Fiscal Sustainability in Burundi

Baseline Projections, Stochastic Simulations, and Policy Scenarios

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Abstract

This paper analyzes Burundi's medium-term fiscal sustainability in the light of the country's vulnerability to various shocks. Earlier studies have highlighted the country's vulnerability to exogenous shocks related to commodity exports, rain-fed agriculture, and volatile foreign aid. Internally, uncertainty about the implementation of the government's fiscal reforms is a key risk. The earlier studies, however, did not quantify the size and impact of the risks on the country's fiscal sustainability. Drawing initially on the standard intertemporal sustainability framework, the baseline analysis shows that Burundi's ongoing fiscal policy strategy is not sustainable, even with a gradually improving external environment and relatively strong growth. Stochastic simulations show that adverse shocks to rainfall or

coffee prices could increase the country's debt-to-gross domestic product ratio by 5 to 7 percentage points above the projected baseline ratio. Aid shocks could have an even larger impact but the estimates are less statistically reliable because of the short time series and because historical volatility in part reflects endogenous shocks (such as reform implementation) as well as exogenous shocks (donors' behavior). The policy scenario analysis shows that future fiscal sustainability will hinge on the government's ability to stick to its plans to broaden the tax base, streamline generous tax incentives and exemptions, and control civil service wages and short-run expenditure pressures—risks that need to be monitored closely over the political cycle in the country

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**Fiscal Sustainability in Burundi:
Baseline Projections, Stochastic Simulations, and Policy Scenarios**

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1. Introduction

Despite recent economic growth, Burundi faces serious economic challenges. Between 2001 and 2012, the country's real GDP grew on average by 3.5 percent a year (Figure 1). Although this was a significant improvement over the previous decade of recurrent civil conflict, the recovery in growth was much less pronounced than in other post-conflict countries (Figure 2). Given Burundi's rapid population growth—the fifth highest in the region at around 3 percent per year—growth in per capita GDP averaged only around 1 percent a year—not enough to make a significant dent in poverty among its 10 million people.¹

Figure 1. GDP and per capita GDP growth, 1980–2012

Source: World Bank World Development Indicators and IMF World Economic Outlook

¹ Based on World Bank World Development Indicators in 2012.

Figure 2. Post-conflict recovery in per capita GDP, in selected post-conflict countries

Source: World Bank World Development Indicators and IMF World Economic Outlook.

After the conclusion of the initial peace accord in 2000, the government, with the help of the international community, introduced economic reforms to stabilize the economy and began the process of reconstruction. To restore the fiscal base and improve tax collection, the Burundi Revenue Authority (OBR) was established in 2009. To strengthen budget transparency and integrity, a number of reforms were enacted, including creation of a court of audit, adoption of modern budget laws, and introduction of a single treasury account. Significant progress has also been made in health and education. For example, the elimination of school fees in 2005 has boosted primary enrollment to nearly 100 percent; and introduction of free health care for children under five and for pregnant women have contributed to the country's progress toward Millennium Development Goals.²

However, there were setbacks. Despite the return of steadier growth and increases in external grants, the fiscal deficit (including grants) persisted, averaging 3–4 percent of GDP. As the government increased spending on health, education, and security, the size of the civil service rapidly expanded—caused by the “absorption of former rebels in lawful security forces” and later by hiring in the health and education sectors. Spending on wages and compensation, as a result, shot up by more than 80 percent in real terms in 2005–2010. The government's revenue raising efforts, in the meantime, remained erratic, with occasional reverses, such as the failure to

² IMF Country Report No. 11/269.

end or streamline tax subsidies or to broaden the tax base.³ Institutions remain weak and serious governance issues have occasionally threatened to undermine donors' confidence (Figure 3).⁴

The country's vulnerability to external shocks further complicates economic and fiscal management in the fragile post-conflict environment. Wide fluctuations in domestic food production—linked to climate change—leave the country vulnerable to volatility in the prices of international food crops. Although subsistence agriculture engages the vast majority of the population, domestic production is insufficient to meet the country's food needs, and it relies on food imports to cover the deficit. Reliance on a few commodity exports—mainly coffee and tea—further exposes the country to volatility in international commodity prices. Finally, the country's heavy dependence on foreign aid—the second highest in the region relative to GDP—also negatively affects the policy continuity, with adverse consequence for investment and growth (Figure 4).

Figure 3. Selected CPIA Scores in 2012

Source: World Bank.

³ More discussions on these topics below.

⁴ For example, an illegal sale of public assets in 2006 which resulted in millions of public revenue losses, and a illegal and fraudulent budget payment to a private company in 2007 which resulted in the suspension of the IMF PRGF program and delays in budget support from other donors (IMF 2011).

Figure 4. Grants in selective countries (percent of GDP)

Source: World Bank

Today, Burundi is at the crossroads. As the country prepares for the next election in 2015, political and security pressures may make it difficult for the government to implement tight macroeconomic policies. The economic situation is still fragile and maintaining reform momentum is a challenge. Can the government strengthen the fiscal management, prevent the repeated cycles of policy slippage and tightening, and restore and strengthen confidence of the private sector to begin investing in the future prosperity of the country?

This paper seeks to help the government and the international community think strategically about Burundi's medium-term fiscal sustainability and priorities for reform. It analyses key risks to the country's fiscal sustainability and quantify their likely impact on the budget, in view of helping the government prioritize policy actions to better manage future risks, build buffers, and protect priority spending on essential public goods to support sustained growth and poverty reduction.⁵ To assess fiscal sustainability, the paper will initially draw on the standard inter-temporal sustainability framework, followed by sensitivity, stochastic, and scenario analyses. The standard framework is deterministic, and defines fiscal sustainability as a

⁵ The paper defines the fiscal sustainability as a situation where the government is expected to meet its current and future financial obligations without unrealistically large future corrections in the balance of revenue and expenditure. The current and future financial obligations will include the statutory payments such as debt service payments to the creditors as well as the implicit commitment to continue providing certain public goods, services, and transfers in the future (Hemming and Petrie 2000). Technically, the definition implies that the present value of government disbursements does not exceed the present value of revenues in the medium term (usually defined as 3 to 5 years), and the assessment of the fiscal sustainability relies on simulation of the debt to GDP ratio given specific macro forecast and fiscal policy assumptions for the period.

situation in which the present value of government disbursements does not exceed the present value of revenues given specific macroeconomic forecasts and assumptions about fiscal policy. However, to take into account the importance of external and internal risks in Burundi, the paper will also draw on sensitivity analysis, stochastic simulations, and scenario analyses to gauge the impact of various risks on the fiscal projections and consequences of alternative policy actions.

In so doing the paper seeks to contribute to the existing literature in several ways. Earlier studies on Burundi have highlighted the country's vulnerability to external shocks related to commodity exports, rain-fed agriculture, and foreign aid.⁶ Internally, uncertainty about the implementation of the government's fiscal reform is also a key risk.⁷ But these studies have not quantified the size and impact of the risks on the country's fiscal sustainability. This paper contributes to filling this gap by estimating the size of the fiscal risks, by applying both the standard inter-temporal framework and stochastic simulation. The paper also complements other fiscal sustainability studies undertaken by the World Bank using similar approaches in countries such as Botswana, Cape Verde, Malaysia, Nigeria, Russia, and Turkey—and is one of the first application of these approaches to a low income country. Finally, by examining the fiscal risk arising from volatility in rainfall, the paper is also one of the first to study the impact of climate change on a country's fiscal sustainability.

The paper is organized as follows. Section 2 presents the baseline analysis, which will examine the medium-term consequences of Burundi's current fiscal strategy using the estimated outturn for the preceding year's budget as the starting point and assuming unchanged policy in the short term (2013–14). The medium term macro-fiscal framework (2013–17) will be aligned with the latest projections available from the World Bank and the IMF's country policy dialogue. Section 3 carries out risk analysis, which will examine the sensitivity of fiscal outcomes obtained under the baseline by subjecting them to various country-specific shocks (also known as fiscal risk analysis). The calibration of the shocks—e.g., their types, sizes, and transmission mechanisms—will be informed by the historical data. Section 4 then carries out the policy scenario analysis, which will examine different fiscal strategies for Burundi with a view to identifying policies that will help keep the country on a sustainable path and make it more resilient to shocks. Section 5 concludes.

⁶ For example, Lim, C. and L. Rugwabiza (2009), World Bank (2011), and IMF (2012).

⁷ For example, World Bank (2008) and IMF (2011).

2. Baseline Analysis

Macroeconomic assumptions

The assumptions underlying the projections in this analysis of fiscal sustainability are in line with the IMF's most recent review under the Extended Credit Facility (March 2013). The main macroeconomic assumptions for the baseline are shown in Table 1.

Table 1. Baseline Projections: Macroeconomic Assumptions

	Act 2011	Prelim 2012	Proj 2013	2014	2015	2016	2017	Av. 2013-17
Real GDP growth rate (%)	4.2	4.0	4.5	5.1	5.5	5.5	5.5	5.2
Inflation (%)	14.3	15.4	11.1	7.8	6.0	5.5	8.3	7.7
Nominal exchange rate (LCU/ USD)	1,261.1	1,440.6	1,596.6	1,622.1	1,637.0	1,653.6	1,641.6	1,630.2
Coffee price (US cents per lb)	273.2	187.6	158.6	171.9	177.9	158.0	158.0	164.9
Oil (US\$/barrel)	104.0	105.0	102.7	98.5	94.7	91.9	89.4	95.4

Source: IMF (March 2013) and Joint World Bank–IMF Burundi Debt Sustainability Analysis (January 2013).

The macroeconomic scenario reflects improved external conditions, with moderate recovery in global growth, continued easing of international food and fuel prices, and strong regional economic activities. Real GDP growth is expected to accelerate over the five-year projection period starting in 2013—from 4.0 percent in 2012 to 4.5 percent 2013, 5.1 percent in 2014, and 5.5 percent in 2015–17. Agricultural output (35 percent of GDP) will continue to dominate economic performance. Recent developments in agro-industry, the construction of the hydroelectric dam (kabu 16) in 2013, and the construction of several road projects in the following years will sustain moderate growth in the secondary sector. Ongoing integration with the East African Community will support growth in wholesale and retail trade while also spurring investments in the tertiary sector more generally.⁸ Annual average inflation is expected to fall from 15.4 percent in 2012 to 11.1 percent in 2013 and to an average of 7.7 percent thereafter. The nominal exchange rate is expected to depreciate against the US dollar at an annual average rate of 2.7 percent.⁹ The coffee price is expected to bottom out in 2013 and then to fluctuate around the medium term average of 165¢ per pound. The oil price is expected to fall throughout the period, from US\$105 per barrel in 2012 to US\$89.4 per barrel in 2017.

Fiscal policy

The government is expected to continue implementing fiscal and structural reforms. Tax revenue is assumed to grow at 5.2 percent a year on average in real terms for the next five

⁸ Background information provided by EIU, CPIA, and IMF.

⁹ Check this is consistent with the inflation projection—depreciation rate is too slow compared to inflation rate (assuming, in effect, 5 percent inflation in the US?)

years.¹⁰ Non-tax revenue—mainly revenues from the sale of state assets, especially in the coffee sector¹¹—will generate additional revenue of around 1 percent of GDP in each year. Grants are assumed to decline as a share of GDP. The government is expected to limit the growth of wages for the civil service and the military. Total expenditure will decline as a share of GDP reflecting declines of similar magnitude in both current and capital expenditures. Ongoing public financial management reform is expected to enhance the effectiveness of public expenditure, offsetting the impact of the (relative) decline.¹²

The fiscal deficit over the next five years is expected to be financed mainly by grants and concessional borrowing from multilateral and bilateral creditors. Grants are expected to decline as a share of GDP as the country graduates from the post-conflict status and humanitarian assistance winds down. The government is expected to finance the remaining deficit mainly with highly concessional loans with grant element of at least 50 percent. Any remaining financing gap will be closed by a mixture of less-concessional external borrowing and domestic borrowing.

Baseline results

Even with strong growth in the economy and commensurate growth in tax revenues, the government will continue to struggle to create fiscal space and reduce debt from its currently high level (Table 2). Burundi is projected to run a deficit throughout the period, expanding from 1.7 percent of GDP in 2012 to 3.8 percent in 2014 and then moderating to 3.7 percent in 2015–2017. The dynamics is explained by the falling grants as a share of GDP and rigidities in current expenditure, mostly the wage bill. The combination of the two, in particular, expands the fiscal deficit in 2014. Although the government is expected to limit wage growth in real terms, unless additional revenue measures are introduced to offset the falling grants, it will struggle to reduce the deficits in the medium term. Gross financing needs will rise with the deficit, but are expected to be financed mostly with external concessional loans. Interest costs as a share of GDP will gradually fall, but with widening deficits, debt will remain high as a share of GDP.

The results suggest the authorities should persist with prudent fiscal policy as there is not much room to maneuver. Slippages in either revenue or expenditure targets will further worsen

¹⁰ The assumption on tax revenue growth is different from IMF, which assumes that share of GDP will grow from 13.8 percent in 2012 to 14.5 percent in 2016, which implies real growth in tax revenue of around 7 percent per year (of nominal growth of 15 percent per year). While it might make sense for the ECF, it will make more sense for the FSA to be on the conservative side, as the baseline in the FSA should represent largely a picture of “status quo”—i.e., not predicated upon major policy actions implemented for it to be realized. The impact of greater revenue efforts on the medium-term fiscal outcomes will be explored in the section on policy scenario analysis.

¹¹ Check this with Marco.

¹² That is, both current and capital expenditures are growing but not as fast as the nominal GDP.

the projected fiscal deficits. Room for additional borrowing is limited without causing macroeconomic sustainability: the country is already rated as being at high risk of debt distress by the latest Joint World Bank-IMF Debt Sustainability Analysis (DSA), and further domestic borrowing will worsen the inflationary pressure, increase exposure of domestic banks to the public sector, and risk crowding out private sector borrowing.

Table 2. Medium-Term Fiscal Projection: Baseline Scenario

(in percent of GDP unless otherwise indicated)

	Prelim. 2012	Proj. 2013	2014	2015	2016	2017
Revenue and Grants	33.0	29.4	26.6	25.9	25.8	24.2
Revenue	14.8	14.8	14.8	14.8	14.8	14.7
Tax revenue	13.8	13.8	13.8	13.8	13.8	13.8
Non-Tax Revenue 1/	1.0	1.0	1.0	1.0	1.0	0.9
Grants	18.2	14.6	11.8	11.1	11.0	9.4
Total expenditure	34.6	31.0	30.4	29.5	29.4	27.7
Current expenditure	22.2	19.9	19.7	18.7	18.6	17.5
Wages and salaries	8.0	7.3	7.5	7.4	7.3	7.0
Interest	0.9	0.8	0.8	0.7	0.7	0.6
Domestic interest	0.8	0.7	0.6	0.6	0.6	0.5
External interest	0.1	0.1	0.1	0.1	0.1	0.1
Other	13.3	11.7	11.5	10.6	10.6	9.9
Capital Expenditure	12.4	11.2	10.7	10.8	10.9	10.2
Overall surplus/ deficit	-1.7	-1.6	-3.8	-3.6	-3.7	-3.5
Primary surplus/ deficit	-0.7	-0.7	-3.1	-2.9	-3.0	-2.9
Financing	1.7	1.6	3.8	3.6	3.7	3.5
External borrowing, net	0.4	1.5	3.6	3.2	3.8	3.1
New borrowing	0.9	2.2	4.5	4.5	5.1	4.4
Amortization (- entry)	-0.5	-0.8	-0.9	-1.3	-1.3	-1.3
Domestic borrowing, net	0.8	-0.1	0.2	0.4	-0.2	0.4
New borrowing	1.3	0.1	0.7	0.8	1.0	1.0
Amortization (- entry)	-0.6	-0.2	-0.4	-0.4	-1.2	-0.6
Changes in financial assets 2/	-0.5	-0.2	0.0	0.0	0.0	0.0
Financing gap	0.0	0.0	0.0	0.0	0.0	0.0
<i>Memorandum items:</i>						
Nominal GDP (in BIF bn)	3,566	4,138	4,690	5,242	5,833	6,662
Government Debt (% GDP)	35.2	33.7	33.9	34.1	34.5	33.6
External debt	21.4	21.9	23.2	24.1	25.7	25.4
Domestic debt	13.8	11.8	10.7	10.0	8.8	8.1

Source: IMF (March 2013), DSA (January 2013), and the author's calculation.

Note: 1/ Includes sale of fixed capital assets. 2/ Negative sign denotes a reduction of financial assets.

3. Fiscal Risk Analysis

The above analysis is deterministic and its assessment of fiscal sustainability is predicated on a realization of given macroeconomic and fiscal policy projections. Macroeconomic outcomes in Burundi tend, however, to be very unpredictable because of the country's exposure to large shocks, both external and domestic. Forecasts are correspondingly volatile (Figure 5).

Figure 5. Changes in Growth Forecasts for Burundi

Source: IMF World Economic Outlook, April 2011–October 2012.

The sensitivity analysis in Table 3 shows how small changes in growth or the exchange rate would affect debt. If real GDP growth was 1 percentage point lower than we have forecast each year up to the year ending in 2017, tax revenue would be around 1.4 percent of GDP lower each year as a result. Lower GDP and the additional cumulative deficit would cause debt to rise to 39 percent of GDP, instead of 34 percent projected under the baseline. Similarly, if the exchange rate depreciated 1 percentage point faster than we have forecast each year up to 2017, the government's grant revenue would be higher while debt service on external debt would also be higher. Because of the offsetting benefits and costs, the impact on fiscal outcomes would be relatively muted, with the ratio of debt to GDP remaining at around the same level as baseline in case of faster depreciation.

Table 3. Sensitivity of Burundi's Debt to Small Changes in Macroeconomic Forecasts

	2013	2014	2015	2016	2017
Debt to GDP under the baseline	33.7	33.9	34.1	34.5	33.6
Impact of change in real GDP growth rate					
Lower GDP growth (-1%)	34.2	35.2	36.4	38.1	38.8
Higher GDP growth (+1%)	33.3	33.1	32.9	32.9	31.8
Impact of change in Exchange rate depreciation					
Lower depreciation rate (-1%)	33.7	33.9	34.4	35.3	35.2
Higher depreciation rate (+1%)	33.8	33.9	34.1	34.5	33.7

Source: The author's calculation.

To address inherent uncertainties in macroeconomic projections, and more importantly, to take into account the structural vulnerabilities of Burundi's economy to external shocks, below, we undertake a stochastic fiscal sustainability analysis. We consider the impacts of external risks that the country is well-known to be exposed to, namely, volatilities in global coffee prices, rainfall, and aid flows. Each type of shock is defined as deviation from the central trend and is assumed to be normally distributed with a mean of zero and a standard deviation estimated by the variable's historical data. Using Monte Carlo simulation, each shock is drawn randomly from its respective probability distribution, and is applied to the relevant endogenous variables to generate a set of alternative fiscal outcomes. The process is repeated 10,000 times to produce a probability distribution of possible fiscal outcomes. Fan charts are then used to illustrate the results.^{13,14}

¹³ The analysis is a type of sensitivity analysis—the shocks are applied on a ceteris paribus basis, i.e., while one shock (e.g., to the coffee price) is being applied, other shocks (e.g., to rainfall) are not taking place. In addition, only the direct impact of the shock on the endogenous variables is considered, not indirect effects, including “feedback” and policy responses. For example, while applying shocks to coffee prices, the direct effect is on the values of exports, and thereby GDP and government revenues. No secondary effects or feedback are considered, such as possible adjustments in imports, interest rates, or exchange rates.

¹⁴ We do not estimate the combined effect of all three types of shocks. Usually such a combined effect is estimated simply by adding up the shocks (e.g., the DSA uses this approach). This is often misleading because (a) some shocks mitigate each other, (b) there will be secondary adjustments (e.g., interest rates, exchange rates), (c) there will be policy response by the government, and (d) there will be donor responses to shocks. This is why some studies estimate the impacts of combined shocks using the variance-covariance matrix estimated via VAR (Vector Auto Regression), which will summarize, in reduced form, the historical patterns of the combined responses from (a)–(d). For Burundi, we cannot implement this approach due to lack of long-term data. VAR usually takes a data series of 20 years or longer to be meaningful (many countries try to increase the sample by using the quarterly data). With VAR dummy running around 10 years (which causes structural breaks), Burundi's covariance matrix cannot be estimated robustly.

Global coffee price shocks

Burundi is one of the countries that is most exposed to fluctuations in global coffee prices. Coffee remains the main source of foreign exchange and the main export product, even though its relative importance has been declining. In the 1990s, it accounted on average for 77 percent of exports, but in the last five years, around 51 percent.¹⁵ Coffee prices are highly volatile. Global prices of Arabica coffee—the prices that matter for Burundi—were firmer during the 2000s, but dropped 30 percent year-on-year in 2012 because of strong supply from top global producers like Brazil (Figure 6).¹⁶

In addition to volatile international prices, the country's export earnings from coffee depend on the quantity and quality of the coffee harvest each year, which have been declining. Burundi has a biennial output cycle because of aging coffee trees. The quantity and quality of output have suffered in recent years from tree disease, low input use, and low incentives from low producer prices.

Despite its good quality, Burundian coffee farmers have historically received a lesser price for their coffee than the international reference price. Producer price of coffee set by the Burundian government is to some extent unrelated to the world market price of coffee (Figure 7).¹⁷ Compared to its neighbors, the gap between the producer price and the market price has been much larger (Figure 8).¹⁸ “The situation profoundly discourages farmers” (USAID 2010, p.4). Due to the country's law, farmers are prohibited from destroying coffee plants. Instead, farmers are choosing to neglect their coffee plants in favor of food crops.

¹⁵ Although it accounts for the bulk of country's exports, coffee contributes less than 5 percent of GDP (EIU 2013).

¹⁶ EIU 2013.

¹⁷ The state-run coffee agency, OCIBU, annually sets the producer price and is in control of marketing and export (IMF 2008). The agency argues that Burundian producers have been protected from fluctuations in international prices. Although this is true, the farmers have also not benefited from periodic price increases (USAID 2010).

¹⁸ There are different reasons for this, including (i) OCIBU's control of coffee sales and bad marketing practices, (ii) the small volume of the country's production, (iii) lack of access to the sea, (iv) the conflict, and according to some, (v) collusion by international traders operating in Burundian market to maintain low prices (Kimonyo and Ntiranyibagira. 2007).

Figure 6. International price of Arabica coffee, in constant US cents per kilogram

Source: World Bank Global Economic Monitor.

Figure 7. Price received by Burundian coffee producers vs. world rice (in constant BIF)

Source: Kimonyo and Ntiranyibagira (2007).

Figure 8. Spread between producer and market prices, 2008

Source: AfDB (2010)

What would be the impact of coffee price shocks on the country's fiscal paths? Other things being equal, a negative coffee price shock will result in lower coffee export values, which will then result in lower government revenue and higher fiscal deficits.¹⁹ The higher fiscal deficits cause a rise in gross financing needs, leading to higher debt. Positive coffee price shocks would have the opposite impact on Burundi's fiscal prospects.

Stochastic simulation suggests that, under very adverse shocks in coffee prices, the government's debt could reach 41 percent of GDP by 2017 (Figure 9). The fan chart shows percentiles of the probability distribution of public debt, centered around the baseline projection. In 2017, for instance, the 75th percentile value corresponds to a ratio of public debt to GDP of 36 percent, which means that there is a 75 percent chance that public debt is 36 percent of GDP or lower (or a 25 percent chance that it would be higher). Put another way, there is a 25 percent probability that coffee price shock in 2013–17 will raise the public debt to GDP ratio by 2 percentage point over and above the 34 percent level expected under the baseline scenario.

Source: The author's calculations.

¹⁹ The impact of coffee price shocks on government revenue is econometrically estimated using a simple reduced-form time-series regression model (see Appendix 1). Based on the world price of Arabica coffee in US cents per kilogram (1980–2012), a shock to the coffee price is defined as the change in the logarithm of the price at time t relative to $t - 1$, and is assumed to be normally distributed, with mean zero and the standard deviation estimated by the historical data (0.37). We found export volume of coffee in Burundi to be completely inelastic to changes in the world price—perhaps due to the limited correlation between the world price and the producer prices in the country (see Kimonyo and Ntiranyibagira, 2007). Because coffee exports can contribute to the central government's revenue in multiple ways (e.g., through trade tax, income tax, revenue from SOEs, etc.), we have estimated the impact of coffee price shocks directly on the government revenue instead of inferring it indirectly from estimating the impact first on exports or on GDP. We abstract from other policy responses like donor support, fiscal adjustment, and exchange rate depreciation.

Rainfall shocks

Burundi's economy is mainly rural, and agriculture dominates as a means of livelihood for a majority of its population. Around 90 percent of the labor force is said to be employed in agriculture. With the exception of commercial tea and coffee production—which contribute less than 5 percent of GDP—agriculture remains largely subsistence, rain-fed farming. Rainfall in Burundi is highly volatile, and draughts are recurrent events (Figure 10). Higher precipitation clearly contributes to faster growth in agriculture. Importantly, growth in agriculture is said to have a large spillover to the rest of the economy: recently, the IMF has estimated that a 1 percent increase in agricultural sector activity leads indirectly to 0.7 percent increase in real GDP growth in other sectors.²⁰ Thus, weather shocks can have a large impact on Burundi's economic performance, and hence fiscal outcomes.

Figure 10. Burundi: Annual Rainfall and Agricultural Growth Rate

Source: Jefferson and O'Connell (2004) and World Bank.

²⁰ IMF (2006).

Other things being equal, a negative rainfall shock will lower growth in agriculture, and through the direct and indirect effects, lower the overall growth.²¹ Lower growth leads to lower government revenues, higher fiscal deficits, and higher gross financing needs, resulting in higher public debt. Positive weather shocks will have the opposite impact.

Stochastic simulation results, reported in Figure 11, suggest that weather shocks pose a smaller risk to fiscal outcomes than shocks to world coffee prices. In the event of very severe weather shocks, the government's debt could reach 39 percent of GDP by 2017. With 25 percent probability, weather shocks in 2013–17 could raise the public debt to 36 percent of GDP; with 10 percent chance, it could reach 37 percent of GDP. The smaller revenue impact of rainfall shocks might be explained by the well-known difficulty of collecting taxes from the mainly rural, subsistent agricultural sector.²²

Figure 11. Fiscal Indicators under Stochastic Rainfall Shocks

Source: The author's calculations.

²¹ The response of agricultural GDP to rainfall shocks is estimated using a simple reduced-form time series regression (see Appendix 1). A shock to rainfall is defined as the logarithm of rainfall in time t relative to its long-run average, and is assumed to be normally distributed with mean zero and the standard deviation estimated by the historical data (0.27). The estimated response of agricultural GDP to rainfall shocks is then used to estimate their impact on GDP using a multiplier of 0.5—i.e., we assume that a 1 percent increase in agricultural GDP will lead to 0.5 percent increase in GDP—somewhat higher than the share of agriculture in GDP (0.34) but lower than the total elasticity implied by the IMF's (share of agriculture in GDP + 0.71). As before, we abstract from policy responses such as potential increase in external support in the event of severe drought and fiscal policy responses (e.g., changes in tax exemptions, subsidies).

²² It is also possible that the multiplier effect of agricultural GDP is much larger than assumed here (0.5), but substantially increasing the assumed size of the multiplier would unlikely make the impact bigger than that of the coffee price shock. See Appendix 1.

Aid shocks

Finally we consider the impact of the volatility of aid. In 2012, grants represented 18 percent of the country's GDP and 55 percent of total government income. In 2008–12, they covered on average 85 percent of overall fiscal deficit excluding grants. Aid flows are generally subject to significant delays and are less predictable than other sources of revenue (World Bank 2012). Heavy reliance on this volatile source of income has been identified as an important risk to Burundi's fiscal sustainability in the most recent Country Assistance Strategy and in the previous Public Expenditure Review. And the risk is unlikely to fall in the near future. In 2012, donors pledged US\$2.5 billion in additional aid to support the country's PRSP-II—more than double the originally anticipated amount (US\$1 billion).²³ Most of the aid will be in the form of grants and highly concessional loans, given the country's high risk rating in the latest IMF-World Bank Debt Sustainability Analysis. Most donors reiterated their determination to tie continued support for the government to tangible improvements in the identified areas of reform including governance, corruption, democratization, and private sector development. Burundi has experienced sharp drops in donor disbursement before in response to deteriorating political situation or governance and fiduciary concerns.

Other things being equal, grant shocks will reduce the government's income on a one-to-one basis.²⁴ Delay in disbursement (negative shock) in any given year will reduce government revenue below the baseline projection, widen fiscal deficits, and increase gross financing needs. The deficit will be financed by new borrowing resulting in higher debt. A positive grant shock—disbursement over and above that projected in the baseline—will have the opposite effect on fiscal outcomes.

²³ The World Bank accounts for nearly one-quarter of the total but other donors such as the African Development Bank, Belgium, the Netherlands, and Germany also remain important players (EIU 2013). Detailed negotiations are expected in coming months.

²⁴ The impact of grant shocks on government revenue is assumed to be one-to-one, i.e., a \$100 reduction in grants in time t will reduce government revenue by \$100 times the BIF/USD exchange rate in time t . Based on the data (in USD) in 2008–17, a shock to grants is defined as the standard deviation of grants as a percent of GDP in time t , and is assumed to be normally distributed with mean zero and a standard deviation estimated by the data (0.06). Grants before 2008 are an order of magnitude smaller than grants thereafter, and using a longer time series would have exaggerated the estimated volatility in grants. The projected exchange rate in the baseline is used to convert grant shocks to the local currency equivalent and as percent of total revenue. As before, we abstract from other possible changes like fiscal adjustment and exchange rate depreciation. The results must be interpreted with caution. The shocks are calibrated on a very short time series. The historical volatility in grants may, on one hand, underestimate the true fiscal impact because it does not capture delays in aid disbursement within year, but on the other hand, overestimate the true fiscal impact because it reflects not only exogenous shocks (donor behavior) but also endogenous shocks (the government's behavior, e.g., implementation of agreed reforms).

Stochastic simulation suggests that, under very adverse shocks, the government's debt could reach 61 percent of GDP by 2017 (Figure 12). In the fan chart, the 90th percentile corresponds to a ratio of debt to GDP of 50 percent in 2017, implying that there is a 10 percent chance that the country's debt will exceed that level. The 75th percentile corresponds to a ratio of debt to GDP of 43 percent in 2017, implying that there is a 25 percent chance that the country's debt will exceed that level.

Figure 12. Fiscal Indicators under Stochastic Aid (Grant) Shocks

Source: The author's calculations.

Note: The 50th percentile outcomes are not centered in the distributions because (a) the gross financing needs are truncated to values greater than equal to zero, and (b) there is no assumption that the fiscal surplus will be used to pay down existing debt faster than it is scheduled in the baseline.

4. Policy Scenario Analysis

The risk analysis in the previous section points to Burundi's vulnerability to exogenous shocks. To mitigate these risks, the authorities should develop buffers. In this connection, some of the reforms that have been initiated in the last few years are promising. However, endogenous risks of partial policy implementation, policy inertia, and inability to control short run expenditure pressures to balance against long run development objectives are some of the risks that have plagued fiscal situation in Burundi in the past, and the risks that need to be monitored closely over the political cycle in the country. This section will consider the specific revenue and expenditure policy reforms that are currently being considered by the authorities and examine their potential medium-term impact on fiscal outcomes.

Scenario 1. Partial policy implementation

The first policy scenario examines the risk arising from partial implementation of revenue reforms. Domestic revenue mobilization remains a top priority for the authorities' fiscal reform agenda. While good progress has been made, sustained improvement in domestic revenue mobilization has eluded the authorities in the past (Figure 13). Two pending issues have been recently highlighted in the policy dialogues with the Bank and Fund. First relates to ending the fuel subsidy (exemption from exercise tax), currently costing an estimate of about 3/4 percent of GDP. The authority has not agreed on the definite timing of the phase out.²⁵ Second relates to the revision of the income tax code (corporate and individual). In the course of discussion in Parliament, new exemptions were introduced in the revised bill, which would reduce the tax revenue by an estimate of 3/4 percent of GDP compared to the baseline.

Figure 13. Government Revenue excluding grants (percent of GDP)

Source: IMF

The simulation results suggest that the government's failure to adhere to the revenue reform would pose a significant fiscal risk. Results are reported in Figure 14 under the "lower tax revenue" scenario. Compared to the baseline, annual revenue shortfalls resulting from the incomplete revenue mobilization effort would have the same detrimental impact on the fiscal position as adverse GDP growth shock by 1.5 percent each year. Foregone revenue rises as GDP grows over the projection period, costing 62 billion a year in 2013 to 100 billion a year 2017. Fiscal balance will widen from 1.7 of GDP in 2012 to 5.1 percent of GDP by 2017. With higher gross financing needs each year, debt to GDP will reach nearly 40 percent by 2017, over 6 percentage points above the baseline. Thus, with expected decline in external grants, future fiscal

²⁵ IMF (March 2013).

sustainability will critically hinge on the government's ability to stick to the revenue mobilization efforts.

Scenario 2. Reduction of tax incentives toward the regional average

The second alternative scenario explores a strategy in which the government boosts revenue collection by broadening the revenue base primarily by reducing tax exemptions. Burundi has a large potential for boosting government revenues by rationalizing its extensive tax incentives. According to the recent World Bank study, the forgone revenue due to tax incentives was around BIF 130 billion—equivalent to 5 percent of GDP or 38 percent of total government revenues.²⁶ Compared to the neighboring countries, the figures are exceptionally high, and since the exemptions are mostly given exclusively to domestic firms, it is said to be not effective for attracting additional investments in the country.²⁷ With move to harmonize tax incentives high on the EAC regional integration agenda, rationalizing tax incentives thus has the potential of not just boosting government revenue but help toward improving investment climate and accelerate regional integration

The simulation results suggest that the government's accelerated effort in this area could have a big impact on fiscal outcomes. Results are reported in Figure 14 under “Higher tax revenue” scenario. We assume the authorities will gradually reduce tax exemptions from the current 7.1 percent of GDP to 5.2 percent of GDP by 2017, adjusting the tax exemption to GDP ratio halfway toward the regional average (3.3 percent). Reducing tax incentives would result in additional revenues of BIF 17.9 billion in 2013 gradually rising to BIF 127.4 billion in 2017 above those projected in the baseline. Revenue excluding grants will rise from 14.8 percent to 17.6 percent of GDP. Fiscal balance will begin to improve after 2014, approaching near balance by 2017. The government could build up fiscal buffer while lowering the level of public debt, potentially creating additional borrowing space for priority investments. With lower gross financing needs each year, the country's debt to GDP will fall from 35.2 percent in 2012 to 25.8 percent in 2017, that is, 7.7 percentage points below the projected debt to GDP in the baseline (33.6 percent).

²⁶ International Finance Corporation (2012).

²⁷ The study also found that for domestic investors, too, tax incentives were not an important factor in decision to invest: “market potential” and “availability of infrastructure” were rated highly as motivation to invest while “tax incentives” was rated quite low. See IFC (2012).

Figure 14. Comparisons of Alternative Reform Scenarios: Baseline vs. Scenarios 1 & 2
Revenue excluding grants (BIF bn)

Fiscal balance to GDP (%GDP)

Debt to GDP (% GDP)

Source: The author's calculation

Scenario 3. Reform of civil service wages

The third alternative scenario considers the implications of the reform of civil service wages currently under discussion. Wages are the biggest component of government expenses (36 percent) costing over half of its own revenues. They cause a significant rigidity in government spending and exacerbate the economic impact of external shocks. In case of negative revenue shocks, spending cuts tend to be borne by other expenditures while wages tend to be protected and are sometimes allowed to grow.

The government, with the help of International Labor Organization (ILO), has been developing a plan to reform civil service pay. Under the current proposal, four policy options are identified, all of which call for a revised pay structure for 23 pay grades, while eliminating disparities within each pay grade.²⁸

Table 4. Salary Scale Adjustment Options

Options	Principle	Estimated one-off cost (billion BIF)
1. Maximum salary adjustment	Salaries within each grade to be raised to the highest observed for the grade	273
2. Average salary adjustment	Salaries of those below the current average to be raised to the average for the grade	17
3. Reference salary adjustment	Salaries to be adjusted to the reference wage for each grade proposed by the union	87
4. Combination of 2 & 3	Salaries to be adjusted to levels that lie somewhere between the average (Option 2) and the reference salaries (Option 3)	18

Source: Government of Burundi Ministry of Public Service, Work, and Social Security (2012).

Note: Estimates costs associated with these options are one-off costs of adjusting the current salaries to the respective reference salaries under each option. See Government of Burundi Ministry of Public Service, Work, and Social Security (2012) for more detail.

The reform proposal aims primarily to reduce inequality within the pay structure and not at controlling short-run growth in the wage bill. All options currently under discussion are going to increase wage bill in the short run, but are expected to generate savings and additional tax revenues in the long run (the rationalization of the pay scale is expected to bring about more orderly management of wage bill eventually resulting in lower shares in terms of revenue, expenditure, and GDP).

Dynamic implication must be carefully studied once the details have been worked out. Apart from the initial costs of adjustment, the different wage structures would have different dynamic implications for the medium-term fiscal outcomes. The dynamic costs will depend on, *inter alia*, growth of new hiring in the priority sectors, their distributions across the pay scales,

²⁸ See Government of Burundi Ministry of Public Service, Work, and Social Security (2012) for detail.

new rules regarding bonuses and allowances, as well as expected efficiency gains from the reforms. Below, we attempt a very preliminary estimate of the potential fiscal implications, based on many simplifying assumptions.²⁹ The analysis must be interpreted with caution, however. In addition to making a number of simplifying assumptions, the analysis does not attempt to incorporate potential efficiency gains from the reform³⁰—which are highly uncertain—in estimating the fiscal impact of the different options for the reform.

The simulations confirm that Options 1 and 3 are the most expensive, even in the medium term (Figure 15). In the first 3–5 years, the dynamics of the wage bill is dominated by the one-off adjustment costs. Growth of the wages bill would be substantially higher under Option 1 and Option 3 even when the costs of adjustments are evenly spread—over 3 years in Option 1 and 2 years in Option 3. After the adjustment to the new salary scale is completed, the growth of the wage bill would converge to the steady-state growth rate as in other options, which is driven by the growth in civil servants in the priority sector (10 percent of the work force in that sector each year) and the automatic annual salary increase (6 percent each year). The wage bill would be permanently higher because the higher wage growth in the first few years would not be compensated by lower growth in the subsequent years. As a result, wage rigidities would worsen, the fiscal deficit would significantly expand, and debt would reach a possibly unsustainable level. More specifically, as a share of GDP, the wage bill would rise from 8 percent to 15 percent (under Option 1) and 11 percent (under Option 3), instead of falling to 7 percent by 2017 as expected under the baseline. The fiscal deficit would expand to 13 percent (under Option 1) and 9 percent of GDP (under Option 3). Debt as a share of GDP would reach 63 percent (under Option 1) and 50 percent (under Option 3).

²⁹ Specifically, we assume that (i) the number of civil service employees will grow by 10 percent per year in the priority sectors (education and health), and 0 percent per year in other sectors; (ii) distribution across the civil servants will remain the same; (iii) after the initial salary adjustment, the annual automatic salary of 6 percent is maintained (as assumed in the Government's study). These are common assumptions across all options. In addition, under Option 1 and Option 3, we assume the costs of adjustments are evenly spread over 3 years and 2 years, respectively. For example, under Option 1, a third of the existing employees are brought under the new salary scale in the first year ($t+1$), another third in the second year ($t+2$), and all existing employees in the third year ($t+3$). Under Option 3, a half of the existing employees are brought under the new salary scale in the first year ($t+1$), and the remaining half in the second year ($t+2$). During the adjustment period, it is assumed that there will be no automatic adjustment of salaries but newly hired employees are paid according to the new salary scale. Note that under Option 2, only salaries of those below the initial average will be raised to the average for the grade. Salaries of those above the initial average are assumed to be frozen. See Appendix 2 for more detail.

³⁰ The rationalization of pay scale is expected to bring about improved public sector performance—though better job satisfaction, worker motivation, and attraction and retention of qualified professionals—as well as more orderly management of wage bill—through better control of bonuses and allowances. See Government of Burundi (2012) for more detail.

Option 2, on the other hand, implies initially higher growth in wages, followed by lower growth, thus neutralizing the impact on fiscal outcomes relative to the baseline. During the adjustment—in which salaries of those below the initial average for each grade will be raised to the average—growth of the wage bill would be higher than the baseline, but in the subsequent years, the growth of the wage bill will be lower because the salaries of those above the initial average for each grade (approximately a half of the initial workforce) are frozen. Only those paid at the reference salaries would have their salaries increased at 6 percent a year. If the reform under this option can reduce the wage inequality as desired, while keeping the fiscal costs in line with the baseline, it would be an attractive option. However, under the given assumptions wage inequalities would persist for a long time, and freezing the salaries of roughly half the (initially better-paid) work force for the time it takes to reduce the inequality may be unrealistic.

Option 4, which is a compromise option between Option 2 and Option 3, not surprisingly, provides an intermediate outcome. With the relatively low adjustment cost, growth in the wage bill would quickly stabilize at the steady-state growth rate driven by the rates of new hiring in the priority sector and the automatic annual salary adjustment. The nominal wage bill would only be slightly higher than the baseline projection, with muted impacts on fiscal deficit and debt. The challenge, therefore, would be for the government to strike the right balance between setting the new reference salaries sufficiently high to achieve the desired long-term objectives (reducing inequality within the pay grade, providing incentives for better performance, eliminating the majority of bonuses and allowances as substitute for orderly salary increase, etc.) and keeping the short-run adjustment costs sufficiently low to avoid a fiscal blowout and risking macroeconomic instability.

Figure 15. Comparisons of Alternative Reform Scenarios: Baseline vs. Options 1–4
Wages and salaries

Fiscal balance (%GDP)

Debt to GDP (%)

Source: The author's calculations.

5. Conclusion

This paper analyzed the sustainability of Burundi's fiscal position in the medium term in view of various risks to which the country is exposed. Studies in the past have highlighted key sources of macro vulnerability in the country,³¹ which include those arising from uncertainty in global commodity prices, dependence on rain-fed agriculture, and dependence on volatile foreign aid. Internally, uncertainty about the implementation of the government's fiscal reforms is a key risk. Until now, the studies have not quantified the size and impact of the risks to the country's fiscal sustainability.

The paper finds that Burundi does not have much room to maneuver. Even with a strong growth projected in the baseline scenario for 2013–17, the government will continue to struggle to create fiscal space and reduce debt from its currently high level. The dynamics is mainly explained by falling grants as a share of GDP combined with persistently high current expenditure, mostly the wage bill. Although the government is expected to limit wage growth in real terms, unless additional revenue measures are introduced to offset the falling grants, it will struggle to reduce its deficit. While the deficit is expected to be largely financed by external concessional loans, debt will remain high as a share of GDP, and will likely keep the country at “high risk of debt distress.”

External risks relating to aid, rainfall, and coffee prices could significantly increase the country's deficits and debt. Stochastic simulations show that, under very adverse shocks to rainfall or coffee prices, the country's debt could reach 39 to 41 percent of GDP by 2017—about 5 to 7 percentage points above the projected ratio of debt to GDP under the baseline. Aid shocks could have a bigger impact—with debt to GDP reaching as high as 50 percent under adverse shocks—but the estimates are the least statistically reliable because of the time series is short and because its historical volatility in part reflects endogenous shocks (e.g., reform implementation) as well as exogenous shocks (donors' behavior).

The analysis suggests that the government should focus on building buffers, increasing flexibility, and reducing exposure to risk. Countries that are exposed to shocks should build buffers to cope with the shocks. Smaller fiscal deficits would allow the government more flexibility to use discretionary policies to respond when hit by a shock. Larger foreign reserves would function as a shock absorber in response to negative external shocks. Lower and more stable inflation would give the authorities greater scope for monetary loosening and fiscal stimulus without triggering inflationary expectations and wage demands. Countries with lower risk of debt distress will have greater access to both concessional and non-concessional emergency financing.

³¹ Lim and Rugwabiza (2009), World Bank (2011), IMF (2012), and IMF and World Bank (2013).

To these ends, the authorities should persist in implementing planned fiscal reforms—to widen the tax base and eliminate unaffordable exemptions and subsidies. The policy scenario analysis shows that future fiscal sustainability will hinge on the government's ability to stick to its plans to increase revenue. The authorities' effort to widen the tax base has recently suffered a setback, however, as the Parliament introduced last minute exemptions in the tax reform bill. Burundi's tax exemptions as a share of GDP remain among the highest in the region.

The authorities should also agree on a sustainable policy for civil service wages. Fiscal space can be created not just through revenue increases but also through expenditure cuts and improved efficiency. Growing civil service wage bill has created a significant rigidity in government spending and exacerbated the economic impact of external shocks. Options for reforming the salary scale currently under discussion are aimed at restoring fairness and improving incentives for better public sector performance, and as such, will not generate savings in the short run. A very preliminary estimate of the potential fiscal implications of the reform, using many simplifying assumptions, suggests that some reform options could be too expensive. In addition to considering the one-off adjustment costs of the salary scale options under consideration, the authorities should carefully study the dynamic costs and savings under each option once all the details have been worked.

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Appendix 1. Regression Results Underlying Fiscal Risk Analysis

Given the short time series available for Burundi, we keep the estimation to the simplest possible forms. The following regression variables are used:

- GDP is the real GDP in local currency at 2005 prices
- AG_GDP is the agricultural value added in local currency at 2005 prices
- REVENUE is the central government revenue excluding grants in local currency at 2005 prices
- P_COFFEE is the world price of Arabica coffee in constant US cents per kilogram
- RAIN is the deviation of annual precipitation from the long run average, normalized to vary from 0 to 100
- WAR is the 1993–2000 civil conflict dummy.

The unit root test results for the variables are reported in Table A1. The models and regression results are reported in Table A2–A3.

Coffee shocks

The impact of coffee price shocks on government revenue is econometrically estimated using a simple reduced-form time-series regression. World coffee prices and civil war are treated as exogenous variables. Adding their lagged values did not significantly improve the estimation. The results imply:

$$\Delta \ln(REVENUE_t) = -0.564 + 0.105 \ln(P_COFFEE_t) - 0.029 WAR_t$$
$$\quad \quad \quad (-1.32) \quad (1.42) \quad \quad \quad (-0.49)$$

The impact of shocks to coffee prices on growth of revenue is given by:

$$\frac{\partial \Delta \ln(REVENUE)}{\partial \ln(P_COFFEE)} = 0.105$$

The stochastic coffee price shock to be applied to the baseline projection of growth in revenue is calibrated based on the historical data in 1980–2012, and assumed to be normally distributed with mean zero and standard deviation defined by the historical data:

$$\varepsilon_t^{P-COFFEE} \sim N(0, 0.38)$$

The growth of revenues under the stochastic scenario is defined as:

$$SS_t = \text{baseline REVENUE growth rate}_t + 0.105 * \varepsilon_t^{P-COFFEE}.$$

Rainfall shocks

The impact of rainfall shocks on the agricultural GDP is estimated using a simple reduced-form time series regression. Annual rainfall and civil war are treated as purely exogenous variables. We tried several models, including models using REVNEUE and GDP as a dependent variables, respectively. The model using AG_GDP as a dependent variable was chosen as it offered the best fit with the data. Including lagged values of rainfall and civil war did not significantly improve the estimation. The estimation results imply:

$$\Delta \ln(AG_GDP_t) = -0.032 + 0.013 \ln(RAIN_t) - 0.025 WAR_t$$

$$(-1.16) \quad (1.60) \quad (-1.05)$$

The impact of shocks to rainfall on growth rate of agricultural GDP is given by:

$$\frac{\partial \ln(AG_GDP)}{\partial \ln(RAIN)} = 0.013.$$

We assume that a 1 percent shock to agricultural GDP will lead to 0.50 percent shock in GDP—somewhat higher than the share of agriculture in GDP (0.34) but lower than the total elasticity implied by the IMF's (share of agriculture in GDP + 0.71).

The stochastic rainfall shock to be applied to the baseline projection of GDP growth is calibrated based on the historical rainfall data (1980–2008), and is assumed to be normally distributed with mean zero and standard deviation 0.266:

$$\varepsilon_t^{RAIN} \sim N(0, 0.266)$$

The growth of real GDP under the stochastic scenario is defined as:

$$SS_t = \text{baseline GDP growth rate}_t + 0.50 * 0.013 * \varepsilon_t^{RAIN}.$$

Table A1. Unit Root Tests: Augmented Dickey-Fuller and Phillips-Perron Tests

Variables:	ADF						PP	
	Level			First difference			Level	First diff
	With constant	No constant	With trend	With constant	No constant	With trend	With trend	With trend
Log of GDP	-1.55	0.965	-2.179	-1.412	-1.202	-1.372	-1.433	-4.14*
Log of AG_GDP	-1.527	-0.045	-3.335*	-1.937	-1.933*	-1.499	-1.919	-5.912*
Log of REVENUE	-2.124	1.003	-2.042	-4.477*	-4.405*	-4.397*	-2.492	-7.723*
Log of P_COFFEE	-2.062	-0.18	-1.89	-4.146*	-4.222*	-4.236*	-2.308*	-5.744*
Log of RAIN	-1.466	-0.91	-1.718	-2.866*	-2.971*	-2.761	-4.579*	-13.082*

Note: Optimal lag lengths for tests for each variable were chosen based on Schwarz Information Criterion for the ADF tests as follows: LN_GDP (3), LN_AG_GDP (4), LN_REVENUE (1), LN_P_COFFEE (1), LN_RAINFALL (2). An asterisk (*) indicates the rejection of the unit root null hypothesis at 90 percent critical level or better.

Table A2. Regression Results for Coffee Price Shocks

```
. regress dlnrevenue lnp_coffee war
```

Source	SS	df	MS	Number of obs = 32		
Model	.056297984	2	.028148992	F(2, 29)	=	1.23
Residual	.665610861	29	.022952099	Prob > F	=	0.3081
Total	.721908845	31	.023287382	R-squared	=	0.0780
				Adj R-squared	=	0.0144
				Root MSE	=	.1515

dlnrevenue	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lnp_coffee	.1053907	.0740651	1.42	0.165	-.0460895	.2568709
war	-.0292527	.0599567	-0.49	0.629	-.1518779	.0933726
_cons	-.5639143	.4200392	-1.34	0.190	-1.422991	.2951622

Table A3. Regression Results for Rainfall Shocks

```
. regress dlngdp lnrain war
```

Source	SS	df	MS	Number of obs = 27		
Model	.01452525	2	.007262625	F(2, 24)	=	3.70
Residual	.047073279	24	.001961387	Prob > F	=	0.0397
Total	.061598529	26	.002369174	R-squared	=	0.2358
				Adj R-squared	=	0.1721
				Root MSE	=	.04429

lnrain	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lnrain	.0049515	.0062728	0.79	0.438	-.007995	.017898
war	-.0492275	.0182825	-2.69	0.013	-.0869607	-.0114942
_cons	.0177835	.020971	0.85	0.405	-.0254986	.0610655

Appendix 2. Note on Policy Scenario Analysis: Reform of civil service wages

To estimate the impact of civil service wage reform under alternative options, we use the survey collected in January 2012—slightly older than the June 2012 survey underlying the Government of Burundi Ministry of Public Service, Work, and Social Security (2012) study (hereafter the Government’s study). The distributions of workforce across pay grades are similar between the two surveys, however. The sample mean salaries within each pay grade also seem to match up reasonably well. This gives us some confidence that the simulation based on the data at hand will give us reasonably close estimates of the impacts of the proposed reforms.

Table B1. Distribution of the workforce across the pay grade

Execution	staff	%Total	Collaboration	staff	%Total	Direction	staff	%Total
EI	2,739	4.38	AI	2,329	3.72	CI	1,249	2
EII	1,006	1.61	AII	32,034	51.2	CII	922	1.47
EIII	734	1.17	AIII	9,741	15.57	CIII	243	0.39
EIV	684	1.09	AIV	4,693	7.5	CIV	187	0.3
EIX	15	0.02	AIX	124	0.2	CV	116	0.19
EV	308	0.49	AV	2,230	3.56	CVI	64	0.1
EVI	78	0.12	AVI	1,455	2.33	CVII	34	0.05
EVII	27	0.04	AVII	969	1.55	CVIII	6	0.01
EVIII	26	0.04	AVIII	555	0.89			
Total	5,617		Total	54,130		Total	2,821	
Percent	8.98%	8.96	Percent	86.51%	86.52	Percent	4.51%	4.51

Source: Survey in January 2012.

Reform options under discussions are shown in Table 4 in the text. The proposed salary scale under each option is as follows.

Table B2. Option 1 proposed wage scale

Execution	SIN FBU	Collaboration	SIN FBU	Direction	SIN FBU
EI	3,984,052	AI	8,464,813	CI	2,030,852
EII	1,899,865	AII	3,237,572	CII	2,767,169
EIII	1,048,288	AIII	1,524,272	CIII	649,156
EIV	861,030	AIV	1,752,108	CIV	2,442,823
EV	728,152	AV	899,388	CV	2,553,932
EVI	451,730	AVI	587,520	CVI	1,032,876
EVII	425,310	AVII	1,187,540	CVII	838,052
EVIII	238,470	AVIII	1,146,878	CVIII	586,100
EIX	240,878	AIX	582,843		

Source: Survey in January 2012.

Table B3. Option 2 proposed wage scale

Execution	SIN FBU	Collaboration	SIN FBU	Direction	SIN FBU
EI	235,671	AI	277,342	CI	432,646
EII	224,421	AII	121,573	CII	232,387
EIII	229,054	AIII	129,520	CIII	221,106
EIV	171,452	AIV	165,273	CIV	289,626
EV	187,073	AV	187,798	CV	347,322
EVI	285,153	AVI	223,778	CVI	347,751
EVII	207,003	AVII	246,441	CVII	407,634
EVIII	204,663	AVIII	283,320	CVIII	421,099
EIX	227,076	AIX	311,835		

Source: Survey in January 2012.

Table B4. Option 3 proposed wage scale

Execution	SIN FBU	Collaboration	SIN FBU	Direction	SIN FBU
EI	140,000	AI	210,000	CI	300,000
EII	154,000	AII	231,000	CII	330,000
EIII	168,000	AIII	252,000	CIII	360,000
EIV	180,000	AIV	273,000	CIV	390,000
EV	196,000	AV	294,000	CV	420,000
EVI	210,000	AVI	315,000	CVI	450,000
EVII	224,000	AVII	336,000	CVII	480,000
EVIII	238,000	AVIII	357,000	CVIII	510,000
EIX	252,000	AIX	378,000	CIX	

Source: Government of Burundi Ministry of Public Service, Work, and Social Security (2012).

Table B5. Option 4 proposed wage scale

Execution	SIN FBU	Collaboration	SIN FBU	Direction	SIN FBU
EI	100,000	AI	120,000	CI	200,000
EII	120,000	AII	130,000	CII	220,000
EIII	130,000	AIII	140,000	CIII	280,000
EIV	140,000	AIV	160,000	CIV	320,000
EV	150,000	AV	190,000	CV	350,000
EVI	160,000	AVI	220,000	CVI	375,000
EVII	170,000	AVII	240,000	CVII	400,000
EVIII	180,000	AVIII	280,000	CVIII	420,000
EIX	200,000	AIX	310,000		

Source: Government of Burundi Ministry of Public Service, Work, and Social Security (2012).

The reference salaries for SC1 (the maximum within each grade) and SC2 (the average within each grade) are estimated based on the Jan 2012 survey. For the former, the 99 percentile salary

in each grade is used instead of the maximum to avoid the extreme values. The reference salaries for each pay grade under SC3 and SC4 are taken directly from the Government's study.

In estimating the fiscal impact, the following assumptions are made under all options.

- (i) The number of civil service employees will grow by 10 percent per year in the priority sectors (education and health), and 0 percent per year in other sectors;
- (ii) Distribution across the civil servants will remain the same, even after new hiring;
- (iii) After the initial salary adjustment (at $t+1$), the annual automatic salary increase of 6 percent is maintained (as assumed in the Government's study).

In addition, the following assumptions are made about the adjustment process.

- Under Option 1 and Option 3, we assume the costs of adjustments are evenly spread over 3 years and 2 years, respectively. For example, under Option 1, a third of the existing employees are brought under the new salary scale in the first year ($t+1$), another third in the second year ($t+2$), and all existing employees in the third year ($t+3$). Under Option 3, a half of the existing employees are brought under the new salary scale in the first year ($t+1$), and the remaining half in the second year ($t+2$).
- During the adjustment period, there will be no automatic adjustment of salaries.
- Newly hired employees are paid according to the new salary scale.