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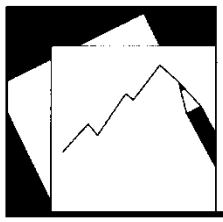

IMF Working Paper

Striking an Appropriate Balance Among Public Investment, Growth, and Debt Sustainability in Cape Verde

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Achieving an Appropraite Balance Among Public Investment, Growth, and Debt Sustainability in Cape Verde

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Abstract

Despite relatively fast economic growth over the past few years, Cape Verde's public debt to GDP ratio has risen rapidly. Achieving an appropriate balance among public investment, growth, and debt sustainability has become a priority for the Cape Verdean authorities. The IMF-World Bank debt sustainability analysis (DSA) framework has helped the authorities monitor the risks of debt stress. However, the DSA has a number of limitations. This paper intends to complement the DSA by addressing aspects currently not covered by the DSA. The paper evaluates public investment scaling-up strategies in Cape Verde by customizing the Buffie and others (2012) model for Cape Verde and conducting various scenario and sensitivity analysis. The paper assesses Cape Verde's public debt risks, taking into account the link between public investment and growth. The paper concludes that the size of scaling-up and aspects of the economic structure have significant impact on the outcome of the public investment. A very large surge in public investment may lead to a debt to GDP ratio that reaches dangerous levels based on the usual DSA criteria. A more moderate scaling-up of public investment may contribute better to stable and sustained growth over the medium and long run. In addition, it is critical that the authorities ensure the quality of public investment.

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I. INTRODUCTION

When Cape Verde graduated from the least-developed-country status in 2007, donors provided a five-year transitional window for concessional funding. The Cape Verde authorities seized this window of opportunity and embarked on a large-scale public investment program.

Despite relatively fast economic growth over the past few years, Cape Verde's public debt has risen rapidly from about 50 percent of GDP in 2007 to over 70 percent in 2011. The risk to debt sustainability has escalated in a highly uncertain external outlook. There is an ongoing discussion on extending the transitional window and further scaling up public investment. It is therefore both timely and critical to look into the appropriate level of indebtedness for Cape Verde, which relies on remittances and tourism as the main pillars of its economy.

The IMF and World Bank (IMF-WB) use a debt sustainability analysis framework (DSA) to identify excessive borrowing that may endanger macroeconomic stability. While the DSA has helped countries monitor their risks of debt distress and enhanced the IMF-WB's assessments and policy advice, it has been subject to various criticisms (Buffie and others, 2012). Debt sustainability analysis using unconditional thresholds such as debt-output ratios are of less value intrinsically for assessing the links between public investment and sustainable growth. For example, Wyplosz (2007) argued that the IMF-WB DSA analysis does not give sufficient consideration to the link between public investment and growth. In addition, it does not capture the key factors concerning the structure of a country's economy, such as the efficiency of public investment, the absorptive capacity of the country, and the return on infrastructure, which have significant impact on the outcome of public investment.

This paper evaluates public investment scaling-up strategies in Cape Verde by customizing Buffie and others (2012) model to the specific context of Cape Verde's economy, such as a high share of imports in public capital formation and relatively easy access to external financing. For example, the original model can accommodate either domestic borrowing or external commercial borrowing, but not both, as sources of funding to fill in the gap of concessional loans. Given that Cape Verde is a country with a pegged exchange rate regime and the government is committed to containing domestic financing to maintain the regime, it would be more realistic to allow a combination of domestic borrowing and external commercial borrowing. We therefore modified the model so that it supports a combination of different funding sources—concessional loans, domestic financing, and external commercial borrowing.

The main objective of the paper is to assess Cape Verde's public debt risks, considering the link between public investment and growth. In particular, the paper intends to complement the standard IMF-World Bank debt sustainability framework for low-income countries (LICs) by explicitly modeling and analyzing the links among public investment, economic

growth, and debt sustainability. Consideration of these links in a coherent analytical framework is especially important for Cape Verde as the country has scaled up its public investment for several years. External debt as a percentage of GDP has increased significantly over the past few years in Cape Verde. This provides a strong rationale for a policy debate on the appropriateness of a further rapid scaling-up to accelerate the growth.

The analysis shows that Cape Verde's debt would be sustainable[2] under certain conditions and assumptions specified in the paper, but the extent of scaling-up and assumptions on the structure of Cape Verde's economy have significant impact on the outcome of public investment. The country's debt level is projected to peak at a wide range of nearly 83 percent to over 127 percent of GDP depending on size of scaling-up and economic structure assumptions.

The paper consists of five sections in addition to Introduction (Section I). Section II presents a brief description of the model and the calibration to Cape Verde's economy. Section III discusses the baseline results of model simulations. Section IV considers alternative scenarios that include a more conservative period of scaling-up (until 2015) and a more aggressive scaling-up between 2013 and 2018. Section V conducts sensitivity analysis on a number of key parameters including efficiency of public investment, return on infrastructure, rate of user fee collection, country absorptive capacity, and depreciation rate of infrastructure. Section VI concludes the paper by drawing policy implications from the analysis.

II. Construction of the Model and Calibration to the Case of Cape Verde

This section customizes the Buffie and others model (2012) for Cape Verde. The model applied to Cape Verde in this paper is a two-sector open economy dynamic general equilibrium model with three types of public sector debt (external concessional, external commercial and domestic debt) that attempts to capture some of the main features of a typical low-income country or a lower middle-income country. This model is intended for long-run analysis and therefore does not include money or nominal rigidities.

A. Model Construction for Cape Verde[3]

This section intends to customize the Buffie and others (2012) model by considering the following three key features for Cape Verde: (i) imports account for a high share of public investment inputs; (ii) the government has ability to obtain external financing; and (iii) the country has the ability to sustain a credible pegged exchange rate regime.

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[2] Sustainability means that the path followed by debt is not explosive in the medium term.

[3] The model section is based mainly on the Buffie and others (2012) model, which has been used for Togo (Andrle and others, 2012).

The Firms

Cape Verde is a small open economy with two productive sectors: Non-tradable goods (q_n) and tradable goods (q_x).

The Cobb-Douglas production function is outlined in Equation 1.

$$q_{i,t} = A_{i,t}(z^{e}_{t-1})^{\psi_i}(k_{i,t-1})^{\alpha_i}(L_{i,t})^{1-\alpha_i} \qquad (1)$$

Where $q_{i,t}$ is output, z^{e}_{t-1} is productive infrastructure, $k_{i,t-1}$ is private capital, $L_{i,t}$ is labor, and *i* (with $i = n, x$) denotes each sector (non-traded and traded sectors).

Firms in both sectors are assumed to operate in a competitive environment and maximize profits,[4] such that the marginal value of each input is equal to its factor price. Thus, they maximize the following objective function (Equation 2).

$$\mathrm{Max}\ \mathrm{p}_{i,t} q_{i,t} - w_t L_{i,t} - r_{i,t} k_{i,t-1} \qquad (2)$$

Where $\mathrm{p}_{i,t}$ is the price of the output, w_t is wage, and $r_{i,t}$ is the rental rate of capital in each sector.

The Consumers

The model has two types of consumers: "savers" and "nonsavers." Nominal consumption is subject to a tax. The tax rate *h* is a summary of the indirect tax burden. Remittances (*R*) and transfers (*T*) are assumed to be proportionate to the consumers' share in aggregate employment.

Nonsavers consume all of their income in each period, which allows for non-Ricardian effects. Nonsavers have the following utility function (Equation 3).

$$\mathrm{Max} \sum_{t=0}^{n} \beta^{t} \frac{(c_t^{S})^{1-1/\tau}}{1-1/\tau} \qquad (3)$$

Where τ denotes the intertemporal elasticity of substitution (and $1/\tau$ is the coefficient of relative risk aversion), and β denotes the discount factor.

The nonsavers are subject to the following budget constraint (Equation 4):

$$(1+h_t)P_t c_t^{H} = w_t L^{H} + \frac{a}{1+a}(R_t + T_t) \qquad (4)$$

[4] This assumption may be a bit unrealistic in most small economies, like Cape Verde.

Where *a* denotes labor ratio of nonsavers to savers, R is remittances; T is transfers, which are defined as current expenditure less direct taxes; and *P* is the consumer price index. P is derived from a constant elasticity of substitution basket that includes a domestic traded good, a foreign traded good, and a domestic non-traded good such that
$P_t = [\rho_x P_{x,t}^{1-\varepsilon} + \rho_m P_{m,t}^{1-\varepsilon} + \rho_n P_{n,t}^{1-\varepsilon}]$.

The model assumes that savers can invest in private capital in both the traded and non-traded sectors ($I_{i,t}^S$ in Equation 5 denotes investment in each of the sectors). They also pay user fees for infrastructure services (μz^e), can buy domestic bonds (b_t^S), and can contract foreign debt (b_t^{S*}). Savers solve the same utility function as the nonsavers, but subject to three constraints (5). The model is rescaled by a permanent component of sector-wide total factor productivity, growing at a rate (g).

$$\text{Max} \sum_{t=0}^{\infty} \beta^t \frac{(c_t^S)^{1-1/\tau}}{1-1/\tau}$$

subject to

$$P_t b_t^S - b_t^{S*} = r_{x,t} k_{x,t-1}^S + r_{n,t} k_{n,t-1}^S + w_t L_t^S + \frac{R_t}{1+a} + \frac{T_t}{1+a} - \frac{1+r_{t-1}^*}{1+g} b_{t-1}^{S*}$$

$$+ \frac{1+r_{t-1}}{1+g} P_t b_{t-1}^S - P_{k,t}(I_{x,t}^S + I_{n,t}^S + AC_{x,t}^S + AC_{n,t}^S) - P_t\, c_t^S (1+h_t) - \mu z_{t-1}^e - \Upsilon_t^S - \Phi_t^S, \qquad (5)$$

and

$$(1+g)k_{x,t}^S = I_{x,t}^S + (1-\delta)k_{x,t-1}^S,$$

$$(1+g)k_{n,t}^S = I_{n,t}^S + (1-\delta)k_{n,t-1}^S$$

Where r is the real interest rate on domestic bonds, r^* is the interest rate on foreign debt, δ is the depreciation rate, Φ_t^S is profits for domestic firms, *g* is the trend growth rate of GDP per capita, $AC_{i,t}^S$ terms are capital adjustment costs in each of the sectors, and Υ_t^S is portfolio adjustment costs linked to foreign liabilities, capturing the degree of financial account openness.

The Government

Equation 6 captures inefficiencies in public capital creation.

$$(1+g)z_t^e = (1-\delta)z_{t-1}^e + s(I_{z,t} - \bar{I}_z) + s\bar{I}_z \qquad (6)$$

Where $\bar{I}_z$ is public investment at the initial steady state; *s* is a value between zero and one, denoting the efficiency of public investment; I_z is public investment; and z^e is additional public capital or infrastructure produced by public investment. This equation implies that one dollar of additional public investment (the second term on the right-hand side of Equation (6) does not necessarily translate into one dollar of productive public capital.

Equation 7 defines the government budget constraint.

$$P_t\Delta b_t + \Delta d_{c,t} + \Delta d_t = \frac{r_{t-1}-g}{1+g}P_t b_{t-1} + \frac{r_{d,t-1}-g}{1+g}d_{t-1} + \frac{r_{dc,t-1}-g}{1+g}d_{c,t-1} \\ + P_{z,t}I_{z,t} + T_t - h_t P_t c_t - G_t - \mu z^e_{t-1} \qquad (7)$$

The left-hand side of Equation 7 is financing ("below the line") and the right-hand side is the government expenditure and revenue ("above the line). The first positive terms on the right-hand side of the equation refer to expenditure on debt service (domestic debt, external commercial debt, concessional debt), infrastructure investment, and government transfers, respectively. The negative terms are "revenue" items, namely tax revenue on consumption, grants (exogenous, obtained from donors), and revenue from user fees on infrastructure. When revenue falls short of expenditure, the deficit is financed by borrowing domestically or abroad (on commercial and/or concessional terms).

Infrastructure is built by combining one imported machine/equipment with α_z units of a non-traded input. The supply price of infrastructure is determined by Equation 8.

$$P_{z,t} = P_{m,t} + \alpha_z P_{n,t} \qquad (8)$$

Where $P_{n,t}$ is the relative price of the non-traded good, and $P_{m,t}$ denotes the relative price of the imported good (machine/equipment).

The key feature of the model is to capture the dynamic interactions of public investment, growth, recurrent costs, and fiscal policy. The government collects revenue from the indirect tax (consumption tax) and from the user fees for infrastructure services. This user fee is expressed as a fixed fraction/multiple (*f*) of recurrent costs of maintaining infrastructure, that is, $u=f^*\delta^*P_{z0}$. The government spends on infrastructure investment, transfers, and debt service.

Equation 9 is the policy adjustment function.

$$GAP_t = \frac{1+r_d}{1+g}d_{t-1} - d_t + \frac{r_{dc,t-1}-g}{1+g}d_{c,t-1} + \frac{r_{t-1}-g}{1+g}P_t b_{t-1} + P_{z,t}I_t + T_o - h_o P_t c_t - G_t - \mu z^e_{t-1} \qquad (9)$$

This *GAP* corresponds to expenditure (including interest rate payments on debt) less revenue and concessional borrowing, when transfers and taxes are kept at their initial levels (h_o and

T_o). In this regards, the policy adjustment function (9) in any given year can be rewritten as Equation (10).

$$Gap_t = P_t \Delta b_t + \Delta d_{c,t} + \Delta d_{t+} (h_t t - h_0) P_t c_t t - P_{z,t} I_t - (T_t - T_0) \qquad (10)$$

The term $P_{z,t} I_t$ in Equation 10 corresponds to public investment outlays including costs overruns associated with absorptive capacity constraints. It is defined by Equation 11

$$P_{z,t} I_{z,t} = HH_t \left(I_{z,t} - \bar{I}_z \right) + \bar{I}_z \qquad (11)$$

Because skilled administrators are in rare supply in small lower middle income countries and low-income countries, ambitious public investment programs are often undermined by poor planning, weak oversight, and poor coordination problems, all of which contribute to large cost overruns during the implementation phase. To capture this, we multiply new investment $(I_{z,t} - \bar{I}_z)$ by Ht which is defined below.

$$H_t = \left(1 + i_{z, \frac{t}{z_{t-1}}} - \delta - g \right)^{\emptyset} \qquad (12)$$

Where $\emptyset \geq 0$ determines the severity of the absorptive capacity–or "bottleneck"–constraint in the public sector.

With the path for public investment and concessional loans taken as given (exogenous to the model), the government uses all concessional resources available, and the fiscal gap before policy adjustment is defined by Equation 10.

We assume the tax path is exogenous. When revenue falls short of expenditure, the adjustment will be done through external commercial borrowing and/or the cutting of Transfers (expenditures).

Given the rigidity of the transfer adjustment, we set the cap for the change of transfer as percentage of the GDP. Given the Cape Verde's context, we set the cap at 1.5 percent of GDP.

B. Model Calibration for Cape Verde

This section calibrates the model parameters for Cape Verde.

Text Table 1. Calibration of Main Parameters (Base Case)

Symbol	Parameters	Values
ρ_n	Value added in non-traded sector	0.600
b_0	Initial public domestic debt-to-GDP ratio	0.157
d_0	Initial public external concessional debt-to-GDP ratio	0.508
$d_{c,0}$	Initial public external commercial debt-to-GDP ratio	0.015
b*	Initial private external debt-to-GDP ratio	0.223
G_0	Grants-to-GDP ratio	0.025
R_0	Remittances-to-GDP ratio	0.114
g	Trend growth rate (percent)	4.382
x	Imports (percent of GDP)	48.288
$i_{z,0}/y_0$	Initial ratio of infrastructure investment to GDP	0.090
h_0	Initial consumption taxes	0.150
r_0	Initial real interest rate on domestic debt	0.050
$r_{dc,0}$	Initial real interest rate on external public commercial loans	0.040
r*	Initial real interest rate on private external debt	0.065
a	Labor ratio of nonsavers to savers	1.200
δ	Depreciation rate	0.040
r_d	Real interest rate on concessional loans	0.000
α_x	Capital's share in value added in the traded sector	0.400
α_n	Capital's share in value added in the non-traded sector	0.550
α	Cost share of non-traded inputs in the production of capital	0.400
η	The portfolio adjustment costs parameter	0.800
f	user fee as a multiple/fraction of recurrent costs of infrastructure	0.600
R_0	Initial return on infrastructure	0.300
s	Efficiency of public investment	0.600
Φ	Absorptive capacity parameter	0.000
ξ	Capital learning externalities	0.000
σ	Sectoral output learning externalities	0.000
r_f	Real risk-free foreign interest rate	0.040
τ	Intertemporal elasticity of substitution	0.340
v	Capital adjustment cost parameter	6.410
ε	Intratemporal elasticity of substitution across goods	1.500
η_g	Public debt risk premium parameter	0.000
u	Private debt risk premium	0.040
v_g	Public debt risk premium	0.020
λ_1	Fiscal reaction parameters (policy instrument terms)	0.200
λ_2	Fiscal reaction parameters (debt terms)	0.020
Ψ_x, Ψ_n	Elasticities of sectoral output with respect to infrastructure	0.170

With the availability of a long series of historical data, the following parameters are calibrated based on averages of Cape Verde's historical data (2000–11): imports as percent of GDP (x), value added in non-traded sector (ρ_n), initial public external concessional debt-to-GDP ratio (d_0), initial public external commercial debt-to-GDP ratio ($d_{c,0}$), initial private external debt-to-GDP ratio (b^*), remittances-to-GDP ratio (R_0), trend growth rate (g), initial ratio of infrastructure investment to GDP ($i_{z,0}/y_0$), and initial transfer- to-GDP ratio.

The following parameters are calibrated based on the average of Cape Verde's recent historical data (2009–11) or an anticipated normal level.

Grants-to-GDP ratio (G_0). The average of grants-to-GDP ratio (G_0) is 0.0636, however, there is a permanent drop of grants-to-GDP ratio to around 0.025 in 2011. We set $G_0 = 0.025$.

Initial public domestic debt-to-GDP ratio (b_0). The average of public domestic debt-to-GDP ratio between 2000 and 2011 is about 25 percent. During the past few years, the government lowered the domestic debt as a percent of GDP and committed to containing domestic borrowing to support the pegged exchange rate regime. For the past three years, the ratio has been stayed at about 0.16. In light of this, b_0 is set at 0.16.

Initial public investment-to-GDP ratio ($I_{z,0}/y_0$). Even though the 2000-2011 average of public investment to GDP ratio was relatively high, 13.25, the normal level of 9 percent is considered a more reasonable figure. Therefore, $I_{z,0}/y_{0\,1}$ is set at 0.09.

Initial consumption taxes (indirect taxes h_0). The value added tax and other indirect tax revenue as a percent of GDP are used to calibrate this parameter. It is set it at 15 percent based on the average of the past five years.

The following parameters are calibrated based on the best estimate for Cape Verde.

Initial real interest rate on domestic debt (r_0). It is set at 0.05 because the average weighted interest of bonds and obligations was around 7.65 percent, and average inflation rate was approximately 2.65 percent over the past three years (2009–11).

Initial real interest rate on public commercial loans($r_{dc,0}$). It is set at 0.04, similar to the assumption in the DSA.

Initial real interest rate on private external debt (r^*). It is set at 0.065 because the interest rate of the private external debt is approximately 9.0 percent in 2011 minus the 2.5 percent world inflation rate.

Capital's share in value added (α_n, α_z). The Global Trade Analysis Project (GTAP) assembled the social accounting matrices. The GTAP5 database for SSA suggests around 35–40 percent for capital's share in value added in the tradable sector and 55–60 percent in the non-tradable sector (Buffie and others, 2012). Given that there are no specific data available for Cape Verde, this pair of parameters are set $\alpha_n = 0.55$ and $\alpha_z = 0.40$.

Cost share of non-traded inputs in the production of capital (α). Given that imported goods account for a relatively higher share of public investment inputs than non-tradable goods, this parameter is set at a relatively low level of 0.4.

The portfolio adjustment costs parameter (η). This parameter controls the degree of openness of the capital account. Given that private sector has some, but limited, access to international capital markets, this parameter is set at 0.8 in the base case.

Real interest rate on concessional loans (r_d). Given that the world inflation rate is about 2.5 percent and the average interest rate of concessional loans is also around 2.5 percent, this parameter is set at 0.

In addition, the labor ratio of nonsavers to savers (a = 1.2) for Cape Verde is based on best estimates in the context of Cape Verde.

The following parameters are estimated based on Cape Verde's circumstances. As the model outcome is sensitive to these parameters, we will undertake sensitivity analysis and discuss it later in the paper.

Efficiency of public investment (s) and the absorptive capacity parameter (ϕ). Efficiency of public investment (s) is set at 0.6 as used in the Buffie and other (2012). The base case also assumes that scaling up does not strain the absorptive capacity (ϕ = 0). The paper also examines later a more pessimistic scenario (lower efficiency of public investment (s = 0.2) associated with tighter absorptive capacity (ϕ = 3)) and a more optimistic scenario (higher efficiency of public investment (s = 0.8) associated with a good absorptive capacity (ϕ = 0)).

Return on infrastructure (R_0). Buffie and others (2012) did some research and concluded that 30 percent could be norm for economies with good governance. Given that Cape Verde has good governance, the parameter is set at 30 percent under the base case. It is also the same value as the one set in Buffie and others (2012). Alternative scenarios of lower return on infrastructure (R_0 = 0.10) and higher return on infrastructure (R_0 = 0.40) are discussed in Section V (Sensitivity Analysis).

User fees for infrastructure services (μ). The user fee for infrastructure services is a multiple/fraction of recurrent costs of infrastructure, $\mu = f\delta P_{z,0}$. According to Briceno-Garmendia, Smits, and Foster (2008), on average, user fees recoup about half of recurrent costs in SSA. According to Buffie and others (2012), f ranges from 0.2 to 1. The paper assumes f = 0.6 under the base case. Since $P_{z,0} = 1/(1-\alpha_z) = 1.61$ and δ = 0.04, then μ = 0.067. The paper also investigates alternative scenarios of a lower (f = 0.20) and higher (f = 1) user fee recoup rate in Section V (Sensitivity Analysis).

Depreciation rate (δ = 0.04). Buffie and others (2012) sets depreciation rate at 0.05. The paper set 0.04 for the base case and also examines that impact of a higher rate of 0.06 in the sensitivity analysis section.

Because of a lack of Cape Verde's specific data, the following parameters are set at the same level as those used in Buffie and others (2012): Fiscal reaction parameters (policy instrument terms λ_1), fiscal reaction parameters (debt terms λ_2), public debt risk premium parameter (η_g), private debt risk premium (u), public debt risk premium (v_g), capital adjustment cost parameter (v), elasticities of sectoral output with respect to infrastructure (Ψ_x, Ψ_n), intertemporal elasticity of substitution (τ), intratemporal elasticity of substitution across goods (ε), and real risk-free foreign interest rate (r^f).

III. THE BASE CASE

This section discusses simulation under the base case. The following are key macroeconomic assumptions under the base case.

Concessional loans and grants. Although donors originally provided the transitional window for concessional loans until 2012, an extension of the transitional window for a few more years is being negotiated. Given the high likelihood for the extension to be agreed, an extension of the transitional window until 2015 has already been incorporated into the base line of the IMF macro framework and the IMF DSA (2012). The paper therefore assumes that the paths of concessional loans and grants are exogenous and are the same as those from the DSA. The level of concessional loans and grants is expected to decline significantly at around 2018–20 as concessional loans contracted over the next few years (2013–15) would be close to full disbursement by then.

Public investment. In line with the above assumption of concessional loans and grants, we assume Cape Verde's authorities would scale up public investment until 2018, and then gradually return to a normal level (around 8.5–9 percent of GDP) over the following two to three years (Figure 1a) as in the IMF DSA (2012).

In addition to analyzing the impact of different sizes of public investment scaling-up, Section IV provides analysis of alternative scenarios (cases).

Domestic debt/GDP ratio. Given that Cape Verde is a country with a pegged exchange regime, it is critical to contain the government's domestic financing to maintain a credible peg regime. We assume that the government will commit to low domestic financing to support the pegged regime. The domestic debt/GDP ratio is exogenous, and its path is assumed to be the same as the DSA domestic debt/GDP trajectory.

Fiscal policy—taxes. We assume that the government will commit to its tax reform plan and gradually increase domestic tax revenue as a percent of GDP by broadening the tax base and rationalizing tax exemptions. Specifically, the indirect tax burden is assumed to follow the path in the macro framework. Tax is projected to increase slightly in the medium term to the level of 2009–10.

Fiscal policy—transfer[5]. Transfer is endogenous. The ceiling for the transfer adjustment cut is set at 1.5 percent of GDP given the rigidity of current expenditure and wage taxes.

The following are key assumptions related to the structure of the economy under the base case: Bases for the assumptions are discussed in Section II. First, return of infrastructure investment is 30 percent. Second, in developing economies, there is inefficiency in public investment. A noticeable amount of public investment often does not increase the stock of productive capital (Hulten, 1996; Pritchett, 2000). One dollar of public investment often cannot create one dollar of public productive capital. Efficiency of public investment is assumed to be 0.60. This means that one dollar of public investment will create $0.6 of public productive capital. Third, user fees can recover 60 percent of the recurrent costs of infrastructure. Fourth, although the government scaled up public investment, we assume there is no absorptive capacity constraint to absorb the scaling-up of the public investment. Finally, the depreciation rate of infrastructure is assumed to be 4 percent.

In addition, since data about those variables related to the structure of Cape Verde's economy are not available, Section V provides sensitivity analysis on the above variables.

Overall, the results of the base case (Figure 1) shows that the scaling-up contributes to growth; public debt remains manageable but with increased risks. Specifically:

Public debt. Public debt is projected to remain self-containable. It is expected to peak in year 11 at around 98 percent of GDP and then declines as the country repays its debt and GDP increases.

Growth. The scaling-up is expected to contribute to higher real GDP growth for the first nine years. Then the GDP growth rate is projected to decline to around 4.25 percent, a level still higher than the normal real GDP growth rate (approximately 3.3 percent) before the scaling-up.

Fiscal response and external commercial borrowing needs. Since domestic financing, tax, concessional loans and grants are exogenous; the financing gap for scaling-up needs to be financed through cutting transfers and external non-concessional borrowing. During the first three years, transfers need to be reduced by about 1.5 percent of GDP (ceiling) to satisfy the government budget constraint. The rest of the financing gap needs to be fulfilled by the external non-concessional borrowing.

Public and private capital. Public effective capital increases as a result of scaling-up of public investment. After around the ninth year, public effective capital starts to decline but stabilizes at a level higher than the initial level. In early years, the private capital is projected to increase and stabilize at a level much higher than the initial steady state.

[5] Transfer is current expenditure less direct taxes (e.g., income tax).

Consumption. The transfer cut is projected to contribute to a permanent drop of consumption as a percentage of GDP.

Current account. The scaling-up of public investment increases the demand for non-tradable resources. As a result, the relative price of non-tradable goods and the real exchange rate appreciate during the initial years. This contributes to a noticeable deterioration of the current account deficit in the short run. In the medium term, the import is projected to slow down with the winding-down of public investment. Therefore, the real exchange rate is projected to depreciate, and the current account is projected to improve.

Figure 1. Base Case

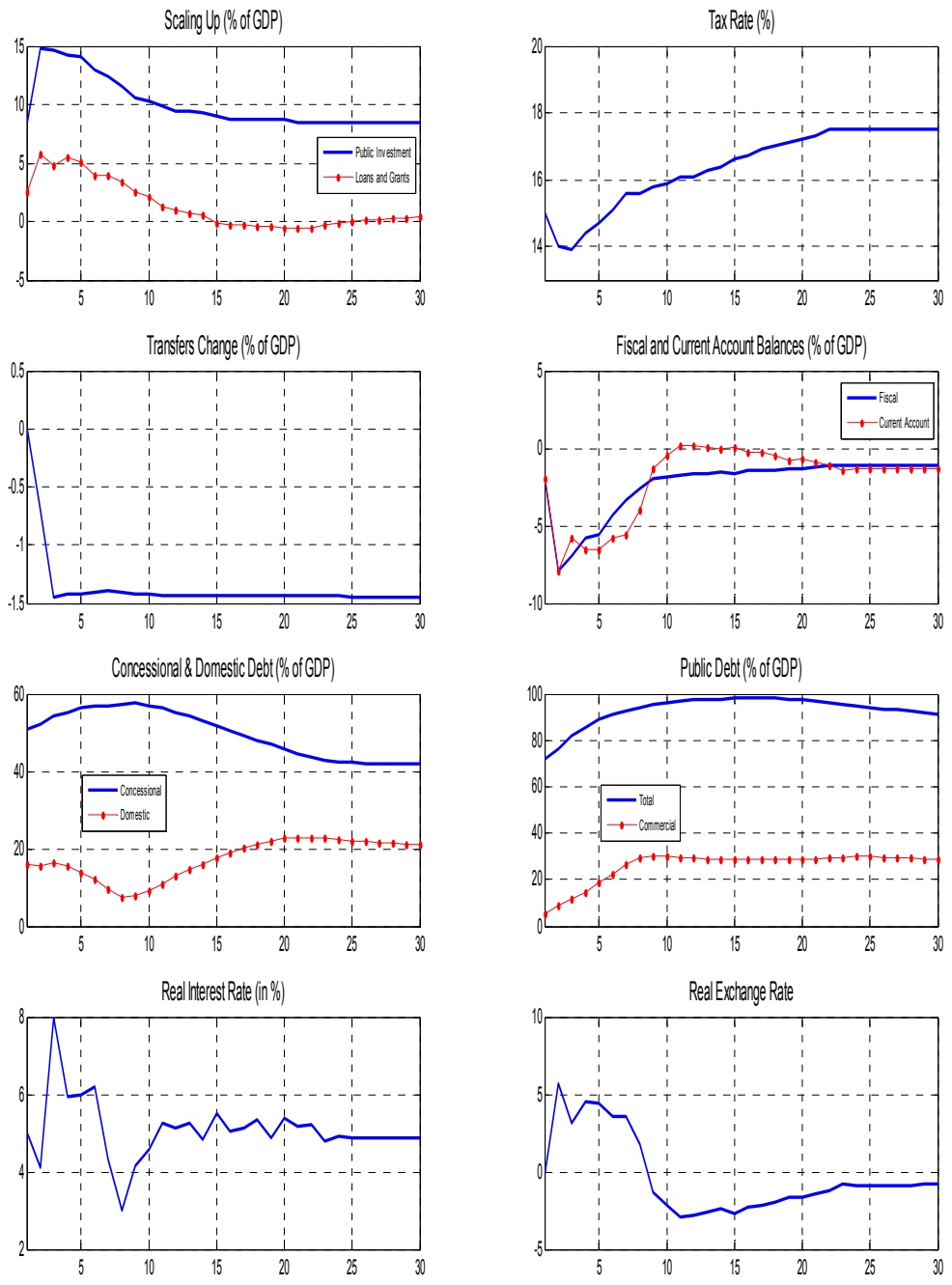
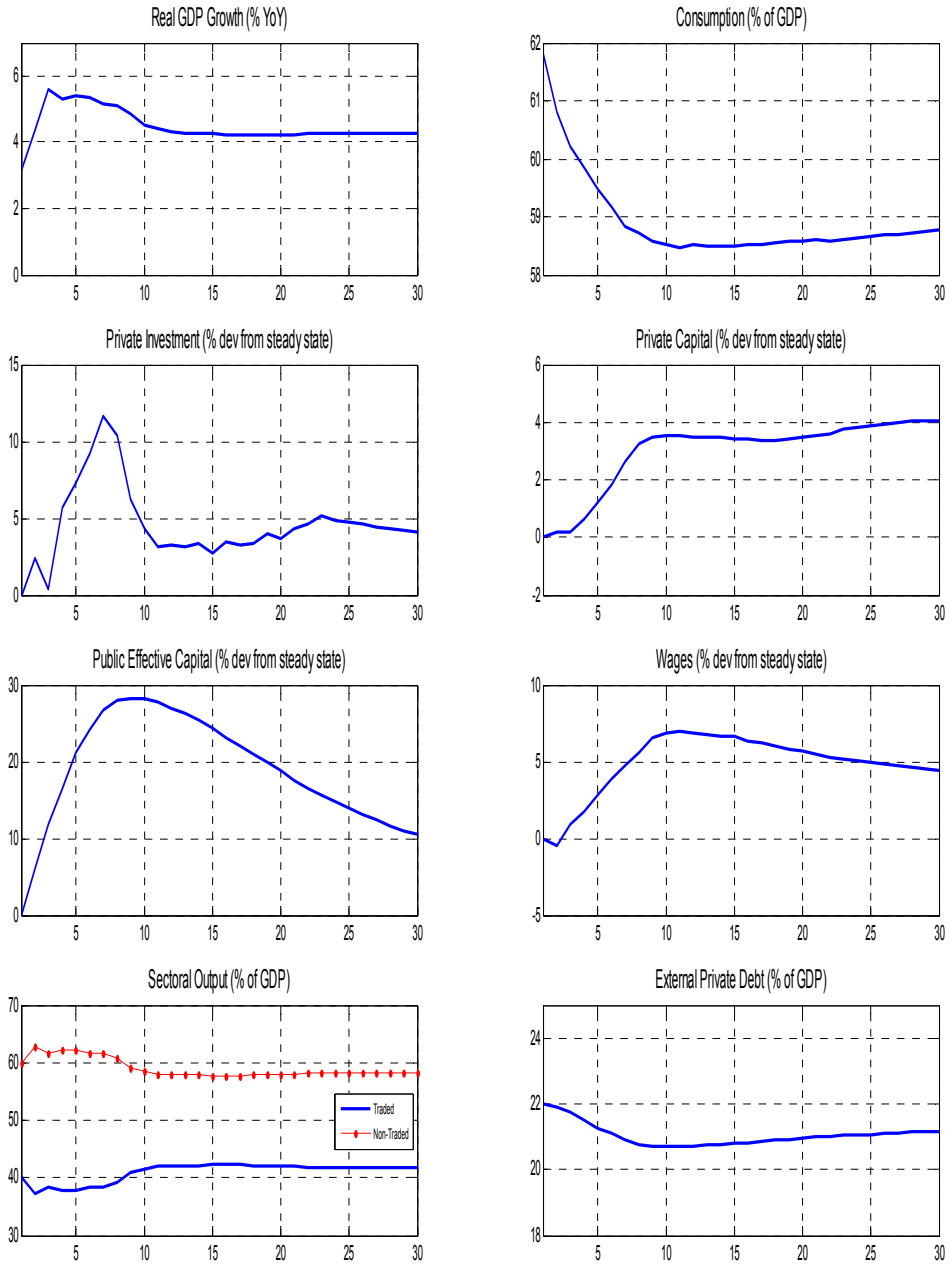


Figure 1. Base Case (continued)



IV. ALTERNATIVE CASES ANALYSIS

This section analyzes the alternative cases. They assume the same structure of the economy as the base case (Section III) but different degrees of public investment scaling-up.

A. Alternative Case—Lower Public Investment

Under a lower public investment scenario, it is assumed that the transitional period is not extended and that the current scaled-up level of public investment lasts until 2012 as originally planned. Public investment will be scaled up only until around 2014–15 with the full disbursement of concessional loans contracted up to 2012 and then gradually revert back to a normal level (8.5–9 percent of GDP) over the next 1–2 years (Figure 2).

Figure 2 [6] shows the outcome of the lower public investment scenario compared to the base case. In a nutshell, while the lower public investment case has slightly worse growth performance in the short run (over about six years), the debt level is much lower and much less vulnerable to adverse shocks. Specifically:

Public debt. Public debt peaks at a lower level than in the base case. This reduces the vulnerabilities to adverse shocks over the medium term. The level of public debt as a percent of GDP reaches about 84 percent in year five in this case, compared to about 98 percent in year 15 in the base case.

External commercial financing needs. The authorities are projected to need to obtain much less external commercial borrowing, around 11 percent of GDP, to finance public investment, compared to nearly 30 percent of GDP in the base case.

Fiscal response and consumption. The early ending of the scaling-up of the public investment contributes to a lower transfer cut between year 4 and year 10. In addition, less consumption adjustment is needed compared to the base case.

Growth. The GDP growth is slightly worse than in the base case between year 2 and 10. After year 10, the GDP growth rates are almost the same.

Deficits. The fiscal and current account deficits are lower in the initial 15 years than in the base case.

[6] In all comparison figures, blue lines denote the base case, and the red lines denote the alternative cases, unless otherwise noted.

Figure 2. Lower Public Investment Scenario and Base Case

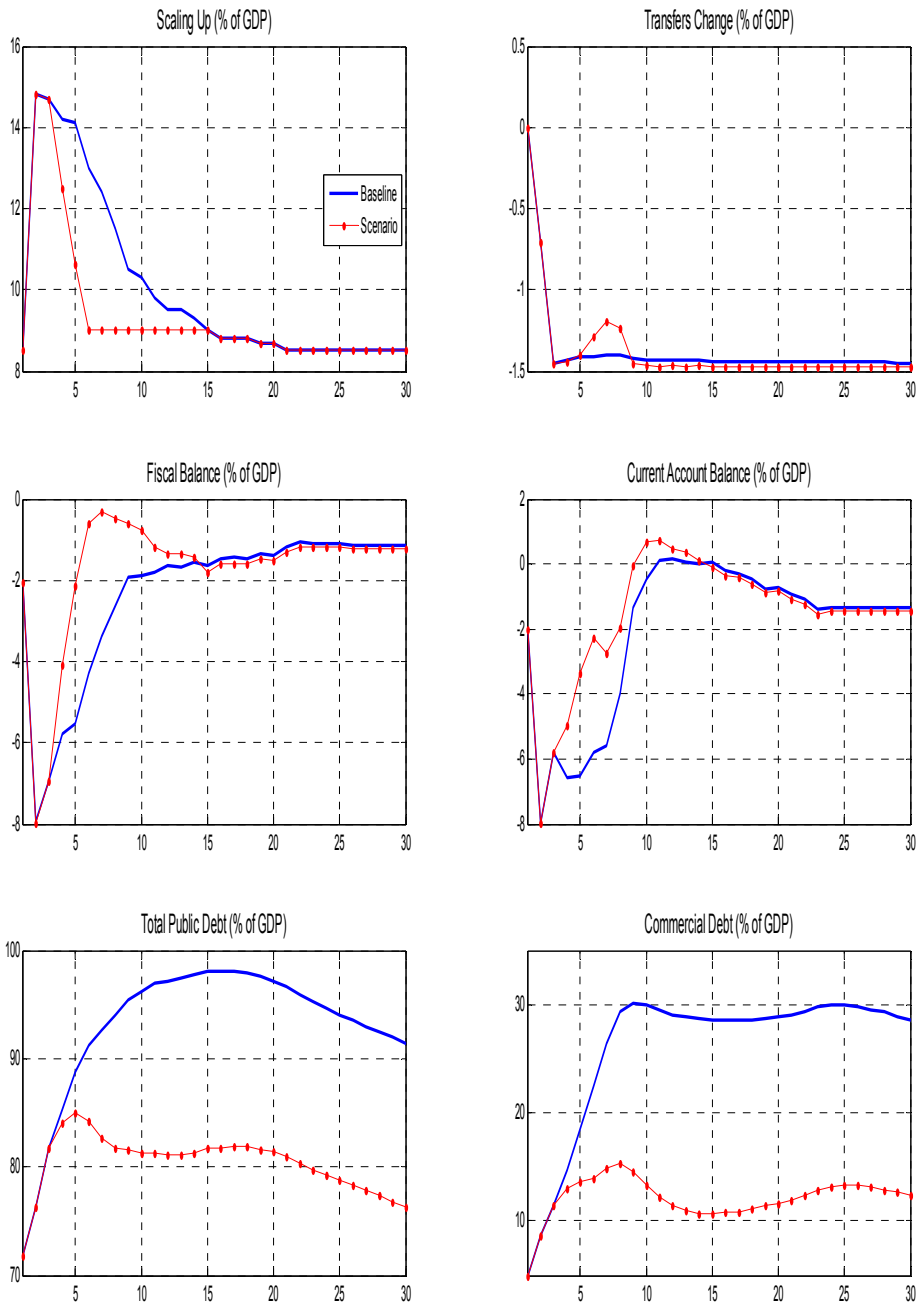
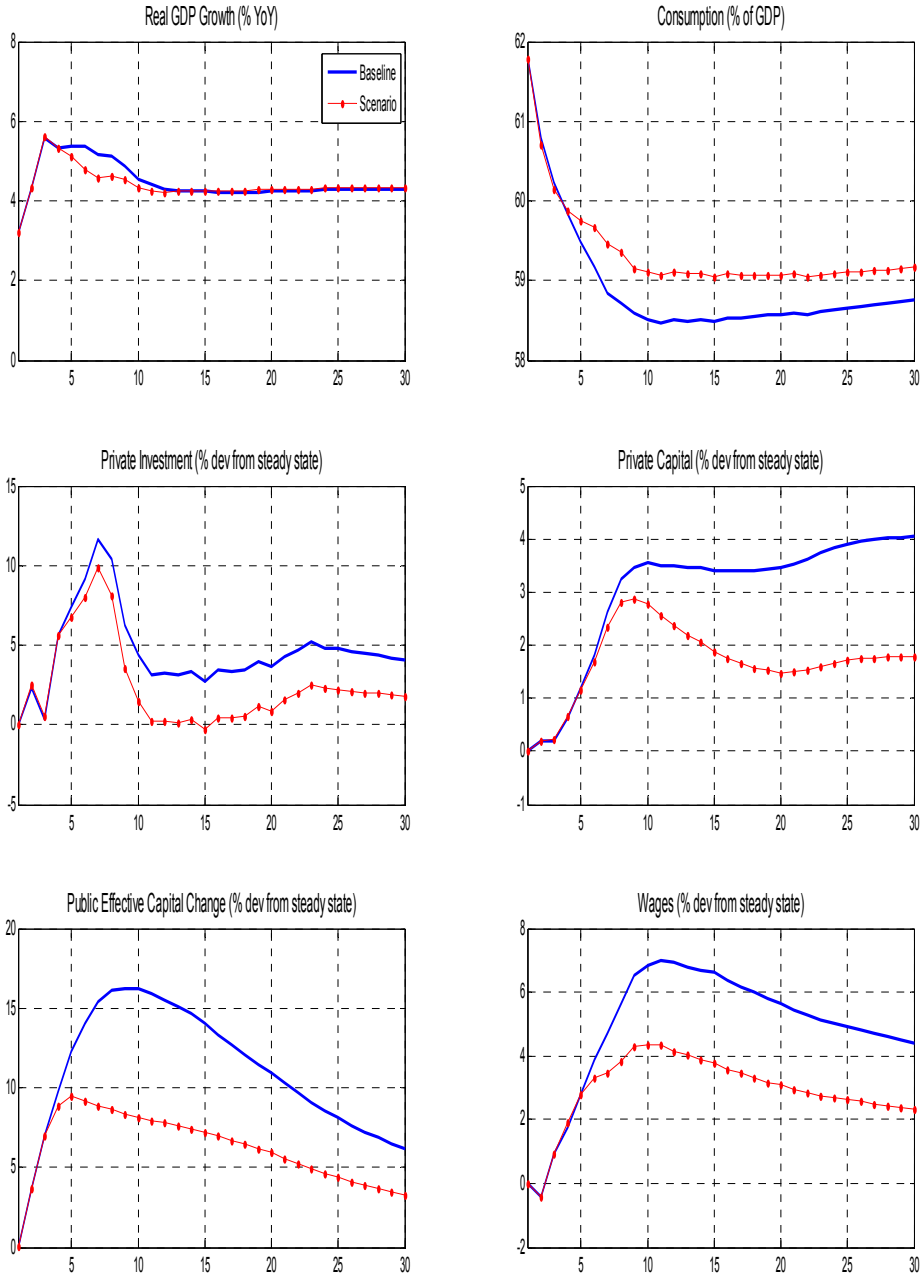


Figure 2. Lower Public Investment Scenario and Base Case (continued)



B. Alternative Case—Higher Public Investment

Under this scenario, we assume the government will further scale up public investment by 20 percent from 2013 to 2018. Figure 3shows the main results of this scenario. Overall, although further scaling-up in the size of public investment is expected to improve growth over a short period of time (about four years), public debt is projected to be on a much higher trajectory compared to the base case. The economy will be much more vulnerable to adverse shocks. Specifically:

Growth and public debt. Compared to the base case, the growth rate is expected to be slightly better between year 4 and year 9, but public debt is projected to be on a much more vulnerable trajectory. Public debt in percent of GDP is projected to reach as high as 110 percent compared to about 98 percent in the base case. This ratio reaches dangerous levels based on the usual DSA criteria.

External commercial borrowing needs. The authorities need to obtain much more external commercial borrowing. The external commercial debt in percent of GDP is expected to reach as high as or even exceed 40 percent compared to nearly 30 percent in the base case.

Consumption. A more severe consumption adjustment will be needed over the medium term.

Deficits. This scenario is expected to have more significant fiscal and current account deficits in the short run, but they tend to converge with the base case in the medium term.

Figure 3. Higher Public Investment Scenario and Base Case

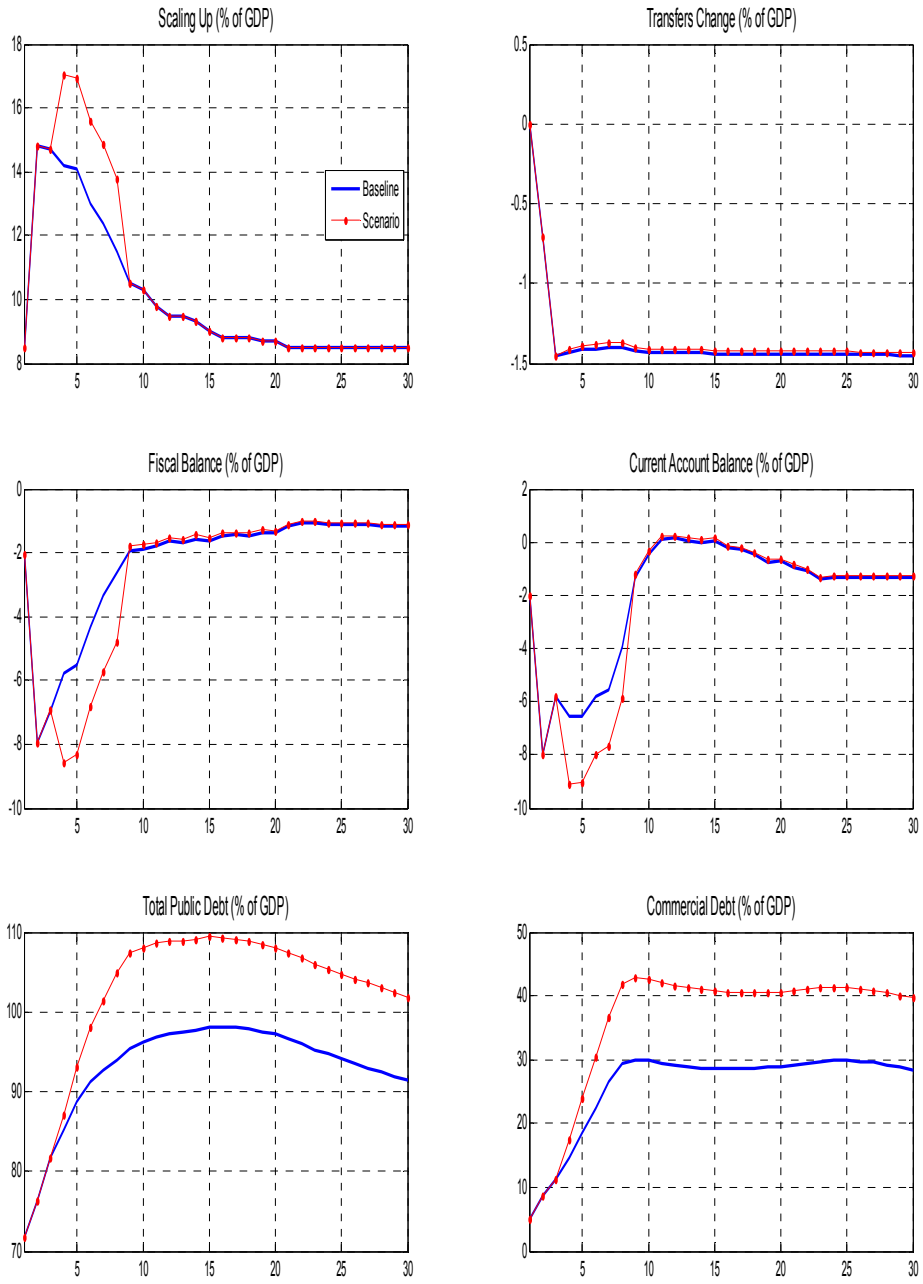
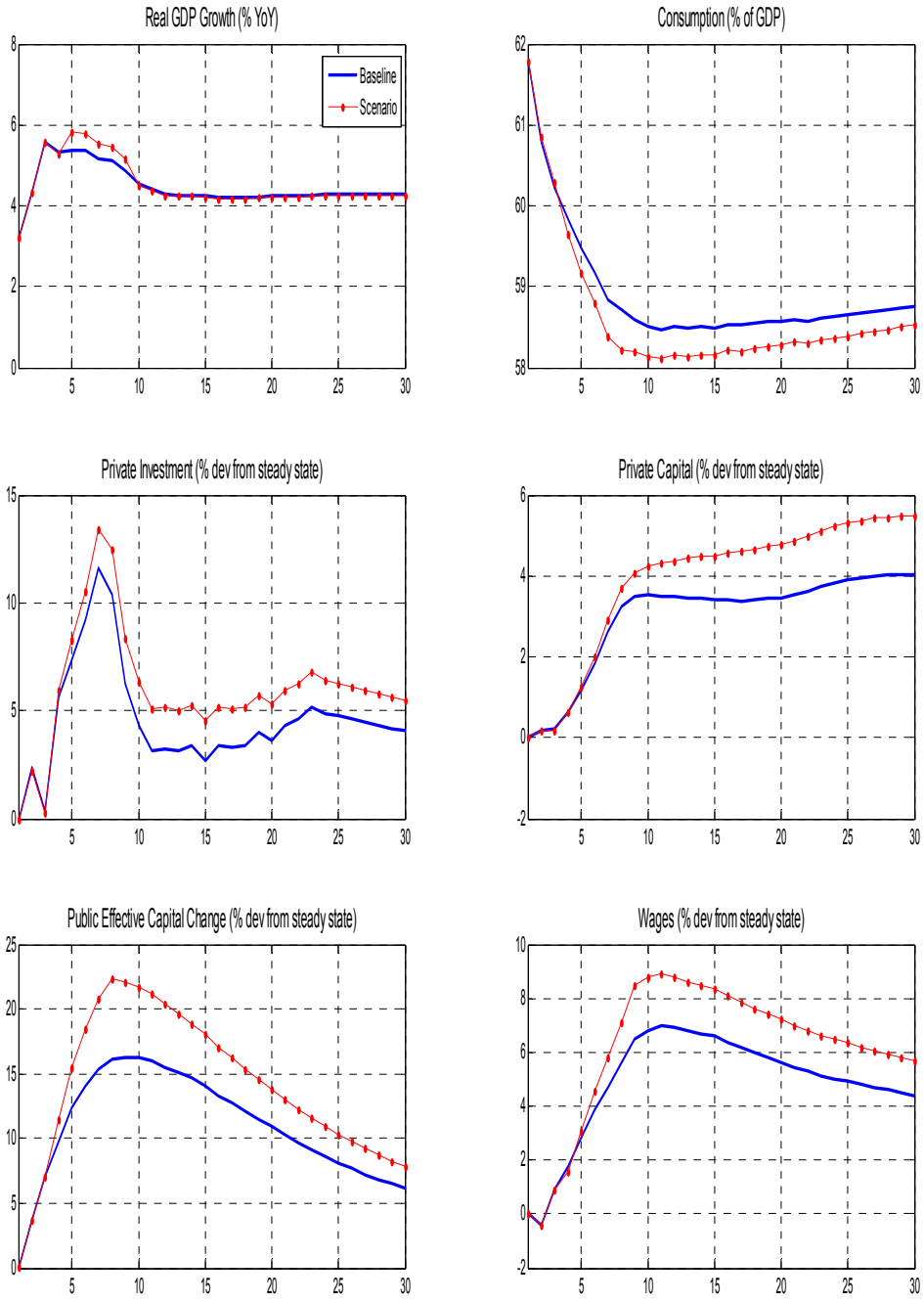


Figure 3. Higher Public Investment Scenario and Base Case (continued)



V. SENSITIVITY ANALYSIS

This section conducts the sensitivity analysis based on the different assumptions of the structure of Cape Verde's economy: return on infrastructure (R_0), efficiency of public investment (s), user fee recovery rate (f), absorptive capacity (ϕ), and depreciation rate of infrastructure (σ) (Text Table 2).

Text Table 2. Sensitivity Analysis Assumption

	Return on infrastructure(R)	Efficiency of public investment(s)	User fee multiple/fraction (f)	Absorptive capacity (φ) 1	Depreciation rate
Baseline	0.30	0.60	0.60	0.00	0.04
Sensitivity A(optimistic)	0.40	0.80	1.00	0.00	0.04
Sensitivity B (pessimistic)	0.10	0.20	0.20	3.00	0.06

1. Value 0 shows high absorptive capacity; Value 3 shows low absorptive capacity.

A. Sensitivity Analysis—Optimistic Scenario

This subsection studies the dynamic implications of a structure of the economy with greater absorptive capacity and a higher return and efficiency of capital. We assume that the return on infrastructure investment is 40 percent vs. 30 percent in the base case, the public capital is more efficient (s=0.8), user fees pay for all recurrent costs of infrastructure (f=1), there is no absorptive capacity restriction (ϕ=0), but the depreciation remains the same as in the base case.

Overall, the paths of this scenario (Figure 4) are notably better than those in the base case, especially in the medium term. Compared to the base case, this scenario generates lower debt but higher capital and growth. Specifically:

Public debt. The total public debt reaches a much lower level than in the base case. The debt paths of this scenario are notably better than those of the base case, especially in the medium term. The public debt in percent of GDP peaks at only 83 percent compared to about 98 percent in the base case. This mitigates vulnerabilities to adverse shocks.

Growth. Growth performance is better in the earlier years than in base case.

External commercial borrowing needs. Much less commercial borrowing is needed in the medium term although it is similar to the base line in the short run.

Public and private capital. The optimistic scenario achieves higher public and private capital accumulation over the medium term.

In conclusion, a good structure of the economy contributes significantly to the result of the public investment and economic growth and sustainability. It is critical that the authorities strive to improve those structural factors such as the return of the infrastructure and the efficiency of the public investment, through improving the frameworks of project selection and monitoring.

Figure 4. Optimistic Scenario and Base Case

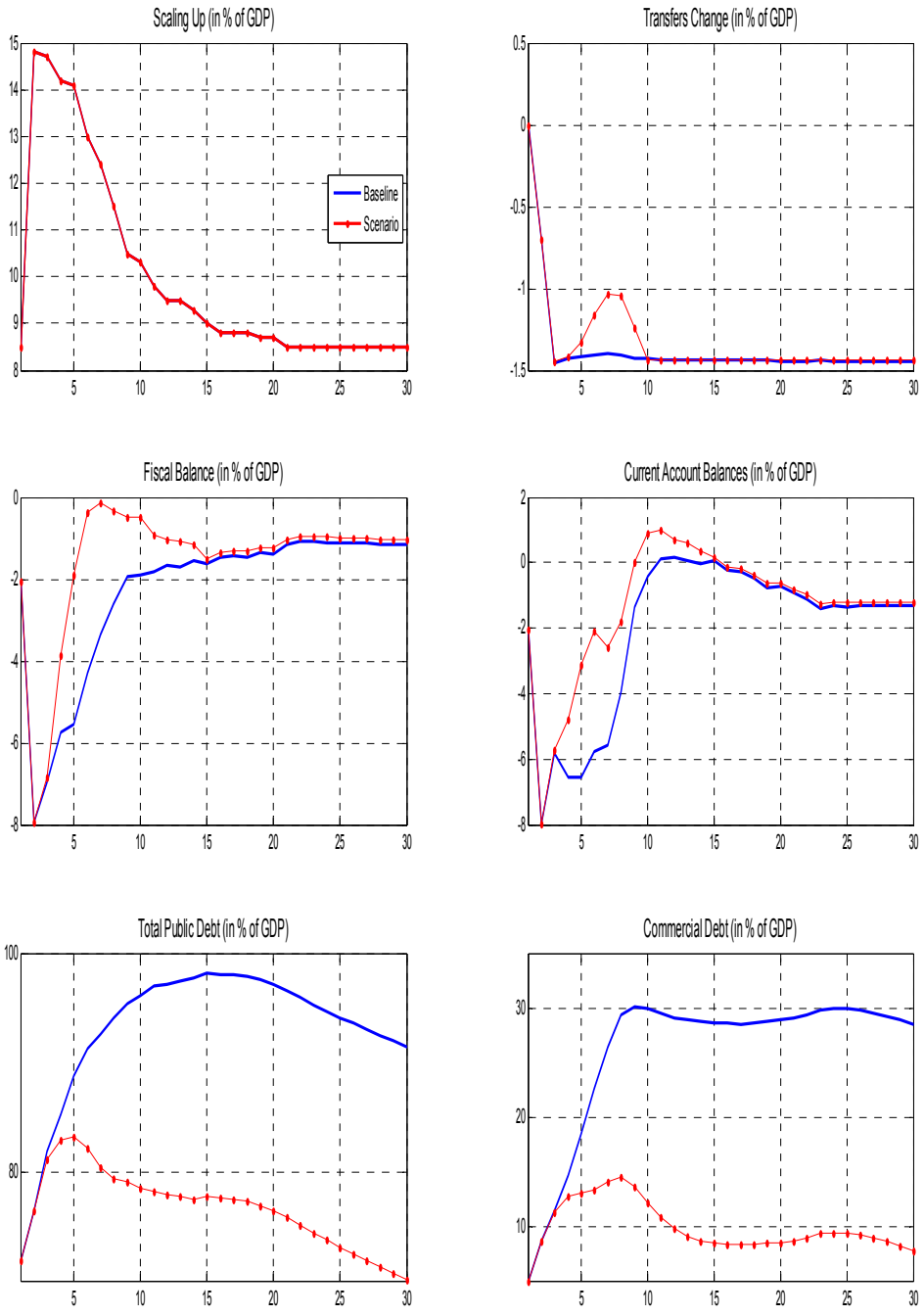
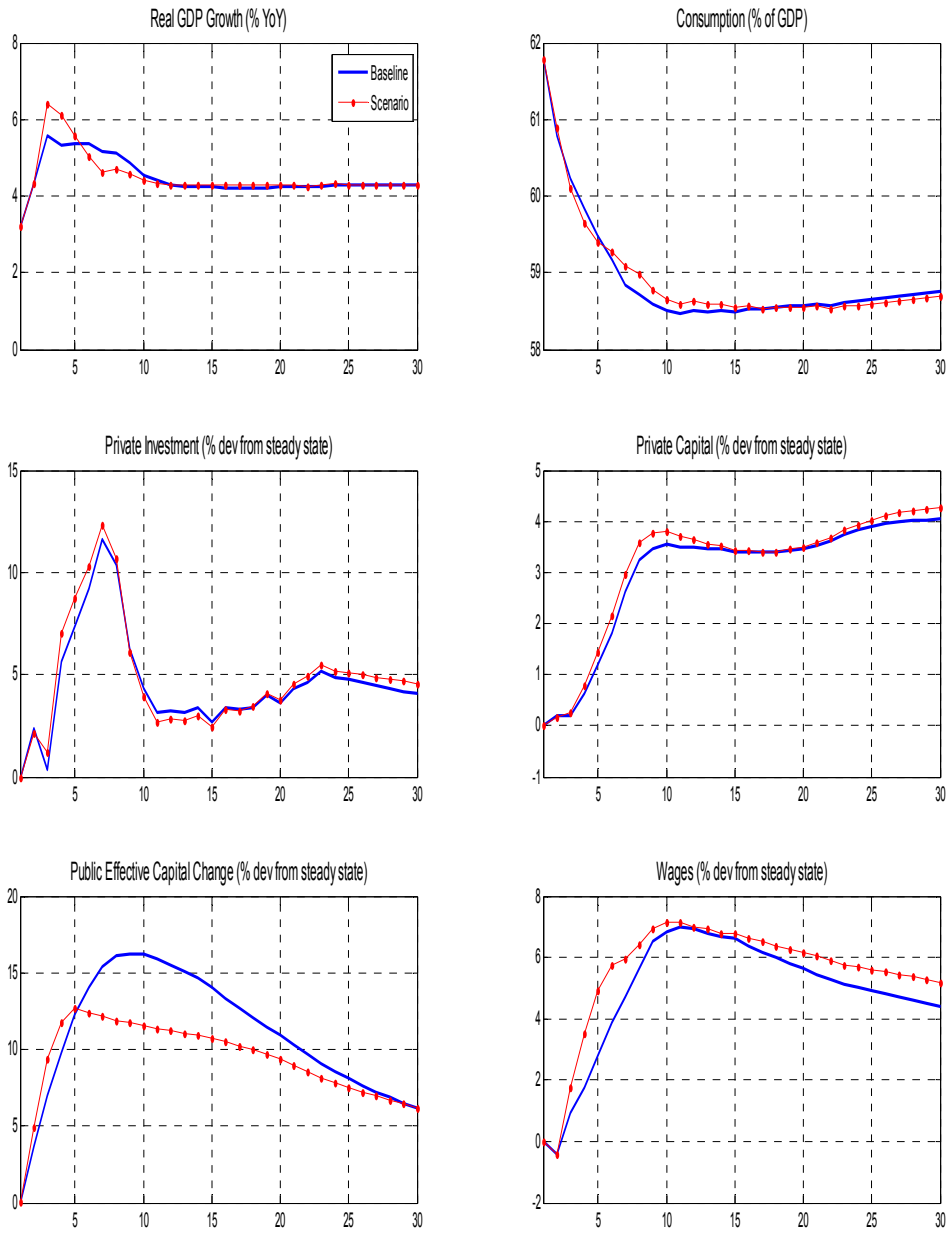


Figure 4. Optimistic Scenario and Base Case (continued)



B. Sensitivity Analysis—Pessimistic Scenario

This subsection studies the dynamic implications of a more pessimistic structure of the economy. Under this scenario, return of infrastructure investment is assumed to be lower at 10 percent (vs. 30 percent in the base case); public capital is more inefficient (s=0.2 vs. 0.6 in the base case); user fees pay for only 20 percent of the recurrent costs (f=0.2); there is absorptive capacity restriction (ϕ =3); and the depreciation rate of infrastructure is higher (δ=0.06).

The paths of this scenario (Figure 5) are notably worse than those in the base case, especially in the medium term. The main findings are as follows:

Growth. Growth performance is worse than in the base case for the first 14 years.

Public debt. The path of public debt is notably worse than that of the base case, particularly in the medium term. Debt is projected to reach at a much higher level. The public debt in percent of GDP peaks at a very high level, about 127 percent, compared to less than 100 percent in the base case. This ratio reaches dangerous levels based on the usual DSA criteria. This increases significantly vulnerabilities to adverse shocks.

External commercial borrowing. Much more external commercial borrowing is needed. The external commercial debt in percent of GDP reaches as high as 55 percent, almost doubling the level of the base case.

Deficits. The pessimistic scenario achieves much worse fiscal and current account deficits in the short run and much lower public and private capital accumulation in the medium and long run compared to the base case.

The analysis indicates that the structure of the economy has a significant impact on the outcome of public investment scaling-up.

Figure 5. Pessimistic Scenario and Base Case

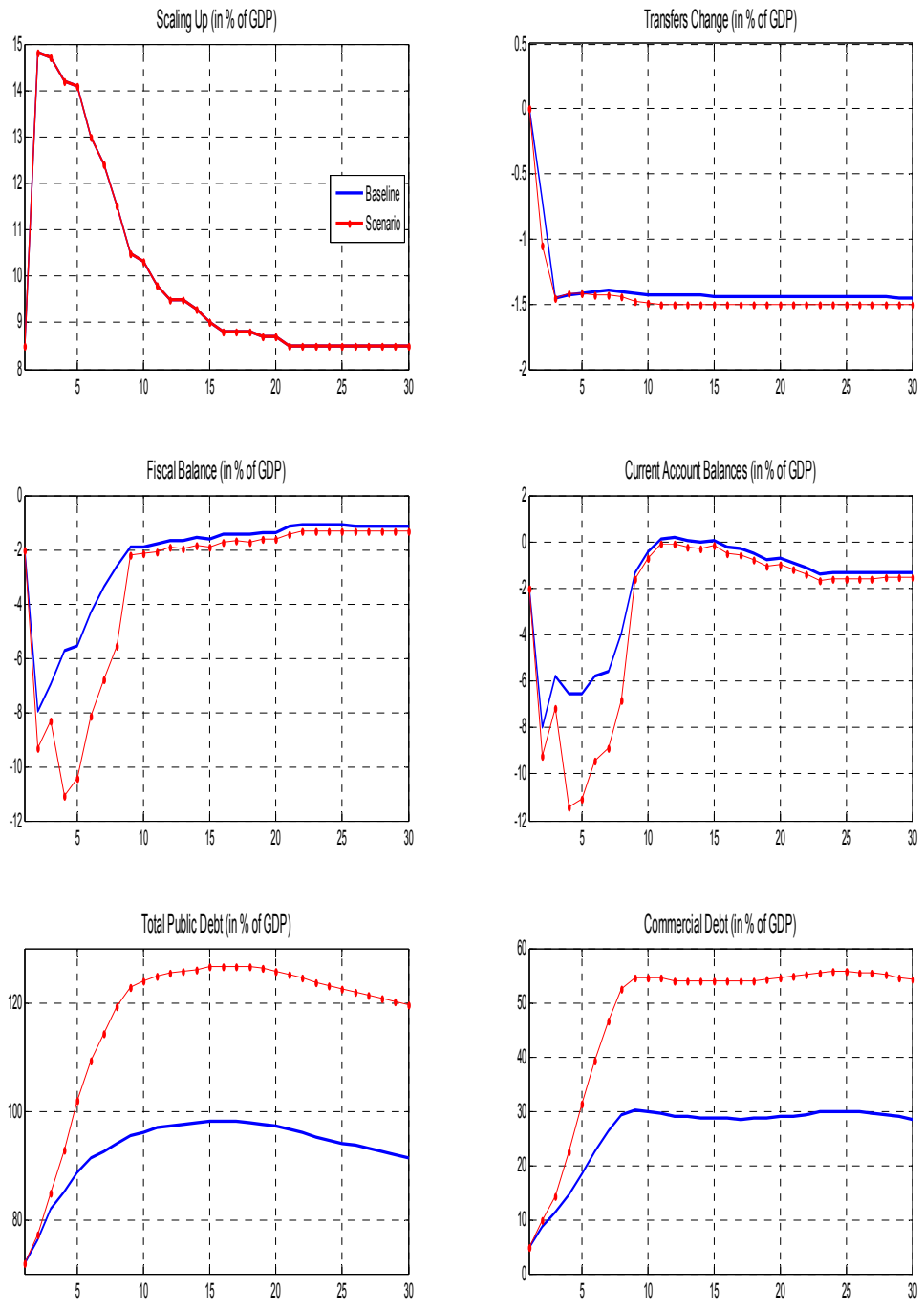
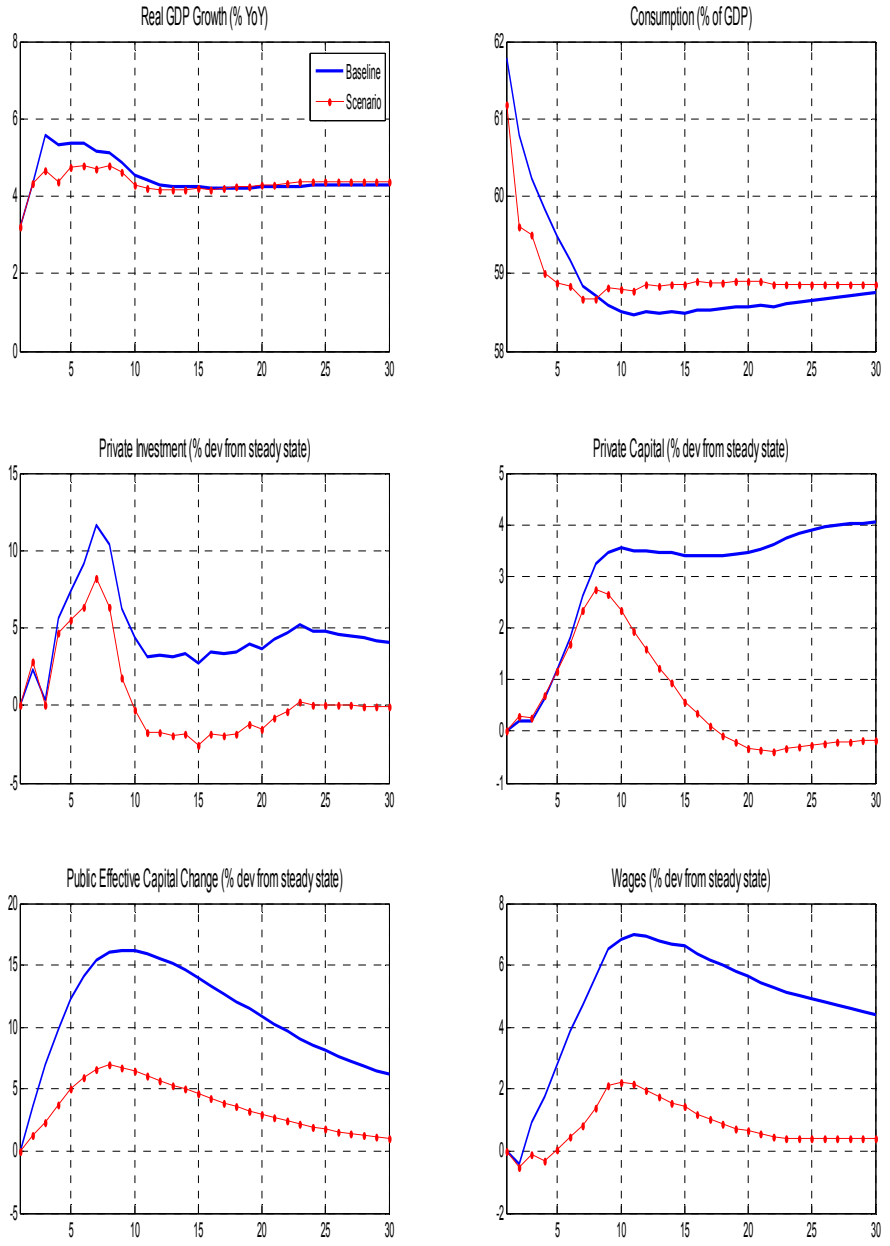


Figure 5. Pessimistic Scenario and Base Case (continued)



VI. POLICY IMPLICATIONS

Results of the simulation exercises discussed in previous sections show that Cape Verde's public debt remains sustainable under certain conditions, but the extent of scaling-up and the assumptions of the structure of the economy have significant impact on the outcome. Public debt level is projected to peak at a wide range of nearly 83 percent to over 127 percent of GDP based on different sizes of scaling-up and the assumptions of the variables related to the structure of the economy (Text Table 3).

Text Table 3. Simulaton Results
(Percent of GDP)

	Growth	Public debt	External commercial debt
Base case (BS)	Contributed to growth	98	30
Scenario analysis			
Lower investment case	Slighter worse than BS	84	13
Higher investment case	Slighter better than BS	110	40
Sentivity analysis			
Optimistic scenario	Better growth than BS	83	13
Pessimistic scenario	Worse growth than BS	127	55

We can draw the following conclusions from the simulation analysis:

It is not sufficient to simply analyze whether the return of public investment projects is higher than their costs of financing. A coherent analysis needs to be employed to look into a set of factors: the efficiency of public investment, the absorptive capacity of the country, the response of the private sector, and the authorities' ability to adjust expenditure and taxes.

Although public debt appears to be self-containable in all the scenarios we simulated, it is important to recognize the vulnerabilities associated with carrying a permanently higher debt level. Particularly, a faster accumulation of public debt over the next few years combined with an uncertain global economic environment augments macroeconomic vulnerabilities.

A very large surge in public investment can boost GDP growth, but it would also lead to a much higher debt to GDP ratio that reaches dangerous levels based on the usual DSA criteria and/or larger fiscal adjustment. More moderate scaling-up of public investment may be appropriate over the medium and long run.

The sensitivity analysis shows that it is critical for the authorities to ensure the quality of public investment, particularly in improving the efficiency of public capital and return of infrastructure.

There are some caveats about the results presented in this paper.

First, the results presented in this paper are conditional on the authorities' commitment to prudent macro and fiscal policies such as raising tax revenue and controlling expenditures, as well as other key assumptions. Otherwise, the scaling-up of the public investment will likely lead to an unsustainable debt dynamics as the stress test of the IMF DSA (2012) pointed out. We echo the view in the IMF DSA (2012) that it is very important for the authorities to implement the long-standing tax policy reforms and contain current expenditures.

Second, data of key parameters regarding the structure of Cape Verde's economy, such as the efficiency of public investment, return of infrastructure, and user fee recover rate, are not available. This is an issue that should be further investigated in future application of the model.

Third, the model assumes the interest rates of external debt and domestic debt which Cape Verde can borrow are fixed at certain numbers. If the interest rate assumptions change, the outcome could be very different. For example, we conducted a simplified sensitivity analysis on interest by assuming 1 percent increase of Cape Verde's borrowing cost (and keeping all others constant), the debt to GDP ratio would increase by about 4 to 5 percent.

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