shortages of local currency. If digitalization enhances access to credit, that may also affect the monetary policy transmission mechanism. Central banks are therefore advised to keep a close eye on developments with e-money.

24. Upgraded and interoperable payments systems are expected to promote efficiency and financial inclusion. Payment systems promote financial stability by reducing systemic and settlement risks. These systems also facilitate financial inclusion by allowing the population (including the unbanked) to make and receive payments in a cost-efficient way. By 2013, Sierra Leone had introduced various electronic systems to facilitate bank-intermediated payments, including Real-Time Gross Settlement (RTGS), used primarily for large-value transactions, and



⁹ According to the BSL, in 2019, only 14 percent of adults (and 4 percent of women) had credit from a regulated financial institution, while 31 percent of SMEs had a loan or line of credit.

¹⁰ Unstructured Supplementary Service Data (USSD) is a communications protocol used in mobile networks for sending short text messages. It allows customers with mobile phones to access basic financial services (UNCDF, 2021).

Automated Clearing House (ACH), used mainly for retail transactions. According to the BSL, the ACH has reduced settlement times substantially, from T+9 to T+1. Nevertheless, most commercial banks, as well as the BSL still do not provide complete straight-through-processing (STP) of transactions. Introducing STP would increase efficiency and reduce operational risk in the financial sector.

Another important area of progress is the National Payments Switch, which allows for interoperability of payment platforms (including MNOs, but excluding other non-bank financial institutions), and which is due to come into operation before the end of 2022. Interoperability can promote competition in the financial sector, reduce fixed costs and enable economies of scale in making payment services more convenient and accessible (Cirasino et al, 2016).

25. The Bank of Sierra Leone introduced a regulatory sandbox for fintech startups in 2017 to encourage innovation and competition in the digital financial space. The regulatory sandbox is supported by the United Nations Capital Development Fund (UNCDF) and incorporates technology in the financial space to improve access to the unbanked population. The fintech window created an opportunity for startups, banks and entrepreneurs to create digital financial solutions whose viability can be tested in a secured space to reduce any potential risk before they are licensed to operate in the financial system. In May 2018, four businesses were selected to enter the regulatory sandbox of which two were granted licenses to operate (Mikashboks and InvestEd) after assessment of the products by sandbox regulators. As of February 2022, fifteen sets of fintech products are in the sandbox, with five having been granted licenses to test their product in the financial system (Afro Mobile Money, Soft Pay, Pay Online, B 'N' B Cash and Stochastic). However, regulatory sandboxes have tended to work better in markets where there is already a flourishing fintech ecosystem, and scarce regulatory resources may be better channeled elsewhere.

26. Digital financial services and payments systems also create new regulatory challenges and risks. The new National Payment Systems Act (NPSA, currently in Parliament), guidelines for mobile money, remittances regulations and agent banking guidelines are a few of the areas where the authorities are working to improve the legal and regulatory environment for digital financial services. The new NPSA will give the BSL the power to regulate and oversee the National Payment System as a whole, including MNOs.

27. For digital money to be adopted widely and promote financial inclusion, it must remain trustworthy. For many customers, their first experience of accessing financial services is through mobile money. A large portion of consumers may be unsophisticated and so are more vulnerable to financial losses, including from agent fraud. The regulatory and supervisory framework of DFS should also support financial integrity and safeguarding of data, including preventing digital money from becoming a safe haven for criminal activity. Cybercrime is a growing problem in developing countries where sufficient safeguards may not be in place to ensure the security of transactions conducted via mobile phone (FSSR, 2021). There are also various risks related to the safekeeping of customer funds, relating to where and how customer funds are invested. In Sierra Leone's case, although the value of transactions and e-money deposits are relatively small compared with those of commercial banks, the rapid growth in the number of transactions and the high number of active accounts highlights the urgency of ensuring adequate supervision and

regulation of the sector. The recent enactment of the guidelines for mobile money and agents network guidelines are therefore welcome developments, although gaps remain in terms of regulation for data management and data protection, and consumer protection. The BSL also needs to ensure that sufficient regulatory capacity is in place and there is adequate understanding on the part of the regulators of where the risks might lie.

28. Microfinance institutions have partnered with MNOs to introduce digital credit products. The introduction of loan products via Orange Money (Lajor Loan) and AfriMoney (Africredit) enable customers to secure credit on their mobile money platforms. Regulatory reforms, including a more tailored regulatory regime for the microfinance sector as well as more data collection on the activities of microfinance institutions, are needed to increase the supply and uptake of such services.

29. Quality collateral often restricts access to credit but the BSL's Collateral Registry and the MNO's Mobile Credit, should improve access to finance. The Bank of Sierra Leone launched a web-based Collateral Registry in June 2017 to improve access to finance for Micro, Small and Medium Enterprises (MSMEs). The scope of the registry has recently been broadened to include registration of immovable assets in addition to movable assets while also enabling non-incorporated entities not registered by BSL to register security interest. This should make it easier for individuals and SMEs to secure loans with collateral such as inventories, farm products, timber, consumer goods, receivables, movable assets (including vehicles), machineries and immovable assets (land and buildings). However, this innovation needs to be complemented by reforms to commercial court processes.

30. There remains scope for the BSL to improve the credit infrastructure services it offers through enhanced digitalization. For example, there are delays in obtaining credit reports from the Credit Reference Bureau, housed at the BSL, which is reliant on a database in Excel and requires reports to be manually produced.

E. Conclusion and Policy Discussions

31. This paper takes stock of digitalization in Sierra Leone and identifies several factors limiting progress. These factors range from prohibitive cost of internet, low quality, legal and regulatory challenges, low private sector participation, lack of adequate IT skills, and supportive infrastructure gaps (fibre optic cable and electricity connectivity). However, adoption of digitalization has picked-up in government's operation, providing a solid platform for efficient, transparent and effective PFM and improved service delivery in priority sectors such as health, education and agriculture and enhanced revenue mobilization. Within the health sector, the use of the mobile and drone technology is helping reach the previously excluded population, while in agriculture use of e-vouchers ensures that input subsidy is well targeted. These aspects indicate numerous opportunities for applying digital technology to maximize on available scarce public resources to provide public service delivery.

32. Reforms to the payments systems is ongoing to support digital payments and promote financial inclusion, while the BSL has launched an incubation (sandbox) for developing digital financial inclusion products. Nonetheless, there is need to incentivize private sector digital adoption including by improving regulatory and legal environment, increasing access to electricity, finance and build capacity to minimize risks to cybercrime and data protection. The following specific recommendations emerge from the analysis:

- **Investment in key infrastructure and complementary social amenities:** The government's pursuit of universal access to electricity at affordable prices remains noble and doing this would enable broader access to connectivity and digitalization. In addition, accelerating completion of laying of the fibre optic cable could substantially cut the cost of internet and raise connectivity speed. Complementary foundational infrastructure such as roads, water, and housing would position Sierra Leone as an investment destination, attracting and retaining needed technology and IT skills.
- **Investment in human capital:** With only about 1.5 percent of approximately 10,387 schools connected to the internet, fast-tracking connectivity for education institutions should be a priority. Building people skills is critical to reap the benefit of emerging digital opportunities in government service provision. However, given that Sierra Leone is starting from a very low base, there would be need to prioritize public secondary schools and technical/vocational institutes. Furthermore, over the medium to long-term, the entire education curriculum will need to integrate information technology into student's learning right from elementary to tertiary level.
- **Recalibrate the policy, legal and regulatory environment to enable and facilitate digitalization.** The private sector cites the lack of an enabling policy and regulatory regime to support adoption of digitalization (i.e. the lack of supportive intellectual property rights). A review of legislation is also needed to strengthen measures to limit cyber-attacks and crimes as well as data protection. Review the regulatory regime to ensure a well-regulated sector that caters for competitive pricing, cyber security, data protection, and business continuity.
- **Build e-business skills, including by enabling public sector workers digital skills and garnering support for behavior change.** Automation of public service delivery and strengthening PFM controls will need to be complemented by critical staff ethics and support for change and adoption of digitalization. This is important to avoid exemptions and unchecking of inbuilt systems controls and desire to revert to manual business processes. Complementary capacity building to instill e-business skills across all public servants would also empower them and uphold systems' integrity.

33. A wider adoption of DFS would increase the ease and speed of payments as well as enhancing financial inclusion. However, due consideration also needs to be given to the regulation of these financial services.

- **Improve data collection on DFS and make data publicly available.** As noted in the BSL's new Financial Inclusion Strategy, one of the challenges faced under the previous strategy was

a lack of data and measurement tools. Improved data collection will therefore be key to monitoring financial inclusion going forward, including data on DFS offered both by banks and non-banks. Greater transparency would benefit investors and customers, and foster a more competitive DFS market.

- **Leading through example.** Increasing the volume of government payments which are made using DFS could encourage broader acceptance of this medium, as opposed to cash.
- **Address regulatory gaps,** such as regulations on consumer protection. Addressing regulatory gaps on microfinance institutions can facilitate more partnerships with DFS and enhance the role of DFS in financial inclusion.
- **Complete the National Switch project and upgrade supervision of payments systems.** The new NPSA, guidelines for mobile money, remittances regulations and agent banking guidelines are a few of the areas where the authorities are working to improve the legal and regulatory environment for digital financial services. The NPSA will give the BSL the power to regulate and oversee the National Payment System as a whole. To complement the reforms on the legal side, the BSL will also need to upgrade its supervision of payments systems, including developing an effective oversight framework, an important priority supported currently by Fund CD.
- **Improve staffing and capacity at the regulator.** The recent FSSR found that the Other Financial Institutions Supervision Department (OFSID) at the BSL, which is responsible for supervising MNOs among others, is severely under-resourced and that staff need capacity building in DFS. In addition, the UNCDF (2021) noted that results from a survey of financial service providers timelines for approval of DFS may be lengthy and non-transparent. Beyond OFSID, staff in other departments, such as the Financial Stability, Monetary Policy, and Research Departments, will need to be aware of the potential impact of DFS on their areas of operation.
- **Digitalize important credit-related services such as the Credit Reference Bureau.** This should remove one of the obstacles to obtaining access to credit in Sierra Leone.

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MEDIUM-TERM FISCAL FRAMEWORK AND DEBT ANCHOR FOR SIERRA LEONE¹

This paper reviews the recent debt dynamics in Sierra Leone and its macroeconomic drivers before developing a medium-term fiscal anchor that could help guide fiscal policy over the medium term. The paper drives an overall balance that can reduce debt to GDP ratio towards its anchor of 51 percent of non-iron ore GDP in 12 years. This is consistent with maintaining a safety buffer of about 19 percent such that Sierra Leone's maximum debt ceiling of 70 percent of GDP is not exceeded in all circumstances. The credibility of this framework depends on ongoing reforms to raise potential output, enhance revenue mobilization, and improved expenditure and commitment controls.

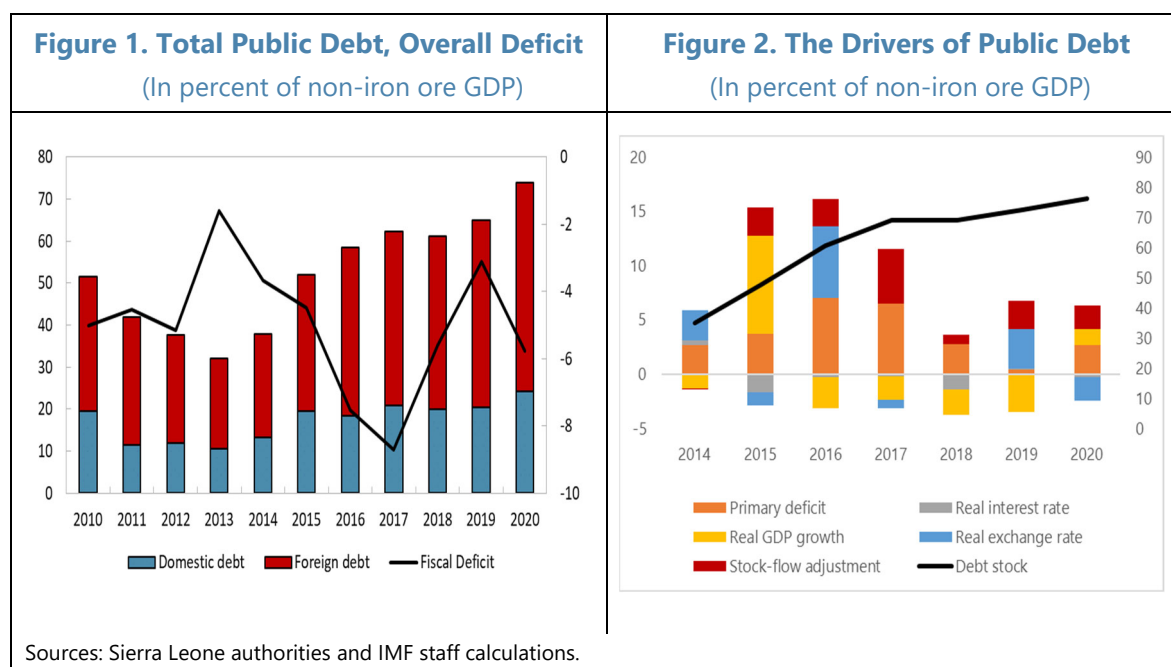
A. Introduction

- 1. Sierra Leone's current medium term fiscal framework strikes a balance between financing large development needs and fiscal prudence.** Under the Medium-Term National Development Plan (MTNDP) 2019-2023, authorities have committed to investing in human and physical capital and strengthening its governance and justice system. In addition, the MTNDP seeks to maintain the public debt stock at or below 70 percent of GDP in nominal terms. This is also broadly reflected in the government's ECF supported program focused at reducing the fiscal deficit and inflation, consistent with debt sustainability and financial stability objectives.
- 2. A series of large macroeconomic shocks compounded by the COVID-19 pandemic have led to a significant increase in fiscal and debt vulnerabilities.** Over the period 2014-2020, the country has experienced massive shocks including the Ebola epidemic in 2014, collapse in prices of iron ore in 2016, as well as the COVID-19 pandemic. These shocks have led to heightened fiscal vulnerabilities undermining Sierra Leone's development agenda. More recently, revenue mobilization targets have been adjusted downwards in part due to prolonged impact of COVID-19 and a relatively narrow tax base. Government obligations on a variety of contingent liabilities (energy subsidies) have crystalized. As a result, debt has risen beyond the 70 percent of GDP ceiling (Figure 1) and its sustainability is pegged on high revenue mobilization targets and continued access to concessional external financing and grants. This paper makes a case for developing safety buffers around the maximum debt limit, so that it is not exceeded in the face of periodic severe macro and fiscal shocks.
- 3. The paper is structured as follows. Section B presents several stylized facts on Sierra Leone's debt dynamics and its drivers over time.** Section C discusses determination of the maximum debt limit while section D undertakes calibration for the debt anchor. Section E calibrates the operational overall balance and medium-term adjustment path to reduce debt towards its anchor and Section F discusses supportive public financial management reforms to the MT fiscal framework. Section G concludes and makes policy recommendations.

¹ Prepared by Fazeer Rahim (FAD), Naoya Kato (SPR), Peter Wankuru (AFR), Saanya Jain (AFR), Yue Zhou (FAD). We are extremely grateful to extensive guidance and comments by Sukhwinder Singh (MC) and voluntary comments from both FAD and SPR. This analysis is based on data up to end-Dec 2020.

B. Debt Dynamics and Key Macroeconomic Drivers

4. Total public debt stock has accelerated in the last five years, driven primarily by wider fiscal deficits amidst large macroeconomic shocks. Debt-to-GDP ratio has increased by some 28.7 percentage points to 76.3 percent of non-iron ore GDP in 2020 (from about 47.6 percent in 2015) (Figure 1). This uptick coincides with a period of large macroeconomic shocks that led to significant deterioration in the country's fiscal position. The shocks amplified automatic drivers of debt accumulation (wider than anticipated primary deficits, large depreciation of exchange rate, and large stock-flow adjustment², while undermining the interest-growth differentials component that is expected to reduce the pace of increase in debt (Figure 2).



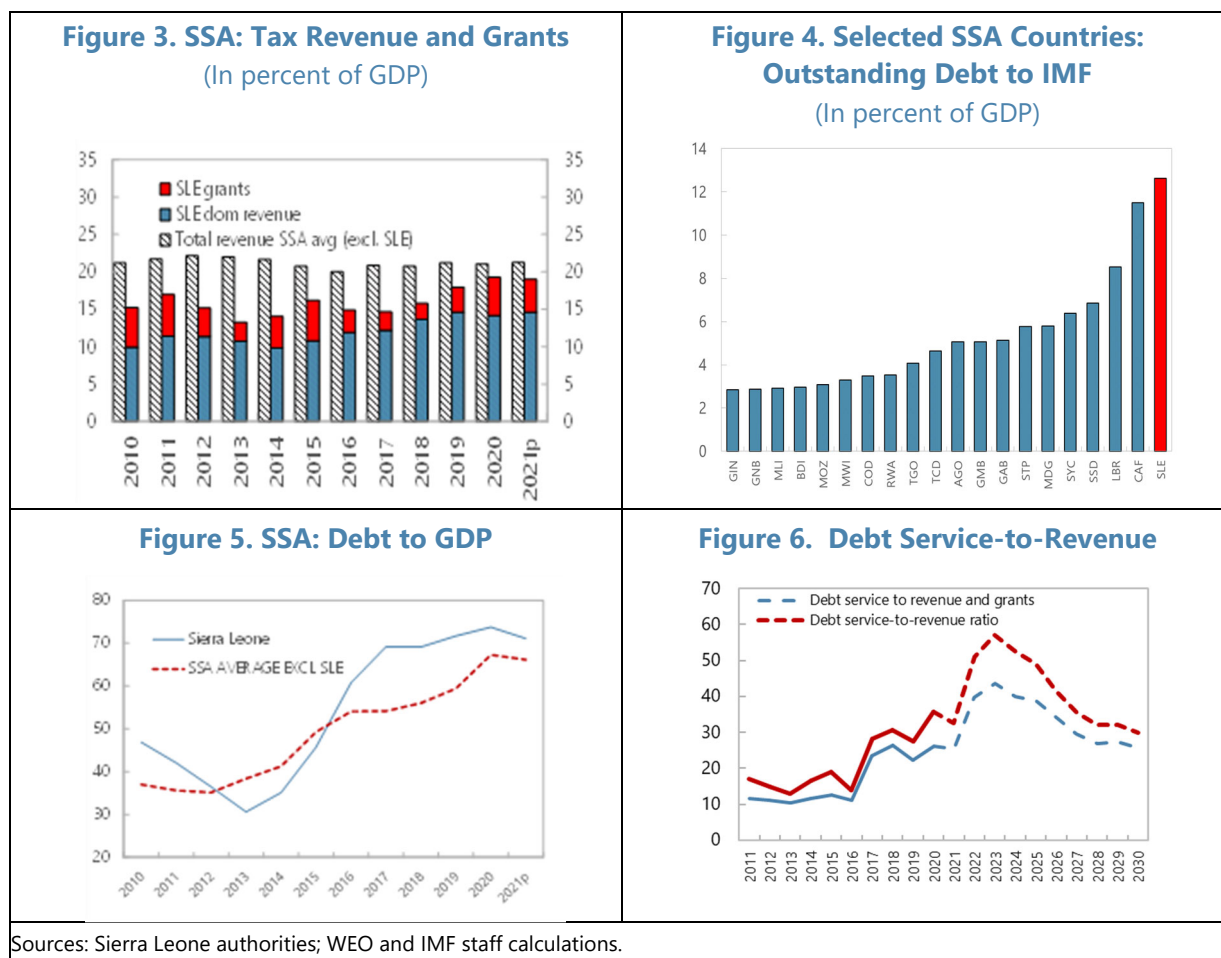
5. In the aftermath of the Ebola epidemic, public debt ratios increased significantly as interest rate-growth differentials deteriorated. Real GDP growth contracted by some 21 percent in 2015 resulting in a steep jump in the debt to GDP ratio by 9 percentage points. As the economy began to recover, it was buffeted by a terms of trade shock in 2016 due to the collapse in the price of iron ore. The real exchange rate depreciated to absorb the ToT shocks resulting in further increase in the debt to GDP ratio by some 7 percentage points of GDP in 2016.

6. Sierra Leone's debt is sustainable. The July 2021 debt sustainability analysis concludes that Sierra Leone remains at high risk of debt distress with sustainability predicated on ambitious fiscal adjustment and continued reliance on concessional financing, largely grants.³ COVID-19 has derailed

² This is also referred to as a residual term as it creates a gap between the above the line deficits and evolution of debt beyond the role played by automatic drivers. For example, accumulation of payment arrears to government suppliers.

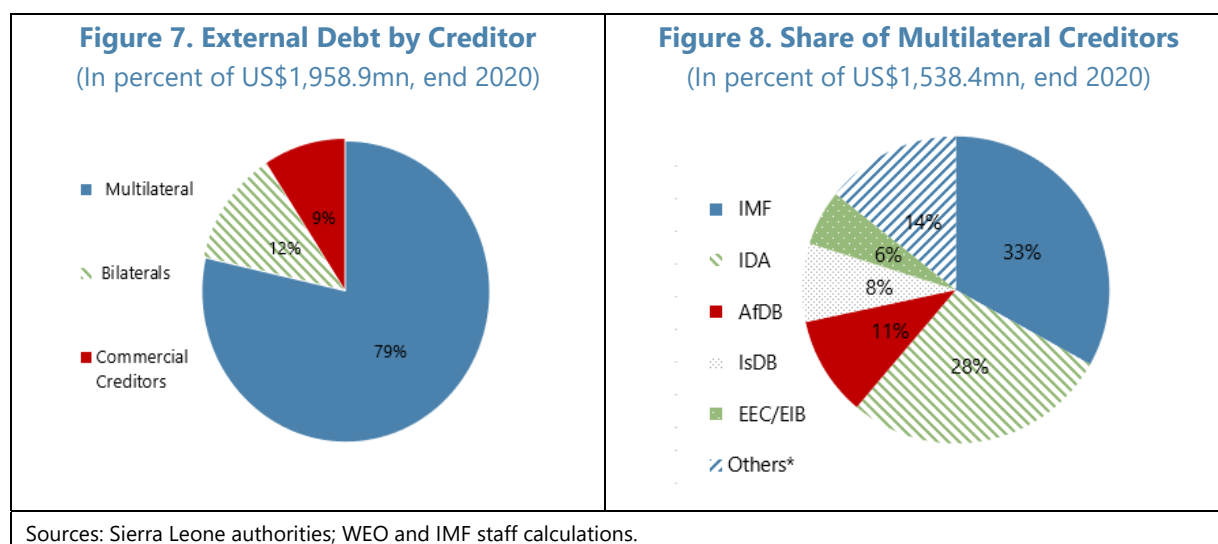
³ See August 2021 Fund/WB Debt Sustainability Analysis (Country Report No.2021/183).

planned fiscal consolidation and exacerbated an already vulnerable debt situation. Access to budget support grants has decreased after most development partners frontloaded disbursement to mitigate the impact of COVID-19 in 2020 (Figure 3). Further, following the exceptional Fund support during the Ebola crisis, Sierra Leone’s outstanding debt to the IMF is now the largest among SSA countries (Figure 4) and overall debt stock is above the regional average (Figure 5). Debt service obligations are onerous to the budget, absorbing about 26.2 percent of revenue in 2020 (Figure 6).

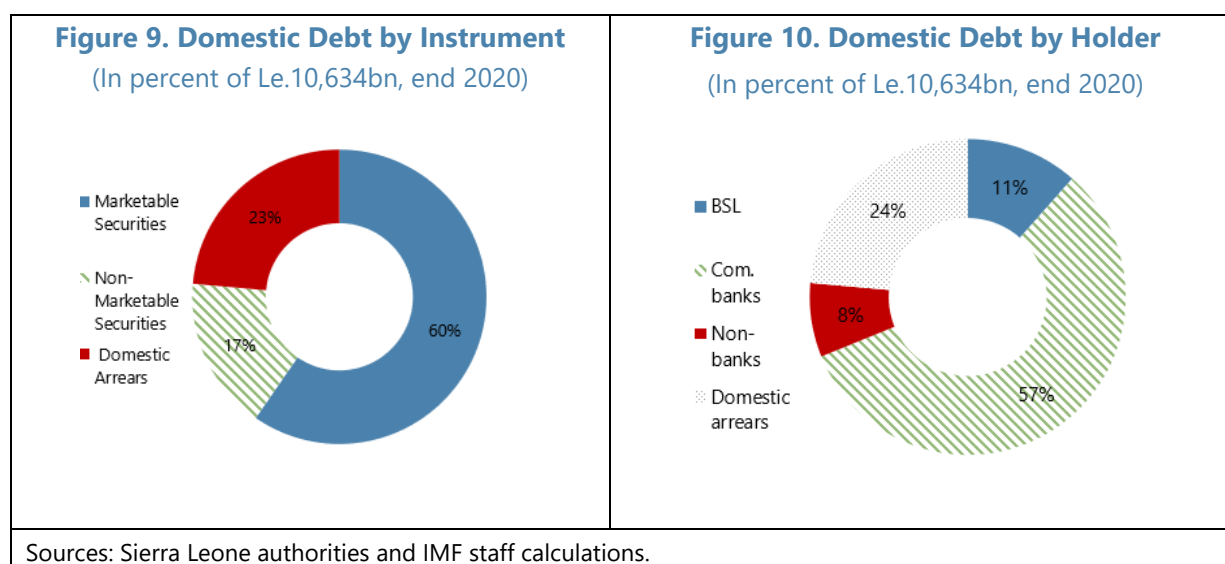


7. A disaggregation of the existing debt portfolio shows a large share of debt owed to multilateral creditors. Foreign currency debt accounts for approximately 50.3 percent of non-iron ore GDP (or 65.1 percent of total public debt stock) at the end of 2020. This is in turn comprised of loans from multilateral creditors, bilateral, and commercial creditors (Figure 7). Amongst multilateral creditors, the largest share of debt is owed to the Fund and the World Bank (Figure 8). This makes debt treatment for Sierra Leone, particularly challenging, given the available tools.⁴

⁴ For example, the G20 common framework for debt treatment.

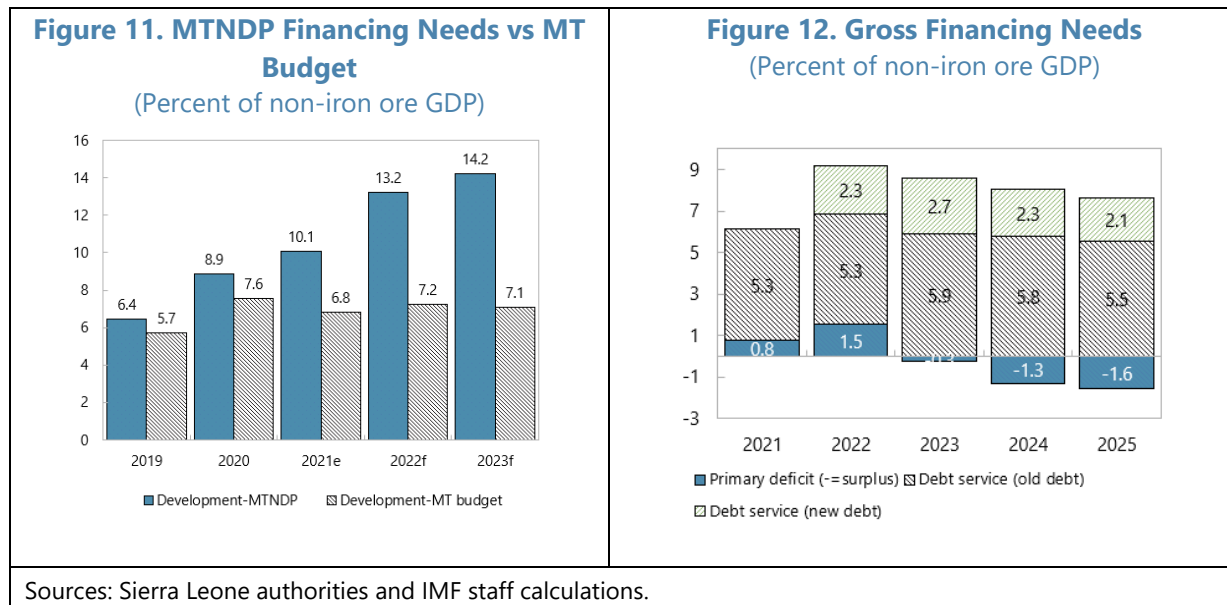


8. The domestic debt component is largely owed to commercial banks and legacy payment arrears to government suppliers. Total domestic debt stock stood at Le.10,634bn (or 26 percent of GDP) by end of 2020. Marketable instruments account for the lion's share of government domestic debt, while non-marketable instruments (mostly zero-coupon bonds) and the stock of pre-April 2018 domestic payment arrears account for the balance (Figure 9). From the holders' perspective, commercial banks account for 57 percent of the domestic debt, while the Bank of Sierra Leone (BSL) and the non-banks makes up 19 percent (Figure 10). This points to the strong linkage between sovereign issuances and the banking sector assets, with approximately 40 percent of the banking sector assets held in the form of government securities.

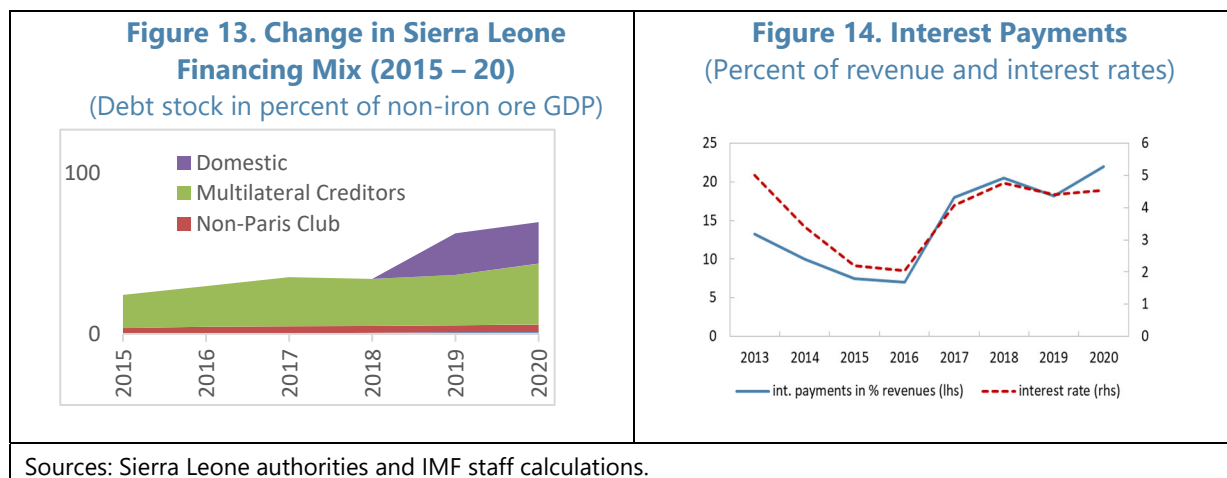


9. The authorities face large development financing needs in order to reduce huge infrastructure gaps and make progress towards Sustainable Development Goals (SDGs). These goals are articulated in the MTNDP, whose implementation cost is estimated at about 12 percent of non-iron ore GDP per year. This is also reflected in the annual budget appropriations where

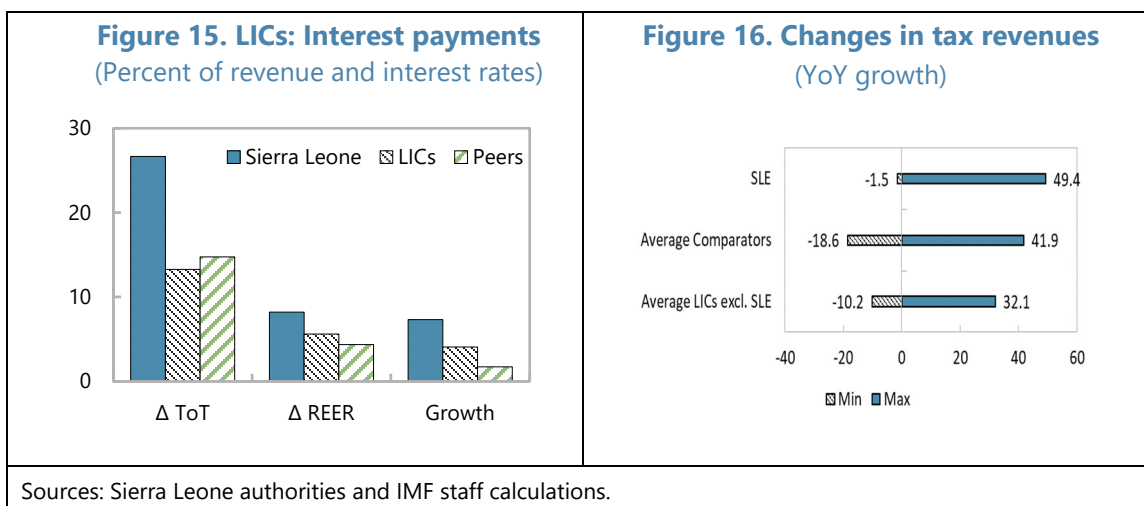
development spending allocations has averaged around 7.3 percent of non-iron ore GDP over 2015-20 (Figure 11). In addition, wider than anticipated primary balance deficit and debt service obligations are expected to continue raising gross financing needs (GFN) (Figure 12) and squeezing fiscal space for development financing needs.



10. Sierra Leone’s financing mix is shifting towards increased reliance on relatively expensive domestic debt. With limited financing from the Paris Club, Sierra Leone’s financing mix is changing swiftly towards more domestic borrowing (Figure 13). This has led to increased interest bill and rising rollover risks partly because domestic debt is contracted at a much higher interest rates but also because these securities are short tenured (99 percent of government securities are 364 days T-bills). Interest payments to revenue and effective interest rates are trending-up (Figure 14). The demand for medium to long-term bonds is very weak (from commercial banks). Reforms to extend the tenure and diversify investor base is ongoing with the Fund’s MCM TA but remains a medium term to long term endeavor to strengthen and deepen the domestic financial markets.



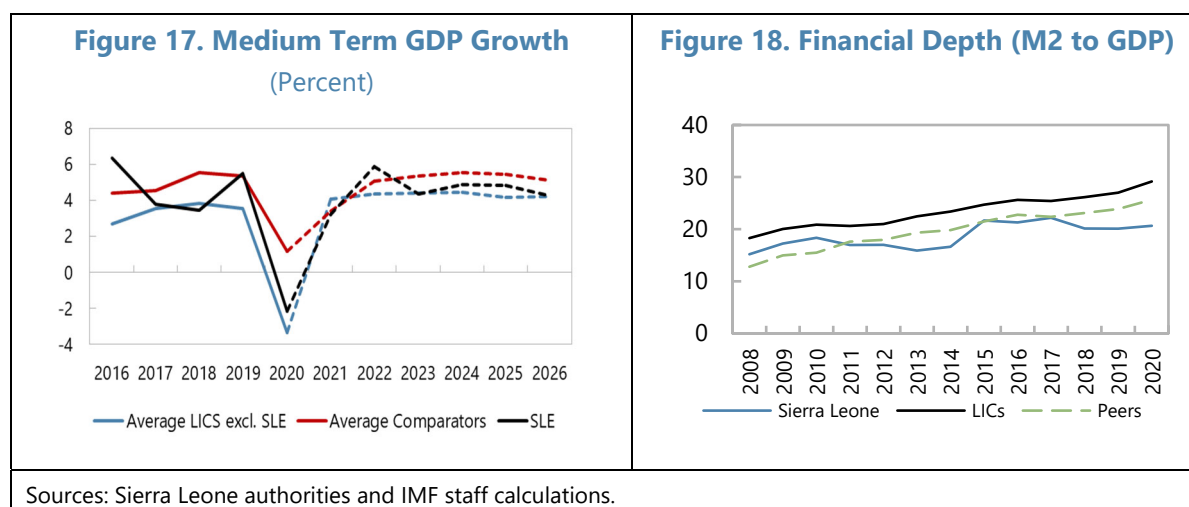
11. Sierra Leone has historically faced large macroeconomic volatility and higher fiscal shocks compared to her peers⁵ and LICs average. The standard deviation from the mean values of the changes in terms of trade, changes in real effective exchange rate (REER), and real GDP growth is large signifying substantial volatility (Figure 15). This volatility is also reflected in the year-on-year growth in tax revenues (Figure 16). The large volatility in key macroeconomic variables creates the need for building large fiscal buffers in good times to accommodate shocks during bad times.



12. Looking ahead, medium-term growth prospects are subject to increased uncertainty due to vulnerability to commodity price fluctuations and the COVID 19 pandemic. Growth prospects for most countries are clouded with high degree of uncertainty around future waves of the COVID-19 pandemic (Figure 17). The outlook is especially dim for commodities exporters, including Sierra Leone following a large drop in the price of iron ore. This is likely to lead to ToT shock, and a loss in mining revenue receipts. The domestic financial markets remain relatively underdeveloped and the scope for raising more funds from commercial banks is narrowing (Figure 18). This could also in a nominal way exacerbate liquidity pressure and increase the sovereign-bank nexus for Sierra Leone.

13. To conclude, Sierra Leone faces a triple challenge of high debt, lower tax base, and large development financing needs. Debt to GDP ratio has risen rapidly over the last five years primarily due to large macroeconomic and fiscal shocks, and unprecedented health crisis. In the aftermath of the current ECF program, putting in place a medium-term fiscal adjustment path could help guide fiscal policy calibrations to reduce debt towards a credible anchor and establish a sufficient buffer to safeguard against frequent macroeconomic and fiscal shocks.

⁵ The selected comparators (or peers) for Sierra Leone include Burkina Faso, Central African Republic, Chad, Guinea, and Rwanda.



14. To conclude, Sierra Leone faces a triple challenge of high debt, lower tax base, and large development financing needs. Debt to GDP ratio has risen rapidly over the last five years primarily due to large macroeconomic and fiscal shocks, and unprecedented health crisis. In the aftermath of the current ECF program, putting in place a medium-term fiscal adjustment path could help guide fiscal policy calibrations to reduce debt towards a credible anchor and establish a sufficient buffer to safeguard against frequent macroeconomic and fiscal shocks.

C. Towards a Medium-Term Debt Anchor for Sierra Leone

15. Sierra Leone requires a credible medium term fiscal adjustment path that will continue to steer debt down to its Medium Term (MT) debt anchor. The MTNDP commits the authorities to maintaining public debt at a threshold of equal or less than 70 percent of GDP in nominal terms or less than 55 percent of GDP in present value terms. However, this has not prevented debt from rising beyond the ceiling, as it reached 76.3 percent of non-iron ore GDP in 2020. Both external and domestic bank borrowing have increased. The capacity for the banking sector to absorb additional sovereign debt through 364 days-Tbills is getting constrained. This sets the stage for considering a credible maximum debt limit that should not be exceeded in almost all circumstances through the design of a sufficient safety buffer around the limit.

16. The difference between such a maximum debt limit and the safety buffer yields a debt anchor that provides a MT fiscal path. This is the level at which debt should be kept at, on average, to ensure that debt remains below the maximum debt limit even under large shocks. It should strike a balance between the economic costs of bearing excessive debt and meeting the development financing needs of Sierra Leone. The debt anchor allows policy makers to have sufficient time and space to take corrective actions.

17. To determine the maximum debt limit for Sierra Leone, the paper uses a framework developed at the Fund (“How to Calibrate Fiscal Rules note”).⁶ Stochastic simulation are run to

⁶ see Baum et al. 2018; Baum et al. 2017; and David et al. 2022

calibrate a debt anchor that provides a safety buffer below a known maximum debt limit (i.e., maximum debt limit needs to be identified beforehand). As such the first important step is to determine the maximum debt limit for Sierra Leone. In the second stage, calibrate the debt anchor. Three main approaches were used to determine the maximum debt limit for Sierra Leone: (i) a prudential approach; (ii) a growth maximizing approach; and (iii) the Bank-IMF's debt sustainability framework for LICs. These are discussed briefly below. In the end, however, the government's own maximum debt limit of 70 percent of GDP was found appropriate and within ranges proposed by these methods.

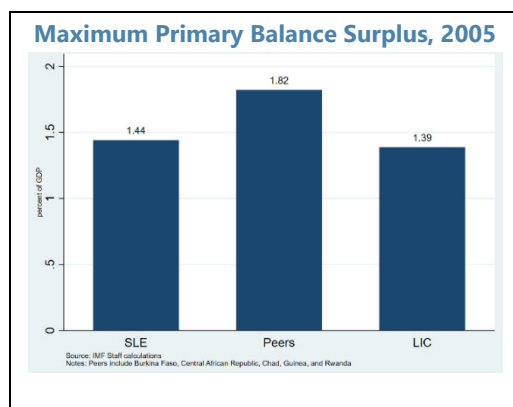
(i) Prudential approach

18. Estimating a debt anchor using a prudential approach puts more weight on the economic costs and risks of bearing an excess debt burden. Several prudential approaches can be used to set the maximum debt limit. Box 1 considers two that are applicable to Sierra Leone, a country whose international market access is relatively nascent.

Box 1. Prudential Based Approaches

Stabilizing debt with a feasible fiscal effort. This estimates a limit above which the debt cannot be stabilized at times of fiscal stress, accounting for the highest primary surplus that Sierra Leone can sustain for a prolonged period. Policy makers cannot realistically claim that they will “do whatever it takes” to generate primary surpluses sufficiently large to stabilize debt when there is a severe distress because tax increases may be ineffective beyond certain levels or steep expenditure cut is politically/socially unacceptable. The maximum debt limit is the ratio of the highest achievable primary balance to interest-growth differentials under stress: $d^* = \frac{pb_{max}}{(r-g)_{stress}}$

Over the period 1990-2020, the highest primary surplus in Sierra Leone was around 1.44 percent of GDP in 2005. This year is characterized by severe fiscal stress with debt to GDP level of 130.8 percent. Given that in SLE the interest-growth differential has mostly been negative, we follow previous literature to select an average value for the SSA region. The David et al. 2022 estimates that the 95th percentile of the distribution of interest-growth differentials for the WAEMU countries was around 3.3 percent. Considering a broad range of emerging and developing countries the real interest rate-growth differentials under stress could be in the order of 2-3.3 percent. This results in debt limits that span between 44 to 72 percent of GDP.



Debt maximum limit based on the principle of debt carrying capacity. This approach focuses on the ratio of interest expenses to tax revenues, which is an indicator of the ability to service debt. Empirical evidence suggests that this measure is tightly linked to fiscal stress. In addition, econometric models applied to emerging markets and developing economies shows that the thresholds for the ratio that would signal

Box 1. Prudential Based Approaches (Concluded)

upcoming fiscal stress would range from 16 to 19 percent. The maximum debt limit is estimated using these thresholds such that $d^* = \tau \left(\frac{\text{tax revenue/GDP}}{\text{effective interest rate}} \right)$ and τ ranges between 16 and 19 percent. Tax revenue to GDP for Sierra Leone is about 13.8 percent over 2022-28, while the effective interest rate is estimated at 3.2 percent. This would suggest a debt limit ranging between 69 and 82 percent of GDP. Keeping interest cost low is also a focus of literature that examines the relationship between higher debt levels and sovereign spreads (Hadzi-Vaskov and Ricci, 2019; Belhocine and Dell'Erba, 2013). Hadzi-Vaskov and Ricci, (2019) find that a 10 percentage points increase of public debt to GDP is associated with 100-120 bps higher spreads across all emerging markets. The lack of sovereign interest rate spreads for SLE limits the latter approach in this paper.

(ii) Debt level that maximizes growth (a bottom-up approach)

19. In the context of large development financing needs, a relevant policy issue is to identify the level of debt that maximizes growth. Checherita-Westphal (2014) presents a theoretical model to derive the level of public sector debt beyond which it starts to have a negative effect on growth.⁷ This builds upon a common empirical regularity that finds a non-linear relationship between per capita income growth and annual changes in public debt to GDP (Checherita et al.2012; Clements et al. 2003; Pattillo et al. 2002; Smyth and Hsing, 1995). The authors estimate an output elasticity of public capital of 0.23 for the Euro area and 0.28 for the OECD. Applying same model, David et al. 2022, finds an elasticity of about 0.30 for the WAEMU countries. Nonetheless, point estimates vary widely in the literature (Bom and Ligthart, 2008). We find an estimate that ranges between 0.16 for the LICs to 0.30 for the high-income countries (Appendix I). There is also a huge literature on how debt impedes growth including on the debt relief laffer curve (Claessens,1990; Krugman, 1988).

With an alpha of 0.25, the growth maximizing debt (optimal debt level) for a panel of low-income countries (LICs) and lower middle-income countries (MICs) is about 55 percent of GDP. The output elasticity of the public capital stock for the LICs/MICs (incl. Sierra Leone)

is estimated over the period 1990-2015 (Text Table 1). The regression controls for country fixed effects and the standard errors are clustered at the country level to both account for country specific trends and serial correlation. Using this optimal debt approach, the implied debt anchor is about 55 percent for the LICs/MICs, and about 72 percent for high income countries (HICs). This result is used to complement the previous two methods (that are largely top-down in a sense) and considers the

Text Table 1. Sierra Leone: Optimal Debt Anchor
(Percent of GDP)

	LICs	LICs/MICs	HIC
Country FE model(α)	0.16	0.25	0.30
Optimal debt anchor	28	55	72
Number of countries	22	66	51

Source: IMF staff estimates.

⁷
 $d^* = \left[\frac{\alpha}{(1-\alpha)^2} \right]^{1-\alpha} d^*$ is the growth maximizing debt level. α is the output elasticity of public capital stock.

safety buffer that could be added to it to derive the maximum debt limit for Sierra Leone (or in bottom-up approach).

(iii) Thresholds inferred from the latest Sierra Leone Debt Sustainability Analysis

Another approach to determining the debt limit is to use thresholds that are built into the DSA. In this paper, the design of the MT fiscal path is complementary and aligned to the medium-term adjustment path in the DSA. This is particularly important for Sierra Leone- a country rated at high risk of external and overall debt distress. This MT fiscal anchor, therefore, complements the DSA by providing alternative calibration of fiscal adjustment paths (based on desired time of adjustment) that are easily visible and monitorable in nominal terms by the policy makers.

20. The Bank-Fund LICs debt sustainability framework provides insights on the maximum PV of total public debt, depending on the country's debt carrying capacity.

The current IMF debt sustainability analysis assesses Sierra Leone's debt carrying capacity as a medium, which puts its present value (PV) total public debt threshold at 55 percent of GDP (Text Table 2). We combine the PV benchmark with the ratio of nominal debt to PV terms debt in 2020 to infer the maximum debt limit (benchmark) in nominal terms. The ratio of nominal debt to PV debt for Sierra Leone is about 1.25 in 2020 and this ratio is sustained over the 10-year horizon. This

Text Table 2. Sierra Leone: Debt Burden Thresholds and Benchmarks
(Percent of GDP)

	PV of PPG external debt in percent of		PPG external debt service in percent of		PV of total public debt in percent of
	GDP	Exports	Exports	Revenue	GDP
Weak	30	240	10	14	35
Medium	40	180	15	18	55
Strong	55	240	21	23	70

Source: IMF

implies a maximum debt limit/ceiling of about 69 percent of GDP. It is noteworthy that the DSA's debt carrying capacity for Sierra Leone has been in the borderline zone between weak and moderate over the last few reviews. While a shift back to weak capacity would take multiple reviews (at least two consecutive cycles), it is within the realm of possibilities in the next few years. There are risks, therefore from a possible downgrade in this parameter and its relation to the maximum debt limit.

21. Putting all these together, the results show that a maximum debt limit of 70 percent of GDP would seem credible for Sierra Leone.

The average across the three methods suggests Sierra Leone's stated maximum debt limit equal or less than 70 percent of GDP in nominal terms is appropriate (Text Table 3). It is also comparable to the regional average debt limit. For instance, a recent IMF paper (David et al. 2022) that finds a maximum debt limit of about 80 percent of GDP for the WAEMU monetary union countries,

Text Table 3. Sierra Leone: Alternative Maximum Debt Limits
(Percent of GDP)

	Risk based approaches		Growth max. optimal debt	LICs-DSF debt benchmark
	Fiscal Effort	Debt Carrying Capacity		
Maximum debt limit	44-72	69-82	--	69
Optimal debt anchor	--	--	55	--

Source: IMF staff estimates.

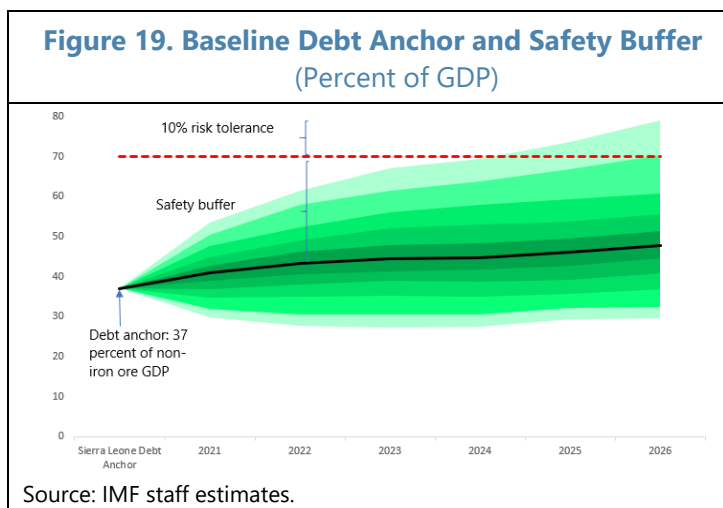
a group that include countries that are structurally similar to Sierra Leone.

D. Calibrating the Debt Anchor for Sierra Leone

22. With the maximum debt limit in hand, the required safety buffer that will keep debt below the limit depends on the history of shocks and assumed contingent liabilities. The calibration entails estimating the distribution of macroeconomic and fiscal shocks facing Sierra Leone derived from a multivariate normal distribution based on annual data for key macroeconomics and fiscal variables. The variables include terms of trade gap, the maximum primary balance, ratio of foreign debt to total debt, ratio of concessional debt to total foreign debt, real effective interest rates, contingent liabilities, and stock-flow adjustments (SFA). These shocks are subsequently used to perform simulations of future debt trajectories based on the standard debt dynamic equation and the fiscal reaction function (Baum et al. 2018).⁸

23. Accounting for possible realization of contingent liabilities would yield a slightly higher safety buffer. Certain types of transactions may lead to a disconnect between the evolution of deficits and debt in the standard debt dynamics equation above. The term SFA_t (Stock-Flow Adjustment) captures unexplained components of public debt changes, such as contingent liabilities (when realized below the line), time of recording, and balance sheet effects. Contingent liabilities are estimated at 3 percent of GDP every 6 years (Bova et al, 2019; David et al. 2022).

24. The safety buffer is determined based on the stochastic nature of the debt and policy maker's willingness to accept a certain level of probability of breaching the maximum debt limit. Under a 10 percent risk tolerance level and accounting for contingent liability of 3 percent of non-iron ore GDP, the safety buffer that is required to avoid that debt breaches the maximum nominal debt limit of 70 percent of GDP would be about 33 percent of non-iron ore GDP, suggesting a debt anchor of 37 percent of non-iron ore GDP (Figure 19). Keeping debt around this level would allow Sierra Leone to withstand typical adverse macroeconomic shocks



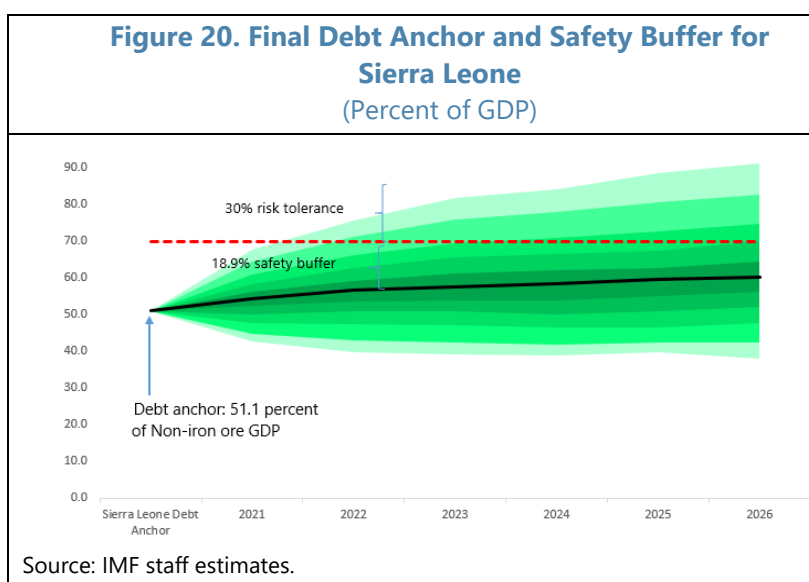
$$^8 d_t = \frac{1}{1+g_t} [d_{t-1} + (\alpha^d r_t^d + \alpha^f r_t^f) d_{t-1} + \Delta \varepsilon_t (1 + r_t^f) \alpha^f d_{t-1}] - p b_t + SFA_t$$

Where d_t is the debt-to-GDP ratio, g is the real growth rate, α^d and α^f are the ratios of domestic and foreign currency denominated to total debt, and r_t^d and r_t^f are the real interest rates on domestic and foreign currency denominated loans, respectively. $\Delta \varepsilon_t$ is the real exchange rate depreciation; while $p b_t$ is the primary balance surplus (or the fiscal reaction variable).

without breaching the maximum debt limit with a 90 percent probability.

25. The above fan chart relies on historical shocks unique to Sierra Leone to deduce the needed safety buffer. However, the team is comfortable with a higher probability of exceeding the maximum debt limit based on the historical fan chart because the historical shocks are drawn from a particularly volatile past period in Sierra Leone. A decade long civil war only ended in early 2000s, a gradual rebuilding was stemmed by a severe Ebola epidemic in 2014Q1-2016Q1. As a result, real GDP growth contracted by some 21 percent in 2015. This crisis was compounded by the collapse in iron ore prices in 2016. More recently, an expenditure overruns in the run-up to the general election in 2018 led to huge accumulation of payment arrears (adding up to 10 percent of non-iron ore GDP in domestic debt stock). These strains have been intensified by the COVID-19 pandemic. It would also entail a significant fiscal effort to achieve such a safety buffer. This safety buffer is also in the range of buffers calculated for countries with similar economic characteristics to Sierra Leone (David et al. 2022).

26. The difference between the maximum debt limit (70 percent of GDP) and the safety buffer of 18.9 percent of GDP gives a debt anchor of 51.1 percent of GDP (Figure 20). This provides limited space to accommodate development financing in the near term while calling for continued fiscal consolidation over the medium term to reign in debt. Further, this trajectory is also aligned to the LICs-DSF debt profile and the April 2022 WEO macro-fiscal assumptions. It is also in line with the optimal debt anchor of about 55 percent of GDP estimated previously for the mix of low-income countries and middle-income countries.



27. Sensitivity analysis of the simulated debt anchor shows that it is broadly robust to variations in levels of contingent liabilities and the risk tolerance. Scenarios 1-2 show how the debt anchor varies across different levels of contingent liabilities while holding the maximum debt limit and the tolerance risk levels unchanged at 70 and 10 percent, respectively. Scenario 3-5 holds the maximum debt limit fixed at 70 percent and the level of contingent liabilities at 3 percent, while allowing variation in the risk tolerance between 15-30 percent. Across all scenarios, the debt anchor ranges between 35.2 to 51.1 percent of GDP during the first year. The spread of the fan chart around the debt anchor is about 50:50 on either side of the line. But that spread around the line changes over time, as the line is not straight. For example, the median debt anchor at the 6th year ranges between 47.9 to 60.4 percent of GDP. For our purpose, the debt anchor is taken

as the value during the base year (or 2020). Scenario 2 is the baseline fan chat in Figure 19 above, while scenario 5 represents a debt anchor level that is used for calibration of the primary and overall balance in Sierra Leone. This implies, given past macro shocks maintaining a safety buffer of about 18.9 percent of GDP would allow Sierra Leone to stay below the maximum debt limit of 70 percent of GDP.

Text Table 4. Sierra Leone: Sensitivity Analysis of Simulated Debt Anchor
(Percent of GDP)

	Scenarios				
	1	2	3	4	5
Parameters					
Maximum debt limit	70.0	70.0	70.0	70.0	70.0
Contingent liabilities	5.0	3.0	3.0	3.0	3.0
Likelihood exceeding debt limit	10.0	10.0	20.0	15.0	30.0
Calibrated Results					
Debt anchor (initial)	35.2	37.0	45.4	40.6	51.1
Median debt anchor at year 6	47.9	47.9	55.8	51.8	60.4
<i>Range of the fan chat</i>					
P75-P25	13.6	14.0	14.3	14.5	15.5
P95-P5	32.0	33.2	33.8	33.7	35.8
P80-P20	16.7	17.4	17.8	17.9	18.8

Source: IMF staff estimates.

E. Calibrating the Primary Balance

28. A standard debt dynamic equation determines the primary balance that will allow public debt to converge to the debt anchor of 51.1 percent of non-iron ore of GDP.⁹ The primary balance that would bring debt to its anchor of the medium term depends on the following parameters.

- **Macroeconomic fundamentals.** a higher real growth rate would provide space to run smaller primary balance (large overal fiscal deficit), while still guiding debt towards its medium term anchor. However, a large depereciation of the exchange rate would require running larger primary balance (smaller fiscal deficits) as debt services would increase.
- **Financing mix.** Higher reliance on domestic borrowing will require larger primary balance because domestic debt is relatively expensive in Sierra Leone compared to external debt, which is concessional with a substantial grant element (of atleast 35 percent or more).
- **The gap between the current debt level and the medium term debt anchor.** The higher the current debt the large the fiscal consolidation needed to bring debt down to the prudent range of debt.
- **The desired pace of adjustment.** The shorter the time needed to converge to the medium term debt anchor the large the fiscal effort needed. For Sierra Leone’s case we set this at 12 years. We

$$^9 pb = \frac{\beta^n d_t - \bar{d}_{t+n}}{\sum_{i=0}^{n-1} \beta^i} = \left(\frac{\beta^n - \delta}{\sum_{i=0}^{n-1} \beta^i} \right) d_t = \frac{(\beta-1)(\delta-\beta^n)}{1-\beta^n} d_t$$

Where pb is the primary balance surplus; $\beta = (1 + r^w)/(1 + g)$ where g is the potential GDP growth rate. r^w is the weighted effective real interest rate, calculated as the sum of effective nominal interest on domestic currency debt and effective nominal interest on the foreign currency debt weighted by their respective shares in total public debt minus average inflation rate. d_t is the initial debt to GDP and \bar{d}_{t+n} is the debt anchor achievable after n years. $\delta = \bar{d}_{t+n} / d_t$ which is the distance, or the amount of debt reduction needed.

also present a scenarios in which the fiscal adjustment is front loaded (Fast) and backloaded (Slower).

29. The baseline macroeconomic forecast is aligned to the April 2022 WEO projections and therefore the latest vintage of DSA. The current debt ratio, the primary balance, and overall balance values are in percent of non iron ore GDP and are taken as at 2021. The long term real interest rate and long term real GDP growth is the average over the medium term range (2022-26). The convergence period is set at 12 years. This period is also aligned with the time horizon needed for debt to converge around the same level within the DSA. Three paths are consistent with attaining a medium term debt anchor of 51.1 percent of GDP by 2033.

- **Scenario 1** presents fast adjustment path with the primary balance (pb) improving from about -4.1 percent of GDP in 2021 to 1.3 percent in 2023 (Figure 21). This is consistent with the projected primary balance in the current vintage of the DSA for the period (2024-27) and the April 2022 WEO. The overall deficit improves from about 6.9 percent of non-iron ore GDP in 2021 to about 0.6 percent in 2023 (Figure 22) and debt is expected to decrease to hit the MT debt anchor by 2033 (Figure 23).

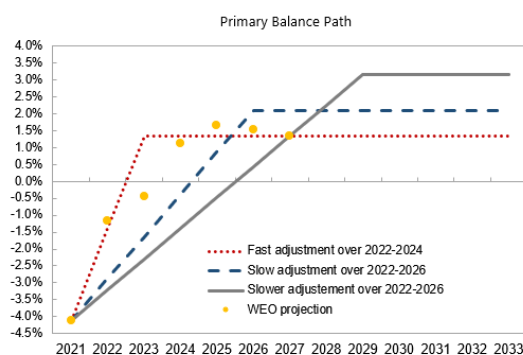
Text Table 5. Sierra Leone: Variables Used in the Calibrations

Key parameter for calibration	value
Current debt ratio (% GDP)	76.2%
Target debt ratio (% GDP)	51.1%
Long-term real interest rate (%)	3.3%
Long-term real growth rate(2022-26) (%)	4.8%
Fiscal balance (% GDP) in 2021	
Primary balance (pb)	-4.1%
Overall balance (ob)	-6.9%
Convergence period for debt (years)	12
Fast fiscal adjustment period (years)	2
Slow fiscal adjustment period (years)	5
Slower fiscal adjustment period (years)	8

Source: IMF staff estimates.

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Figure 21. Primary Balance (Percent of non-iron ore GDP)



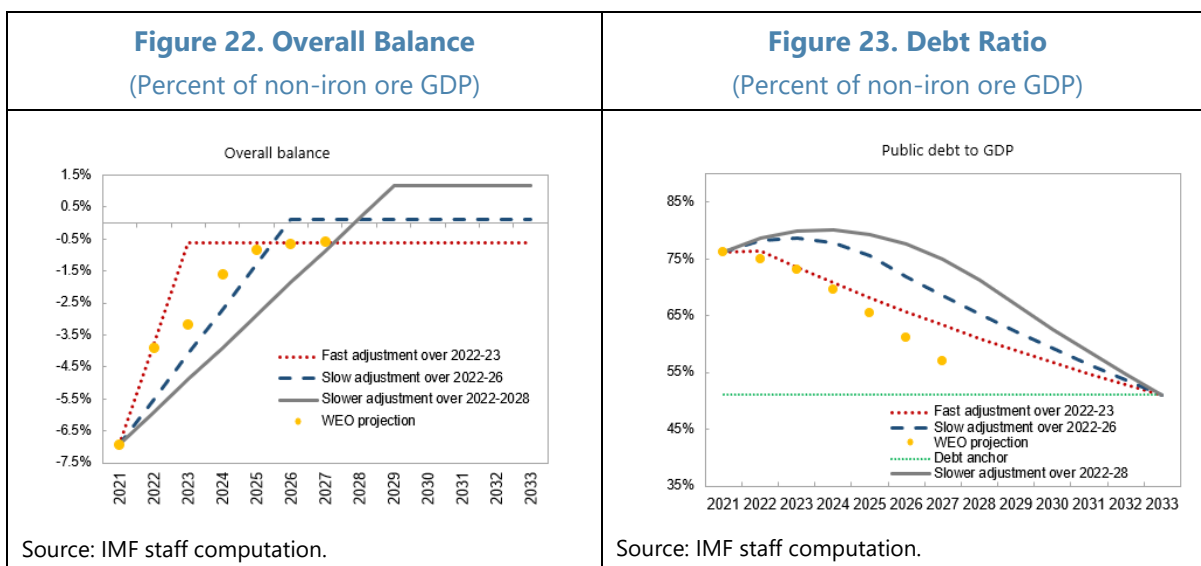
Source: IMF staff computation.

- **Scenario 2 shows slow adjustment in the primary balance within five year transition period.** However, to compensate for the gradual pace of fiscal consolidation, stronger fiscal effort will be needed in the outer years compared to scenario 1 to be able to anchor debt at the same level, within 12 years. As a result, the calibrated primary balance

ranges from -4.1 to +0.9 percent of non-iron ore GDP in 2025 before being set at much higher level of +2.1 percent of non-iron ore GDP in the long-term (2026-2033). The implied long term overall balance is about 0.1 percent of non-iron ore GDP (2026-33) (Figure 22) and debt should converge to its MT debt anchor in 12 years (Figure 23).

- **Scenario 3 indicates slower adjustment in the primary balance within 8 years transition period.** A small but gradual fiscal consolidation effort is made over the transition period while the rest of the consolidation is backloaded to the last four years to convergence to the medium term debt anchor in 12 years. The primary balance ranges from -4.1 to 2.2 percent of non iron ore GDP (2022-28) and then set at a higher level of 3.1 percent over the medium term (2029-33). The implied long term overall balance is about 1.2 percent of non-iron ore GDP (2029-33) (Figure 22) and debt should converge to its MT debt anchor in 12 years (Figure 23).

30. Scenario 2 is the most realistic scenario that could guide medium term fiscal policy post the ECF. The calibrated primary balance ranges from -2.9 to +0.9 percent of non-iron ore GDP in 2022-25 before being set at much higher level of +2.1 percent of non-iron ore GDP in the long-term. It is also consistent with the WEO projection and hence the latest DSA.

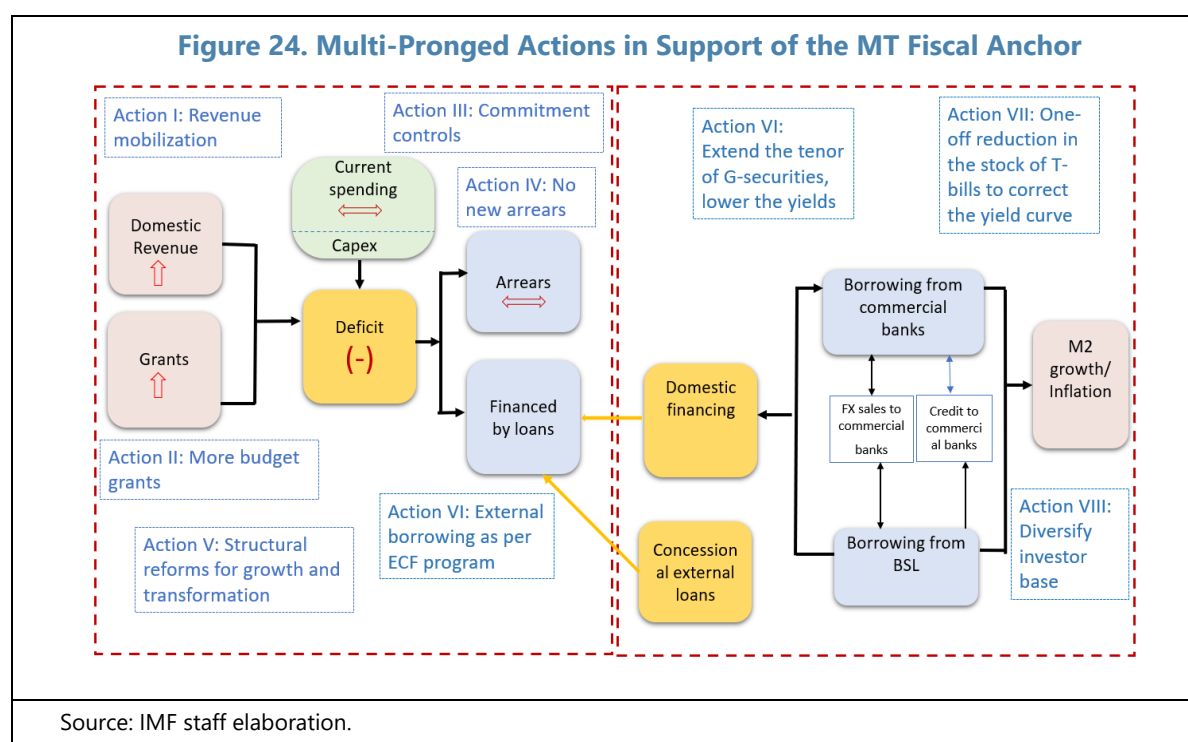


31. Credibility of the above fiscal adjustment path is dependent on ongoing structural reforms to expand potential growth and revenue mobilization. The three-year average of fiscal adjustment over 2022-25 reflects a structural break recovery from a sharp deterioration in the primary balance in 2020 and 2021 due to the COVID-19 shock and its impact on revenues, higher energy subsidies, and wage pressures from key sectors (education, security and health). The projected fiscal adjustment from 2026 onwards is realistic and feasible, considering: expected recovery in domestic revenues as the full efficiency gains from ongoing automation and modernization reforms materializes; ongoing investment in agriculture and mining, as well as services is expected to raise potential output; the gradual efficiency improvements (including in improved appraisal, selection, and execution of priority development projects). However, the risk of this not being realized is also high, due to still evolving COVID-19 that could stall progress in

reforms and impact the output in the mining sector. The next section highlights some of supporting PFM reforms for this medium-term fiscal trajectory.

F. Supporting Public Financial Management to the MT Framework

32. Effective public financial management (PFM) processes would be central in the implementation of the medium-term fiscal anchor. A multi-pronged action points focusing on among others revenue mobilization and securing more budget grants; strengthening expenditure and commitment controls; a policy on no new domestic payment arrears and keeping new external loans explicitly concessional for debt sustainability would be key (Figure 24). Furthermore, advancing structural reforms to raise growth and promote economic transformation and efficiency would be essential. Reforms to bolster the domestic financial market, reduce the sovereign bank nexus, and de-risking government securities will also be critical.



33. Revenue mobilization potential exist but the associated COVID-19 disruptions on both reforms and economic activity has pushed back the target. The MTNDP explicitly pegs achievement of development goals on increased domestic revenue mobilization to at least 20 percent of GDP by 2023 (from about 13.8 percent in 2020). A recent tax gap study by the World Bank (in 2019) finds that Sierra Leone collects less than 70 percent of its tax potential, with a tax gap of about 4 percent of GDP. Closing this gap calls for broadening of the tax base (through new taxpayer registration and strengthening the governance framework for managing tax expenditure/or exemptions. A recent AFW2 technical report on strengthening management of tax exemptions calls for action to: (a) develop and implement an effective framework to guide the administration and control over the exemption regime; and (b) put in place a complete and updated register of all

taxpayers benefiting from concessions, exemptions and other investment incentives. The development of a medium-term revenue strategy (MTRS) by fall of 2022 is also expected to improve the structure and tax laws to guide tax policy over the medium term. Strengthening compliance and improved tax administration is also bound to benefit from ongoing automation processes (Integrated tax administration system-ITAS and installation of electronic cash registers for GST liable establishments).

34. Authorities are undertaking several PFM reforms to improve the efficiency of spending and strengthen expenditure and commitment controls. Sierra Leone is in its 5th year of implementing the PFM reform strategy 2018-2021, including a key pillar on budget execution, reporting, monitoring and evaluation. Government has also taken greater strides in extending IT systems to support budget execution with the coverage of IFMIS extended to some 61 MDAs and is carrying out testing protocols for a web based IFMIS that will substantially ease processing and execution of payments with government suppliers. Besides IFMIS, the authorities are exploring the possibility of adopting the top-down strategic budgeting to align the expenditure commitments with the availability of resources and hence enhance budget credibility. This budgeting strategy, if properly implemented, could mitigate the risks of excessive commitments by MDAs and provide additional PFM support to achieve the MT debt anchor.

35. Developing and deepening the domestic financial market remains key in de-risking government domestic borrowing and reducing exposure of the banking system. Sierra Leone's financing mix is shifting towards increased reliance on relatively expensive domestic debt. This has led to increased interest bill and rising annual rollover risks partly because domestic debt is contracted at a much higher interest rates but also because these securities are short tenured. Reforms to extend the tenure and diversify investor base is ongoing with the Fund's MCM TA but remains a medium term to long term endeavor. Authorities could also explore domestic debt treatments, including fiscally sustainable way of securitization of legacy arrears to infuse liquidity to the system, 364 days T-bill sequester operations to restructure and issue other market instruments to extend the yield curve as has been recently suggested by the recent MCM Technical report of 2019.

G. Conclusion and Policy Recommendations

36. Authorities are considering developing a fiscal adjustment path that could credibly guide fiscal policy beyond the live of the current ECF. This paper develops a medium-term fiscal adjustment path that could help achieve the above objective post ECF. The debt anchor set at around 51.1 percent of GDP is deemed appropriate and achievable within 12 years, predicated on expected recovery on growth, revenue mobilization, improved expenditure and commitment controls, and other PFM improvements. Three scenarios present feasible fiscal adjustment pathway that allow public debt to GDP to converge to its anchor after 12 years. Scenario 2 is the most realistic scenario that could guide medium term fiscal policy post the ECF. The calibrated primary balance ranges from -2.9 to +0.9 percent of GDP in (2022-2025) before being set at higher level of +2.1 percent of GDP in the long-term. It is also consistent with the WEO projection and hence the latest DSA.

37. A multi-pronged approach is required to contain rising debt vulnerabilities and safeguard this MT fiscal adjustment path. This needs to be all encompassing focusing on among others raising potential growth, increasing revenue mobilization, securing more budget support grants, strengthening expenditure and commitment controls, keeping new external debt highly concessional, and de-risking government securities to contain domestic interest bill. Specifically, the following are the main policy recommendation from the paper:

Fast tracking ongoing structural reforms to raise potential growth. Effective implementation of ongoing projects in agriculture, human and physical capital is expected to raise potential output. Leverage digitalization of government operations for efficiency in service delivery and improved transparency and accountability in budget execution.

Revenue mobilization. Tap on identified tax revenue potential and forge new heights in tax revenue mobilization. A recent tax gap analysis by the World Bank (in 2019) indicate that Sierra Leone collects less than 70 percent of its tax potential (4 percent of GDP in potential revenue). A medium-term revenue strategy (MTRS) under development should identify a properly sequenced and coherent set of tax policy and administrative measures to widen the tax base.

Given scarce resources, improvements in expenditure controls and spending efficiency are essential in creating fiscal space for priority spending. Spending in health and social support will remain critical, as well as continued investments in human and physical capital. Reforms of the energy sector and other SOEs could help contain spending on subsidies and transfers, creating space for priority items.

Finally, advance reforms to develop and deepen the domestic financial markets. This will help de-risking government securities and reduce exposure of the banking system. Extending the maturity tenure of government bonds and diversify investor base over the medium term should help reduce rollover risks.

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Appendix I. Fixed Effects Regression of Output Per Worker

Table AI.1: Fixed Effects Regression of Output per Worker to Public Investment

	dln(Y/L)			
	(1) LICS	(2) LICS/MICS	(3) HICS	(4) All
L.dln(K _g /K)	0.157* (0.080)	0.252*** (0.093)	0.303*** (0.103)	0.267*** (0.079)
L.dln(K/L)	0.295** (0.111)	0.588*** (0.075)	0.726*** (0.063)	0.614*** (0.060)
Constant	5.613*** (0.821)	3.864*** (0.642)	2.910*** (0.736)	3.846*** (0.564)
Observations	549	1,649	1,270	2,944
R-squared	0.885	0.960	0.941	0.979
Country FE	YES	YES	YES	YES
Number of periods	25	25	25	25
Number countries	22	66	51	118

Standard errors are clustered at the country level.

*** p<0.01, ** p<0.05, * p<0.1

Notes: Fixed effects regression of output per worker on public to private sector capital stock. The elasticity is the coefficient of ratio of public to private capital stock. Explanatory variables are lagged to partly account for reverse causality. Standard errors are clustered around country level to account for both serial correlation, while the country fixed effects accounts for country specific factors.

INFLATION IN SIERRA LEONE: DRIVERS AND POLICY RESPONSES¹

This paper examines the long run and short run drivers of inflation in Sierra Leone. It finds that secular wave of inflation in the 1980s and early 1990s were largely driven by money growth and unpredictable exchange rate policy. The short run analysis finds strong relationship of current inflation with its past values, suggesting a high level of inflation persistence. Monetary policy also affects inflation, although with a lag. Policy discussions concludes that a clearer hierarchy of objectives, with price stability at the top, as well as a strong communication framework would enhance central bank credibility and allow the Bank of Sierra Leone (BSL) to have a greater influence on inflation expectations. Furthermore, a more forward-looking monetary policy based on enhanced analytical capabilities at the BSL would improve the effectiveness of monetary policy. Coordination with fiscal policy is critical, given the role of credit to government in driving money growth. Reducing the government's borrowing from the banking system would also facilitate more lending to the private sector, thus strengthening a key monetary policy transmission channel.

A. Motivation

- 1. Inflation in Sierra Leone has on average been higher than the regional average for sub-Saharan African countries.** Sierra Leone experienced very high inflation in the 1980s and early 1990s but was successful in bringing inflation down to manageable levels after the civil war in the early 2000s, aided by a lower inflation environment globally and an improved policy framework.
- 2. Sierra Leone recently entered another phase of high inflationary pressures, triggered by soaring energy and food prices.** Inflation was mostly contained during the lockdown episodes of the COVID-19 pandemic. However, it has accelerated since the second half of 2021, driven both by food and non-food factors. The steep increase in global food and fuel prices, a strengthening US dollar, and the war in Ukraine have all put pressure on prices. In addition, in 2021, external flows moderated, terms-of-trade deteriorated, and shipping costs began to rise. The announcement of currency redenomination in August 2021 also caused uncertainty and speculation, putting downward pressure on the exchange rate and contributing to higher import costs. The Leone-dollar exchange rate has depreciated significantly (28 percent y-o-y in May 2022) and is expected to depreciate further on account of spillovers from U.S. monetary policy and increased need for dollars to access essential commodities.
- 3. Attaining and maintaining single-digit inflation is one of the key macroeconomic objectives of Sierra Leone's current National Development Plan (2019-23).** The NDP partially attributes high inflation to excessive borrowing from the banking system and low levels of exports,

¹ Prepared by Rosalind Mowatt, Jack Ree, Michael Saffa and Peter Wankuru. We are grateful to the staffs of the Bank of Sierra Leone and the Sierra Leone Ministry of Finance, for their discussion on this topic during a joint BSL-IMF seminar. We also thank Romain Bouis and Luis Brandao-Marques (MCM), Liam O'Sullivan (SPR) and Brian Graf (STA) for their useful comments. All errors are of course our own.

which reduce the supply of foreign exchange and trigger inflationary pressures. The plan affirms that the main monetary policy objective of the Bank of Sierra Leone is to lower inflation, re-anchor inflation expectations and ensure progressive convergence to medium-term single-digit inflation. However, it also states that monetary policy is not very effective in curbing inflation, given the low level of financial sector development.

4. Understanding the drivers of inflation is important in calibrating the policy response to inflationary pressures. Sierra Leone is highly vulnerable to exogenous shocks, which often have an inflationary impact. Food and energy-related items make up about half of the consumption basket (Box 1). Many essential goods (including about half of rice, the staple grain, as well as fuel) are imported and previous studies (e.g. Bangura et al, 2012) have found a high exchange rate pass-through to inflation. While there have been improvements in recent years, the monetary policy toolkit in Sierra Leone is relatively undeveloped. A previous IMF selected issues paper (IMF, 2020) found monetary policy transmission to be weak and overwhelmingly influenced by fiscal behavior. Despite these constraints, this paper argues that the central bank policy response does matter for inflation outcomes.

5. To investigate the determinants of inflation, we analyze both long-term relationships and short run drivers. A panel fixed effects regression of 130 countries is estimated over a 50-year sample period to examine the long-term drivers of inflation in Sierra Leone. This paper also uses an autoregressive distributed lag (ARDL) model and a structural VAR (vector autoregression) to examine the significance of monetary and exchange rate shocks in driving short-run inflation,

B. Context

6. Historically, Sierra Leone's inflation has been higher than regional averages (Figure 1 and 2). Its long-term average rate of CPI inflation (1971-2020) was 21.6 percent, which is higher than SSA (13 percent) and emerging market and developing economy (EMDE) (13.6 percent) averages. Compared to the SSA (7.2 percent) and EMDE (6.2 percent) median, the difference is even more distinctive. What has instigated this undesirably high inflation? A quick look at data unveils two likely factors (Figures 3 and 4). First, Sierra Leone's broad money (M3) growth has been very high—with its 50-year average registering 25 percent. This is about 1½ times more than EMDE (18.5 percent) and SSA (16.7 percent) averages. Likewise, its exchange rate underwent more persistent depreciation. Sierra Leone's long-term rate of currency depreciation (on average 17.7 percent annually since 1973) was 2½ times higher than both EMDE (7.2 percent) and SSA (7 percent). The historical behavior of NEER shows that Sierra Leone's NEER depreciation episodes tended to be more abrupt and disorderly compared with EMDE and SSA peers, where exchange rate adjustments have been more continuous (Figure 4). Moreover, periods of persistent depreciations seem to closely coincide with those of steeper monetary expansions, than was the case for EMDE and SSA.

Figure 1. Growth of Prices and Real GDP, 1981-2021
(Annual percent change)

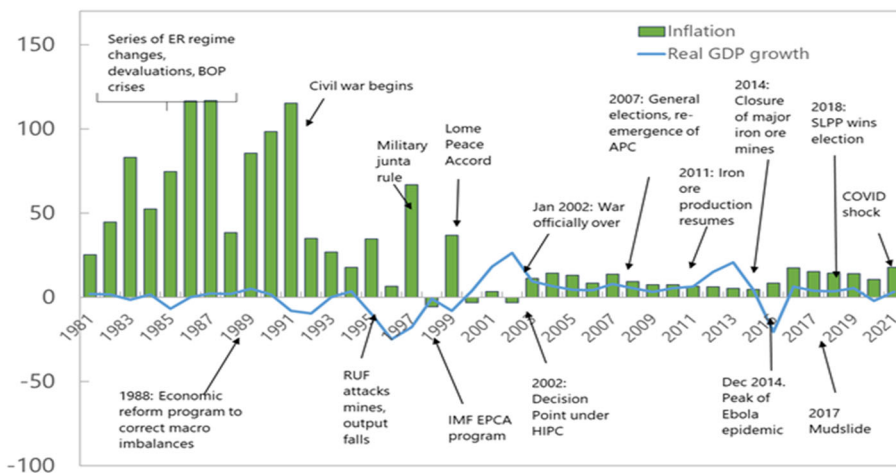
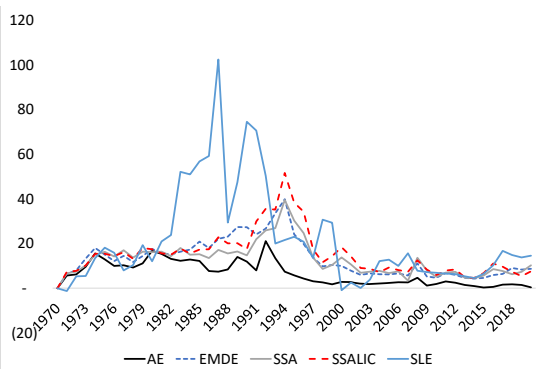
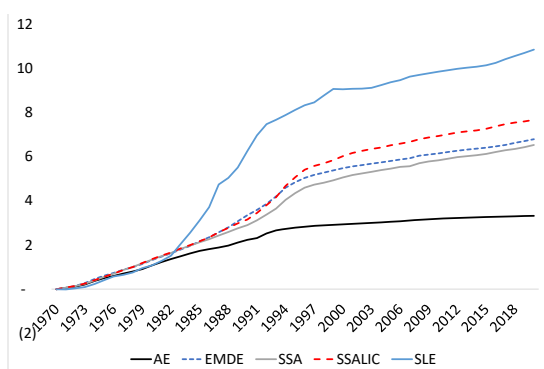


Figure 2. Inflation, 1971-2020
(Percent, annual)



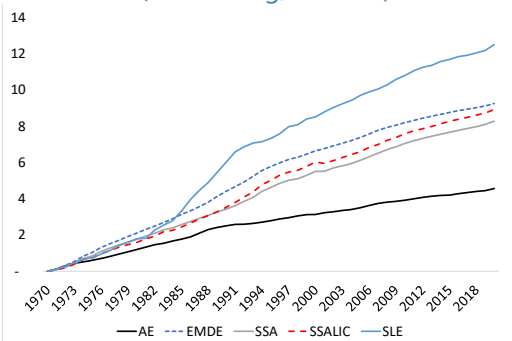
Source: WEO, WDI, World Bank (2019), IMF staff estimates.

Figure 3. CPI, 1970-2020
(Natural log, 1970=0)



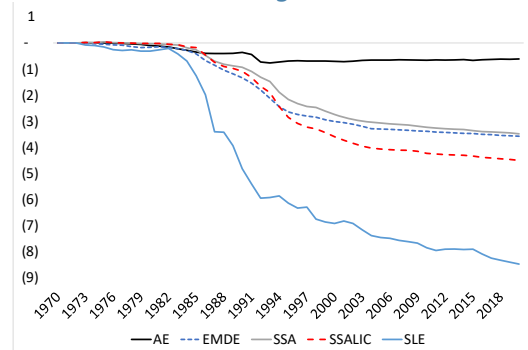
Source: WEO, WDI, World Bank (2019), IMF staff estimates.

Figure 4. Broad Money, 1971-2020
(Natural log, 1970=0)



Source: WEO, WDI, World Bank (2019), IMF staff estimates.

Figure 5. NEER, 1971-2020
(Natural log, 1970=0)



Source: WEO, WDI, World Bank (2019), IMF staff estimates.

7. Like many countries in SSA, Sierra Leone’s historical inflation is characterized by two distinctive waves.

- **Great inflation (1984-93):**
 - *During this period, Sierra Leone’s inflation saw a rapid acceleration, nearly quadrupling to 56.2 percent (from an average of 15.7 percent in 1971-83). During this period, EMDE’s average inflation also rose from 13.7 percent (1971-83) to 22.5 percent (1984-93). But Sierra Leone’s inflation during this period was clearly distinctive, to the 92nd percentile of the SSA group—next only to DRC (134.7 percent), Zimbabwe (60.2 percent), and Uganda (58.8 percent).*
 - *The policy framework during this period resulted in large macroeconomic imbalances. The BSL’s objectives were focused on providing cheap credit to state-owned enterprises, direct financing of the government budget, and promoting economic growth. Monetary policy tools during this era included credit ceilings, sectoral credit allocation, and reserve requirements. The price of staple goods such as rice was controlled. The pursuit of exchange rate stability was the primary goal of the central bank (Bangura et al, 2021), but there were multiple changes of exchange rate regime during the 1980s, including periods of a dual exchange rate regime, large parallel market spreads, and several devaluations.*
- **Great disinflation (1996-2020):**
 - *Sierra Leone’s inflation sharply receded to average 11.7 percent over this period. Similarly, SSA’s average inflation fell from 18.3 percent to 10.7 percent.*
 - *Disinflation was supported by more market-oriented policies. The BSL has, since the early 1990s, pursued a more market-based monetary and exchange rate policy. The BSL adopted a money targeting framework, with reserve money as the operating target, and shifted more to the use of indirect instruments. Restrictions on current account transactions were lifted and a more flexible exchange rate regime implemented (Bangura et al, 2021). Despite the upheaval of the civil war, macroeconomic management mostly continued in this fashion through the 1990s.*
 - *The exchange rate regime was more stable as the country avoided disruptive devaluations (Figure 6). According to Ilzetzki et al’s (2017) taxonomy, Sierra Leone’s *de facto* exchange rate regime shifted from “flexible” to “fixed” one in 2003, as, with the exception of a few*

periods of rapid depreciation, the currency mostly remained relatively stable against the dollar.² This shift seems to have significantly helped stabilizing inflation expectations.³

8. The current monetary policy framework can be characterized as a hybrid framework.

- *Price stability is the primary objective of the Bank of Sierra Leone.* However, this may conflict in practice with other objectives. As outlined in IMF (2020), the central bank has various de jure and de facto objectives in formulating its policy, beyond price stability, including maintaining financial stability, meeting fiscal financing needs, mitigating exchange rate volatility (and sometimes dealing with shortages of foreign exchange), achieving reserve targets, and financial inclusion. Although the BSL is operationally independent under its legal framework, its independence is constrained by expectations that it will help government in meeting the objectives listed above.
- *The BSL has shifted away from money targeting.* Like many developing country central banks, the BSL has moved away from a money targeting framework in recent years as the relationship between inflation and monetary aggregates has appeared less clear (Bangura et al, 2021). The BSL introduced a monetary policy rate (MPR) in 2011 and since 2016 has maintained a corridor around this rate with the Standing Deposit Facility and Standing Lending Facility. The MPR is set quarterly by the Monetary Policy Committee, informed by the BSL's near-term inflation forecast. It mainly serves a signaling purpose, communicating the monetary policy stance. Monetary aggregates are, however, still discussed in the context of the IMF's ECF-supported program, which has a floor on net domestic assets and a ceiling on net foreign assets.

C. Cross-Country Panel Data Regression

9. To quantify the likely drivers of Sierra Leone's great inflation and disinflation episodes, we construct a large cross country panel data set, which includes all 130 EMDEs from the IMF's World Economic Outlook (WEO) database for the period 1970 to 2020.⁴ ⁵ We use a fixed effect panel regression (equation 1) taking advantage of the large sample size to obtain precise

² See Ilzetki, Reinhart, and Rogoff (2017) and World Bank (2019) for historical shifts in de facto exchange rate regimes. Although Sierra Leone's exchange rate regime is characterized as "other managed float" by the IMF's AREAER database, the Ilzetki et al classification, which is an algorithmic approach measuring the size of fluctuations against the anchor currency (in Sierra Leone's case, the US dollar), is used here. In Ilzetki's et al's classification, Sierra Leone switched from managed floating/freely falling classification in the 1990s and early 2000s to a crawling band which is narrower than +/-2 percent in 2003.

³ Ghosh, Gulde, Ostry, and Wolf (1997) established causal relationship between exchange rate pegs and lower inflation.

⁴ The empirical model is based on Ree (2021).

⁵ Our rolling window analysis indicates that the relationship between CPI, M3 and NEER may have changed since mid-1990s for the EMDE group as a whole. However, model specifications incorporating a structural break (see Ree (2021)) make the model's fit for SLE significantly poorer, suggesting that SLE has been on an outlier from the trend of structural changes. Hence, our model of choice does not assume a structural break in M3 or NEER coefficients during the sample period.

estimates while controlling for cross-sectional heterogeneity and country specific effects to account for omitted time invariant variables. The regression is specified as:

$$\begin{aligned} d\log(CPI_{i,t}) = & c_i + b(1) \cdot d\log(M3_{i,t}) + b(2) \cdot d\log(NEER_{i,t}) + b(3) \cdot \\ & d\log(DebtGDP_{i,t}) + b(4) \cdot d\log(Energynet_{i,t}) + b(5) \cdot Foodnet_{i,t} + \\ & b(6) \cdot d(TradeOpen_{i,t}) + b(7) \cdot IT_{i,t} + b(8) \cdot XRregime_{i,t} + b(9) \cdot \\ & d\log(CPagriculture_{i,t}) + u_{i,t} \end{aligned} \quad (1)$$

Where: *CPI*, *M3*, *Dum_{break}*, *NEER*, *DebtGdp*, *Energynet*, *Foodnet*, *Tradeopen*, *IT*, *XRregime*, *CPagriculture* denote consumer price index, broad money, structural break dummy (1 if $t > 93$, 0 otherwise) net effective exchange rate index, public debt-to-GDP ratio, net energy import-to-GDP ratio, net food import-to-GDP ratio, trade-to-GDP ratio, inflation targeting dummy (1=yes, 0=no), de facto exchange rate regime dummy (1=fixed, 0=flexible), and commodity price index for agricultural products. Scalar $b(j)$ denotes regression coefficient for j^{th} non-constant regressor, u statistical disturbance, scalar c_i a country fixed effect. See Table 1 for data description ⁶

Results

10. Sierra Leone's historical inflation dynamics were mainly driven by monetary and exchange rate factors.

Our regression results indicate that 63 percent of Sierra Leone's long-term average inflation is associated with M3—which is broadly in line with SSALIC's common trend.⁷ M3 expansion has been predominantly driven by credit to government; at least since 2002. In fact, net credit to government (NCG) accounts for 85 percent of Sierra Leone's M3 growth during 2002-2021. The rest is attributed to private sector credit (PSC, 21 percent) and Net Foreign Assets (NFA)+Other Items Net (OIN, -5 percent). NFA+OIN drove 60 percent of M3 growth until 2009 but its contribution turned to -13 percent since 2010 which was largely offset by PSC's contribution (19 percent) to M3 growth, with the remainder explained by NCG growth.

NEER accounts for about a third of long run inflation, which is also consistent with SSALIC's average trend. However, one should bear in mind that NEER is also a function of CPI. As is well known, such a feedback loop could lead to an endogeneity bias⁸ and possible overestimation of the NEER effect.

About a quarter of historical inflation is explained by deterministic drift—which contains a Sierra Leone-specific fixed effect, which may be interpreted as an unidentifiable structural factor. However,

⁶ Our data borrows extensively from the data [published](#) online by the authors of World Bank (2019). Time series splicing techniques (e.g., backward extrapolation) were used to match them with more recent data.

⁷ Our model estimates M3's long-term average contribution to inflation for SSALICs at 68 percent.

⁸ Our regression model does not rule out endogeneity problems (i.e., changes in dependent variable feeding back to independent variables) particularly for M3 and NEER. However, we use (1) as our baseline model as our focus is not on regression coefficient itself but decomposition of historical inflation into various underlying factors—which are associated with inflation (including through feedback). GMM or TSLS also does not work for this large cross section-large sample period set up. However, an alternative specification using lagged variables of M3 and NEER hint that our baseline results are quite robust.

identifiable structural factors have played limited roles. Our estimation suggests that Sierra Leone's non-adoption of inflation targeting (IT) explains the relatively limited roles played by the identifiable structural factors: as coefficients for such factors are very small.⁹ It also indicates that Sierra Leone's more stable exchange rate helped mitigate inflationary pressures even after controlling for its impact through the NEER channel—e.g., by directly stabilizing inflation expectations.

11. Sierra Leone's two secular waves¹⁰ of historic inflation are largely explained by the interplay between NEER and M3 shocks and their unwinding (Figures 8-10).

- **Great inflation (1984-93):** During this period, annual average inflation rose by 40.6 percentage points from the 1971-83 average. About one half of this is attributed to NEER depreciation (+47 percent), which was accompanied by M3 expansion shocks (+34 percent). Further pressures stemmed from frequent devaluations¹¹—following the onset of an inflation-exchange rate spiral spells. According to economic literature, exchange rate shocks may result in destabilizing inflation-depreciation feedback loops if monetary accommodation of those shocks leads to de-anchored inflation expectations.¹² Some degree of monetary accommodation of the exchange rate shocks seems to have been a common phenomenon in the SSALIC group during this period. However, Sierra Leone's weaker macroeconomic fundamentals (e.g., higher inflation during 1971-83), larger exchange rate misalignment, and more aggressive monetary accommodation seems to have set in motion a freer drifting of expectations and self-fulfilling currency flights from leones.
- **Great disinflation (1994-2020):** Restoration of exchange rate stability, along with rebuilding of some monetary discipline may be credited for breaking the vicious circle which had prevailed (Figure 8).
 - During this period Sierra Leone's inflation declined from 56.2 percent (1984-93, period average) to 11.7 percent (period average). The largest contributor to disinflation was NEER (37 percent)¹³—followed by M3 (30 percent), the exchange rate regime dummy (16 percent), and unexplained residual (15 percent).

⁹ The estimated coefficient of IT dummy is -0.026. It means that an adoption of an IT permanently lowers the inflation rate (i.e., log difference of annual CPI) by 2.6 percentage points. For example, Ghana's average inflation rate was reduced from 28.5 percent (1971-2007) to 10.9 percent (2008-20) since adopting an IT. Had it not introduced an IT, its 2008-20 average inflation rate would have been 13.5 percent according to our regression model.

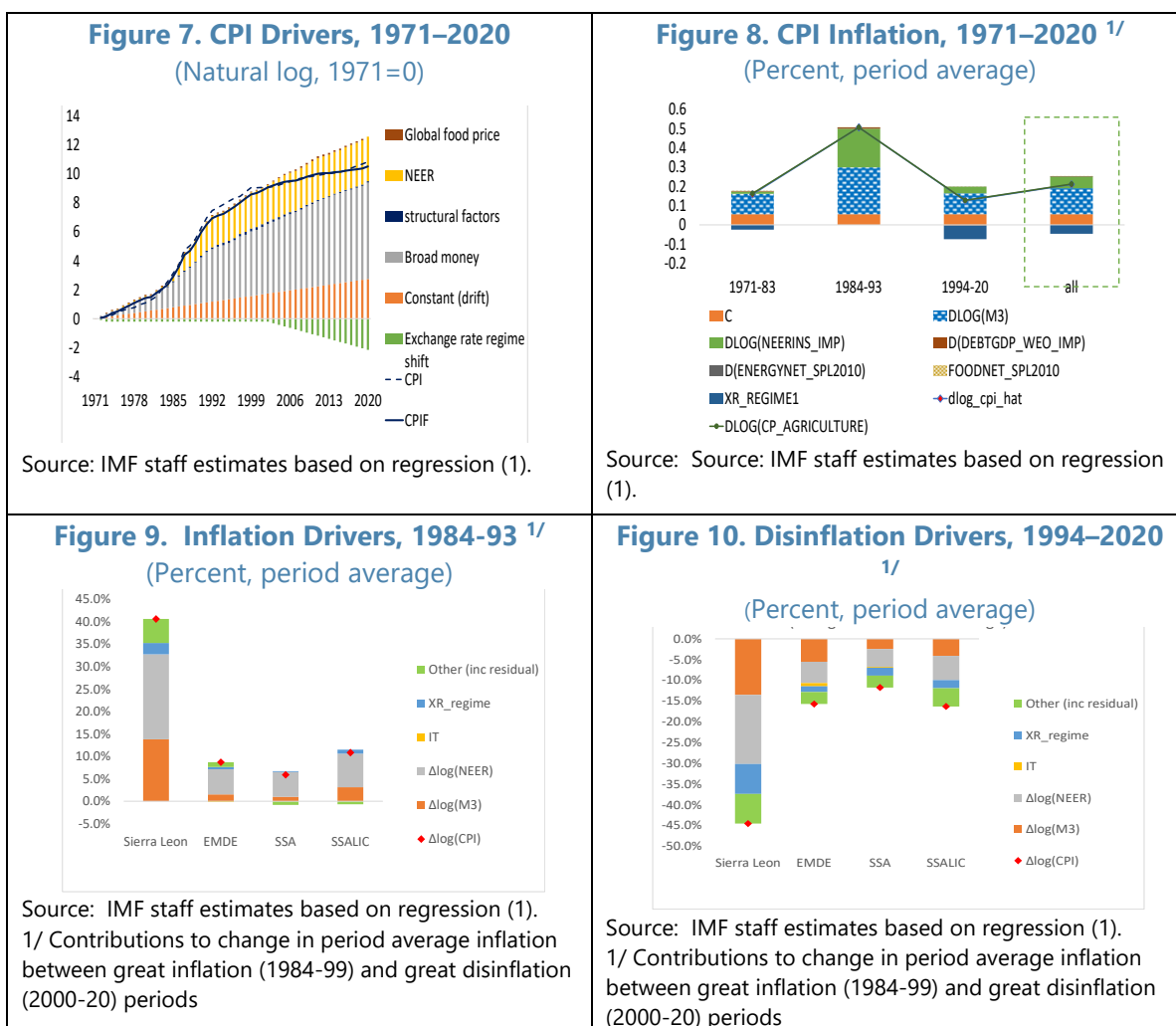
¹⁰ The period breakdown for these two episodes is a bit different from the description in ¶19 because we shifted the starting point of great disinflation to 2020 when the path of actual and forecasted inflation (cumulative) cross. The adjustment aims to maximize the power that the empirical model explains the historical inflation and disinflation episodes.

¹¹ This is captured by the impact of the exchange rate regime dummy (XR_Regime) variable (Figure 9).

¹² Vicious circle hypothesis maintains that an initial shock may set in motion an endless exchange rate-inflation vicious circle when and only when monetary policy is accommodative (See Bond (1980), Bilson (1979)).

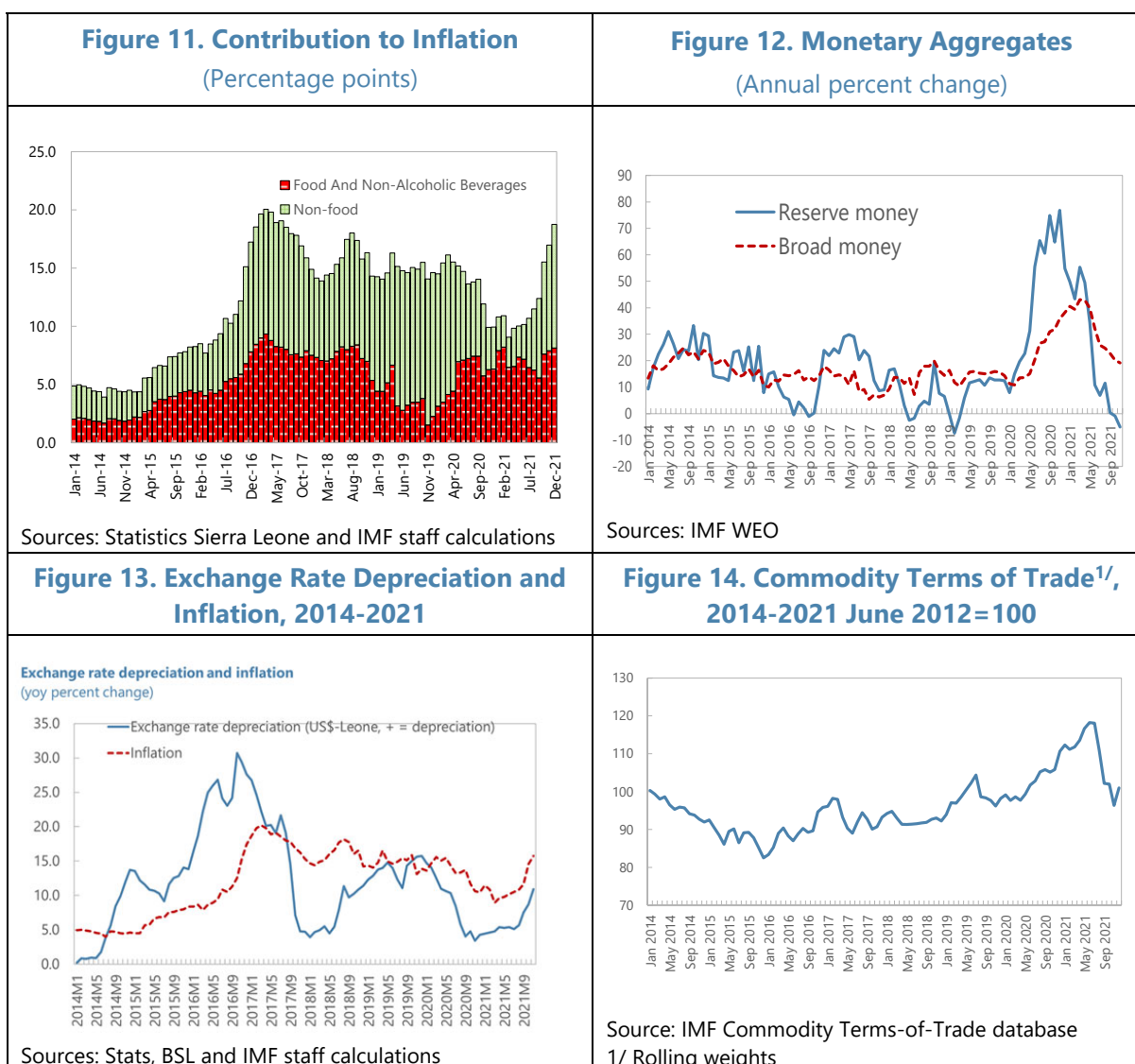
¹³ This can be deemed principally as autonomous as the leone's freefall during the previous episode kept petering out during this period.

- While still on a steeper path than SSALICs peers, Sierra Leone managed to decelerate its M3 growth more forcefully.
- It also managed to introduce more exchange rate stability from 2003 onwards, taking the opportunity provided by favorable inflation environment in early 2000s.
- Since the early 1990s, NEER also saw a significant correction from its more explosive path of decline –compared with the SSALICs peers. And this deceleration largely coincided with the corresponding dampening of the CPI path. Put together, these two seem to point to an unwinding of inflation-depreciation spiral.



D. Understanding Inflation Dynamics Over the Short Run

12. Understanding short-term dynamics and drivers of inflation in Sierra Leone is now a central macroeconomic policy concern. In this section we examine the importance of both monetary, exchange rate, terms of trade shocks, and other factors in the recent uptick in inflation in Sierra Leone.



13. Models of short-run inflation dynamics such as the Phillips curve and the mark-up model are challenging to estimate in Sierra Leone in the absence of data. The lack of real sector variables such as unemployment, and the output gap limit the extent to pursue the demand side drivers of inflation. These models work for data rich countries unfortunately, where there is data on unemployment and real output on fairly short frequencies (Blanchard and Quah, 1989). The alternative is to analyze short-term inflation and its drivers, making use of available nominal data. i.e. domestic prices (CPI), reserve money (that is the monetary aggregate under the control of the BSL), the nominal exchange rate, and terms of trade. We also considered fiscal variables such as gross financing needs (debt service plus primary balance), as well as government spending. Monetary growth, the exchange rate, and the terms of trade have been shown in the past literature to be important drivers of inflation in Sierra Leone (see Box 2 for a summary of selected studies of inflation in Sierra Leone).

14. To examine the short-run drivers of the recent surge in domestic prices, we estimate an autoregressive distributed lag (ARDL) model of CPI against key drivers. The ARDL model¹⁴ captures the short-run relationship between CPI and key explanatory variables, namely: changes in the monetary base (*FASMB*), exchange rate (*EXRATE*), government spending (*GOS*), and the terms of trade (*ToT*). The ARDL model satisfies the standard requirements. The optimal lag length of one is selected, which is found to minimize the Akaike Information Criteria. The model is robust to serial correlation and is stable. A bounds test is used to test for the presence of a cointegrating relationship between the CPI and other explanatory variables. We do not reject the null of no cointegrating relationship and conclude that the use of the ARDL method is appropriate to model short run inflation dynamics in Sierra Leone. We also included other nominal variables such as crude oil prices, government financing needs, and government spending, but they were all found not statistically significant at both level and lag-values. The results are summarized in Table 1.

Table 1. Sierra Leone: Regression Results 1/

	Dependent variable: Quarterly CPI index (in logs)		
	ARDL Levels	ARDL First-Difference	OLS First-Difference
	A	B	C
LQ_724PCPI_SA(-1)	0.95 (0.03)***	0.54 (0.11)***	0.57 (0.12)***
LQ_724FASMB_SA	0.02 (0.02)	0.01 (0.02)	0.00 (0.00)
LQ_724FASMB_SA(-1)	-0.03 (0.02)**	-0.04 (0.02)**	0.00 (0.00)
LQ_724ENDA_SA	0.08 (0.02)***	0.08 (0.06)	0.00002 (0.00)**
LQ_724TOT_SA	0.04 (0.02)**	0.06 (0.02)***	0.0007 (0.00)***
LQ_724TOT_SA(-1)	-0.05 (0.02)**		-0.0003 (0.00)*
Constant	-0.22 (0.13)	0.01 (0.00)***	0.01 (0.002)***
Observations	50.00	50.00	50.00
Adj.R-squared	1.00	0.5	0.7
F-statistic	11341	9.8	12.5
Durbin-Watson stat	1.6	2.0	2.3
Akaike info criterion	-6.4	-6.3	-6.6

1/ Dataset is quarterly, seasonally adjusted and logged for the period 2009Q1-2021Q2. Notes: PCIP: CPI index (in logs and seasonally adjusted). FASMB: Reserve money; ENDA: Nominal exchange rate.

15. All the three regressions show that short term inflation dynamics is mainly associated with previous period's inflation. Column A results are obtained through an ARDL regression at levels. We see a near perfect fit, which is not uncommon feature of ARDL but there is a concern that with all variables being $I(1)$, this could be spurious (although ARDL has the advantage of being able to deal with these concerns). Column B presents the results in the first difference, yet this also shows that only persistence in inflation matters. Column C is a short-run OLS and again apart from the previous period's inflation, point estimates of other factors are very small although statistically significant. In many ways we assess these results as suggestive of problematic identification strategy amidst of data measurements issues at high frequency level.

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$$d\ln(CPI_t) = C + \sum_{j=1}^k \beta_j d\ln(CPI_{t-j}) + \sum_{j=1}^m \beta_j d\ln(FASMB_{t-j}) + \sum_{j=1}^p \beta_j d\ln(EXRATE_{t-j}) + \sum_{j=1}^q \beta_j d\ln(ToT_{t-j}) + \epsilon_t$$

16. So how do we interpret the impact of past inflation? The model results are interpreted as associations, rather than causal. A one percent increase in previous quarter's CPI is associated with a 0.54 percent increase in present quarter CPI, holding all other factors constant, consistent with inflationary expectations (measured by previous periods inflation). There is no impact of the monetary base on short-run inflation, although it is significant at lagged value with a small point estimate. A depreciation in the exchange rate is associated with an increase in the CPI but results are not statistically significant, while the sign on terms of trade is not correct, suggesting potential omitted variable bias. These results are broadly consistent with previous findings. Kallon (1994) uses a two-stage LS with data 1967Q1-1987Q4 and finds that a one percent increase in narrow money growth was associated with a ½ percent increase in inflation over four quarters (which suggests small point estimates are common). Kovanen (2006) finds that price changes are frequent in Sierra Leone due to uncertainty about inflation and low value addition in domestic products.

17. In addition to ARDL, a structural VAR (SVAR) was estimated to fully trace the time path of short run inflation and its drivers. The SVAR relies on economic theory to sort out contemporaneous links between the variables in our model by allowing us to impose economic theory founded relationships together with sensible assumptions (Blanchard and Quah, 1989). In contrast with the reduced form regressions where residuals are considered as simply noise, in this case they represent exogenous primitive forces that are responsible for the stochastic behavior of inflation in Sierra Leone. The structural residuals (e_t) are central to the VAR approach and are typically referred to as structural shocks/factors. Their role is encapsulated in the moving average presentation which models variables as a function of the structural shocks and a deterministic component.¹⁵

18. As is common in the literature, short-run restrictions are imposed to identify the structural model. First, domestic prices can respond contemporaneously to the terms of trade shock but not to shocks from reserve money or the exchange rate. This restriction is consistent with likely delays in the transmission mechanism of monetary policy or exchange rate pass-through on prices, whereas terms of trade changes are likely to affect domestic prices immediately. Second, terms of trade are restricted to respond contemporaneously only to its own shock because developments in terms of trade are in general exogenous for a small open economy. Third, reserve money can respond contemporaneously to terms of trade and domestic price shocks but not to exchange rate shocks. This restriction reflects the fact that the central bank has no explicit exchange rate target and is unlikely to respond instantaneously to exchange rate movements. Finally, the exchange rate can respond contemporaneously to all other variables. This also presents the order in which the variables are ranked from the most endogenous to the most exogenous. The order plays a role as the restrictions on the matrix implies some shocks have no contemporaneous effects on some variables in the system.

19. The VAR satisfies all the required standards. The model is estimated over the period 2009-2021 using available complete quarterly data. All variables enter in natural logs, are seasonally

¹⁵ $y_t = C(L)\theta_0 + C(L)e_t$

adjusted and in first difference as most of these are I (1). A formal unit root test was performed using the Augmented Dickey Fuller (ADF) procedure (Table 2) indicating that with the exception of government spending all other variables are I (1) and should enter the VAR in first difference. The Akaike information criteria was used to select the lag length of three for parsimony with residuals that are well behaved (i.e., no serial correlation and are normally distributed). Our model identifies four structural shocks: the own price shock (which captures domestic supply disruptions such as delayed harvests), the monetary policy shock (tightening); commodity terms of trade shock and the nominal exchange rate shocks to capture external shocks that are mostly take as given for the small open economy such as Sierra Leone. The model is stable with all roots of the characteristic AR polynomials precisely inside the unit circle.

Table 2. Unit Root Tests, Sample Period 2009Q1-2021Q2

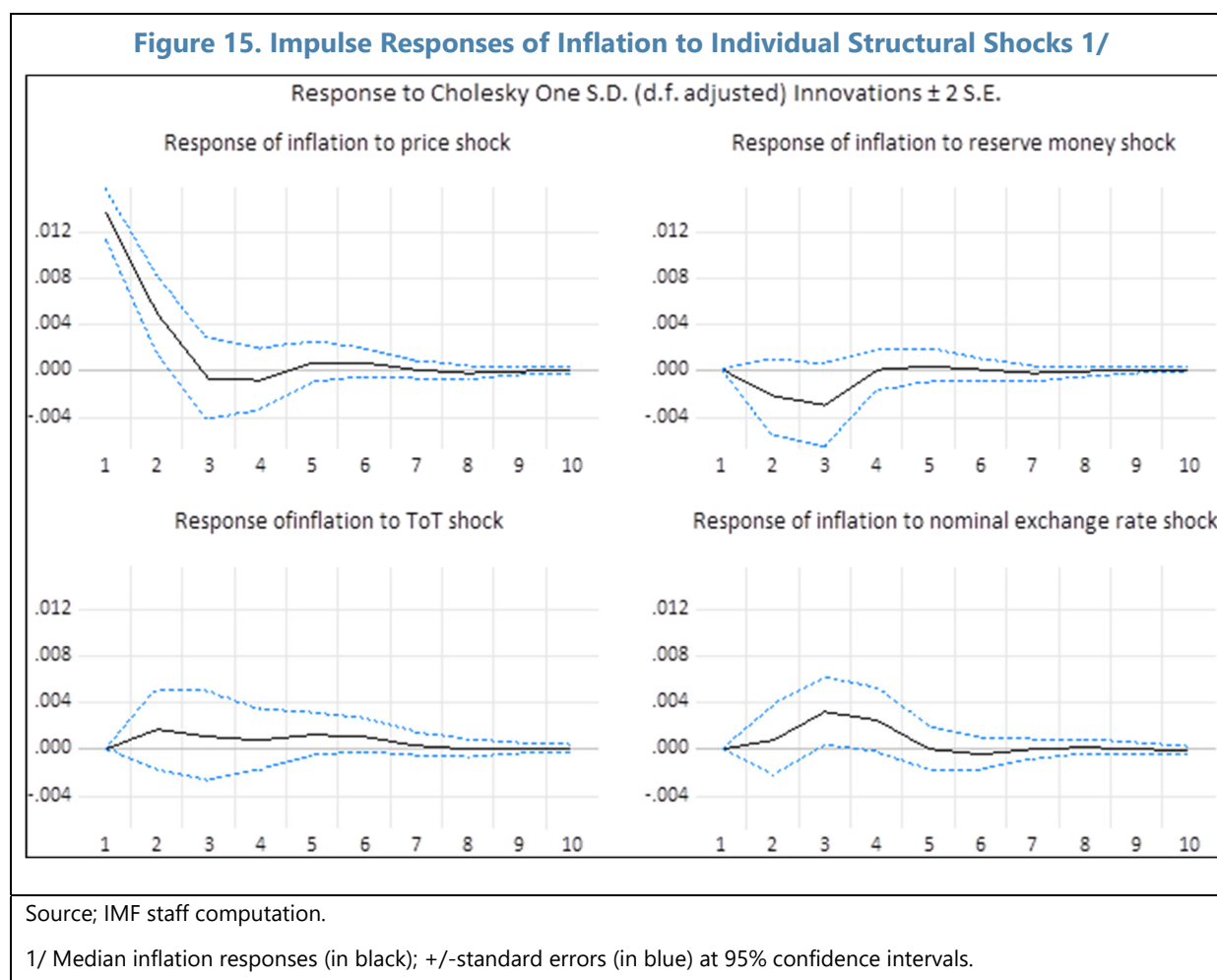
Variables	α	Tau	Ho: $\alpha=0$ (non stationary)
CPI	-2.91	-3.50	Non stationary
Reserve money	-3.27	-3.50	Non stationary
Government spending	-6.99	-3.50	Trend stationary
Exchange rate	-1.96	-3.50	Non stationary
Terms of trade	0.82	-3.50	Non stationary
Spot crude oil	-2.79	-3.50	Non stationary

Source: IMF Staff computation

Notes: Unit root test: Augmented Dickey Fuller Test. Critical values at 5%: tau=-3.50. Variables are in logs

20. Results are interpreted using Impulse Response Functions (IRFs) and the variance decomposition of the forecast standard errors. IRFs helps us to trace out the time path of inflation (and other variables in our model) to a one unit increase in the current value of one of the VAR errors. Figure 15 show the IRF of inflation (dark solid line) to a one standard deviation in the price shock, monetary policy shock, ToT shock, and exchange rate shock. The blue dashed lines indicate 95 percent confidence interval. Given that the variables are in logs, the deviation from the baseline can be interpreted as percent deviation. Variance decomposition displays the percentage points of the error made forecasting a variable over time due to a specific shock. In other words, how much of the variability in the dependent variable is explained by its own shocks versus the shocks in the other variables in the system.

21. Impulse response shows how inflation in Sierra Leone responds to individual shocks. Price shocks, for example reduced seasonal supply of domestic food items, tend to drive up domestic prices instantly. A one standard deviation increase in the price shock leads to an immediate increase in CPI by about 13.6 percent in the first quarter, a 4.9 percent increase in the second quarter before returning to its baseline. Inflation responds to the monetary policy shock (tightening) with a lag. A one standard deviation in the monetary policy shock leads to a decrease in inflation by about 2.3 percent in quarter two and about 3.0 percent in quarter three before returning to its baseline by quarter four. This is consistent with relative delays in the transmission mechanism of the monetary policy shock in Sierra Leone.



22. The response of inflation to terms of trade shocks and exchange rate also entails substantial lags. A one standard deviation increase in terms of trade shock (a deterioration) from its baseline has no impact on CPI in the first quarter but is associated with a 1.7 percent increase in CPI in the second quarter before returning to its baseline by quarter three. A one standard deviation increases in the exchange rate shock (depreciation) has no impact on CPI in the first quarter but is associated with increase in CPI in quarter two by 0.9 percent peaking at 3.3 percent in quarter three before returning to its baseline by the fifth quarter. These results could be driven by the identification restrictions imposed. Follow-up work is needed to understand the exchange rate pass-through effects on domestic prices, which is beyond the scope of the present paper.

23. The variance decomposition shows that own price shocks account fully for the variation of CPI in the first quarter and in explaining its dynamics in subsequent quarter. Monetary policy shocks have no contemporaneous impact in the variation of domestic prices (in the first quarter), largely due to relatively slow transmission mechanism (Table 3). However, its impact picks up in quarter four, explaining approximately 10.5 percentage points of the variation in CPI. This suggests presence of monetary policy transmission mechanism to inflation, but this kicks in after some time, which might undermine monetary policy as a short-term stabilization instrument at the

hand of BSL. Both terms of trade and exchange rate depreciation have a negligible immediate impact on the variation of CPI but persistent lagged effect. Terms of trade and exchange rate shocks explain about 4.2-4.2 percentage points of the variation in CPI in the 4th quarter four and about 6.0 -6.2 percentage points in the 12th quarter.

Table 3. Variance Decomposition of CPI inflation Using Structural VAR Factors 1/

Forecast Horizon	Forecast S.E.	Variance decomposition (percentage points)			
		Price shock	Monetary policy shock	TOT shock	Exchange rate shock
1-Quarter	0.01	100.0	0.0	0.0	0.0
4th-Quarter	0.01	80.9	10.5	4.2	4.4
8th-Quarter	0.02	77.4	11.2	5.6	5.8
12th-Quarter	0.02	76.4	11.4	6.0	6.2

1/ Factorization: Structural; Order: CPI, reserve money, ToT, exchange rate

E. Conclusions and Policy Implications

24. The historical performance of inflation in Sierra Leone can be put in the context of two secular waves: a period of great inflation (from mid-1980s to mid-1990s) and that of great disinflation (from mid-1990s to present). While this has been a common pattern across SSA and EMDEs, both Sierra Leone's inflation and disinflation experiences have been significantly more accentuated than the peers, and its long-term inflation higher and more volatile. Our analysis finds that Sierra Leone's structurally high inflation is in large part associated with persistently high monetary growth. Reactive and disruptive exchange rate adjustment frequently set inflation-depreciation spirals in motion, while monetary accommodation seems to have aggravated it—including by de-anchoring inflation expectations. It also shows that Sierra Leone's laudable gains in disinflation can be explained by an improved policy framework, which minimized these inflation-depreciation spirals.

25. An analysis of inflation since 2009 confirms the importance of exogenous shocks in driving inflation in the short run. Both exchange rate depreciation and a terms of trade deterioration are associated with higher inflation, although their impacts are felt with a lag. The impact of changes in the monetary base in the ARDL model were ambiguous, while a monetary policy shock takes one quarter to feed through into inflation. We were not able to pin down a clear relationship between fiscal variables and inflation in the short run. Finally, exogenous (domestic) price shocks appear to be an important driver of short-run inflation dynamics. This captures the variables we were unable to control for in the model, including delays in food harvests but also fiscal impulse.

26. The short run and long run analyses illustrate that, despite high vulnerability to exogenous shocks, the monetary policy response does matter. The relationship between money and inflation appears to hold in both the short and long run. Maintaining control of money growth, including avoiding deficit monetization, should therefore remain an important goal of monetary policy. However, in the short run, a tightening of reserve money growth may not generate a significant deflationary response. The analysis suggests that the impact of shifts in reserve money tend to be felt only one quarter later, highlighting the need for monetary policy to be as forward-looking as possible. Improvements are being made on this front, with advances in inflation forecasting at the BSL, but there is scope to further deepen the BSL’s analytical capacity to inform monetary policy decisions. Work in this area is ongoing, with support from Fund TA.

27. Further improvements to Sierra Leone’s monetary policy framework would help to mitigate inflation risks. Although the low level of financial development in Sierra Leone is a constraint to effective monetary policy transmission, work by the IMF demonstrates that monetary policy can still have an impact in these environments (see, for example, Brandao-Marques et al, 2020), particularly where there is central bank independence and transparency. The ability of the BSL to anchor inflation expectations should therefore not be underestimated. A well-articulated medium-term inflation objective, a clearer hierarchy of the BSL’s objectives, and clarifying that price stability is the overriding objective of monetary policy (IMF, 2015) would increase the credibility of the BSL’s policy response. Communication is also key (IMF, 2015), including via the timely publication of statistics, economic reviews and monetary policy statements on the BSL’s website. In the medium term, improvements to monetary operations and improving liquidity management (including via closer coordination with the Ministry of Finance), would help to improve the transmission mechanism.

28. Consistency in exchange rate policy is important. The exchange rate policies of the 1980s, with sudden devaluations and abrupt changes of exchange rate regime, did not foster price stability. The shift in ER regime to a more market-determined one has resulted in a more predictable exchange rate, which appears to have helped to anchor inflation.¹⁶ At the same time, the currency has also experienced periods of relatively rapid depreciation in recent years, including at the current juncture, which has stoked inflationary pressures. As noted in IMF (2015), monetary policy and exchange rate intervention decisions should be evaluated within a unified framework. As the BSL moves towards improving the functioning of the foreign exchange market, including by moving to a daily Leone/US\$ exchange rate calculation, there may be a role for the BSL to intervene to smooth volatility. IMF (2022b) notes a potential role for FXI in preventing large exchange rate depreciations from de-anchoring inflation expectations in SSA. However, Sierra Leone’s weak external position constrains the potential for intervention; increased reserve buffers and a better external position would provide more policy flexibility. Over the medium term, measures to improve the functioning

¹⁶ We can only speculate on the reasons for the lack of exchange rate volatility (despite the “free floating”/“other managed float” classification in the AREAER) but this is likely attributable to very limited exposure to global financial flows, shallow FX markets and relatively tight administrative controls on foreign exchange. There is a parallel market for FX but spreads tend to be rather narrow.

of the foreign exchange market, enhance exchange rate flexibility and diversify sources of foreign exchange, would help to avoid episodes of exchange rate pressure which then feed back to inflation.

29. Reduced reliance on food imports would reduce vulnerability to external shocks. The frequency and severity of domestic price shocks could be reduced through policies to enhance productivity in the agricultural sector, given the important role of this sector in Sierra Leone's economy and the weight of domestic food in the consumption basket. However, this does not imply that the central bank should play a role in these areas, which are better left to relevant agencies in government and the private sector.

30. Fiscal prudence and containing bank financing of the deficit are necessary to bring inflation back down. While the fiscal variables were insignificant in our regressions, the role of

credit to government from the banking system in driving money growth is clear. Government borrowing also crowds out bank lending to the private sector, which weakens the monetary policy transmission mechanism. To the extent that the private sector is excluded from commercial banks' business model, this weakens transmission mechanism through an undermined bank lending channel.

Table 4. Sierra Leone: Data Summary

Name	Description	Source	Mean	Max	Min	Std. Dev
DLOG(CPI_SPL)	CPI index. Splicing technique used to handle base year change over time	WEO, World Bank (2019)	0.114341	6.484239	-1.29936	8363
DLOG(M3)	Broad money	WEO, WDI	0.175057	4.837324	-6.59793	6474
DLOG(NEERINS_IMP)	Nominal effective exchange rate. Splicing technique used to handle base year change over time	IMF INS, World Bank (2019)	-0.06155	2.245908	-8.22444	8338
D(DEBTGDP_WEO_IMP)	Public debt-to-GDP ratio. Splicing technique used to handle source data inconsistency	WEO, World Bank (2019)	0.341676	604.3264	-657.919	6375
D(ENERGYNET_SPL2010)	net energy export (percent of GDP). Splicing technique used to handle source data inconsistency	COMTRADE/ WDI, World Bank (2019)	-0.00373	328.8514	-373.438	8015
FOODNET_SPL2010	net food export (percent of GDP). Splicing technique used to handle source data inconsistency	COMTRADE/ WDI, World Bank (2019)	0.385497	156.5032	-92.9879	8371
D(TRADE_OPEN)	Sum of exports and imports of goods and services as percent of GDP	World Bank (2019)	0.360795	341.3552	-303.871	8019
IT	Inflation targetting dummy	World Bank (2019) Ilzetzki,	0.072157	1	0	8925
DLOG(NEERINS_IMP)*XR_REGIME1	cross effect: exchange rate regime (1=fixed, 0=flexible) and NEER	Reinhart, and Rogoff (2017), World Bank (2019)	-0.01117	1.727221	-3.70103	7651
DLOG(CP_AGRICULTURE)	World Bank commodity price index	World Bank (The Pink Sheet)	0.024853	0.492264	-0.21411	9555

Box 1. New Consumer Price Index

Reliable price statistics are an essential tool for policymakers and provide important information for investors, donors, and the public. Sierra Leone's CPI is published consistently by Statistics Sierra Leone on a monthly basis with about a one-month lag. Fund CD has supported the development of a new Consumer Price Index (CPI), to be released at end-February 2022. Weights will be based on the 2018 Sierra Leone Integrated Household Survey, updating previous weights were based on 2003 expenditure data. These updated weights will represent a significant improvement, as using outdated CPI weights can create a bias in the index. The new series will be referenced to December 2021=100. The revised weights show higher relative expenditure on communication, reflecting increased internet and mobile phone use since 2003. The weight for restaurants and hotels has also grown significantly, reflecting efforts to include food purchased at more informal eateries in the basket. The new basket contains 83 new items as well as 357 items retained from the previous basket. In addition to collecting information from Freetown, Bo, Kenema, Kono and Makeni, the new CPI will also include information from a new data collection center in the Northwest region, and so will now cover all four provinces along with Freetown/Western Area. Data collection remains largely urban; at a later stage, Statistics SL plans to expand coverage to rural areas.

New and Old CPI Weights

	Old Weights (%) 1/	New Weight (%) 2/	Difference (pp)
Food and non-alcoholic beverages	41.9	40.3	-1.5
Alcoholic beverages, tobacco and narcotics	1.7	1	-0.7
Clothing and footwear	7.3	7.7	0.3
Housing, water, electricity, gas and other fuels	13.7	8.9	-4.8
Furnishings, household equipment and routine household	5.9	5.6	-0.3
Health	11.4	7.6	-3.8
Transport	7.8	8.6	0.8
Communication	2	4.7	2.7
Recreation and culture	1.5	2.6	1.1
Education	2.9	3.1	0.3
Restaurants and hotels	0.9	6.1	5.2
Miscellaneous goods and services	3.1	3.9	0.7
Total	100	100	0

1/ Classified according to COICOP 2018

2/ Classified according to COICOP 1999

Sources: Statistics Sierra Leone, IMF

Box 2. Summary of Selected Empirical Studies of Inflation

- **Kallon (1994)** utilized OLS with data spanning from 1967Q1-1987Q4. In the long run, a one percent increase in the growth of the money supply increases inflation by 1.3 percent. Real GDP growth and higher inflation expectations also lead to higher inflation.
- **Kovanen (2006)** found money growth and inflation expectations as important factors of inflation in addition to supply side factors.
- **Gottschalk et al (2008)** use a structural VAR with monthly oil price, reserve money, and nominal exchange rate as explanatory variables for the sample period 2000-2006. Domestic inflation is associated with higher oil prices, higher money supply, and nominal exchange rate depreciation. However, they do not distinguish between long-term factors and short-term factors and have a short sample period.
- **Bangura et al (2012)** investigated exchange rate pass-through to inflation using a structural vector autoregressive approach over the period 1998Q1-2011Q4. Monetary shocks on inflation are short-lived, while exchange rate shocks exert a more significant impact on prices than monetary shocks.
- **Korsu (2014)** employed an ARDL model to investigate the inflation effect of fiscal deficits and found that growth of money, exchange rate depreciation, and real GDP are determinants of inflation. Budget deficit was accounted for by the elasticity of money supply (M2).
- **Danladi (2020)** examined the impact of international commodity prices on inflation dynamics in Sierra Leone; prices of cocoa, oil and rice were employed as explanatory variables. The international price of oil and rice have both short and long-run impacts on inflation; cocoa in the short run reduces persistence of inflation but exerts significant impact on inflation in the long run.
- **Jackson et al (2020)** used an unrestricted VAR to examine the adoption of inflation targeting in Sierra Leone. The results indicated a weak dynamic between inflation and money supply in the short run and a strong influence present between inflation and a shock to itself in addition to heavy influence of exchange rate movements. This suggests that IT framework is not a viable option for both the short and medium term.

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