

African Department

# Make Investment Scaling-Up Work in Benin

## A Macro-Fiscal Analysis

*Karim Barhoumi, Qiang  
Cui, Christine Dieterich,  
Nicolas End, Matteo  
Ghilardi, Alexander  
Raabe, and Sergio Sola*

The African Department

# **Make Investment Scaling-Up Work in Benin: A Macro-Fiscal Analysis**

*A staff team comprising Karim Barhoumi, Qiang Cui, Christine Dieterich, Nicolas End, Matteo Ghilardi, Alexander Raabe, and Sergio Sola*

**INTERNATIONAL MONETARY FUND**

Copyright © 2016  
International Monetary Fund

## Cataloging-in-Publication Data

Names: Barhoumi, Karim. | Cui, Qiang, 1976- | Dieterich, Christine. | End, Nicolas. | Ghilardi, Matteo F. | Raabe, Alexander. | Sola, Sergio. | International Monetary Fund. | International Monetary Fund. African Department.

Title: Make investment scaling-up work in Benin : a macro-fiscal analysis / a staff team comprising Karim Barhoumi, Qiang Cui, Christine Dieterich, Nicolas End, Matteo Ghilardi, Alexander Raabe, Sergio Sola.

Description: Washington, DC : International Monetary Fund, 2016. | At head of title: The African Department. | Includes bibliographical references.

Identifiers: ISBN 978-1-51357-147-8 (paper)

Subjects: LCSH: Public investments – Benin. | Benin – Economic conditions. | Economic development -- Benin.

Classification: LCC HC1010.Z9 P83 2016

ISBN: 978-1-51357-147-8 (paper)

The African Departmental Paper Series presents research by IMF staff on issues of broad regional or cross-country interest. The views expressed in this paper are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

Publication orders may be placed online, by fax, or through the mail:  
International Monetary Fund, Publication Services  
P.O. Box 92780, Washington, DC 20090, U.S.A.  
Tel.: (202) 623-7430 Fax: (202) 623-7201  
E-mail: publications@imf.org  
[www.imfbookstore.org](http://www.imfbookstore.org)  
[www.elibrary.imf.org](http://www.elibrary.imf.org)

# Contents

|   |           |
|---|-----------|
| <b>Overview.....</b>  | <b>4</b>  |
| <b>Chapter 1. Growth Performance and Constraints .....</b>                      | <b>5</b>  |
| Cost of Finance .....   | 7         |
| Return to Economic Activities .....   | 8         |
| <b>Chapter 2. The Macro-Fiscal Impact of Scaling-Up Public Investment. ....</b> | <b>14</b> |
| <b>Chapter 3. Creating the Fiscal Space for Successful Scaling-Up.....</b>      | <b>22</b> |
| Creating Fiscal Space by Using Tax Revenue Potential.....                       | 22        |
| Methodology to Estimate Potential Tax Revenue .....                             | 23        |
| Creating Fiscal Space by Improving Spending Efficiency.....                     | 25        |
| <b>Conclusion and Policy Discussions.....</b>                                   | <b>29</b> |
| <b>References.....</b>  | <b>31</b> |

## Figures

|  |    |
|--|----|
| Figure 1.1. Per Capita GDP Growth .....  | 5  |
| Figure 1.2. Main Drivers of Growth in 2012–14.....   | 5  |
| Figure 1.3. The HRV Decision Tree to Explore Growth Constraints.....                                     | 7  |
| Figure 1.4. Financial Sector Indicators: Benin and Comparator Countries.....                             | 10 |
| Figure 1.4a. Average Lending Rate and Lending Spread in Benin<br>and Comparator Countries, 2009–12 ..... | 10 |
| Figure 1.4b. Trend of Average Lending Rate in Benin and Comparator Countries,<br>2009–12 .....           | 10 |
| Figure 1.4c. Credit to the Private Sector in Benin<br>and Comparator Countries, 2000–12 .....            | 10 |
| Figure 1.4d. Adults with an Account at a Formal Financial Institution .....                              | 10 |
| Figure 1.5. Foreign Direct Investment Inflow in Benin and Comparator Countries,<br>2000–12 .....         | 11 |
| Figure 1.6. Average Schooling in Benin and Comparator Countries, 1995–2011 ..                            | 11 |
| Figure 1.7. Key Macroeconomic Indicators: Benin and Comparator Countries .....                           | 11 |
| Figure 1.8. Doing Business Indicators: Benin and Comparator Countries.....                               | 12 |
| Figure 1.9. Total Export and Its Components in Benin, 2000–12 .....                                      | 13 |

|  |    |
|--|----|
| Figure 2.1. Only Taxes Adjust to Close the Fiscal Gap.....   | 17 |
| Figure 2.2. Allowing for Public Debt to Close the Fiscal Gap .....                                       | 18 |
| Figure 2.3. Macroeconomic Consequences of an Increase of<br>the Efficiency in Tax Collection .....       | 20 |
| Figure 2.4. Macroeconomic Consequences of a Decrease<br>in Tariff Revenues.....                          | 21 |
| Figure 3.1. Benin's Total Tax Revenue Collection Compared with WAEMU<br>and Sub-Saharan Africa .....     | 24 |
| Figure 3.2. Benin's Tax Gap Indicators .....   | 25 |
| Figure 3.3 Efficiency of Education Spending: Adult Literacy versus Per Capita<br>Spending, 2008–12 ..... | 27 |
| Figure 3.4. Efficiency of Health Spending: Life Expectancy versus Per Capita<br>Spending, 2008–12 .....  | 27 |
| Annex Figure 1. Tax Efficiency in Benin by Category.....   | 34 |

## **Tables**

|  |    |
|--|----|
| Table 1.1. GDP Growth Decomposition: Benin and Comparator Countries.....                     | 6  |
| Table 2.1. Welfare Analysis of Fiscal Stabilization with Different Taxes .....               | 19 |
| Table 3.1. Education Spending and Results Indicators .....                                   | 26 |
| Table 3.2. Health Spending and Results Indicators .....                                      | 26 |
| Table 3.3. Efficiency Scores of Education and Health Spending<br>and Estimated Savings ..... | 28 |

## **Annexes**

|   |    |
|---|----|
| Annex 1. Stochastic Frontier Analysis .....       | 35 |
| Annex 2. Regression Results by Tax Category ..... | 37 |

## Acknowledgments

The authors thank Domenico Fanizza for valuable comments and suggestions and assume responsibility for any remaining errors. Nadia Margevich provided excellent editorial assistance.

# Overview

Benin has deepened macroeconomic stability and accelerated growth in recent years, but even higher, broader-based, and more sustainable growth is essential to substantially reduce poverty and bring prosperity. To accelerate growth, Benin's government announced in 2014 a major increase in public investment, equivalent to about 12.5 percent of GDP, until 2019. This will be complemented by investments that could be financed by private sources, including public-private partnerships (PPPs), of about 20 percent of GDP. Investment will focus on energy and transportation infrastructure, which are considered the main bottlenecks to growth. This paper aims to conduct a systematic growth and fiscal analysis to answer two questions: (1) What is the growth potential of this ambitious scaling-up of investment? (2) How can the government generate the necessary fiscal space to increase investment without jeopardizing Benin's solid macroeconomic performance?

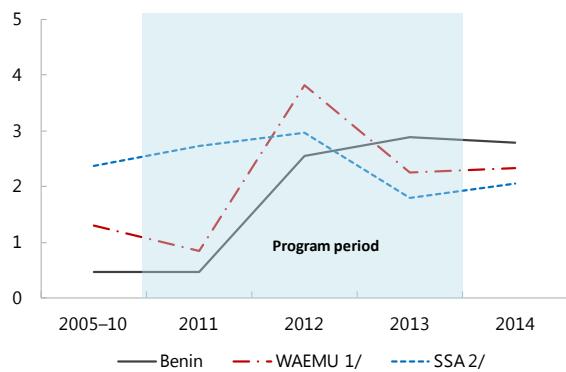
To address these questions, the paper first analyzes in Chapter 1 the growth gap and constraints in Benin; in particular, causes for low total factor productivity (TFP) growth. The analysis mainly compares Benin's experience in the past decade with that of a group of fast-growing non-resource-rich sub-Saharan African (SSA) countries, using the diagnostic decision tree approach by Hausmann, Rodrik, and Velasco (HRV) (2005). Chapter 2 presents the findings of a dynamic stochastic general equilibrium (DSGE) model on how such a large scaling-up of investment would affect growth and macroeconomic stability going forward, including the debt dynamics under different financing scenarios. It underscores the importance of creating sufficient fiscal space for the expected salutary impact on growth and consumption to materialize without substantial risks to fiscal sustainability. Chapter 3 focuses on how the fiscal space can be created through revenue and expenditure channels. On the revenue channel, it examines unused tax potential at the aggregate level, but also tax by tax how additional revenues could be mobilized, taking into consideration the characteristics of the Beninese economy. Particular attention is given to the fact that Benin de facto taxes some consumption in Nigeria because of significant informal reexports that are subject to customs and value-added tax. On the expenditure channel, it explores the extent to which enhancing spending efficiency would create fiscal space, by comparing Benin's health and education spending with those in a comparator country group. Finally, the paper presents conclusions and policy discussions.

# 1

## Growth Performance and Constraints

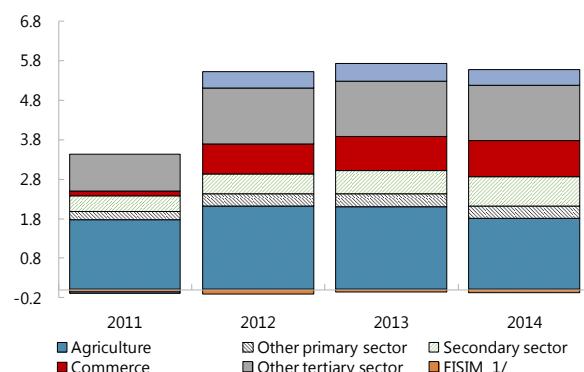
**Benin has made strong recent progress in accelerating growth while maintaining macroeconomic stability.** Benin's per capita GDP growth lagged behind the sub-Saharan African average from 2005 to 2011, but this gap has been closed during the past three years (Figure 1.1). The main growth drivers were agriculture and services, reflecting strong demand in neighboring countries—in particular Nigeria (World Bank 2015)—and good harvests, partly related to the recovery of cotton production since the government took over the sector in 2012 (Figure 1.2). Looking at the factors that have been holding back Benin's growth prior to 2011 provides valuable lessons about how to further strengthen growth in the future, but also how to diversify growth to make it less vulnerable to climate and demand swings in neighboring countries. To assess the growth constraints, this section compares Benin with six fast-growing countries in sub-Saharan Africa—Burkina Faso, Ethiopia, Mozambique, Rwanda, Tanzania, and Uganda—non-resource-rich economies found to have relatively robust drivers for sustainable growth over the past decade (IMF 2013).

**Figure 1.1. Per Capita GDP Growth (In percent)**



1 Excluding crisis countries: Côte d'Ivoire, Guinea-Bissau, and Mali  
2 Excluding oil producers

**Figure 1.2. Main Drivers of Growth in 2012–14 (Contribution to total growth, in percent)**



1/ FISIM is the financial sector value added.

Sources: Benin authorities; and IMF staff estimates.

**Growth accounting<sup>1</sup> finds that Benin's lower productivity growth and lower capital investment contributed to the growth gap between Benin and the comparators** (Table 1.1).

In 2000–10, the average contribution of TFP to growth was –0.1 percentage points in Benin, but 0.4 to 3.4 percentage points in the comparator countries. Physical capital accumulation contributed 1.7 percentage points in Benin compared with about 1.9 to 3.1 percentage points in comparator countries. In contrast, the difference in the contribution of labor and education to growth was negligible. As a result, lower TFP growth explains about three-quarters of the growth gap between Benin and the comparators, while lower capital stock explains about one-quarter.

**Table 1.1. GDP Growth Decomposition: Benin and Comparator Countries**

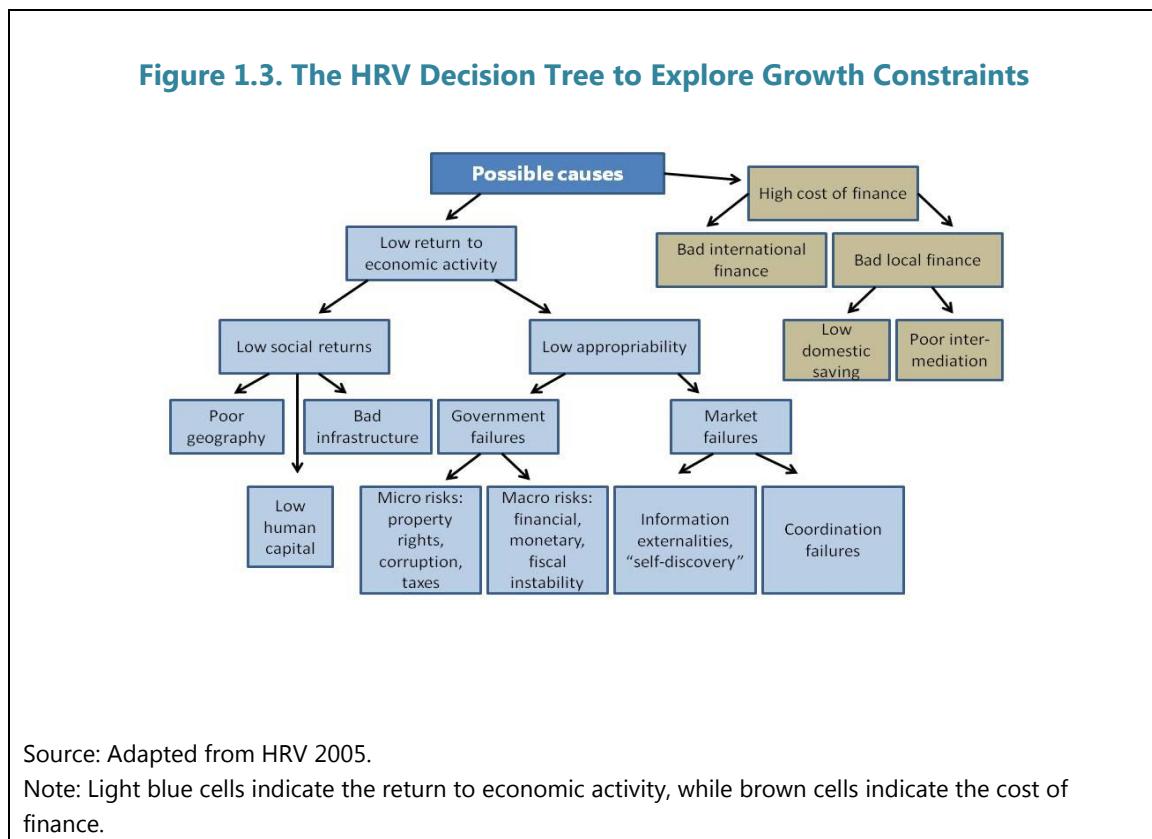
|                     | Real GDP | Capital Stock | Adjusted Labor | Education | Adjusted TFP |
|---------------------|----------|---------------|----------------|-----------|--------------|
| <b>Burkina Faso</b> | 1980–90  | 2.3           | 2.6            | 1.0       | 0.6          |
|                     | 1990–00  | 4.6           | 1.7            | 1.3       | 0.6          |
|                     | 2000–10  | 5.5           | 1.9            | 2.8       | 0.4          |
| <b>Ethiopia</b>     | 1980–90  | 2.2           | 1.7            | 0.8       | 0.7          |
|                     | 1990–00  | 2.9           | 0.7            | 1.0       | 0.4          |
|                     | 2000–10  | 8.1           | 2.4            | 2.1       | 0.3          |
| <b>Mozambique</b>   | 1980–90  | -0.1          | 0.7            | 0.6       | -0.1         |
|                     | 1990–00  | 5.4           | 2.3            | 3.9       | 0.0          |
|                     | 2000–10  | 7.9           | 2.4            | 1.9       | 0.4          |
| <b>Rwanda</b>       | 1980–90  | 1.8           | 2.8            | 0.9       | 0.2          |
|                     | 1990–00  | 1.7           | 0.5            | -2.2      | 0.3          |
|                     | 2000–10  | 7.7           | 2.4            | 2.3       | 0.2          |
| <b>Uganda</b>       | 1980–90  | 3.1           | 0.8            | 1.5       | 0.3          |
|                     | 1990–00  | 7.2           | 2.1            | 1.2       | 0.2          |
|                     | 2000–10  | 6.4           | 3.1            | 1.7       | 0.2          |
| <b>Tanzania</b>     | 1980–90  | 3.5           | -0.2           | 1.8       | 0.1          |
|                     | 1990–00  | 3.3           | 1.2            | 1.4       | 0.1          |
|                     | 2000–10  | 6.8           | 2.5            | 1.6       | 0.2          |
| <b>Benin</b>        | 1980–90  | 4.3           | 1.5            | 2.1       | 0.2          |
|                     | 1990–00  | 4.7           | 1.4            | 2.1       | 0.2          |
|                     | 2000–10  | 3.9           | 1.7            | 2.1       | 0.2          |

Sources: Penn World Table 8.0; World Economic Outlook database; and IMF staff estimates.

**The diagnostic decision tree approach by HRV (2005) provides a framework to assess the causes for lower growth.** It focuses on two aspects: the cost of finance and the return on investments (Figure 1.3):

<sup>1</sup> Following IMF (2013), the human-capital-augmented Solow growth accounting exercise uses data from the Penn World Table version 8.0 and decomposes growth into inputs of capital as well as education and labor, while the residue is labeled TFP.

- The **cost of finance** is analyzed by comparing interest costs in the domestic financial system as well as possible cost factors arising from access to international capital markets.
- The **return on investment** is broken down into social and private return factors. Social returns depend on complementary factors of production, including geography, human capital, and infrastructure, which have spillover effects to different economic sectors. Private returns focus on factors that more directly affect the payoff of an economic activity, including public sector failures (macroeconomic risks in fiscal, financial, or monetary policies; and microeconomic risks in corruption and property rights) and market failures (in particular, information and coordination externalities).



## Cost of Finance

**The cost of finance does not appear to be a binding constraint for investment in Benin.**

Two key indicators of the cost of financing in Benin—lending rate and lending spreads—are on par with averages in the comparator countries (Figure 1.4a). The lending rate has been declining faster than in peer countries (Figure 1.4b), while credit to the private sector grew significantly from 2000 to 2012 and reached a level similar to the fast-growing comparators (Figure 1.4c). IMF (2012) finds that while Benin's financial sector is shallow, it is rather advanced compared to low-income countries with similar features of development. This does not preclude the need for

further reforms to facilitate private sector access to the financial sector, in order to strengthen the impact on growth. Benin's microfinance sector is among the largest in the West Africa Economic and Monetary Union (WAEMU), but most institutions operate without adequate supervision. The challenges of financial access and inclusion (Figure 1.4d) will be analyzed later in the discussion of government or market failures.

**Similarly, limited access to international finance does not appear too binding.** Overall stable macroeconomic conditions have led to an average current account deficit of about 7 percent in 1995–2010—close to the average in the comparator countries. While Benin does not borrow from international markets, it has been able to attract stable net foreign direct investment inflows in recent years (Figure 1.5) on par with the comparators, excluding resource-driven investments in a few countries. Furthermore, thanks to prudent fiscal policies, Benin's public debt has remained low, about 10 percentage points below the WAEMU average. Consequently, the risk of debt distress, as measured by the joint World Bank–IMF Debt Sustainability Framework for low-income countries, has been low in recent years (IMF 2012).

## Return to Economic Activities

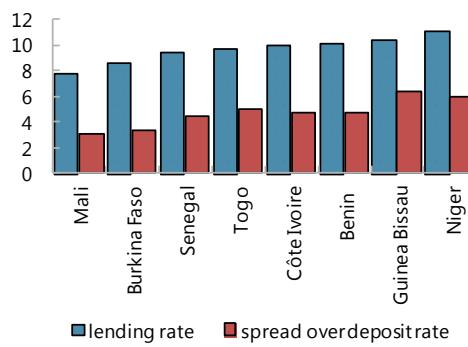
**Among the factors that affect the social return to economic activities, geography and human capital do not appear binding, but infrastructure is a constraint.** Benin enjoys political stability; favorable geography, including a coastal location; good soil and plant life; and proximity to a large market, Nigeria. While agriculture remains vulnerable to climate change, this is also true in the fast-growing comparators. Benin's human capital contribution to growth was found to be on par with fast-growing comparators. Moreover, Benin's average schooling is in line with the average (Figure 1.6). This is consistent with the World Bank (2009) survey finding that most firms do not perceive a shortage of skilled labor as a major short-term constraint. In contrast, Domínguez-Torres and Foster (2011) find that Benin's road quality is poorer than low-income sub-Saharan African countries. The poor conditions are concentrated at major transport corridors, such as the Benin portions of the Cotonou–Niamey (Niger) and Abidjan (Côte d'Ivoire)–Lagos (Nigeria) corridors, which handle the most traffic in the subregion. Also, improving irrigation infrastructure was found to be important to increase returns in agriculture. Private businesses consider infrastructure problems, in particular energy shortages, to be a key constraint (World Bank 2009). Poor infrastructure also limited trading across borders based on Benin's geographical advantages. World Bank (2011) estimates that the financing needed to address the infrastructure gap in Benin is about US\$712 million per year over 2006–15 (about 10.5 percent of GDP) for investment and for operation and maintenance, mostly in water and sanitation, power, and transport.

**Among the factors that affect the private rate of return, microeconomic factors are far more prominent than macroeconomic ones.** Benin's macroeconomic indicators are as favorable as those of the comparator countries (Figure 1.7). Perception indicators in firm surveys also corroborate this finding (World Bank 2009). In contrast, some microeconomic constraints have been significant:

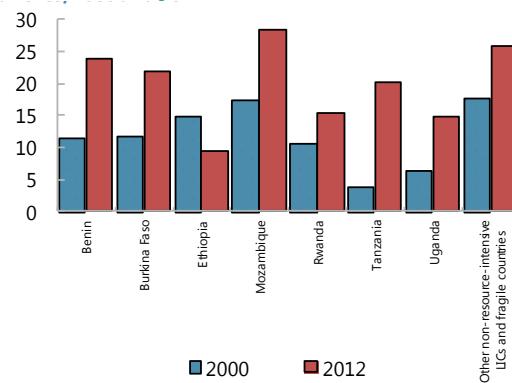
- **Despite recent improvements, the business environment is comparably poor.** Doing Business ranked Benin at 158st in 2016 and 167th in 2014 among 189 countries, far below the average rank of 120 among the six fast-growing comparators (Figure 1.8). The subindicators confirm the electricity infrastructure constraint discussed earlier and reveal constraints in paying taxes and enforcing contracts. Corruption was also ranked as a severe obstacle to operations by nearly 85 percent of the surveyed firms. The size of the large informal sector, which is estimated to account for between 30 percent (INSAE 2011) and 56 percent (World Bank 2015) of total trade, is an indicator of the poor business environment. In addition, a recent estimate (Benjamin and Mbaye 2014) put Benin's share of employment in the informal sector at about 93 percent of nonagriculture activities, much higher than the average of about 75 percent in other West African countries.
- **While market failures—measured by information and coordination externalities—adversely affect growth, they do not appear to be binding constraints.** Information externalities are assessed in the HRV 2005 framework by measuring how innovative firms have been in exploring new products. Beninese firms have done reasonably well in this area, as evidenced by rising and diversified exports (Figure 1.9). Coordination externalities are measured by large-scale investments that enable businesses to create new products or markets. Benin has engaged in regional integration efforts, including coordinating its policies, laws, and regulations with other WAEMU countries, and joined some large regional infrastructure projects (e.g., regional energy, information communication technology, and transport and trade facilitation projects). Strong entrepreneurship is also present, including in informal activities. While within-region trade remains low, the major constraints have been infrastructure and nontariff barriers attributable to the weak business environment (World Bank 2009).

**Figure 1.4. Financial Sector Indicators: Benin and Comparator Countries**

**Figure 1.4a. Average Lending Rate and Lending Spread in Benin and Comparator Countries, 2009–12  
(In percent)**

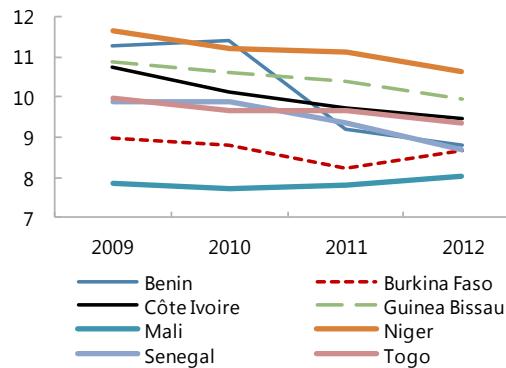


**Figure 1.4c. Credit to the Private Sector in Benin and Comparator Countries, 2000–12  
(In percent of GDP)**

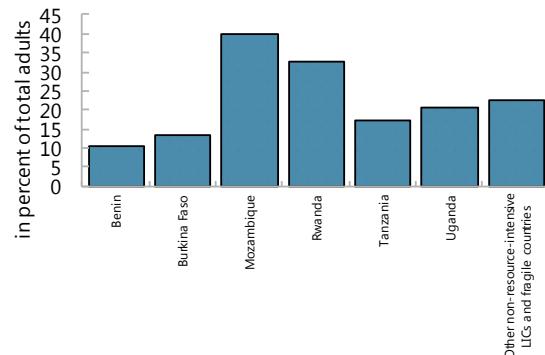


Sources: Benin authorities; and IMF staff calculations.

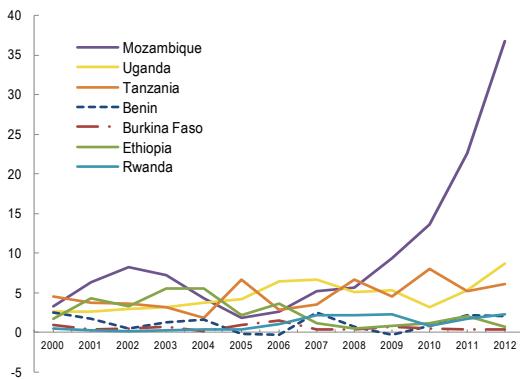
**Figure 1.4b. Trend of Average Lending Rate in Benin and Comparator Countries, 2009–12  
(In percent)**



**Figure 1.4d. Adults with an Account at a Formal Financial Institution  
(In percentage of adults)**

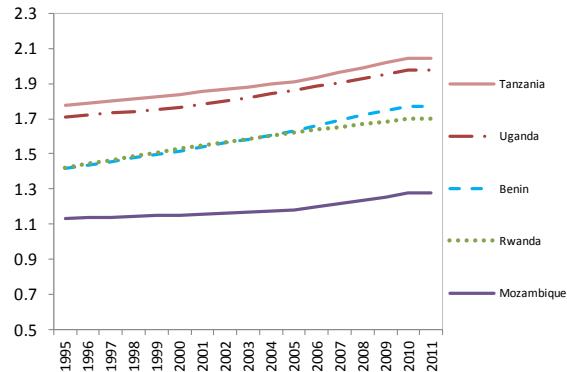


**Figure 1.5. Foreign Direct Investment Inflow in Benin and Comparator Countries, 2000–12  
(In percent of GDP)**



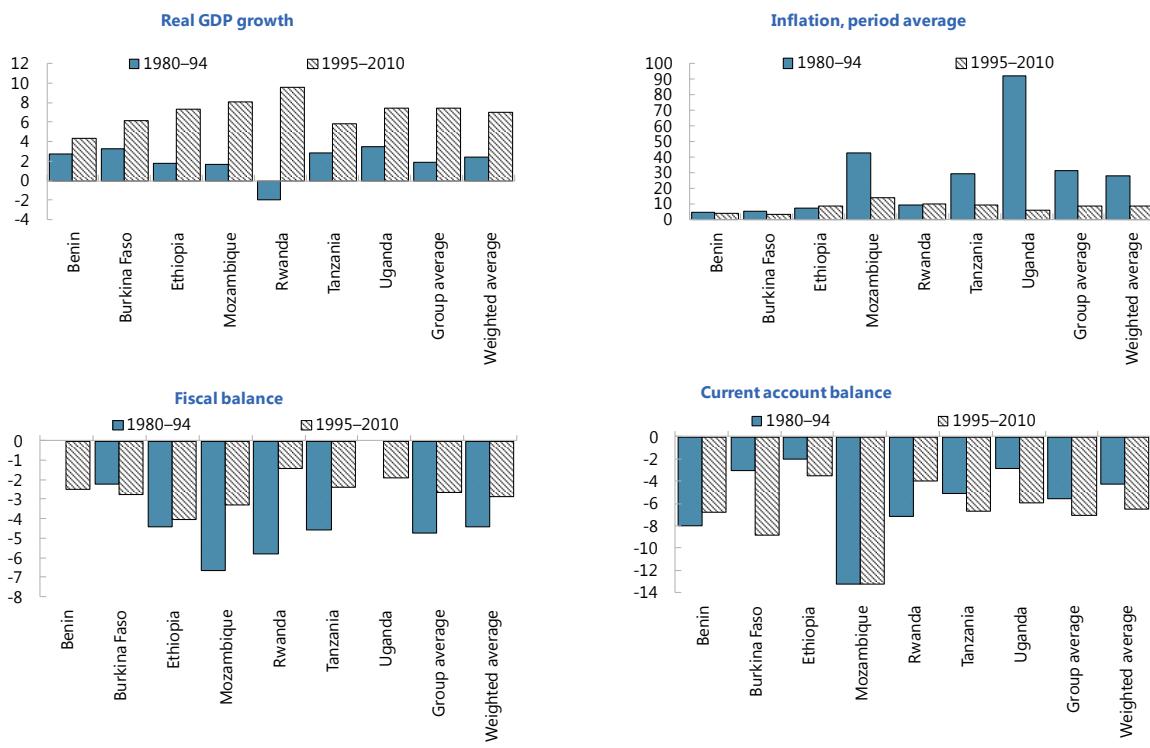
Source: World Bank (2013) World Development Indicators.

**Figure 1.6. Average Schooling in Benin and Comparator Countries, 1995–2011**



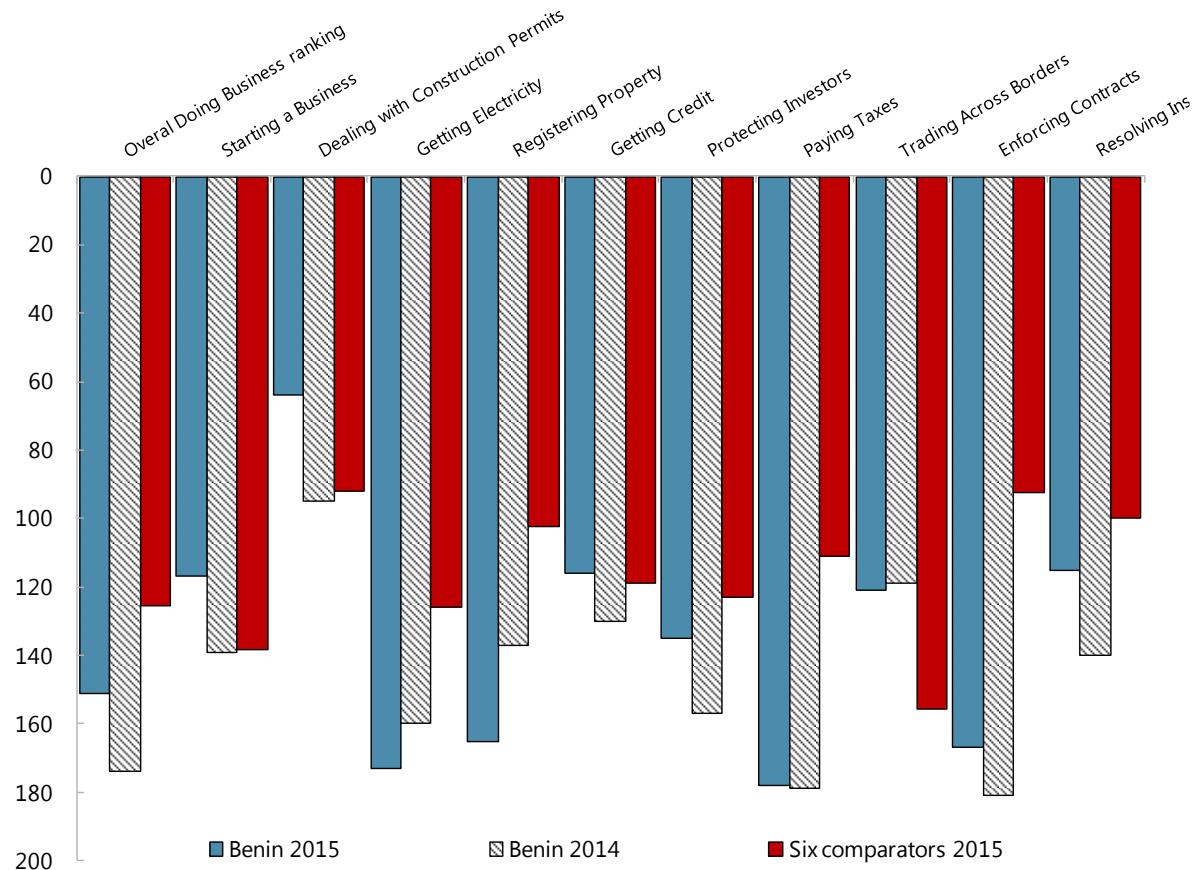
Source: Penn World Table 8.0; and IMF staff calculation.

**Figure 1.7. Key Macroeconomic Indicators: Benin and Comparator Countries (Percentage change)**



Sources: World Economic Outlook database; and IMF staff calculation.

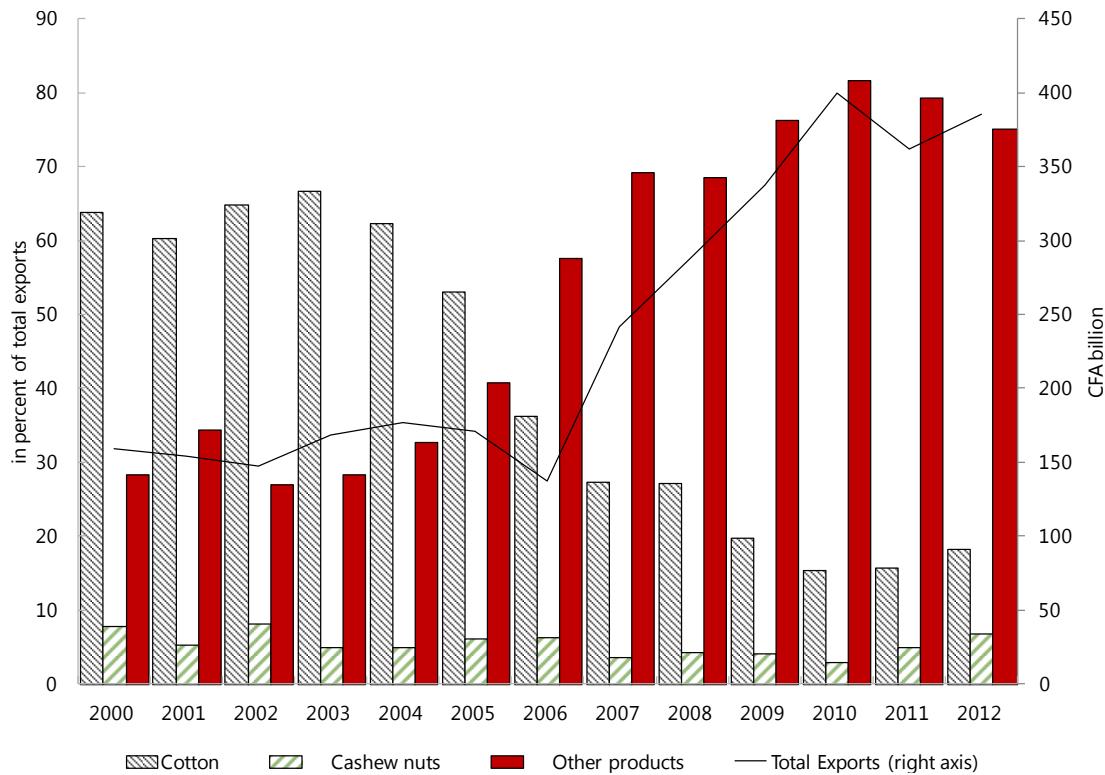
**Figure 1.8. Doing Business Indicators: Benin and Comparator Countries**



Sources: World Bank Doing Business database; and IMF staff calculation.

**The findings that infrastructure and business environment are the main obstacles to growth are consistent with the government's reform objectives.** The government's decision to invest in infrastructure has the potential to address major cost factors for businesses and to unleash the growth potential from Benin's favorable geography and human resources endowment. In particular, the announced public investment focus in power and transport is in line with the identified infrastructure needs (see, for example, Domínguez-Torres and Foster 2011).

**Figure 1.9. Total Export and Its Components in Benin, 2000–12**



Sources: Benin authorities; and IMF staff calculation.

**While the government also announced a comprehensive reform plan to improve the business environment, less progress has been made in this area.** Along with plans to scale up investment, the government presented a reform plan to improve the business environment, including reforms to reduce red tape, improve tax and customs administration, enhance the judicial system, and facilitate access to financing. However, while accelerating investment has been at the center of government activities over the past year, efforts to enhance the business environment have advanced at a slower pace. Successful reforms in facilitating the registration of new businesses led Benin's Doing Business ranking to improve from 167th in 2014 to 158th in 2016. After long delays, the opening of a functioning credit bureau is now expected to move forward in 2016; this would facilitate bank access to credit information and, consequently, reduce lending risks. Similarly, progress has been limited in customs and tax administration reform as well as in facilitating running a business by reducing red tape.

# 2

## The Macro-Fiscal Impact of Scaling-Up Public Investment

**Ambitious programs for scaling-up public investment require a careful assessment of the benefits against the country's ability to raise financing.** Large increases in public investments can be beneficial if they help remove the growth bottlenecks identified in the previous section. Moreover, such increases may have high rates of return both because of the scarcity of capital and because of their complementarity with private investments. On the other hand, despite the possibility for borrowing on concessional terms, a program of investment scaling-up can also pose threats to fiscal sustainability. First, inefficient public spending could mean that only a small fraction of public investment is productive, hence motivating authorities to keep ramping up spending. Second, the government could face hurdles in implementing the required fiscal adjustment, either because of lack of political support for increasing tax rates or because of difficulties in broadening the tax base. Finally, unexpected large shocks can hit the economy and affect growth and/or revenues with negative consequences for the sustainability of public debt.

**This chapter analyzes the macro-fiscal implications of the scaling-up, using a DSGE model with endogenous fiscal adjustments.** The model contains a large set of fiscal instruments and allows analysis of the welfare implications of different fiscal stabilization packages. It also considers two assumptions on the financing of the scaling-up: (1) the government can finance its investments only through taxes and concessional borrowing (considered exogenous), and (2) the government can also borrow externally on nonconcessional terms to smooth its fiscal adjustment.

**Because of investment financing constraints faced by low-income countries like Benin, this chapter also analyzes how fiscal space can be created by cutting inefficiencies.** The model features two types of inefficiencies. On the spending side, it assumes a share of inefficient public spending. On the revenue side, it assumes that the process of tax collection is inefficient, so that actual revenue is a fraction of what is implied by tax rates and tax base.

**The analytical framework is based on Ghilardi and Sola (2015) and features a medium-scale open-economy model as in Buffie and others (2012), but it includes a richer set of fiscal instruments.<sup>2</sup>** The stylized economy features three agents: households, firms, and

---

<sup>2</sup> We extend the analysis of Buffie and others (2012) along four dimensions: (1) we enrich the set of fiscal tools by introducing differentiated tax rates on domestic consumption, labor, and capital; (2) we endogenize labor supply; (3) we introduce government inefficiency in tax collection, which we calibrate using results from estimation; and (4) we introduce windfall revenues.

government, including government inefficiencies. The main features of each agent are as follows<sup>3</sup>:

- *Households.* There are two types of consumers: optimizers and hand-to-mouth consumers. Both consume a basket of domestically produced tradable goods, domestic nontradable goods, and foreign-produced tradable goods. The main difference between optimizers and hand-to-mouth consumers is that the former have access to financial markets so they can smooth consumption over time, while the latter do not have access and they consume all of their income within the period. The hand-to-mouth consumers' behavior creates non-Ricardian effects observed in low-income countries like Benin. Moreover, optimizing households own the capital used in domestic firm production.
- *Production sector.* The economy has two sectors, each producing two types of goods: traded and nontraded goods. In each sector, labor, private capital, and public productive capital are combined in a Cobb-Douglas-type production. Both private and public capital are produced using imported and domestic goods. The role of public capital in the production is the core feature of the model. An increase in public investment boosts growth because public and private capital are complementary.
- *Government.* The government collects revenues through taxes on labor, capital, and consumption and levies user fees on existing infrastructure. It also receives windfall revenues. The revenues are spent on debt services and public investments. The government can issue three types of debt: domestic, external concessional, and external commercial.
- *Government inefficiencies.* The model features two types of government inefficiencies. The first one is spending inefficiency due to limited capacity. Therefore, effective government investment is only a fraction of government investment expenditure. Consequently, one dollar spent on public investment translates in less than one dollar of public capital. The second inefficiency is in tax collection. We assume that only a fraction of collected taxes enter in the budget.

**The model is calibrated to Benin and simulated to analyze the implications of the scaling-up under different policy responses.** In the baseline scenario, the government is supposed to have access to concessional external borrowing, and it adjusts all taxes—on consumption, labor, and capital—to close any remaining financing gaps. The welfare implications of the baseline scenario are then compared with the case in which the fiscal gap is covered not only through taxes and concessional external borrowing but also through nonconcessional external debt. We then use the model to compare the welfare implications of different fiscal stabilization packages, which differ depending on the tax that the government decides to adjust. Finally, to reflect a particular feature of the Beninese economy, the model analyzes the consequences of lower

---

<sup>3</sup> For a complete description of the model, see Ghilardi and Sola (2015).

custom revenues as a consequence of trade liberalization with Nigeria, which could adversely affect informal reexports to Nigeria through Benin and, consequently, tax revenues.

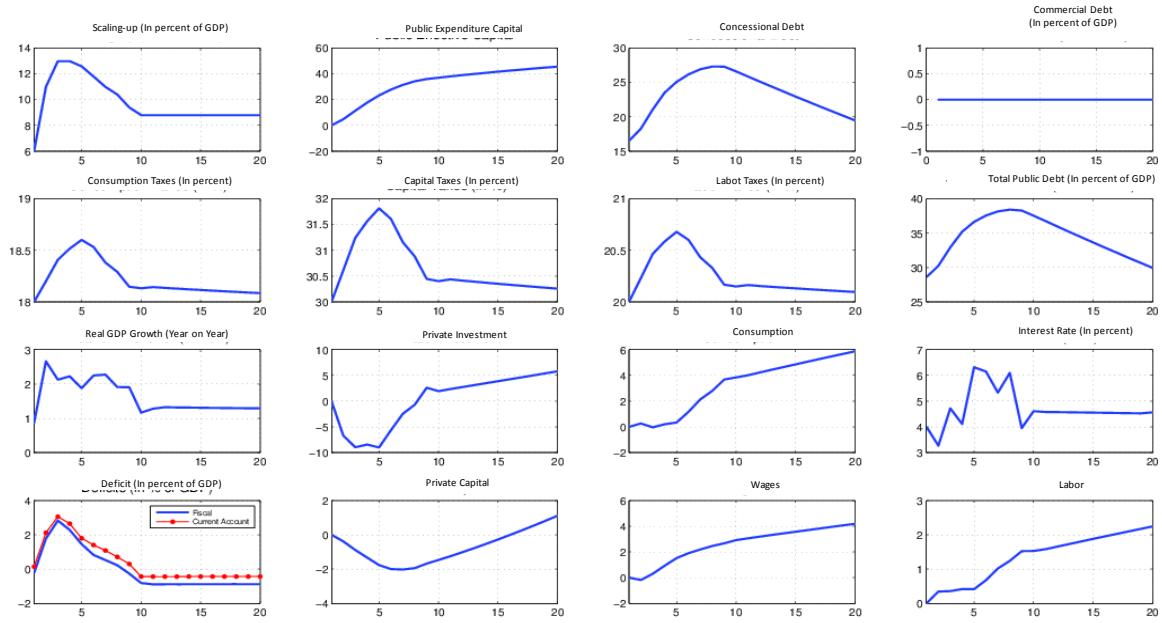
**Results from the baseline model show that higher public investment increases growth while fiscal sustainability is preserved, thanks also to higher tax rates.** The growth rate of GDP per capita increases to 2.5 percent on impact and remains high (between 2.5 and 2 percent) during most of the scaling-up period, before reverting back toward the steady state (Figure 2.1). The stock of debt-to-GDP ratio peaks at about 37 percent and then reverts back to its pre-scaling-up levels. Three main factors contribute to the fiscal sustainability of higher government spending: (1) the presence of fiscal space because of low initial stock of debt, (2) the assumption that most of the scaling-up is financed by concessional resources, and (3) the adjustment of tax rates.<sup>4</sup> The increase in tax rates is, however, relatively small (about 1 percentage point) and short-lived. After the end of the scaling-up, tax rates decrease and reach a level that is slightly higher than their starting point, to cover interest payments on the newly accumulated stock of public debt. As the burden of such payments decreases, tax rates converge back to their initial level.

**Within limits, external nonconcessional debt allows for a smoother fiscal adjustment while fiscal sustainability remains preserved** (Figure 2.2). When the government is allowed to borrow externally, the increase in tax rates is lower and smoother. Consequently, private consumption increases more rapidly and there is less crowding-out of private investments. Also in this case, adjustments in tax rates allow fiscal sustainability to be preserved. Total debt reaches about 45 percent of GDP, but declines relatively quickly. It is important to notice, however, that this relies on the assumption that the interest rate on newly contracted commercial debt does not respond to the higher debt-to-GDP ratio. In reality, this is not likely the case, especially in times of distressed financial markets when emerging and developing economies are more susceptible to sudden stops and reversals in capital flows.

---

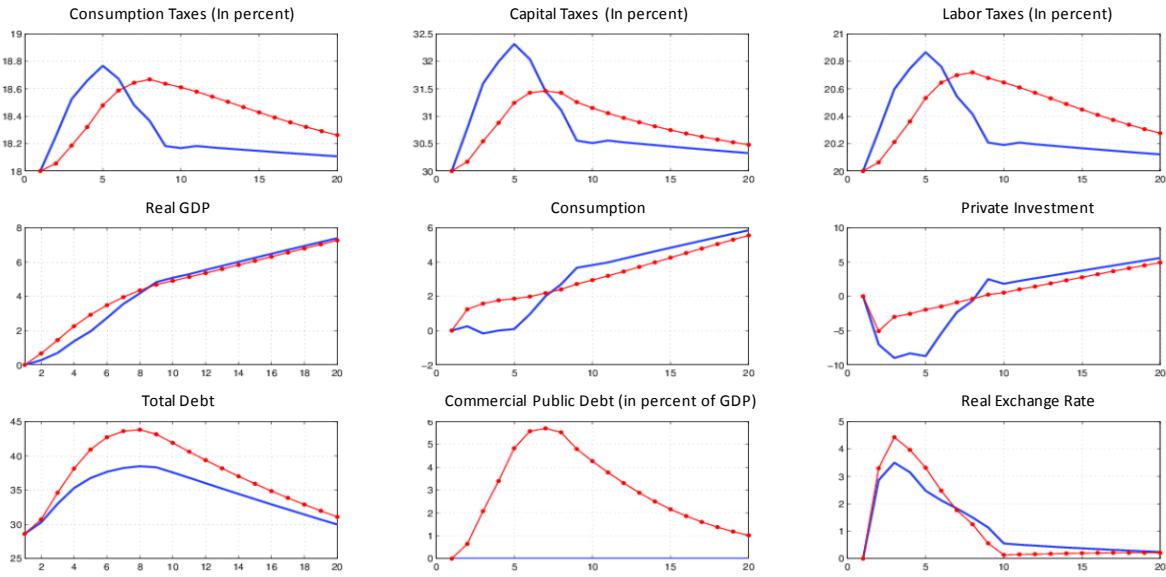
<sup>4</sup> The VAT on domestic consumption increases by 0.8 percentage points, the tax on capital goods increases by slightly more than 2 percentage points, and the tax on labor increases by slightly less than 1 percentage point.

**Figure 2.1. Only Taxes Adjust to Close the Fiscal Gap**



Source: Ghilardi and Sola (2015).

**Figure 2.2. Allowing for Public Debt to Close the Fiscal Gap<sup>1</sup>**



<sup>1</sup> The blue lines refer to the baseline scenario and the red lines refer to the scenario with fiscal adjustment.

Source: Ghilardi and Sola (2015).

**Welfare analysis suggests that—as long as fiscal sustainability is preserved—smoother tax adjustments are preferred.** When the scaling-up is financed by some external nonconcessional borrowing, consumers' welfare—expressed in terms of steady-state consumption—is 8.9 percent higher than when external nonconcessional debt is not allowed. This result occurs because nonconcessional debt allows for a smoother adjustment in tax rates and therefore higher private consumption.

**In terms of the different fiscal adjustment packages, consumers would prefer levying taxes only on capital (or capital owners).** This is because higher taxes on capital produce a larger increase in private consumption in the model. Losses from imposing fiscal adjustment by levying taxes on labor and on consumption amount to 5.7 and 6.9 percent of steady-state consumption, respectively (Table 2.1). Losses become even higher (10.1 and 11.7 percent, respectively) when the government is allowed to smooth fiscal adjustment through higher borrowing.

**Table 2.1. Welfare Analysis of Fiscal Stabilization with Different Taxes**

| Welfare Comparison |          |                     |
|--------------------|----------|---------------------|
|                    | Tax Only | Tax and Public Debt |
| Consumption tax    | 0.069    | 0.117               |
| Labor tax          | 0.057    | 0.101               |
| Capital tax        | -        | -                   |

Source: Ghilardi and Sola (2015).

**However, this solution of capital-only taxes relies on the stringent assumption of immobility of capital across countries.** Despite welfare gains, higher taxes on capital have a long-term cost in terms of lower future levels of output and consumption. This causes the debt-to-GDP ratio to decline at a slower pace after the scaling-up period. Hence, even with a fiscally responsible government, the scaling-up of investment generates a debt profile that is more vulnerable to shocks and carries higher risks for fiscal sustainability. Moreover, the optimality of taxation on capital hinges on the assumption that private capital is not internationally mobile. Removing this assumption will most likely overturn this result. Instead, the optimality of smoothing tax adjustments through higher external debt will carry through.

**On the revenue side, fiscal space can be created not only by increasing tax rates but also by improving the efficiency in tax collection.** In the previous policy scenarios, the efficiency of tax collection was calibrated to 0.4—with 1 being the highest value, or perfect efficiency. The calibration was based on estimation of a stochastic frontier model for tax collection (see Ghilardi and Sola 2015). A marginal improvement from 0.4 to 0.5 already implies some welfare gains, especially in terms of slightly lower taxes and higher long-term consumption and private investments (Figure 2.3). The debt-to-GDP stock is also lower, although not dramatically so. Due to larger tax bases, however, the decline in the debt-to-GDP ratio (especially the commercial debt) is faster than in the baseline case.

**However, the gains from higher public investments could be washed out if the government were to lose significant revenue from the liberalization of the Nigerian trade regime.** Due to its geographical position, Benin is a transit country for merchandise destined for Nigeria. Because Nigeria prohibits the import of several goods (mainly rice, vegetable oil, and used cars), these are imported through Benin. As the Beninese and Nigerian authorities reached an agreement to prohibit these re-exports to Nigeria, the only way for illegal importers to reach the Nigerian market is to declare these goods for domestic consumption in Benin, pay VAT and customs, and re-export them informally to Nigeria. This represents a net revenue gain for the Beninese government, estimated at 2 percent of GDP based on customs data on Benin-Nigeria trade.<sup>5</sup> However, this revenue is vulnerable to changes in Nigeria's trade regime, including trade

<sup>5</sup> Consistent with findings on informal trade in World Bank (2015), the estimate of total revenue gain is based on the assumption that 80 percent of the goods cleared at "adjusted value" are destined for final consumption to Nigeria. As

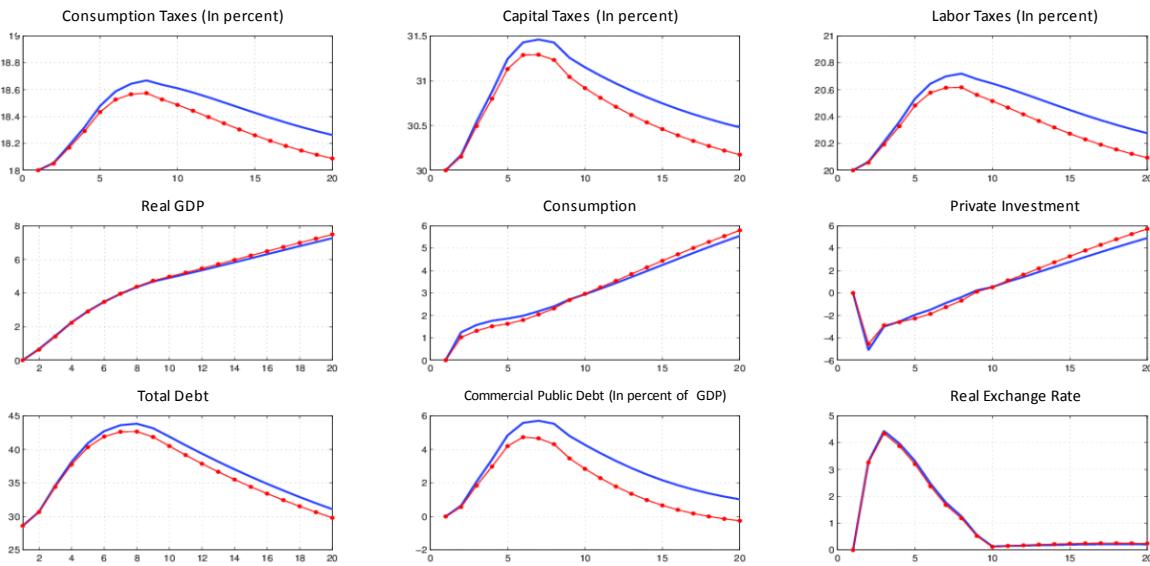
liberalization in the Economic Community of West African States, which was initiated in 2015.<sup>6</sup> Under this scenario, a scaling-up in public investments would prove much more detrimental to public finances. The simulation results show that tax rates would have to increase substantially and remain persistently above their initial steady state, which would have long-term adverse effects on all real variables (Figure 2.4). Output would increase by 3 percentage points less than in the baseline, while consumption and private investments would not increase above their original steady state. Total public debt would increase up to 55 percent of GDP and remain persistently above its initial level, therefore exposing Benin to debt distress risks. Furthermore, lowering the share of concessional funding or allowing interest rates to respond endogenously to the accumulation of debt would considerably worsen the outcome and could make the debt-to-GDP ratio unsustainable.

---

such, a liberalization of the Nigerian trade regime would cause these goods to be imported as goods in international transit, on which the average tariff of 2.9 percent would apply. The data do not allow a breakdown of the total revenues collected on informal reexports in VAT and customs revenue. Based on a comparison of the average effective customs rate and the VAT rate, approximately two-thirds of the revenue represents VAT, and one-third customs revenues. This estimate is also consistent with other estimates in recent Technical Assistance reports. See additional details in Geourjon, Chambas, and Laporte (2008) and Rota-Graziosi and others (2013).

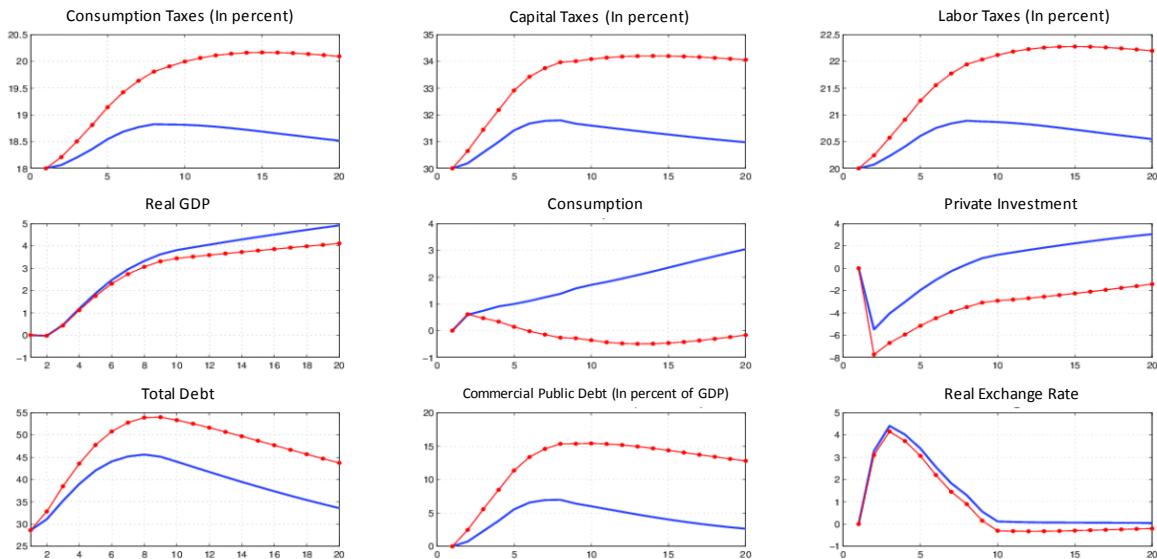
<sup>6</sup> Even though generous transition arrangements allow for a gradual change in trade patterns over time.

**Figure 2.3. Macroeconomic Consequences of an Increase of the Efficiency in Tax Collection**



Source: Ghilardi and Sola (2015).

**Figure 2.4. Macroeconomic Consequences of a Decrease in Tariff Revenues**



Source: Ghilardi and Sola (2015).

**In summary, the scaling-up of public investment in Benin can increase total investment and long-term output and consumption, but not without major risks.** Tighter fiscal policy will be important for preserving fiscal sustainability. The DSGE analysis shows that this can be

achieved through either higher tax rates, a mix of higher tax rates and higher external borrowing, or higher efficiency in tax collection. From a welfare perspective, as long as fiscal policy remains responsible, a mix of higher tax rates and higher external borrowing increases consumers' welfare while allowing for a smoother fiscal adjustment over time. However, the analysis also shows that welfare gains from the scaling-up are subject to considerable risks. The presence of a restrictive trade regime in Nigeria allows Benin to benefit from a large "wealth transfer" from Nigerian consumers of about 2 percentage points of GDP. If the Beninese authorities were to lose such windfall revenues, the fiscal risks from the scaling-up of public investments would be significant, to the point that the fiscal adjustment required to preserve fiscal sustainability would wipe out gains from higher public investments.

# 3

# Creating the Fiscal Space for Successful Scaling-Up

**To generate financing for higher public investment while preserving macroeconomic stability, Benin needs to widen its fiscal space.** The DSGE analysis confirmed that Benin has space to increase debt, even some scope for mobilizing external nonconcessional loans thanks to low external debt, reflecting prudent fiscal policies and the Heavily Indebted Poor Countries Initiative (HIPC) as well as the Multilateral Debt Relief Initiative (MDRI) debt relief. But the DSGE analysis also emphasized the need to create fiscal space in the future to ensure that the positive impact of higher public investment on growth, identified in the HRV 2005 growth diagnostic, can materialize under stable macroeconomic conditions. The two channels already discussed in the DSGE model—increasing tax revenues and enhancing spending efficiency—will be assessed in more detail by comparing Benin’s level of tax revenues and its spending efficiency with those of other countries.

## Creating Fiscal Space by Using Tax Revenue Potential

**While Benin succeeded in increasing total tax revenue, mainly owing to good performance in terms of customs revenue collection, revenue performance is still lagging behind the WAEMU convergence criterion.** Between 2000 and 2011, Benin’s total tax revenue increased from 14.1 percent to 16.2 percent of GDP, exceeding the average of WAEMU and sub-Saharan African low-income non-resource-rich economies. This good performance is mainly explained by notable improvements in customs revenue during the same period (Figure 3.1). However, even with this improved performance, Benin is lagging behind the WAEMU convergence criterion of a minimum tax-to-GDP ratio of 20 percent.

**The increasing trend in total tax revenues is significantly affected by taxing informal re-exports to Nigeria.** As discussed in the previous chapter, about 2 percent of GDP of Benin’s tax revenues are levied on consumer goods that are informally re-exported to Nigeria. While no time series data are available on the development of this component, the Beninese government’s 2010 decision to abolish the VAT credit for informal re-exports to Nigeria increased revenues from these re-exports. Since then, importers have to pay customs and VAT for products for informal re-exports, as they do for any products imported for final consumption in Benin. In addition, the dependence on Nigeria’s economic activity makes Benin vulnerable to oil price fluctuations that significantly affect Nigeria’s economy and thus its demand for informal re-exports from Benin. Therefore, analyzing the revenue impact of the informal re-exports is important for assessing tax potential and guiding policies to reduce risks from spillovers from Nigeria, particularly in light of ongoing and future trade liberalization initiatives.

## **Methodology to Estimate Potential Tax Revenue**

**Cross-country econometric analyses are used to analyze Benin's tax potential based on determinants identified in the literature.** Drawing on the literature on determining the tax potential,<sup>7</sup> the following variables were included to estimate tax potential, defined as the projected tax revenue level that a country can achieve given its macroeconomic fundamentals: GDP per capita, consumption, gross fixed capital formation, inflation, imports and exports as a share of GDP, share of agriculture in GDP, share of the urban population, natural resource rents, and broad money as a share of GDP (Annex 2, Annex Table 1). Potential revenue is obtained as predicted value from a standard fixed-effect panel regression using cross-country data for 1995–2011. Stochastic frontier regressions were prepared to confirm the results. The tax gap is calculated as the percentage deviation of actual revenue from potential revenue. WAEMU and sub-Saharan African low-income non-resource-rich countries are used as reference groups (Annex 1). In addition to the usual approach of conducting regression analysis for total tax revenue, this assessment includes a more granular analysis for revenues in the subcategories goods and services, trade, and income (Annex 2, Annex Tables 1–4).

**The results show that while total revenues are above potential, there is scope to raise more domestic revenues, after correcting for revenues on informal re-exports.** Estimation results reveal that since 2011 total tax revenue performance in Benin has been above its potential, mainly owing to overperformance of customs revenue. However, after correcting for revenue collected from the Nigerian consumption,<sup>8</sup> total tax revenue is below its potential. The negative tax gap is mainly driven by the underperformance of domestic tax revenue. Depending on the sample of countries used in our estimations, Benin has substantial scope to increase its domestic tax revenue by at least 1.5 to 2 percent of GDP (Figure 3.2).

**Similar results are obtained with the stochastic frontier analysis (SFA), which confirms the robustness of the findings.** Following Pessino and Fenochietto (2010), the SFA estimation applies a time-varying parameter of technical inefficiency in tax collection to the different tax categories already discussed in the panel regression analysis. The results (Annex 1, Annex Figure 1) confirm the findings using panel regressions: Benin performs relatively well in terms of total tax collection, but the results are mostly driven by trade taxes. When looking at income taxes, Benin is less efficient than sub-Saharan African and WAEMU countries.

**Reforms in tax policy and revenue administration are necessary to turn this potential to increase domestic tax revenues into reality.** The government is currently in the process of developing a comprehensive tax administration reform and also starting to facilitate the tax system for small companies. Beyond that, tax policy reforms could focus on broadening the tax base, including by eliminating the VAT exemptions not included in the WAEMU code, as well as

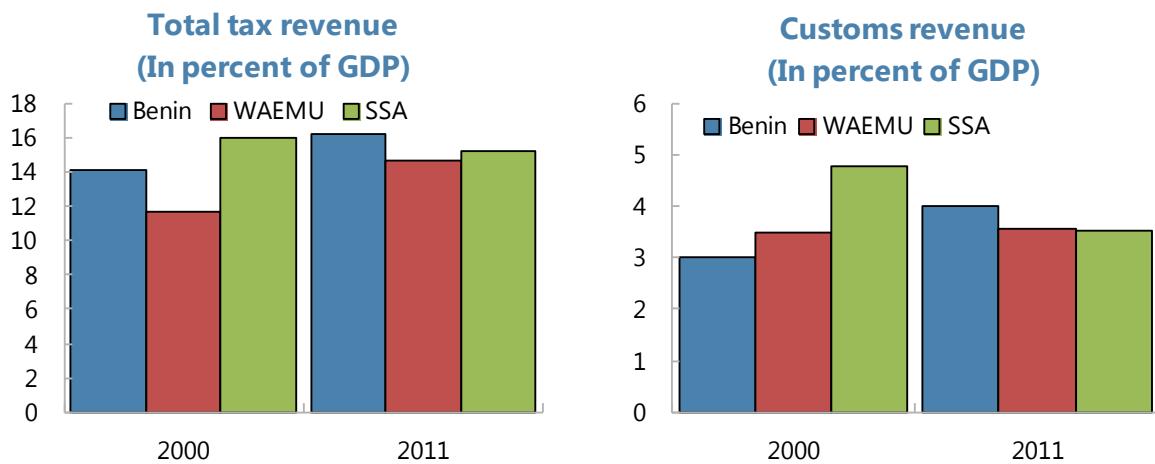
---

<sup>7</sup> For example, Gupta (2007), Davoodi and Grigorian (2007), and Pessino and Fenochietto (2010, 2013).

<sup>8</sup> This is distributed as one-third for customs revenue and two-thirds for goods and services tax revenue as an empirical estimate.

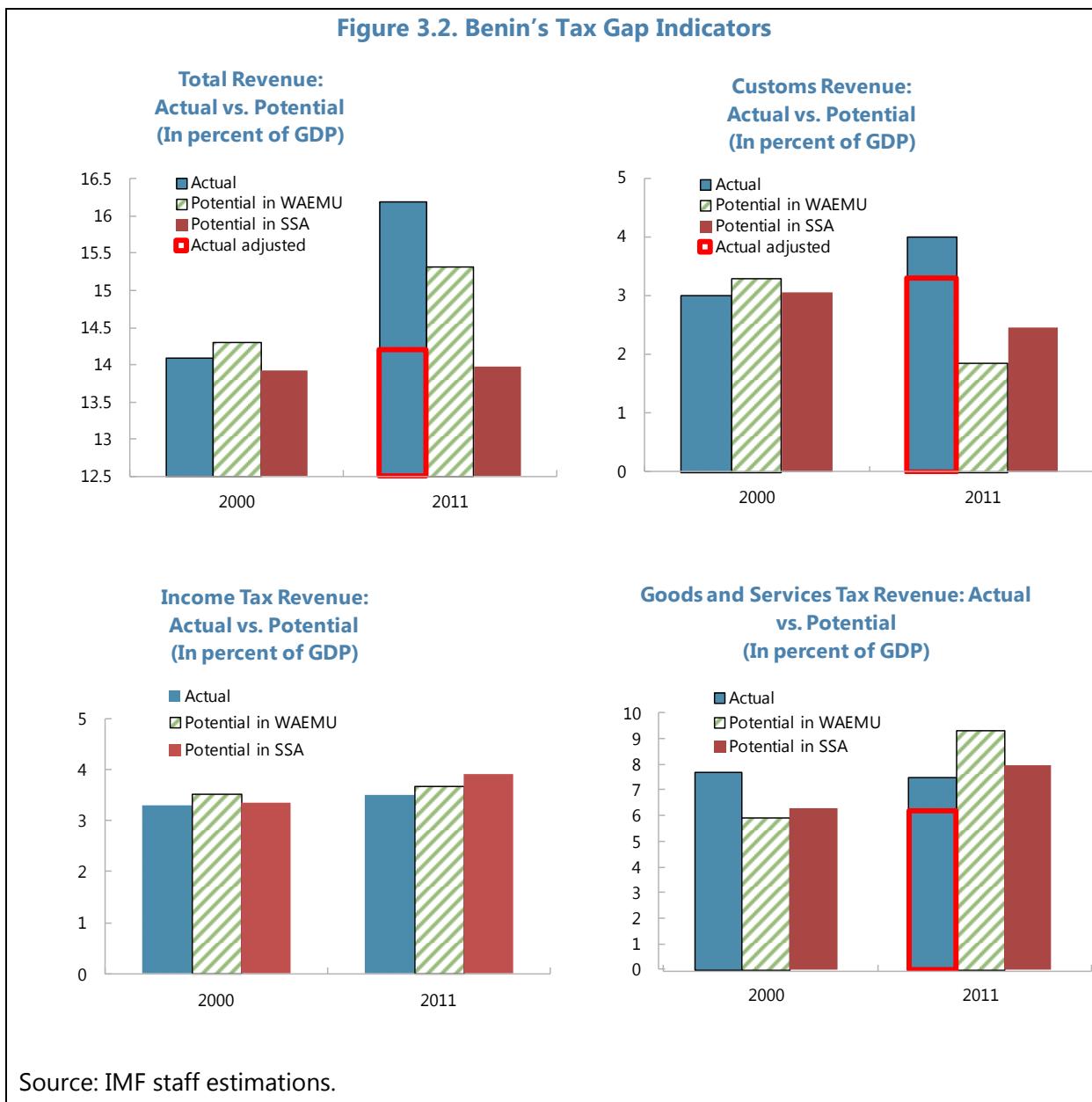
preventing the granting of new tax exemptions for newly created enterprises. Increasing the excise tax rate for some products, such as tobacco, cigarettes, and luxury cars, in line with WAEMU directives would also strengthen revenues. Regarding tax administration, potential reforms could be focused on: (1) combating fraud by securing the single taxpayer identification numbers and reinforcing fiscal controls of large firms; (2) finalizing the segmentation of enterprises according to their turnover; (3) reinforcing the control of VAT credits; and (4) improving services to taxpayers by introducing simple, transparent, and digital options for paying and declaring taxes, such as by Internet, credit cards, and mobile devices.

**Figure 3.1. Benin's Total Tax Revenue Collection Compared with WAEMU and Sub-Saharan Africa**



Source: IMF staff estimations.

**Figure 3.2. Benin's Tax Gap Indicators**



## Creating Fiscal Space by Improving Spending Efficiency

**In addition to tax revenue, spending efficiency is the second pillar of creating fiscal space.**

As discussed in the earlier chapters, the efficiency of spending not only directly contributes to fiscal space, but also critically affects how spending translates into the intended results. This section analyzes the efficiency of public spending on education and health in Benin and estimates the potential savings. The analysis focuses on the technical efficiency of translating public spending into results. Efficiency is assessed by comparing Benin's performance with other WAEMU and low-income African countries. The scope is limited to education and health, sectors for which public spending plays a major role and cross-country data are available. Quantitative

analyses are conducted through a nonparametric data envelopment analysis (DEA)<sup>9</sup> that provides a parsimonious model to assess the efficiency of spending. This method relies on input–output analysis without having to specify the production function. It first identifies the most efficient countries that achieve the highest results at their level of spending through input–output analysis and then compares other countries with these countries to calculate their relative efficiency through linear programming.

**Table 3.1. Education Spending and Results Indicators**

|                      | Public Education<br>Spending (In percent<br>of GDP) |                | Primary Enrollment<br>Rates (In percent) | Adult Literacy<br>Rate (In percent) |  |
|----------------------|---|----------------|--|-------------------------------------|--|
| Benin                | 2003–07<br>3.7                                      | 2008–12<br>4.7 | 2003–07<br>106.0                         | 2008–12<br>124.2                    | 2003–<br>07<br>38.5<br>2008–12<br>42.4 |
| WAEMU excl.<br>Benin | 4.0   | 4.3            | 74.9                                     | 88.9                                | 35.4<br>46.0                           |

**Table 3.2. Health Spending and Results Indicators**

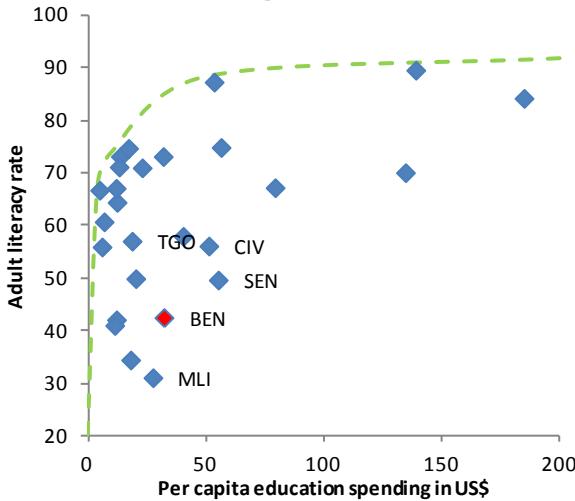
|                   | Public Health<br>Spending (In percent<br>of GDP) |                | Life Expectancy<br>(In years) | Child Survival Rates<br>(Per 1,000) <sup>1/</sup> |  |
|-------------------|--|----------------|-------------------------------|---|--|
| Benin             | 2003–07<br>2.3                                   | 2008–10<br>2.3 | 2003–07<br>57.1               | 2008–10<br>58.6                                   | 2003–<br>07<br>879.8<br>2008–10<br>903.4 |
| WAEMU excl. Benin | 2.3  | 2.8            | 53.2                          | 55.1  | 856.4<br>85.5                            |

Sources: World Development Indicators; Fiscal Affairs Department database; and IMF staff calculation.

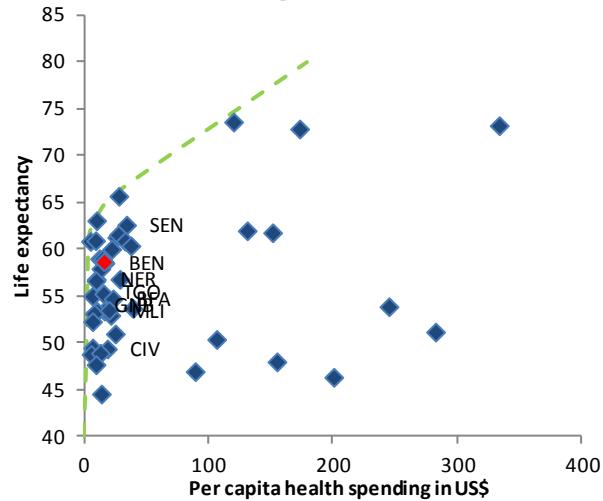
<sup>1/</sup> Data are transformed from the under-5 child mortality rate so that higher spending is expected to result in a higher level.

<sup>9</sup> The DEA method has been used in a recent analysis on the efficiency of public spending in Iceland and in cross-country studies by the Fiscal Affairs Department, such as Belhocine (2013) and Grigoli and Kapsoli (2013).

**Figure 3.3. Efficiency of Education Spending: Adult Literacy versus Per Capita Spending, 2008–12**



**Figure 3.4. Efficiency of Health Spending: Life Expectancy versus Per Capita Spending, 2008–12**



**Benin's education indicators have shown mixed results despite higher spending in recent years.** Comparing the period of 2003–07 with 2008–12, Benin's education spending increased by 1 percentage point, to 4.7 percent of GDP—an increase three times higher than the WAEMU average (Table 3.1)—but the result indicators improved less proportionately. Benin's primary school enrollment rates increased by 18 percentage points, and adult literacy by 4 percentage points, while the respective WAEMU average increases are 14 and 10.6 percentage points. Benin's increase in the adult literacy rate is less than half of the WAEMU average. These facts are mirrored by the DEA analysis, which shows that Benin stays well below the efficiency frontier as defined by results achieved by the most efficient peer countries (Figure 3.3). Efficiency score and potential savings are then calculated in relation to most efficient countries in WAEMU (Table 3.4), suggesting a scope for improvement between 10 and 65 percent.

**Benin's health indicators have improved, driven by higher spending and higher efficiency.** Between 2003–07 and 2008–12, Benin kept its health spending at 2.3 percent of GDP (Table 3.2), while WAEMU countries increased it by 0.5 percent of GDP on average, but Benin's health indicators improved by about the same magnitude as others'. For example, Benin's life expectancy increased by 1.5 years as compared with a WAEMU increase of 1.9 years and its child mortality rate declined by 2 percentage points, equal to the WAEMU average. DEA analysis also shows that Benin is closer to the efficiency frontier in health spending than in education spending, with few countries achieving better results with lower spending (Figure 3.4), and

higher efficiency scores.<sup>10</sup> Estimated savings are calculated in relation to the most efficient WAEMU countries (Table 3.3), suggesting a scope of improvement by 30 to 42 percent.

**Table 3.3 Efficiency Scores of Education and Health Spending and Estimated Savings<sup>1/</sup>**

|   | Baseline<br>Efficiency Score<br>Relative to<br>WAEMU <sup>2/</sup> | Alternative<br>Efficiency Score 1<br>Relative to<br>WAEMU <sup>2/</sup> | Alternative<br>Efficiency Score 2<br>Relative to<br>WAEMU <sup>2/</sup> |
|---|--|---|---|
| Benin's education spending<br>(percent)             | 35   | 42  | 90  |
| Estimated saving (percent of<br>GDP <sup>11</sup> ) | 2.2  | 2.0   | 0.4   |
| Benin's health spending<br>(percent)                | 68   | 54  | 70  |
| Estimated saving (percent of<br>GDP)                | 0.4  | 0.6   | 0.4   |

<sup>1/</sup> To estimate potential savings in spending, input efficiency scores are calculated based on low-income sub-Saharan African countries and then converted to relative scores based on the highest score of WAEMU countries.

<sup>2/</sup> To enhance robustness, three input-output specifications are used. For education, the baseline is based on adult literacy and per capita spending; alternative 1 is based on primary enrollment rates and per capita spending, while alternative 2 is based joint literacy and primary enrollment rates and per capita spending. These specifications produced consistent rankings. The baseline specification has the best country coverage, while the other two cover less than half of the WAEMU countries. For health, the baseline is based on per capita private and public spending and child survival rate; alternative 1 is based on per capita public spending and child survival rate, while alternative 2 is based on public and private spending in percent of GDP and child survival rate. Data coverage is similar.

**Improving the efficiency of education and health spending is important not only for creating fiscal space, but also for supporting more inclusive growth.** Education and health services are essential to build a productive labor force to accelerate growth. The analysis finds that Benin's efficiency of public spending is largely on par with the WAEMU average in health spending, and below average in education spending. Improving the efficiency to the highest level in WAEMU can yield savings of about 1 to 3 percent of GDP, which is a sizable contribution to Benin's fiscal space.

<sup>10</sup> While basic education is generally considered a public good that is fully supported by public spending, the health sector requires significant private spending beyond public spending to achieve results, and thus the DEA analysis included both sources of spending in most specifications.

<sup>11</sup> Given the decreasing return to scale pattern exhibited in the cross-country data, this is estimated as  $(X_i - X_{min})^*(1 - E_i)$ , where  $X$  refers to education spending as well as health spending in percent of GDP and  $E_i$  refers to the relative efficiency score for country  $i$ . This refers to potential savings while achieving the same level of result indicators.



## Conclusion and Policy Discussions

**This paper finds that the Benin authorities' reform strategy of scaling up public investment addresses binding growth constraints, but to achieve maximum impact on growth, it should be complemented by improvements in the business environment.** The growth diagnostic finds that both the infrastructure and business environments are binding growth constraints. As such, while the government strategy for scaling up public investment has strong potential to accelerate growth, the efforts need to be supported by further structural reforms to improve the business environment and boost private sector activities. In addition, the salutary impact of scaling up on growth and consumption depends on complementary fiscal measures to mitigate the risks to fiscal and debt sustainability. With limited scope for external, nonconcessional financing, enhanced domestic revenue mobilization will be important to support macroeconomic stability in the future. Enhancing spending efficiency is critical for delivering the expected results from infrastructure investment, but also for creating further fiscal space for scaling up investment or to achieve social objectives.

**The strong potential to improve domestic revenue mobilization identified in this paper underlines the significant benefits from tax policy and administration reform.** Benin achieves a good total tax collection in line with comparator countries, but relies heavily on trade taxes, which are vulnerable to spillovers from Nigeria, as evidenced in the recent slowdown in Nigeria after the decline in oil prices. Over the medium term, potential losses from regional trade liberalization initiatives could put these revenues under pressure. Cross-country econometric analysis suggests substantial room to improve domestic tax collection by up to 2 percent of GDP. This can be achieved by a combination of tax policy and tax administration reforms.

**On the expenditure side, Benin has significant scope to improve the efficiency of its spending to increase fiscal space.** Based on cross-country analysis focused on WAEMU countries, the potential savings in education and health spending are about 1–3 percent of GDP, which can be used to support the authorities' efforts to deliver better results in these sectors. The 2014 Public Expenditure and Financial Accountability framework identifies several priority areas for improving public financial management and investment planning and management, including enhancing budget credibility, transparency, and audit. Spending efficiency can also be improved by strengthening the government's investment expenditure chain, including (1) better monitoring of the different spending steps to timely identify problems that lead to arrears; (2) enhancing cash forecasting and management, including by introducing a treasury single account; and (3) developing multiyear project planning. Moreover, while the government also plans to PPPs in building infrastructure, a PPP regulatory framework is not yet in place and would warrant some priority actions.

**Finally, in light of the needs of increased new borrowing, the authorities should enhance their capacity for integrated debt monitoring and management.** These enhancements would require developing capacity and systems for integrated debt management, including a mechanism to assess and monitor fiscal risks from guarantees on infrastructure projects including PPPs. A medium-term debt strategy would be needed to specify objectives and a borrowing strategy to achieve the appropriate cost risk tradeoff. These measures would further ensure that the scaling-up of public investment for stronger growth stays on a sustainable path.

## REFERENCES

- Aigner, Lovell, and Peter Schmidt. 1977. "Formulation and Estimation of Stochastic Frontier Production Function Models." *Journal of Econometrics* 6: 21–37.
- Belhocine, Nazim. 2013. "Assessing Efficiency of Public Spending on Health and Education." In *Iceland: Selected Issues*. Washington, DC: International Monetary Fund.
- Benjamin, Nancy, and Ahmadou A. Mbaye. 2014. "Informality, Growth, and Development in Africa." WIDER Working Paper 2014/052, United Nations University. Finland.
- Buffie, Edward F., Andrew Berg, Rafael Portillo, Catherine A. Pattillo, and Luis-Felipe Zanna. 2012. "Public Investment, Growth, and Debt Sustainability: Putting Together the Pieces." Working Paper 12/144, International Monetary Fund, Washington, DC.
- Davoodi, Hamid R., and David A. Grigorian. 2007. "Tax Potential vs. Tax Effort: A Cross-Country Analysis of Armenia's Stubbornly Low Tax Collection." Working Paper 07/106, International Monetary Fund, Washington, DC.
- Development Committee. 2015. "From Billions to Trillions: Transforming Development Finance," Post-2015 Financing for Development: Multilateral Development Finance. Development Committee Discussion Note.
- Domínguez-Torres, Carolina, and Vivien Foster. 2011. Benin's Infrastructure: A Continental Perspective. World Bank Policy Research Working Paper 5869, Washington, DC.
- Geourjon, A.-M., G. Chambas, and B. Laporte. 2008. "République du Bénin. Modernisation du Système Fiscal. Orientations et Stratégie de Réformes." International Monetary Fund, Washington, DC, September.
- Ghilardi, Matteo F., and Sergio Sola. 2015. "Investment Scaling-up and the Role of Government: The Case of Benin." Working Paper 15/69, International Monetary Fund, Washington, DC.
- Grigoli, Francesco, and Javier Kapsoli. 2013. "Waste Not Want Not: The Efficiency of Health Expenditure in Emerging and Developing Economies." Working Paper 13/187, International Monetary Fund, Washington, DC.
- Gupta, Abhijit Sen. 2007. "Determinants of Tax Revenue Efforts in Developing Countries." Working Paper 07/184, International Monetary Fund, Washington, DC.

Hausmann, Ricardo, Dani Rodrik, and Andres Velasco. 2005. "Growth Diagnostics," Harvard Kennedy School Working Paper. Available at  
<http://ksghome.harvard.edu/~rhausma/new/growthdiag.pdf>

Institut National de la Statistique et de l'Analyse Economique (INSAE). 2011. *Enquête sur le Commerce Extérieur Non Enregisstre au Cordon Douanier (ECENE)*. Cotonou.

International Monetary Fund (IMF). 2012. Benin: 2012 Article IV Consultation and Fourth Review Under the Extended Credit Facility Arrangement—Staff Report. Washington, DC.

International Monetary Fund (IMF). 2013. *Regional Economic Outlook of Sub Saharan Africa*. Washington, DC, October.

International Monetary Fund (IMF). 2014. "Fiscal Policy and Income Inequality." IMF Policy Paper, Washington, DC.

Moretti, D., B. Taiclet, N. End, and S. Ramangalahy. 2014. "Renforcer la Chaine de la Dépense (volet Investissement)." FAD TA Report, May.

Pessino, Carola, and Ricardo Fenochietto. 2010. "Determining Countries' Tax Effort." *Hacienda Pública Española / Revista de Economía Pública* 195 (4): 65–87.

Pessino, Carola, and Ricardo Fenochietto. 2013. "Understanding Countries' Tax Effort." Working Paper 13/244, International Monetary Fund, Washington, DC.

Rota-Graziosi, Gregoire, Michel Bua, Anne-Marie Geourjon, and Marcel Steenlandt. 2013. "Simplifier et Améliorer le Système Fiscal et Son Administration." Technical Assistance Report for the Republic of Benin, International Monetary Fund, Washington, DC, January.

World Bank. 2009. Benin Country Economic Memorandum: Constraints to Growth and Potential for Diversification and Innovation. Report No. 48233, Washington, DC.

World Bank. 2015. "Benin-Diagnostic Trade Integration Study (DTIS) Update: From Rents to Competitiveness." Washington, DC.

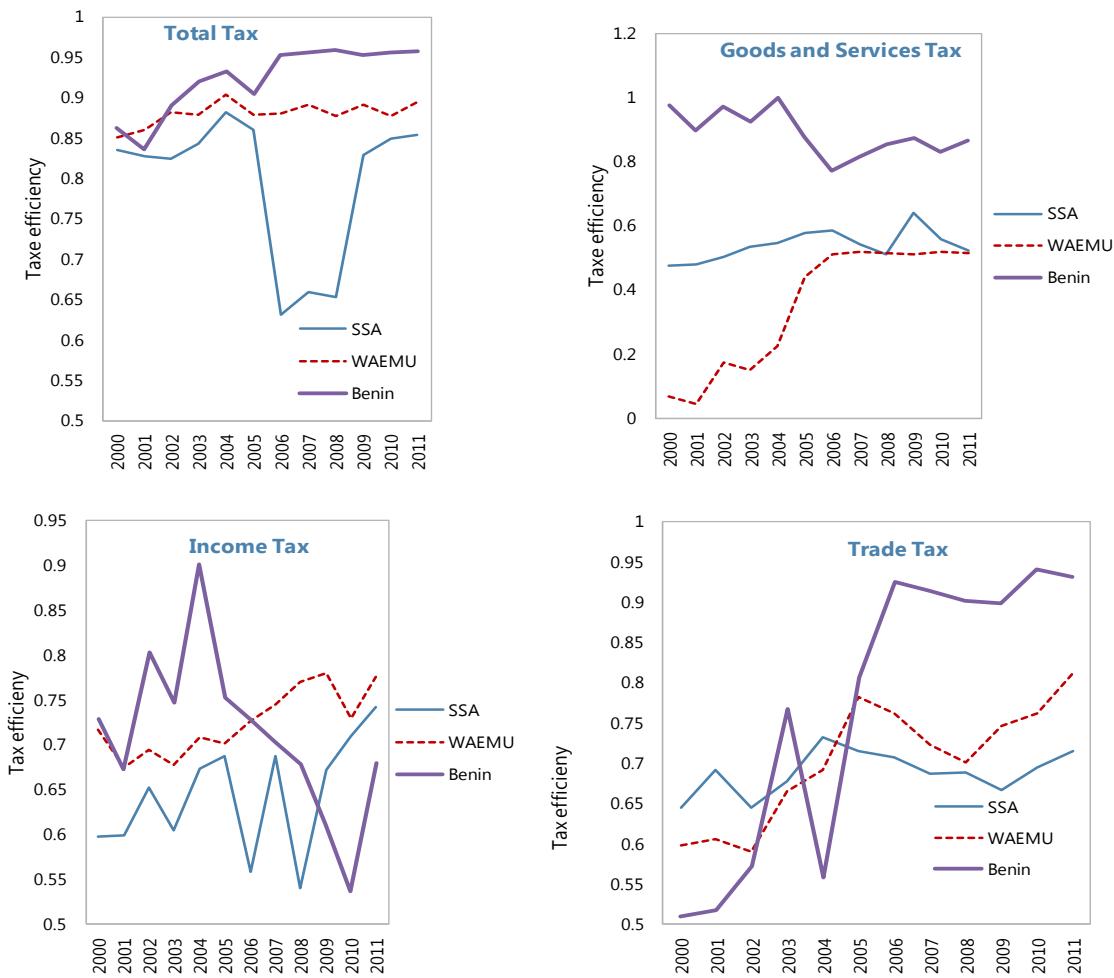
## Annex 1. Stochastic Frontier Analysis

The stochastic frontier model of Aigner, Lovell, and Schmidt (1977) and Pessino and Fenochietto (2010 and 2013) can be represented as follows:

$$\begin{aligned}y_{it} &= \alpha_i + \beta X_{it} + \varepsilon_{it} \\ \varepsilon_{it} &= v_{it} - u_{it} \\ v_{it} &\sim N(0, \sigma^2) \\ u_{it} &\sim F^+(\delta, \sigma^2_u)\end{aligned}$$

Where  $\alpha$  represents a set of country-specific intercepts, and  $X$  is the vector that represents variables affecting tax revenue. The error term  $\varepsilon$  is a composite error term made of the standard component  $v$ , and of a component  $u$  that is distributed following a probability density function, which is positively definite. The element  $u$  is the time-varying element that represents the degree of inefficiency: higher values correspond to higher inefficiencies; therefore, the efficiency is calculated as  $1 - u$ . Similar to the panel regression, four different models are used to analyze each type of tax revenue. Starting from a general model for the estimation of the determinants of tax revenue to GDP, the model is then modified to exclude statistically insignificant explanatory variables.

**Annex Figure 1. Tax Efficiency in Benin by Category**



Source: IMF staff estimations.

## Annex 2. Regression Results by Tax Category

*Annex Table 1. Determinants of Total Tax Potential*

| Total Tax Revenue                              | WAEMU                | SSA                 |
|--|----------------------|---------------------|
| GDP per capita                                 | 5.969**<br>[1.882]   | 2.637<br>[1.879]    |
| Inflation, consumer prices (annual percentage) | -0.040***<br>[0.007] | 0.002<br>[0.013]    |
| Imports (percent of GDP)                       | -0.235*<br>[0.108]   | -0.090<br>[0.089]   |
| Exports (percent of GDP)                       | 0.223*<br>[0.115]    | 0.128<br>[0.102]    |
| Agriculture (percent of GDP)                   | -0.027<br>[0.051]    | -0.166**<br>[0.062] |
| Consumption (percent of GDP)                   | 0.246*<br>[0.121]    | 0.105<br>[0.093]    |
| Gross fixed capital formation (percent of GDP) | 0.390***<br>[0.100]  | 0.077<br>[0.098]    |
| Urban population (percent of total)            | 0.140**<br>[0.054]   | 0.109<br>[0.138]    |
| Total natural resources rents (percent of GDP) | -0.049<br>[0.035]    | -0.015<br>[0.043]   |
| M2 (percent of GDP)                            | 0.080***<br>[0.018]  | -0.001<br>[0.027]   |
| Observations                                   | 201                  | 707                 |
| Number of Countries                            | 8                    | 38                  |
| R-squared                                      | 0.701                | 0.113               |
| R2   | 0.686                | 0.101               |

Robust standard errors in brackets  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimations

*Annex Table 2. Determinants of Trade Tax Potential*

| Trade Tax revenue                              | WAEMU  | SSA                       |
|--|--------|---------------------------|
| GDP per Capita                                 | -1.009 | -1.545<br>[2.091] [1.375] |
| Inflation, Consumer Prices (annual %)          | -0.001 | -0.004<br>[0.010] [0.003] |
| Imports (percent of GDP)                       | -0.002 | -0.034<br>[0.036] [0.045] |
| Exports (percent of GDP)                       | 0.020  | 0.021<br>[0.066] [0.040]  |
| Urban Population (percent of total)            | -0.118 | -0.012<br>[0.264] [0.204] |
| Total Natural Resources Rents (percent of GDP) | 0.028  | -0.008<br>[0.038] [0.034] |
| Trend  | 0.029  | -0.009<br>[0.144] [0.115] |
| Observations                                   | 200    | 716                       |
| Number of Countries                            | 8      | 38                        |
| R-squared                                      | 0.046  | 0.036                     |
| R2   | 0.0109 | 0.0261                    |

Robust standard errors in brackets  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimations

*Annex Table 3. Determinants of Income Tax*

| Income Tax Revenue                         | WAEMU   | SSA       |
|--|---------|-----------|
| GDP per capita                             | 1.636*  | 2.370***  |
|  | [0.698] | [0.626]   |
| Agriculture (percent of GDP)               | -0.049  | -0.035*   |
|  | [0.028] | [0.020]   |
| Consumption ( percent of GDP)              | -0.010  | 0.025*    |
|  | [0.010] | [0.013]   |
| Gross Fixed Capital Formation (in percent) | 0.021   | 0.010     |
|  | [0.020] | [0.013]   |
| Urban Population (in percent of total)     | 0.036   | 0.091**   |
|  | [0.034] | [0.035]   |
| Total Natural Resources Rents (in percent) | 0.043*  | 0.006     |
|  | [0.021] | [0.014]   |
| M2 (percent of GDP)                        | 0.007   | 0.023**   |
|  | [0.008] | [0.009]   |
| Public Wage Bill (percent of GDP)          | 0.132*  | -0.000*** |
|  | [0.057] | [0.000]   |
| Observations                               | 170     | 629       |
| Number of Countries                        | 8       | 35        |
| R-squared                                  | 0.430   | 0.201     |
| R2   | 0.401   | 0.191     |

Robust standard errors in brackets  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimations.

*Annex Table 4. Determinants of Goods and Services Tax*

| Good and Services Tax Revenue                   | WAEMU   | SSA      |
|---|---------|----------|
| GDP per Capita                                  | 8.984** | 4.415*** |
|   | [2.710] | [1.270]  |
| Inflation, Consumer Prices (annual percentage)  | -0.030  | 0.006    |
|   | [0.019] | [0.006]  |
| Agriculture ( percent of GDP)                   | 0.022   | -0.026   |
|   | [0.074] | [0.036]  |
| Government Consumption ( percent of GDP)        | 0.079   | 0.023    |
|   | [0.341] | [0.046]  |
| Household Consumption ( percent of GDP)         | -0.130  | 0.042    |
|   | [0.285] | [0.037]  |
| Gross Fixed Capital Formation ( percent of GDP) | -0.050  | 0.003    |
|   | [0.263] | [0.034]  |
| Urban Population (in percent of total)          | 0.196*  | 0.129*   |
|   | [0.100] | [0.064]  |
| M2 ( percent of GDP)                            | 0.056   | 0.023    |
|   | [0.037] | [0.019]  |
| Imports (percent of GDP)                        | 0.187   | 0.021    |
|   | [0.286] | [0.036]  |
| Exports ( percent of GDP)                       | -0.192  | 0.021    |
|   | [0.280] | [0.035]  |
| Observations                                    | 199     | 698      |
| Number of Countries                             | 8       | 38       |
| R-squared                                       | 0.589   | 0.397    |
| R2  | 0.567   | 0.388    |

Robust standard errors in brackets  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: IMF staff estimations.