



SURINAME

SELECTED ISSUES

December 2018

This paper on Suriname was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on November 1, 2018.

Copies of this report are available to the public from

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

International Monetary Fund
Washington, D.C.



SURINAME

SELECTED ISSUES

November 1, 2018

Approved By
Nigel Chalk (WHD)

Prepared by J. ten Berge (Ministry of Finance of Suriname),
T. Dowling, D. Kovtun (both WHD), Y. Liu, M. Saeed (both
ITD), I. Shibata (all WHD), and K. Tanyeri (ITD).

CONTENTS

ALTERNATIVES FOR A FISCAL ANCHOR	3
A. Introduction	3
B. Overview of Natural Resources in Suriname	4
C. Summary of the Current Fiscal Framework	5
D. Options for an Alternative Fiscal Anchor	9
E. Conclusions and Policy Implications	11
FIGURES	
1. Sustainability Assessment Indicators	13
2. Sustainability Assessment Indicators (Longer Production Horizon)	14
References	15
FISCAL MULTIPLIERS OF GOVERNMENT SPENDING	16
A. Introduction	16
B. Empirical Strategy	18
C. Data	18
D. Results	19
E. Policy Implications	20
TABLE	
1. Empirical Results	21
References	22

A MACHINE LEARNING APPROACH TO FORECASTING GDP _____ **23**

FIGURE

1. Real GDP Growth Forecasts Using Elastic Net Regression _____ 25

References _____ 26

SPILLOVERS FROM ABROAD _____ **27**

FIGURES

1. Effects of Global Trade War _____ 28

2. Effects of U.S. Tax Cuts _____ 29

References _____ 30

ALTERNATIVES FOR A FISCAL ANCHOR¹

The opening of Merian gold mine in 2016 and adding the new Saramacca gold field to Iamgold's Rosebel gold mine enhanced Suriname's natural resource wealth. The prospects of new commercially exploitable oil offshore have further boosted Suriname's potential wealth. To facilitate the management of Suriname's current and prospective resource income, the authorities established a Savings and Stabilization Fund (SSF) in June 2017. This paper provides an overview of the current fiscal framework and discusses options for adopting a new fiscal anchor that would focus on long-term sustainability taking into account Suriname's development needs.

A. Introduction

1. **The opening of Merian gold mine by Newmont in 2016, adding the Saramacca gold field to IAMGOLD's production, and the prospects of new commercially exploitable oil offshore, have renewed questions regarding management of natural resource wealth in Suriname.** Resource wealth should support sustainable development, avoid boom-bust cycles, and create benefits for future generations. A sound framework would be a prerequisite for avoiding the natural resource curse that affected many resource-rich countries (RRC).
2. **An important question is how to allocate revenues from natural resources across current consumption, investment into capital, and financial savings.** Despite recent discoveries, the horizon for the currently-proven resources is relatively short, with current gold reserves expected to last until 2034, and oil production tapering off around 2030. The relatively short horizon implies the need for building a stock of financial savings to avoid drastic adjustment after the mineral revenue declines. At the same time, Suriname faces significant infrastructure gaps and development needs, and could improve its potential growth through investing into infrastructure or human capital. To achieve an optimal allocation of resources, Suriname needs a robust fiscal anchor that delivers long-term fiscal sustainability taking into account development needs and policy tradeoffs.
3. **This paper explores ways for strengthening the current fiscal framework in Suriname and considers options for a new fiscal anchor.** First, the paper provides an overview of mineral natural resources and their importance for the budget. Second, the paper lays out the current framework for fiscal planning and budget execution in Suriname and discusses the analytical underpinnings of modernizing it to make it more robust. The paper also presents estimates of long-term sustainability benchmarks based on the IMF's policy toolkit for resource-rich developing countries (IMF 2012). Bringing these issues to the forefront would benefit the policy dialogue within Suriname, enrich the discussions with development partners, and lead to better policy outcomes.

¹ Prepared by Joy ten Berge (Suriname Ministry of Finance) and Dmitriy Kovtun (WHD).

B. Overview of Natural Resources in Suriname

4. **Suriname's mineral resource wealth consists of deposits of gold, oil, and bauxite.** At present, only gold and oil are extracted after the US-based historical partner Alcoa stopped production of bauxite in 2015.

5. **Based on the proven reserves, oil production would last until early 2030s.** Proven reserves of oil are 87 million barrels. With the production rate of about 6-6.3 million barrels per year, these reserves would last until the early 2030s and taper off afterwards. At the same time, there is significant potential for discovering oil offshore, and there are exploration activities with a variety of international oil companies. In 2018, two new production sharing contracts were signed with Tullow Oil and Cairn Energy.

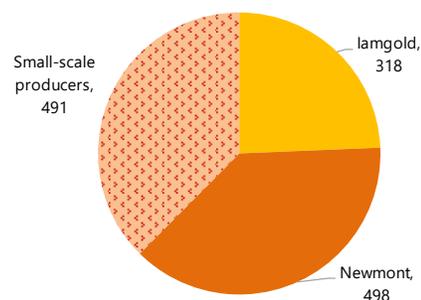
Off-shore oil exploration partners

Area	Exploration partners
Block 42	Chevron, Hess
Block 45	Kosmos Energy, Chevron
Block 47	Tullow oil, Ratio Exploration
Blocks 48, 52	Petronas
Block 53	Apache, Petronas
Block 54	Tullow oil, Equinor, Noble Energy
Block 58	Apache
Block 59	ExxonMobil, Hess, Equinor
Block 60	Equinor
Block 61	Cairn Energy

Source: Staatsolie.

6. **Gold production in Suriname consists of large-scale industrial production and numerous small-scale operations.** The industrial production is carried out by Canada-based Iamgold (Rosebel gold mine, in operation since 2004) and U.S.-based Newmont (Merian gold mine, in operations since October 2016). In September 2018, Iamgold lengthened Rosebel's life to 2033 with an increase in proven and probable reserves to 5.5 million ounces from the Saramacca gold field (the reported overall inferred mineral resources are significantly higher at 10.3 million ounces, suggesting that the production horizon could be longer).² Proven and probable reserves in Merian gold mine were 5.3 million ounces at the end of 2017.³ With the average production of 0.5 million ounces per year, the production horizon would be slightly more than 10 years, although it could be also longer due to the presence of inferred mineral resources not included in proven and probable reserves (1.8 million ounces). Small-scale producers include a few well-established mechanized operations (e.g. the public enterprise Grassalco), but also many informal operators which often generate an adverse environmental impact (World Bank, 2016).

Gold production in 2017
(Millions of troy ounces)

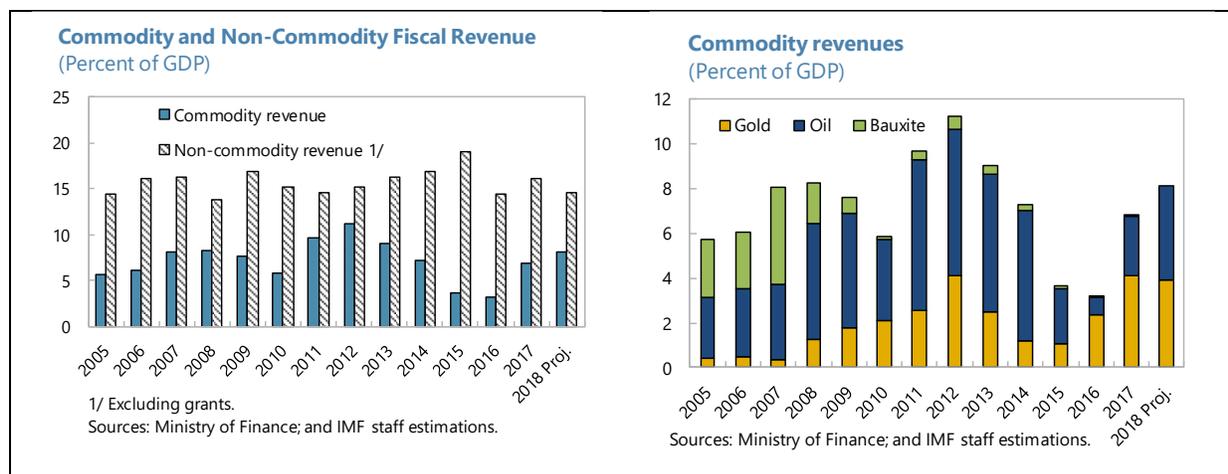


Sources: National Planning Office; Iamgold; and Newmont.

² Press-release by Iamgold on September 23, 2018, available from http://s1.q4cdn.com/766430901/files/doc_news/2018/09/NR-33-18_RGM-Saramacca_EN.pdf

³ Press-release by Newmont on in February 21, 2018, available from https://s1.q4cdn.com/259923520/files/doc_downloads/reserves_and_resources/Newmont-Reports-2017-Reserves-and-Resources.pdf

7. **Commodity revenues are an important contributor to the budget, although they are subject to considerable volatility.** Since 2005, commodity revenues—defined as a sum of tax and non-tax revenues related to production of bauxite, gold, and oil—have averaged 7.1 percent of GDP (close to one-third of total fiscal revenues, excluding grants), with oil revenues contributing close to 60 percent of the total commodity revenues. As in many other resource-rich countries, commodity revenues have been subject to significant volatility, ranging from 11¼ of GDP in 2011 to a mere 3¼ percent of GDP in 2016. Commodity revenues have been more volatile than non-commodity revenues.



C. Summary of the Current Fiscal Framework

8. **The fiscal framework for fiscal planning and execution in Suriname features several principal elements.** It comprises the Debt Act (DA) specifying the debt ceilings and escape clauses, the moratorium on applying monetary financing, the Savings and Stabilization Fund (SSF), and a medium-term fiscal framework (MTFF). The DA limits government indebtedness to 60 percent of GDP, with escape clauses to allow further indebtedness in specified situations. In 2016, the authorities ended monetary financing of the budget through a Memorandum of Understanding (MoU) between the Minister of Finance and the Governor of the CBvS that suspended a provision in the Central Bank Act (CBA) permitting temporary financing of fiscal deficits. The SSF Act sets out rules for accumulating and decumulating financial wealth derived from the sale of natural resources. Both Acts and the MoU constitute a legal framework for the fiscal rules contained in them. The MTFF is the integrated analytical framework for projecting and calibrating the fiscal stance and its sustainability.

Government Debt Act

9. **The DA sets a ceiling on government debt of 60 percent GDP, although its February 2017 amendment introduced an escape clause.** The DA limited domestic debt to 25 percent of

GDP and external debt to 35 percent of GDP.⁴ The February 2017 amendment to the DA permits temporary suspension of the debt limit when it is exceeded due to a fall in GDP and/or depreciation of the exchange rate. When the debt ceiling of 60 percent of GDP is exceeded, each loan needs to be approved by the National Assembly. In addition, in the first year of this occurrence, the government is authorized to borrow to finance a deficit of up to 6.5 percent of GDP. In the following 4 consecutive years, the government is authorized to borrow to finance a deficit of up to 5 percent of GDP.⁵ Finally, the public debt can increase with these amounts only if this is included in the budgets as financing for programs and investments.

10. **To evaluate compliance with the DA, the debt-to-GDP ratio is computed using the last published GDP data.** For amounts denominated in foreign currency, the domestic currency value is calculated based on the exchange rate quoted by the central bank on the last banking day of the calendar year to which the GDP refers (Article 3-3). To illustrate, the debt ratio for 2018 is computed on 2017 GDP.

11. **The DA amendment calls for termination of the escape clause once the debt stock has returned to the ceiling of 60 percent.** However, it does not specify procedures of how to return to the ceiling of 60 percent and implicitly assumes that it will be the case once growth resumes. The arrangement for addressing a recession longer than 5 years consists of returning the DA to the National Assembly for further deliberation.

Memorandum of Understanding on Non-Monetary Financing

12. **In May 2016, the authorities took measures to prevent monetary financing of the fiscal deficit.** The Minister of Finance and the Governor of the central bank signed an agreement in May 2016 preventing extension of credit by the CBvS to the government, defined as (i) any overdraft facilities; (ii) the issuance of guarantees by the CBvS on behalf of the state, any public authority or state-owned enterprise; and (iii) the purchase by the CBvS of Treasury Bills or other debt instruments issued by any of the public authorities or state-owned enterprises directly on the primary market.

Savings and Stabilization Fund

13. **The Act establishing the SSF was adopted in June 2017, with the stated purpose (Article 3) to:** (i) stabilize the assets provided by the public authorities for the financing of expenditures so as to limit the effects of macroeconomic volatility by protecting the level of public revenues during times of lower proceeds from the mining sector; (ii) generate an alternative flow of

⁴ The original DA limited domestic debt to 15 percent of GDP and external debt to 45 percent of GDP. The limits were modified in 2011.

⁵ The authorities' budget deficit definition includes certain loans and repayments into revenues and expenditures. It differs from the authorities' MTF definition that follows closely staff's fiscal estimates and projections.

revenues so as to diversify and, where necessary, supplement public revenues; and, (iii) generate revenues for future generations through savings from the State's mining revenues.⁶

14. **The rules for accumulating financial wealth are based on the difference between actual and budgeted mining revenues.** If an increase in mining revenues is expected, then budgeted mining revenues for the next year are set as the budgeted mineral revenues for the current year increased by the average growth rate of real GDP over the previous 10 years.⁷ If actual mining revenues in the current year are higher than budgeted, the Ministry of Finance would transfer the excess to the SSF on a quarterly basis. If a *decrease* in mining revenues is expected, then the budgeted mining revenue for the coming year should be reduced by half of the unweighted average real growth rate over the previous 10 years.

15. **The SSF is subject to strict withdrawal rules.** To ensure that the SSF starts on a solid footing, no withdrawals are permitted until 2022. In general, withdrawals are permitted when actual mining revenues are less than one quarter of the budgeted revenue for that year.⁸ In this case, the SSF would provide half of the shortfall subject to the ceilings: (i) 5 percent of SSF assets if assets are below US\$100 million; (ii) 10 percent of SSF assets if assets are between US\$100 million and US\$500 million; (iii) 15 percent of SSF assets if assets are more than US\$500 million. The Act further establishes that, on an annual basis, the SSF is expected to transfer one quarter of asset management income to the Treasury within 3 months of approval of the annual budget by the National Assembly.

Medium-Term Fiscal Framework

16. **The Medium-Term Fiscal Framework (MTFF) serves as a tool for the annual and multi-annual budget planning, including enveloping the financing needs.** The MoF updates the MTFF framework, encompassing the current year and next 5 years, at least twice a year. One update coincides with the next year's budget preparation, which starts in May and ends in September with the submission of the draft budget to the National Assembly. The MTFF provides the revenue and financing parameters and spending ceilings of the Medium-Term Budget Framework, which translates to directives to the line ministries. The process for analyzing the fiscal policy stance,

⁶ The SSF Act defines mining revenue as all current and future revenues of the State obtained from the extraction and processing of non-renewable commodities, including but not limited to direct taxes, dividends, and royalties paid by enterprises that have entered into a company-specific mining agreement with the State and that are active in the extraction and processing of gold and associated metals, petroleum, bauxite, and other non-renewable commodities, which were or are denominated in foreign currencies or internationally marketable commodities.

⁷ Article 4-2 sets the rate at 3 percent, while the remainder of Article 4 implies that the rate is meant to adjust annually to reflect unweighted average real growth percentage of the economy over the last 10 years.

⁸ Withdrawals are also permitted in the event of a national disaster, which is defined as damage greater than three percent of GDP. Withdrawals in such event are nonetheless subject to the fund's strict de-accumulation rules.

designing and assessing the needed measures still needs to get entrenched in the many levels and details of public policy-making. This process is just starting albeit with rapid progress.⁹

17. **The Ministry of Finance employs the MTFF for gauging the impact of fiscal developments and measures on fiscal and debt sustainability.** The MTFF and the related analysis are based on the government finance statistics (GFS) methodological and data quality framework. This is useful because budget documents are prepared partially in a central bookkeeping fashion and are tabled mostly for authorizing budget spending rather than for policy analysis. Thus, the MTFF serves to analyze both revenues and expenditures, and evaluates financing from a fiscal analytical perspective that is widely used in economic theory and practice.

18. **The MTFF contains additional analyses of the non-resource overall and primary balances.** Judgement is made on the desired path of reducing the non-resource balances by assessing the financing gap and possible (and desirable) means of closing it. While this has been done in light of the upcoming operations of the SSF, the conceptual trigger stems from the need to assess and monitor the fiscal dynamics of the non-resources sectors of the economy, and design policies considering the available envelope of non-renewable mineral resources.

19. **The MTFF parameters are used in the macroeconomic programming exercise for assessing fiscal, real, monetary, and external sector policies in conjunction.** The key economic institutions of Suriname produce a Financial Policy Programming report, although the process is relatively new. Recent developments are thus analyzed in a more integrated fashion and scenario analyses are used by policy makers for making policy choices and developing measures. Fiscal policy evaluation makes use of, amongst others, the MTFF tool for calibration and assessing the fiscal stance and outlook.

20. **Overall, the current fiscal framework is facing several challenges.** The first challenge relates to the consumption-saving choices. Insofar as the SSF leads to savings of a part of mineral revenue by running fiscal surpluses at times when mineral proceeds are high, this would be an important change in the current conduct of fiscal policy. So far, the link between budgeted mineral revenue and expenditure remains unspecified as neither the Debt Act nor the SSF Act limit growth of expenditure, although it is included in the fiscal programming through the MTFF. Prudent programming can be enhanced by institutionalizing fiscal rules on expenditure ceilings. The second challenge is to improve expenditure composition by emphasizing growth-enhancing expenditure over unproductive spending, in particular by strengthening capital investment in priority areas. Expenditure targeting in this fashion would also prevent elevated deficits that could lead to sharp adjustments during negative commodity shocks. The third challenge relates to asset-liability management: The SSF could mandate savings while public debt is increasing due to elevated fiscal deficits. Ideally, the framework should allow paying down expensive debts before accumulating savings. Finally, whereas some parts of the legal framework have been amended to introduce policy

⁹ Recent institutional developments with an impact on the fiscal planning and analysis functions are described in the national Multi-Annual Development Plan (MADP) 2016-2020, the MADP 2017-2021, and the IADB's Program for Fiscal Strengthening to Support Economic Growth (FISEG).

flexibility and prudence, the legal framework could be augmented with a clear medium-term fiscal anchor.

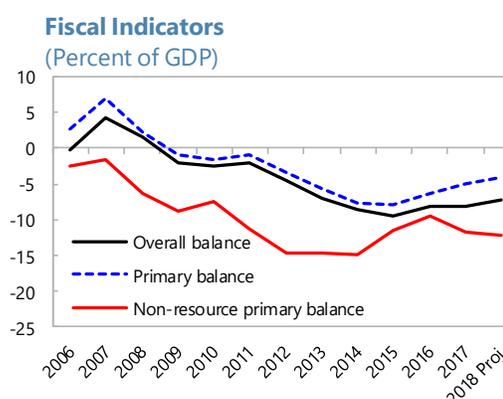
D. Options for an Alternative Fiscal Anchor

21. **The macro-fiscal framework in Suriname could be strengthened by taking advantage of the latest analytical concepts applied in other resource-rich countries.** Recently, fiscal frameworks and policy analysis tools have become better at addressing the challenges of transforming resource wealth into other assets that support sustained development, while also maintaining mechanisms to avoid the boom-bust cycles that stem from volatility in natural resource revenues (IMF 2012). The following questions should be considered when designing a robust fiscal framework:

- What set of fiscal indicators should be monitored to track the fiscal position and broader resource flows in RRCs?
- How to design reinforcing and consistent fiscal rules that achieve long-term fiscal sustainability and, at the same time, smooth revenue volatility?
- How to incorporate the growth- and revenue-enhancing impact of public investment and how to analyze the fiscal and macroeconomic implications of saving/investment scaling-up scenarios?
- How to measure and project the intertemporal impact of macro-fiscal policies on economic growth and inclusion?

22. **The fiscal framework in Suriname needs a credible medium-term anchor.** Suriname would benefit from transitioning from the current anchors based on the Debt Act and the SSF Act to setting targets on the non-resource primary balance (NRPB). Focusing on the NRPB rather than on the overall balance has the advantage of filtering out fluctuations in revenue due to swings in international commodity prices and thus providing a better assessment of the underlying stance of fiscal policy.

23. **The choice of an anchor should consider the length of the resource horizon.** In countries with relatively long resource horizons, the focus could be on smoothing out revenue volatility, justifying the use of structural balance fiscal rules. In countries with relatively short resource horizons, the anchor should focus on safeguarding long-term fiscal sustainability, considering the period when resource wealth is exhausted. Given that Suriname's resource horizon is relatively short, setting an anchor should be guided by assessment of long-term fiscal sustainability.



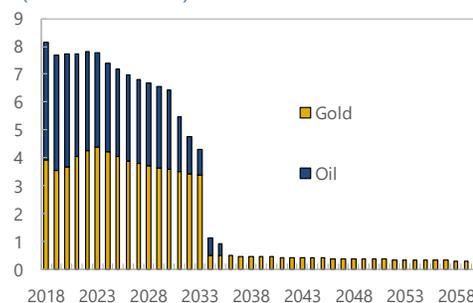
Sources: Ministry of Finance; and IMF staff estimations.

24. **There are several alternative approaches for assessing long-term sustainability benchmarks** (IMF 2012): First, the *traditional permanent income framework* (PIF) allows examining a basic consumption/savings tradeoff and stipulates that the NRPB should be set to the sum of the real return on already accumulated financial wealth and the implicit return on the net present value of future resource revenues. However, PIF is overly simplistic as it does not distinguish between public consumption and investment. *The modified permanent income (MPIF) framework* takes investment into consideration and incorporates the possibility of scaling up investment in an initial period, relaxing the NRPB accordingly before stabilizing it in the medium term. Yet, it does not include the effects of higher investment on growth. *The fiscal sustainability framework (FSF)* incorporates the effect of higher public investment on growth and therefore adds a possibility to examine the tradeoff of saving in financial assets versus in public infrastructure.

25. **Applying these anchors for Suriname indicates a significant need for further fiscal adjustment that would allow saving a part of natural resource revenues.** In order to provide a transition period to reduce the gap between the current NRPB and the long-term sustainability benchmarks, the benchmarks are computed for the period starting in 2024 (Figure 1). Potential NRPB paths during the transition period are illustrated by IMF staff's baseline and adjustment scenarios prepared in the framework of

2018 Article IV consultation with Suriname. The adjustment scenario envisages improving the NRPB by 6 percent of GDP through introduction of VAT, reducing electricity subsidies, and other measures. Beyond 2023, the following long-term variables are assumed: GDP growth rate of 3 percent, inflation of 3 percent, and real interest rate of 5 percent. The benchmarks are computed assuming a conservative scenario in which commodity revenues taper off by mid-2030s.

Commodity Revenues: Outlook
(Percent of GDP)



Source: IMF staff projections.

- **Permanent income framework (PIF).** Under the baseline assumptions, the value of natural resource wealth at 2024—estimated as the present value of mineral resource revenues—is 65 percent of GDP (Figure 1). The long-term NRPB benchmark consistent with maintaining constant value of this wealth is $-1\frac{1}{4}$ percent of GDP, implying an adjustment gap—relative to expected 2018 NRPB of $12\frac{1}{4}$ percent of GDP—of about 11 percent of GDP.¹⁰ Maintaining this NRPB starting from 2024 would be consistent with accumulating financial savings of about 55 percent of GDP by 2034 when revenues would start to taper off.
- **Modified permanent income framework (MPIF).** The modified PIF framework illustrates the tradeoff between frontloading of fiscal spending and future adjustment needs: increasing spending by 2 percent of GDP during an illustrative frontloaded spending period (2024-2033)

¹⁰ The long-term benchmark is computed as a ratio of NRPB to GDP that can be maintained indefinitely under given steady state growth assumptions.

would require maintaining NRPB surpluses of up to 1 percent of GDP during the adjustment period to safeguard the wealth from natural resources. This framework, however, does not consider the effects of spending on GDP growth.

- **The fiscal sustainability framework (FSF).** The FSF assumes that higher capital investments would boost growth in non-resource sectors, which in turn would increase non-resource revenues. This reduces the need for adjustment during the adjustment period. The model assumes that adding 2 percent of GDP in capital investments during the frontloaded investment period would increase growth rate from 3 to 3.4 percent of GDP. Nevertheless, the NRPB would need to adjust by 2.6 percent of GDP to about -0.65 percent of GDP during the adjustment period to save part of the commodity revenues for future generations.

26. **Lengthening the production horizon by 10 years would increase policy space but would not eliminate the need for adjustment.** To assess sensitivity to the production horizon, the long-term sustainability benchmarks are re-estimated for a scenario where the production of oil and gold is extended by 10 years to mid-2040s (Figure 2). This increases the policy space by about 0.75 percent of GDP: the NRPB in the permanent income framework is a negative 2 percent of GDP. Overall wealth increases to about 100 percent of GDP. The MPIF framework with this longer production horizon suggests a 10-year frontloaded investment period should be followed by adjusting the NRPB to about zero by 2035. In the FSF model, the longer resource horizon implies that long-term fiscal sustainability would be attainable with the NRPB of -1¼ percent of GDP. It should be noted that the results are specific to the assumptions (e.g. real and nominal interest rate, growth, inflation, and the length of the frontloaded investment period).

E. Conclusions and Policy Implications

27. **Suriname's fiscal framework can be strengthened through a fiscal anchor rooted in the non-resource primary balance.** Focusing on the NRPB will allow better assessments of the policy stance and reduce procyclicality. Given the relatively short resource horizon in Suriname, the anchor should be guided by long-term sustainability. Illustrative estimations suggest that the permanent income target for non-resource primary deficit consistent with long-term fiscal sustainability should be around 1-2 percent of GDP depending on the length of resource horizon, although frontloading of capital expenditure can be justified if it strengthens growth and non-resource revenues.

28. **Given the size of fiscal adjustment required to bring the NRPB in line with the long-term sustainability benchmark, a substantial transition period is needed to implement it.** Staff's adjustment scenario—designed to put public debt on the downward path—closes the current gap by less than half (relative to PIF benchmark), implying that adjustment would need to continue beyond the 5-year horizon. During the transition, it would be important to: (i) re-configure expenditure composition by giving more priority to growth-enhancing expenditure such as public investment, and (ii) assure consistency between fiscal policy and asset and liability management (accumulating savings in SSF while borrowing at high cost should be avoided and costly public debt should be repaid first). This can be taken into consideration during future reviews of the SSF. It will

be also instrumental to conduct broad reforms to reduce Suriname's dependency on public spending (e.g., phasing out inefficient and poorly targeted subsidies) and conduct supply-side reforms (e.g., labor market reforms) to improve the non-mining economy in order to boost non-resource revenue.

29. **The framework needs to be further developed and incorporate the country-specific circumstances for the Suriname case.** Working on the enhanced fiscal anchor framework is shedding light on areas which will need much attention in the period ahead. Nonetheless, this is seen as an opportunity to enrich the dialogue on policy instruments and the institutional coordination mechanisms in Suriname. The authorities foresee many benefits to institutional capacity to continue analysis of natural resource wealth and how to put this to use for higher economic growth and improved income distribution over time. The authorities' commitment to transparency is an important part of the framework. The participation in the Extractive Industry Transparency Initiative (EITI) in 2017 was a key step towards increasing transparency.

Figure 1. Suriname: Sustainability Assessment Indicators

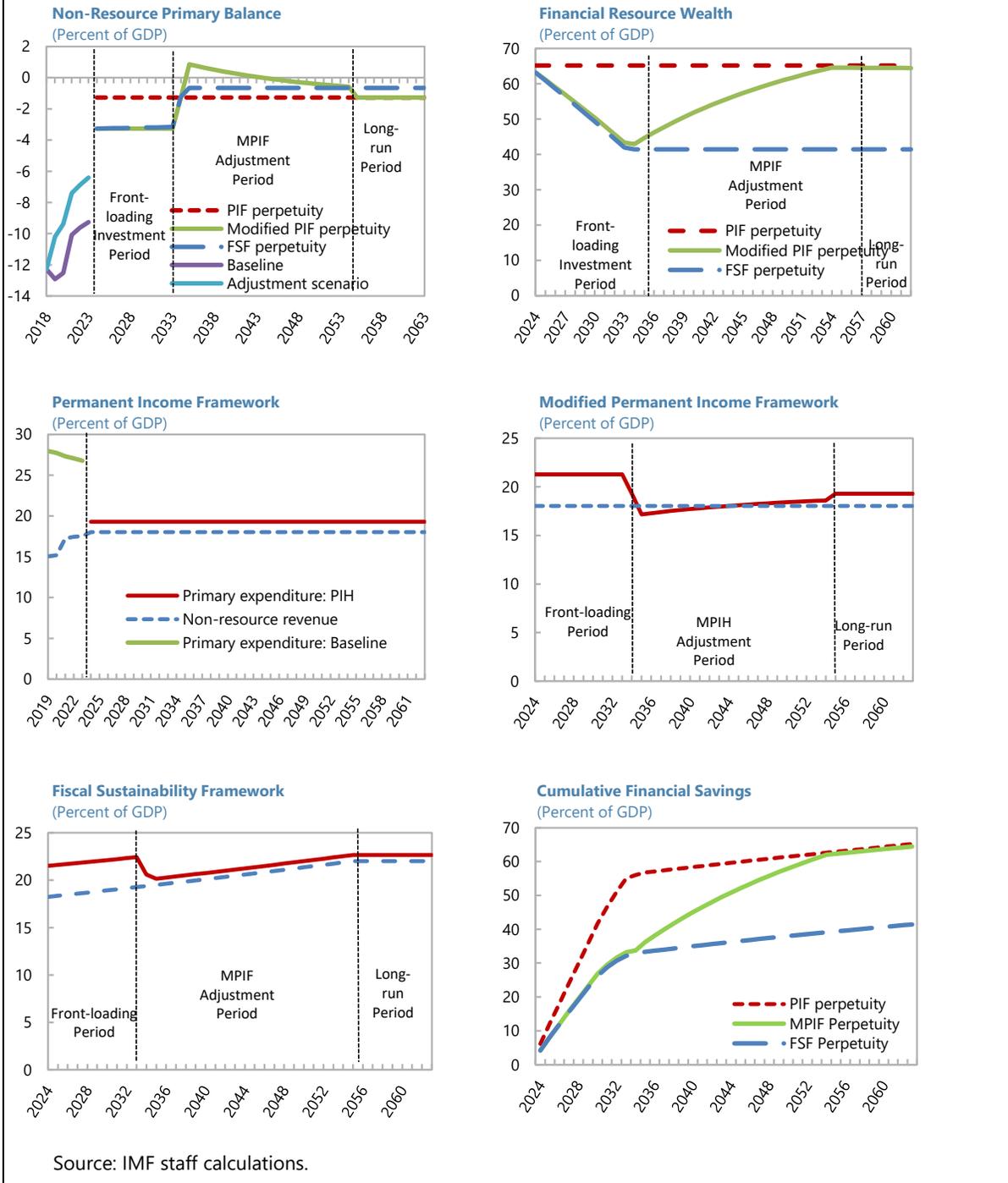
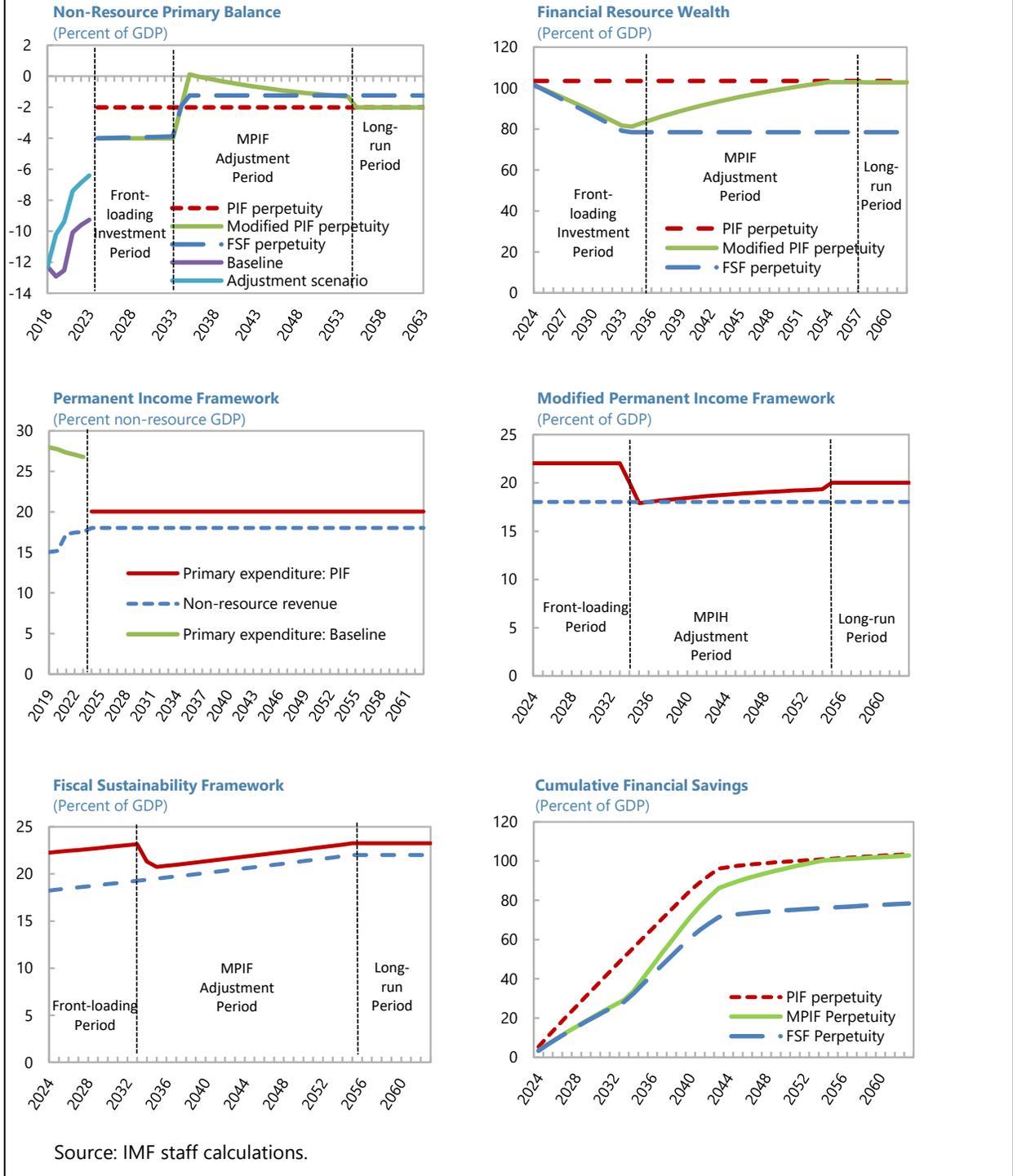


Figure 2. Suriname: Sustainability Assessment Indicators (Longer Production Horizon)



References

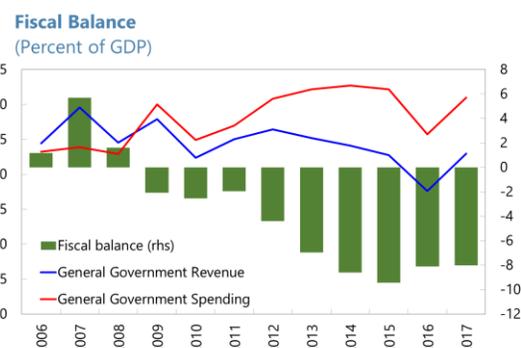
- Baunsgaard, T., M. Villafuerte, M. Poplawski-Ribero, and C. Richmond. 2012. "Fiscal Frameworks for Resource Rich Developing Countries", IMF Staff Discussion Note SDN/12/04, (Washington: International Monetary Fund).
- International Monetary Fund. 2012. "Macroeconomic Policy Frameworks for Resource-Rich Developing Countries—Analytical Frameworks and Applications," IMF Policy Paper (Washington: International Monetary Fund).
- Medas, P and D. Zakharova. 2009. "A Primer on Fiscal Analysis in Oil-Producing Countries" IMF Working Paper 09/56 (Washington: International Monetary Fund).
- Kanda, D. and M. Mansilla. 2014. "Modeling Appropriate Fiscal Targets and Optimal Consolidation Paths for Resource-Rich Countries: The Case of Suriname" IMF Working Paper 14/121 (Washington: International Monetary Fund).
- Ossowski, R and H. Hålland. 2016. "Fiscal Management in Resource-Rich Countries: Essentials for Economists, Public Finance Professionals and Policy Makers" World Bank Studies, Washington, DC: World Bank, doi: 10.1596/978-1-4648-0495-3.
- World Bank. 2017. "Suriname Sector Competitiveness Analysis: Identifying Opportunities and Constraints to Investment and Diversification in the Agribusiness and Extractives Sectors." World Bank, Washington, DC. License: Creative Commons Attribution CC BY 3.0 IGO.

FISCAL MULTIPLIERS OF GOVERNMENT SPENDING¹

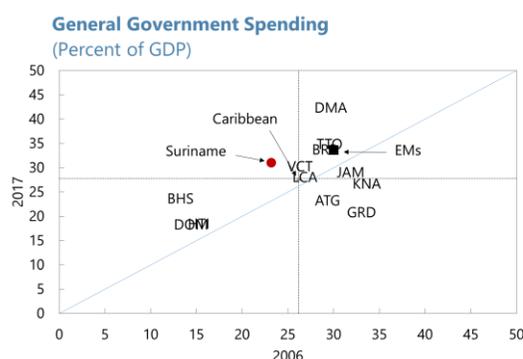
A. Introduction

1. **Suriname has experienced a sharp increase in fiscal deficits in recent years partly due to higher spending.**² The fiscal balance averaged $-7\frac{1}{2}$ percent of GDP during 2012-2017, significantly lower than the average of 0.3 percent of GDP during 2006-2011. Of this 8 percent of GDP deterioration in the fiscal balance, $5\frac{1}{2}$ was due to higher spending and $2\frac{1}{2}$ was due to lower revenues. While higher government spending and lower revenues are almost equally important for the case of Suriname, this paper focuses only on government spending.³ Nonetheless, considering Suriname's vulnerability to potential resource revenue shocks, which could be short but severe such as for 2013-2016, an emphasis on sustainable spending is very important.

2. **The rise in Suriname's government spending is higher than its peers.** The increase in Suriname government spending from 2006 to 2017 (7.7 percent of GDP) is higher than the average increase in the Caribbean (1.2 percent of GDP) and the average increase for the broader group of emerging markets economies (3.4 percent of GDP).⁴



Sources: IMF FAD Expenditure Assessment Tool; and World Economic Outlook.



Sources: IMF FAD Expenditure Assessment Tool; and World Economic Outlook.

¹ Prepared by Ippei Shibata (WHD).

² Public debt ratio has sharply increased from 26.3 percent of GDP in 2014 to 77.2 percent of GDP in 2017 based on the IMF definition of debt.

³ For the revenue side, the Surinamese government is making preparations to implement the VAT.

⁴ Average values for Caribbean and emerging market economies are based on Expenditure Assessment Tool as of September 2018 while values for Suriname reflect the latest framework consistent with the 2018 AIV staff reports.

3. **What stands out for Suriname, and the rest of the Caribbean, is the compositional changes towards less capital spending.** Despite the increases in overall spending, during 2006-2017 capital spending in Suriname was cut by 0.5 percent of GDP. For the Caribbean average, capital spending was cut even more severely by 2.2 percent of GDP. For the average of the broader group of emerging markets, capital spending was cut by only 0.2 percent of GDP during this period. Regarding the current spending, it increased by 8.3 percent of GDP in Suriname during this period. This value is significantly higher than the increases of 3.3 and 3.6 percent of GDP in current spending during this period for both the average of the Caribbean and the average of the broader group of emerging market economies, respectively.

Change in Total Spending from 2006-2017
(Percent of GDP)

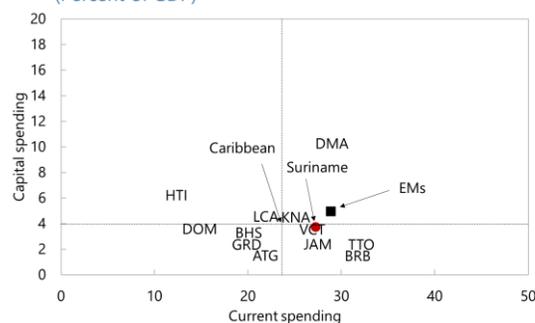


Sources: IMF FAD Expenditure Assessment Tool; and World Economic Outlook.

4. **In terms of level as of 2017, capital spending in Suriname is close to the average of the Caribbean but is lower than the average of the broader group of emerging market economies.**

However, Suriname's current spending as a percent of GDP is above the Caribbean average and is lower than the average of the broader group of emerging market economies.

Current and Capital Spending 2017
(Percent of GDP)



Sources: IMF FAD Expenditure Assessment Tool; and World Economic Outlook.

5. **What are the growth implications of a change in government spending for Suriname?** Given Suriname's large deficits and high level of government spending, fiscal consolidation is an important tool for policymakers to ensure suitability. A large body of empirical literature has attempted to estimate fiscal multipliers looking into the impact of fiscal policy on growth (e.g. Blanchard and Perotti, 2002, Auerbach and Gorodnichenko, 2012). However, most studies have focused on total government spending and on certain region or income types (e.g., Abiad, Furceri, and Topalova, 2016). Only a few have estimated fiscal multipliers for different types of government spending, and even fewer with a focus on the Caribbean countries.

6. **This paper examines the fiscal multipliers of government investment and current spending with a stronger focus on the Caribbean countries.** Using the IMF's World Economic Outlook (WEO) data for 1990-2017 for 16 countries (9 in the Caribbean and 7 in Latin America), we employ a forecast error approach to obtain exogenous unanticipated variations in government spending. With the forecast error as an instrument, we use a local projection method as in Jorda (2005) to estimate differential growth impacts of investment spending and current spending.

7. **The rest of the paper is organized as follows.** Section B discusses empirical strategy and Section C discusses data. Section D presents empirical results, and Section E provides policy implications.

B. Empirical Strategy

8. **This paper uses a local projection methodology as in Jorda (2005).** This methodology (unlike a Vector Autoregression, VAR, approach) allows for a non-linear response of real GDP to a change in a fiscal variable. The growth impacts of fiscal shocks are estimated using the following baseline specification:

$$Y_{i,t+h,t-1} = \alpha_i + \gamma_t + \beta G_{i,t} + \delta X_{i,t} + \epsilon_{i,t} \quad (1)$$

where $Y_{c,t+h,t-1}$ is GDP growth rate between year $t-1$ and $t+h$ for country i ; α_i is a country fixed effect capturing factors that are time-invariant and country-specific; γ_t is the time fixed effect that captures a common factor affecting country's growth each year; $G_{i,t}$ is growth rate of fiscal variable (i.e. public investment and public current expenditure) which will be instrumented by an unanticipated shock of the fiscal variable (as in Ramey and Zubairy, 2018); $X_{i,t}$ is a set of control variables including two lags of GDP growth rates, two lags of fiscal variable growth rates, and terms of trade for country i in year t .

9. **To estimate a causal impact of increase in government spending on GDP growth, we instrument government spending by forecast errors, which are plausibly exogenous variations in the government spending.** We use the IMF's October publications of World Economic Outlook (WEO) for 1990-2017 vintage data following Furceri and Li (2017). Forecast errors are constructed from the annual growth rates of public investment and public current spending. We calculate the shock of the fiscal variable, $ShockG_{i,t}$, as the difference between *actual* and *forecast* growth rates:

$$ShockG_{i,t} = G_{i,t}^{Actual} - G_{i,t}^{Forecast} \quad (2)$$

where actual growth rate of fiscal variable, $G_{i,t}^{Actual}$ is calculated based on the October WEO of the following year; forecast growth rate, $G_{i,t}^{Forecast}$ is calculated based on the October WEO of that year. For instance, forecast the growth rate for year 2015 is taken from the growth rate of the fiscal variable from October WEO 2015 and the actual growth rate is taken from the growth rate of the fiscal variable from October WEO 2016, for year 2015.

C. Data

10. **The estimation is performed using data from the WEO database spanning 1990-2017.** For real GDP growth, we use the October 2017 WEO vintage to calculate the real GDP growth rate based on real GDP series *ngdp_r*. This is to avoid any possible measurement errors that may arise from data revision and updates of compilation methodology. We use the historical *vintage* IMF WEO database to calculate relevant variables. Public investment spending uses series *nfig*, following the recent IMF's Regional Economic Outlook (REO) for the Western Hemisphere region (2018). Public current spending uses current expenditure series *gcec* prior to 2000 and

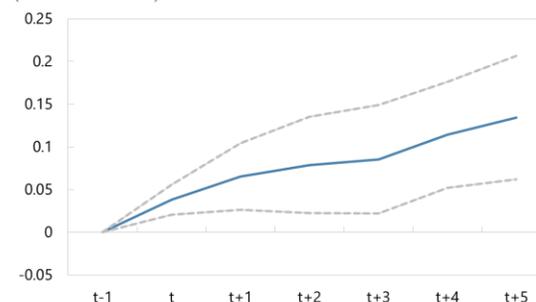
calculates by subtracting general net-acquisition of nonfinancial assets $ggaan_t$, and interest payment, $ggei$ from total general government expenditure gge thereafter. Terms of trade index uses series ttt . The sample was limited by excluding outliers that have extremely high growth rates in the variables and are left with 16 Latin American and Caribbean countries: Bahamas, Belize, Columbia, Dominica, Ecuador, Grenada, Guatemala, Honduras, Jamaica, Panama, Paraguay, St. Kitts and Nevis, St Lucia, Suriname, Trinidad and Tobago, and Uruguay.

D. Results

11. **Our results suggest that government investment has a significant positive growth impact while current spending has a negligible growth impact.** A one percent

increase in government investment spending would increase GDP by less than 0.1 percent in the same year. Its growth impact is about 0.1 percent in the following year ($t+1$). With a historical average of around 4.0 percent of GDP on government investment spending for the sample, the results would translate into a fiscal multiplier of 1.0 on impact and 1.6 a year later. On the other hand, government current spending does not have a significant impact on growth.

Cumulative Impulse Response: Investment Expenditure
(Percent of GDP)

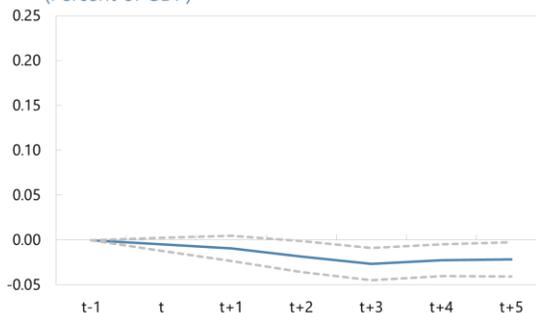


--- 95% C.I (Specification 5). A shock size is in one percent of fiscal variable.
Sources: World Economic Outlook; and IMF Staff Estimations.

12. **The results are robust to various specifications.** Table 1 presents the estimates

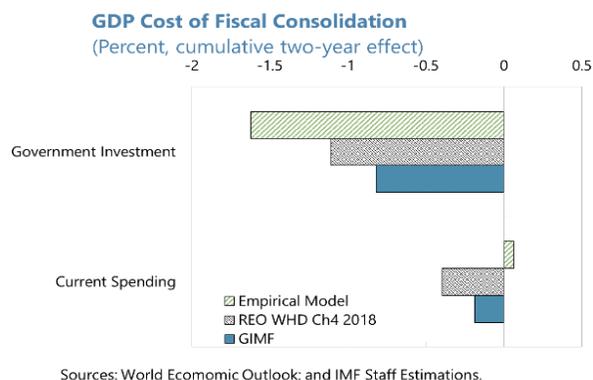
of growth impacts by increase in government investment spending and current spending under various specifications. Specification 1 estimates fiscal variable coefficients (i.e. government investment spending and current spending) with only country and time fixed effects. Specification 2 further adds two years of lags of GDP growth rates and two years of lags of the fiscal variable. Specification 3 further adds the terms of trade to capture commodity price movements. Specification 4 uses an instrument variable approach and estimates investment spending and current spending in separate regressions. A separate or joint estimations of government investment spending and current spending both confirm that the growth impact of public investment spending is strong in a short run while that of public current spending is very limited. In all cases, government investment expenditure has a positive and statistically significant GDP impact while current spending has a negligible impact on growth.

Cumulative Impulse Response: Current Spending
(Percent of GDP)



--- 95% C.I (Specification 5). A shock size is in one percent of fiscal variable.
Sources: WEO and IMF Staff Estimations.

13. **The results are consistent with findings in other studies.** The GDP cost of fiscal consolidations across different models—i) the current empirical study, ii) IMF Global Integrated monetary and Fiscal Model (GIMF)'s model, and iii) IMF's 2018 Regional Economic Outlook: Western Hemisphere Department (REO WHD)'s estimates (2018) all show that public investment has a larger growth impact than current spending.⁵ The growth impacts of government investment are much higher than those of the current spending.



E. Policy Implications

14. **This paper suggests several policy implications for Suriname, which faces a high deficit and thus needs to consolidate going forward:**

- i. Suriname needs to embark on a consolidation path to contain public debt at a sustainable level.
- ii. When faced with choices, policymakers should not sacrifice government investment spending for current spending as it has a significant growth impact. The case for pro-growth spending is even more acute when considering vulnerability of public finances in Suriname to resource revenue shocks.
- iii. In particular, Suriname should gradually reduce electricity subsidies, which are part of current spending and thus should not have a significant growth impact.
- iv. Suriname should also continue strengthening public financial management to enhance the growth impact of public investment.

⁵ The samples of countries in this study and 2018 REO WHD are different. While 19 LAC countries in REO WHD only include a few Caribbean countries, the current study includes more Caribbean countries. REO WHD's 19 LAC countries are: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.

Table 1. Suriname: Empirical Results

Dependent Variable: GDP Growth Rate in year t+h										
	Specification 1		Specification 2		Specification 3		Specification 4		Specification 5	
Controls										
Investment Expenditure	Beta	t-stat								
t	0.04	4.51	0.03	4.38	0.03	4.39	0.04	3.32	0.04	4.30
t+1	0.07	3.95	0.05	3.90	0.05	3.90	0.05	2.02	0.07	3.27
t+2	0.08	3.40	0.06	3.32	0.06	3.31	0.02	0.60	0.08	2.75
t+3	0.09	3.53	0.07	2.92	0.07	2.91	0.01	0.16	0.09	2.63
t+4	0.10	4.30	0.08	2.97	0.08	3.00	0.00	0.10	0.11	3.60
t+5	0.11	4.15	0.09	2.93	0.09	2.97	-0.03	-0.60	0.13	3.64
Current Spending	Beta	t-stat								
t	0.00004	29.5	0.000	-0.02	0.000	-0.04	-0.001	-0.20	-0.005	-1.28
t+1	0.00006	32.3	-0.005	-0.60	-0.005	-0.63	-0.004	-0.47	-0.009	-1.28
t+2	0.00008	36.3	-0.008	-0.70	-0.008	-0.73	-0.004	-0.33	-0.018	-2.10
t+3	0.00007	29.5	-0.005	-0.42	-0.005	-0.42	-0.003	-0.21	-0.027	-2.90
t+4	0.00003	10.8	0.004	0.31	0.004	0.32	0.007	0.47	-0.022	-2.48
t+5	-0.00011	-50.1	0.004	0.28	0.004	0.28	0.008	0.48	-0.021	-2.19
Country Fixed Effects	Yes									
Time Fixed Effects	Yes									
2 Lags of GDP			Yes		Yes		Yes		Yes	
2 Lags of Fiscal Variable					Yes		Yes		Yes	
Terms of Trade							Yes		Yes	
IV estimation							Yes		Yes	
Fiscal Var Jointly Estimated									Yes	

References

- Abiad, A., D. Furceri, and P. Topalova. 2016. "The Macroeconomic Effects of Public Investment: Evidence from Advanced Economies." *Journal of Macroeconomics* 50: 224–40.
- Auerbach, A. J., and Y. Gorodnichenko. 2012. "Measuring the Output Responses of Fiscal Policy." *American Economic Journal: Economic Policy* 4 (2): 1–27.
- Blanchard, O., and R. Perotti. 2002. "An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output." *Quarterly Journal of Economics* 126: 51–102.
- Fuceri, D., and B. G. Li. 2017. "The Macroeconomic (and Distributional) Effects of Public Investment in Developing Countries" *IMF Working Paper 17/217*, International Monetary Fund, Washington DC.
- International Monetary Fund, 2018. Chapter 4 "Fiscal Multipliers: How Will Consolidation Affect Latin America and Caribbean?" *Regional Economic Outlook: Western Hemisphere Region April 2018* Ch.4.
- International Monetary Fund. FAD Expenditure Assessment Tool. (EAT).
- Jorda, O. 2005. "Estimation and Inference of Impulse-Response by Local Projections." *American Economic Review* 95(1): 161-82.
- Ramey, V. A, and Zubairy S. 2018. "Government Spending Multipliers in Good Times and in Bad: Evidence from US Historical Data" *Journal of Political Economy*: 126:2, 850-901.

A MACHINE LEARNING APPROACH TO FORECASTING GDP¹

- GDP is a critical indicator of the health of the economy but is often lagged.** In addition, GDP data is subject to revisions which make it difficult to assess the current state of the economy. Suriname's GDP is released after 3 quarters but is subject to revisions for 3 years, some of which can be large. Many policymakers turn to high frequency data to make an assessment, but in many countries, such data does not exist.
- The Central Bank (CBvS) estimates economic activity for policy making using a monthly economic activity index (MEAI).** This is done using high frequency data, some of which, is not publicly available. The publicly available high frequency data is sparse and is often still subject to lags. The current lag of the MEAI is around 5 months.
- We propose a method of estimating GDP with publicly available high frequency data using the machine learning (ML) approaches.** ML is a very powerful tool but its use in macroeconomics has been somewhat limited because it requires very large datasets. We innovate a method to expand the available dataset for Suriname. We identify cross-country structural characteristics using ML, which help expand the dataset available for each individual country. We assume that countries that are structurally similar to the country of interest will be subject to the same external shocks and they will propagate through the economy in a similar way. This is done in 2 stages:

Stage 1: Identify the countries that have structural similarities.

- Using big data on the structure of the economy and the categories of exports from the CIA Factbook, we group countries by structural similarities using two ML methods.** We use principal component analysis (PCA) for dimensionality reduction to encode countries into their latent factors and then use encoded latent factors to group similar countries using Gaussian mixture model (GMM). Our second approach is to use SimRank to find similar countries to Suriname based on their major shared industries.

Suriname's Structurally Similar Countries	
Gaussian Mixture Model	SimRank
Bolivia	Belize
Chile	Brazil
Guyana	Colombia
Haiti	Guyana
Honduras	Peru
Panama	
Paraguay	

Source: Fund staff calculations.

Stage 2: Employ elastic net regression method to forecast the variable of interest.

- Elastic net regression is similar to an ordinary least squares regression (OLS) with two penalty terms.** The first is called the ridge penalty that compresses the estimates towards

¹ Prepared by Thomas Dowling (WHD), Yang Liu, and Mamoon Saeed (both ITD).

zero. The second is called the LASSO penalty that allows the coefficients to be zero when they are very small, resulting in a parsimonious model. The elastic net approach chooses to tradeoff variance for bias in order to maximize the accuracy of forecasting out of sample. We augment the naive elastic net regression model to accommodate the addition of the GDP growth rates of the countries identified in the previous exercise:

$$loss = \sum_i^N \sum_{j=1}^{N_i} (\|y_{i,j} - \mathbf{X}_{i,j}\beta - b\|^2) + \lambda_2 \|\beta\|^2 + \lambda_1 \|\beta\|_1 \quad (1)$$

i from 1 to N which represents i^{th} country and j from 1 to N_i which represents the j^{th} observation in the i^{th} country samples such that,

$$\begin{aligned} \beta &= \underset{\beta}{\operatorname{argmin}} (\sum_i^N \sum_{j=1}^{N_i} (\|y_{i,j} - \mathbf{X}_{i,j}\beta - b\|^2) + \lambda_2 \|\beta\|^2 + \lambda_1 \|\beta\|_1) & (2) \\ b &= \underset{b}{\operatorname{argmin}} (\sum_i^N \sum_{j=1}^{N_i} (\|y_{i,j} - \mathbf{X}_{i,j}\beta - b\|^2)) & (3) \end{aligned}$$

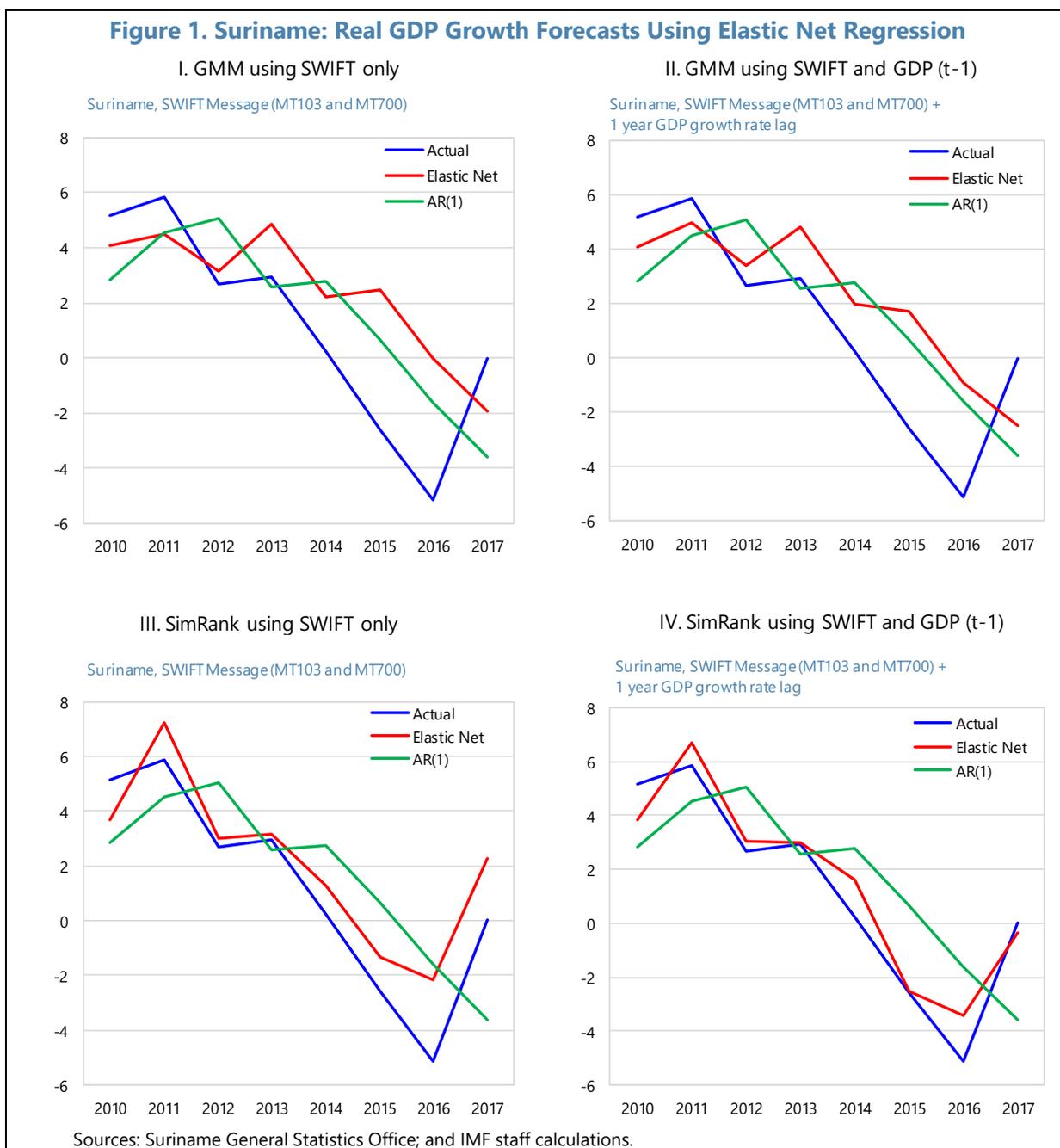
The parameters β and b are optimized by minimizing the loss function where y are the GDP growth rates in time t and \mathbf{X} are the predictors which include the SWIFT data in time t and the GDP growth rates in $t-1$. Then the nowcast equation is:

$$\widehat{y}_{SUR,t} = \hat{\beta}_1 y_{SUR,t-1} + \hat{\beta}_2 SWIFT_{103,SUR,in,t} + \hat{\beta}_3 SWIFT_{103,SUR,out,t} + \hat{\beta}_4 SWIFT_{700,SUR,in,t} + \hat{\beta}_5 SWIFT_{700,SUR,out,t} + \hat{b} \quad (4)$$

where the SWIFT messages used for inflows and outflows are MT103 (financial institutions transfers) and MT700 trade related messages.

6. We add high frequency SWIFT data that captures financial transactions and international trade to address the lag as these data are released 9 days after the close of the period. The forecasts are 1-step ahead and the training set used to optimize the model is from time 0 to $t-1$. Then we estimate the following optimizations (Figure 1):

- i. using Suriname's SWIFT data we estimate GDP growth using an AR(1) (*RMSE 2.6%*) model as a benchmarking exercise then we use the naive elastic net regression approach on the Suriname SWIFT data (*RMSE 2.9%*) and find that the AR(1) still performs better;
- ii. adding the GDP lagged by 1 period of the countries identified by GMM (*RMSE 2.5%*) we find that there is a slight improvement in the forecast;
- iii. using SWIFT data of the countries identified by SimRank and the augmented elastic net regression approach we see an improvement in the forecasting power (*RMSE 1.6%*);
- iv. adding the GDP lagged by 1 period of the SimRank countries increases the forecasting power (*RMSE 1.0%*) of the model significantly.

Figure 1. Suriname: Real GDP Growth Forecasts Using Elastic Net Regression

7. **The additional forecasting accuracy of the ML approaches suggest this is a useful tool for policymakers.** Additional expansion of the dataset with other big data sources such as exchange rates, financial market data, COMTRADE, APIs, or media/word count/IoT data could help increase forecasting accuracy even further. The team is developing a tool that can be easily employed for use by researchers and policymakers.

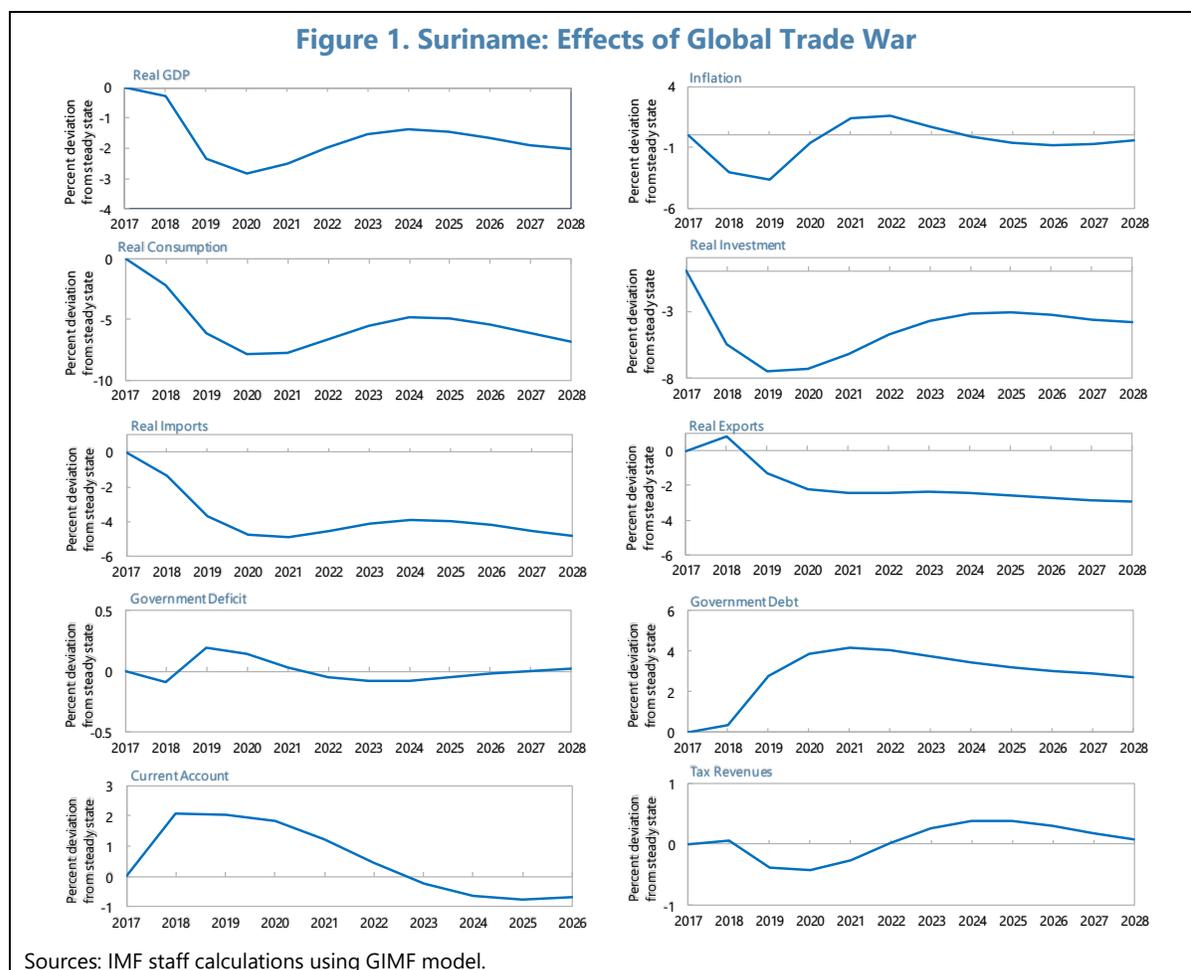
References

- Bishop, C. (2006). *Pattern recognition and machine learning*. New York, NY: Springer.
- Jeh, G. and Widom, J. (2002). SimRank: a measure of structural-context similarity. In *KDD '02 Proceedings of the eighth ACM SIGKDD international conference on Knowledge discovery and data mining* (pp. 538-543). New York, NY: ACM.
- Zou, H. and Hastie, T. (2005). Regularization and variable selection via the elastic net. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, 67.2, 301-320.

SILLOVERS FROM ABROAD¹

1. **The IMF's Global Integrated Monetary and Fiscal (GIMF) model provides some insights on the spillovers of a potential global trade war and the tax cuts that were approved last year in the U.S. onto the Surinamese economy.** This model is a dynamic general equilibrium model that allows the analysis of monetary and fiscal policies, and their spillover across economies, and is widely used to conduct policy analysis in IMF flagship publications. The 3-economy version of the GIMF used in the simulations has been calibrated to replicate key macroeconomic ratios such as the external openness, the tax collection and composition, fiscal spending patterns, and trade relationships among Suriname, the United States, and an aggregate of rest of Suriname's trading partners.
2. **In the context of the 2018 Article IV consultation, the GIMF was used to answer the following key questions:** What are the likely spillovers of a potential global trade war on Suriname? How would a tax reform in the U.S. (along the lines that was approved last year) would affect Suriname?
3. **A global trade war would affect every country even if it is not directly targeted by tariffs.** Indirect effects like reduced trade volume, supply chain disruptions and lost confidence would damage economic growth everywhere. The GIMF model enables us to quantify how much damage an active trade war could bring to the Surinamese economy.
4. **In the model, we have assumed the U.S. and the rest of the world raise tariffs on imports from each other by 10 percentage points.** Suriname tariffs vis-a-vis the U.S. or rest of the world—including Suriname's import tariffs on goods from its trading partners and the trading partners' tariffs on exports from Suriname—are assumed to be unchanged.
5. **The results suggest that there will be substantial effect of this global trade war on the Surinamese economy.** The levels of real GDP, imports, exports, consumption and investment will be permanently lower, given that the cost of producing goods globally increases (Figure 1). Government debt as a percent of GDP increases through the medium term, but very gradually returns to its steady state value after the medium term.

¹ Prepared by Kadir Tanyeri.



6. **A second exercise assesses the effects of tax cuts, along the lines approved in the U.S. last year on Suriname.** The U.S. is Suriname’s largest trading partner. In addition, the Surinamese economy is highly dollarized. As a result, the economic policies and developments in in the U.S. heavily influence Suriname. This exercise involves illustrative deficit enhancing tax cuts in the U.S., which are in line, but not precisely the same as the U.S. tax cuts approved last year (text table). These include permanent corporate tax cuts in the U.S. with a cumulative size of 1.5 percent of GDP, in addition to temporary tax cuts on labor with the peak size of 0.5 percent of GDP.

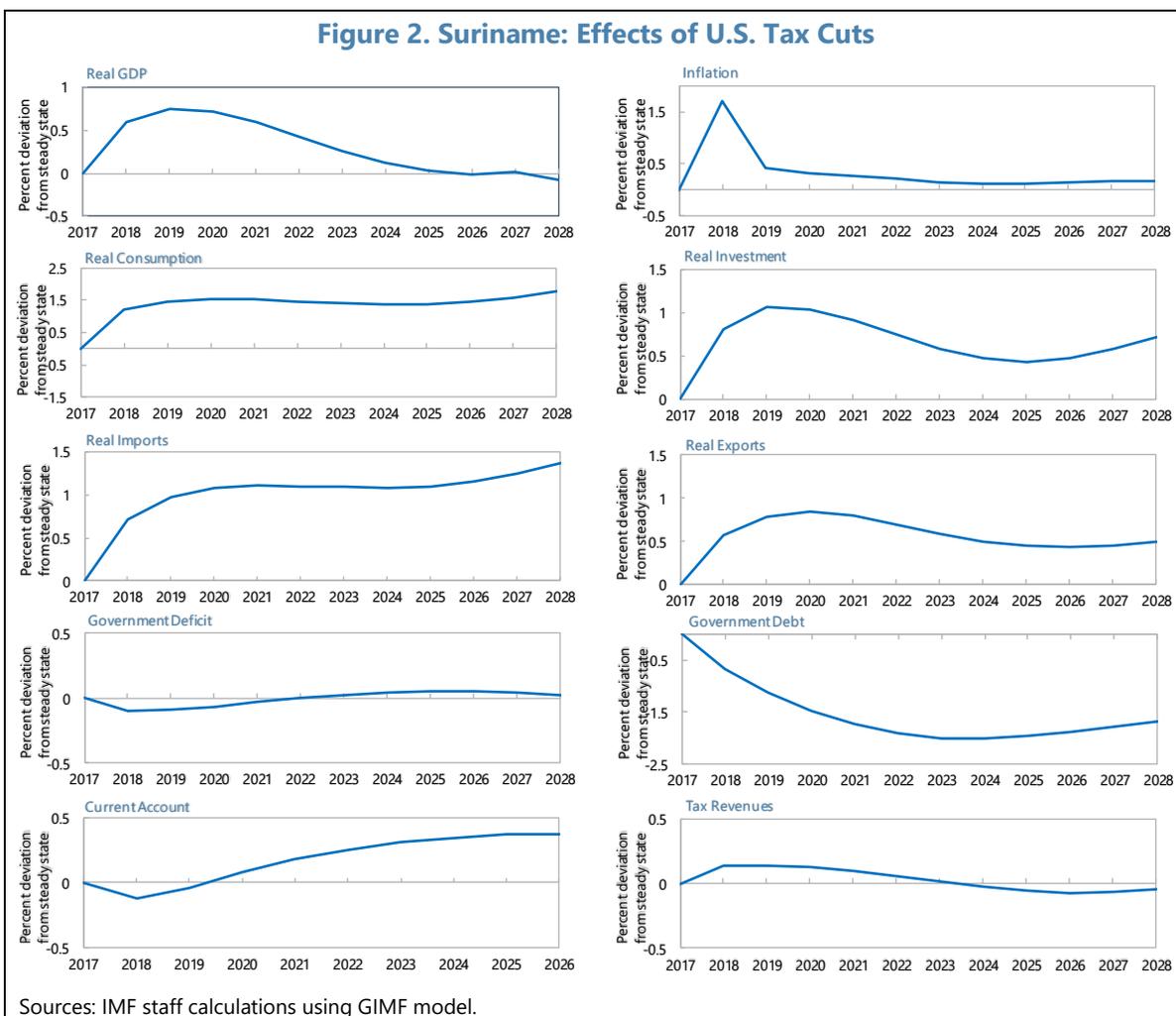
Simulated Fiscal Policy Changes in the United States
(Changes in percent of GDP, resulting from changes in tax rates)

	2018	2019	2020	2021
Tax on capital (Permanent)	-0.5	-1.5	-1.5	-1.5
Tax on labor (temporary; reverses starting 2022)	-0.25	-0.5	-0.5	-0.5

Source: IMF staff calculations.

7. **The results provide the following insights.** First, some effects can be substantially different in the short term than in the long term (Figure 2). In the short term, the U.S. will have higher demand for imports from Suriname and the rest of the world to feed through its increased domestic demand, part of which is for investment and capacity building. This boosts

Suriname’s exports. Since Suriname’s exports have a high import content, imports also rise. More net exports lead to more income and more consumption and, investment and GDP as well. As the U.S. builds capacity and produces more, its need for imports decrease and further benefits of the U.S. tax cuts on Suriname gradually disappear. In addition, as the temporary labor tax cuts expire their effects in the U.S. and spillovers onto the Surinamese economy disappear too. In sum, the U.S. corporate tax cuts indeed make the U.S. more efficient and lead to permanent increases in economic activity in the U.S. because they reduce distortions at the production level. While these expansions have a lingering effect on economic activity in Suriname, their long-term effect on the Surinamese GDP will be minimal.



References

Kumhof, M., Laxton, D., Muir, D. and Mursula, S. (2010). "The Global Integrated Monetary and Fiscal Model (GIMF) – Theoretical Structure." IMF Working Paper 10/34 (Washington: International Monetary Fund).

Freedman, C., Kumhof, M., Laxton, D., Muir, D. and Mursula, S. (2009). "Fiscal Stimulus to the Rescue? Short-Run Benefits and Potential Long-Run Costs of Fiscal Deficits Rank." IMF Working Paper 09/255 (Washington: International Monetary Fund).