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The Macroeconomics of Scaling Up Aid:
The Gleneagles Initiative for Benin

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The Macroeconomics of Scaling Up Aid: The Gleneagles Initiative for Benin

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Abstract

This paper assesses the macroeconomic implications of scaling up aid for Benin in line with the Gleneagles commitment to double aid to poor countries over the next three years to reach $85 per capita by 2010 and keep it at that level thereafter. The analysis suggests that the additional aid inflows can be accommodated under Fund-supported programs without major disruptions to macroeconomic stability, provided the inflows are highly concessional and used effectively. There are, however, significant risks that the impact on growth and poverty reduction of the additional aid inflows could fall short of expectations, given Benin's limited absorptive and administrative capacity.

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I. INTRODUCTION

The international community committed itself in 2000 to achieving eight Millennium Development Goals (MDGs) by 2015, which range from halving extreme poverty around the world to halting the spread of HIV/AIDS and providing universal primary education.[2] The achievement of these goals is predicated on a substantial scaling-up of aid per capita to low-income countries, mostly in Sub-Saharan Africa (SSA), to finance the increase in public expenditures needed to meet the MDGs. The international community renewed its commitments at the G8 Summit in Gleneagles, Scotland, in 2005 in order to make progress towards the MDGs. The so-called Gleneagles commitments call for doubling aid to Africa to $85 per person by 2010. So far the scaling-up of aid has fallen short of the original commitments (Figure 1).

Figure 1. The Scaling-Up of Grants:
Net Per Capita Official Developments Assistance to Sub-Saharan Africa
(2000 US dollars)

Source: OECD, and IMF data.
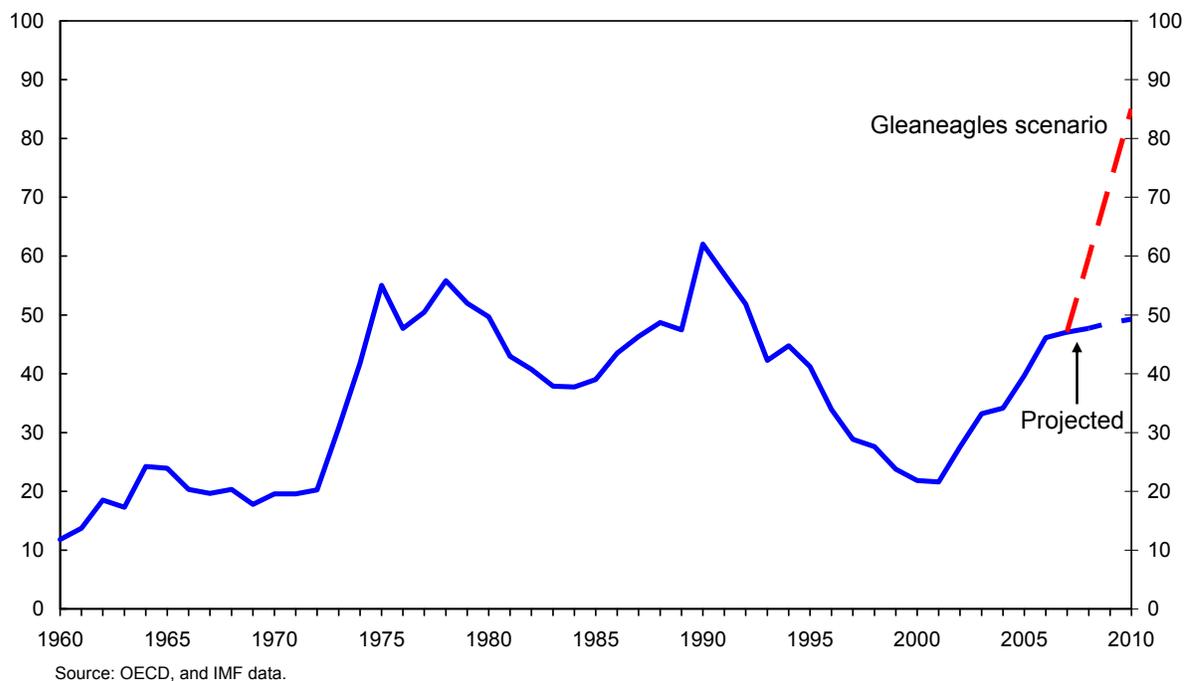
In June 2007, UN Secretary General Koffi Annan set up an Africa Steering Group to support implementation of the Gleneagles commitments. The objectives of the Steering Group, which includes representatives of the IMF and the World Bank, are to support achieving the MDGs

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[2] For a complete list of the Millennium Development Goals, see the http://www.un.org/millenniumgoals/

by: (i) securing full buy-in from the government and bilateral donors; (ii) executing country-specific work plans; (iii) reviewing and endorsing the MDG/Gleneagles Scenarios; and (iv) lobbying for the Gleneagles commitments ahead of key G8 meetings. Initially, ten countries, one of them Benin, were selected to operationalize this new approach at the country level.

This paper contributes to the analytical mandate of the Steering Group by examining the macroeconomic impact of the Gleneagles commitments for Benin. The case of Benin is interesting in the context of the literature on scaling up aid because it is a small open economy with significant challenges of limited absorptive and administrative capacity constraints. The analysis seeks to answer the following question: to what extent, given the authorities' baseline medium- and long-term economic framework, could Benin accommodate additional aid inflows without affecting macroeconomic stability? It employs two dynamic stochastic general equilibrium (DSGE) models to answer these questions. Assuming full absorption and spending of aid over time, as acknowledged by Berndt et al. (2008), the analysis: (i) takes into account aid composition; (ii) considers fiscal sustainability and the degree of concessionality of aid; and (iii) analyzes such risk factors as limited absorptive and administrative capacity. The paper does not, however, assess the likelihood of Benin reaching the MDGs by 2015 with the additional Gleneagles support.

The contribution of this paper to the literature is twofold. It proposes a comprehensive analysis of the scaling up of aid that is robust to model selection by employing two structural macroeconomic models and deriving comparable results; and quantifies aid-policy-related risk in terms of its debt sustainability implications and capacity limitations. The analysis confirms that additional aid inflows averaging 2.4 percent of GDP in 2008–10 and 2.0 percent of GDP in 2011–15 can be accommodated under Fund-supported programs without major disruptions to macroeconomic stability, provided the aid is highly concessional and used effectively.

The paper is organized as follows. Section II provides a review of the literature on aid effectiveness; Section III presents the two DSGE models; key findings and risks are discussed in Section IV; and Section V concludes.

II. THE LITERATURE ON AID EFFECTIVENESS

The challenge of scaling up aid has attracted renewed attention from academia and policy makers in the context of the commitments of the international community to reach the MDGs by 2015. In the words of Sachs (2005), the scaling up aid to reach the MDGs is equivalent to a "big push" to escape the poverty trap that keeps Africa from enjoying the benefits of globalization. Sachs also argues that aid can be effective in raising growth, provided it is used to address key structural poverty traps in health and education. Easterly (2006a), on the other hand, cautions against the ability of African countries to absorb a significant scaling up of aid, given the lack of adequate physical and institutional infrastructure to spend the aid

effectively. A key question at the core of the literature on aid effectiveness is therefore how to ensure that aid is effectively used, considering the ample empirical evidence showing a weak link between aid and growth (see Burnside and Dollar, 2000, 2004; Rajan and Subramanian, 2005). Two issues arise in this literature: 1) how aid can effectively be managed at a macroeconomic level to maximize the impact on sustainable growth, while mitigating the negative effects on inflation and the real exchange rate (absorptive capacity constraint); and 2) how can aid effectively be channeled to public investment projects with the highest social rate of return (administrative capacity constraint).

The first line of inquiry dwells on the concepts of absorptive capacity and spending of aid pioneered by Berg *et al.* (2005, 2007, 2008) and Gupta *et al.* (2006). The literature considers absorptive capacity to be defined as the macroeconomic constraints that recipient countries face in using aid resources effectively, including: (i) inflationary pressures arising from aid spending, the appreciation of the real exchange rate, and relative price distortions (like government-induced distortions in the sectoral allocation of resources).

The empirical evidence on the impact of absorptive capacity is mixed. Burnside and Dollar (2000) find that aid has no impact on the rate of growth in countries with poor macroeconomic policies. In an update, the same authors (Burnside and Dollar (2004)) argue that the positive impact of aid on growth is conditional on "good" institutions. Rajan and Subramanian (2005) cast doubt on the view that aid can stimulate growth, because of the impact of aid on the real exchange rate, the so-called Dutch disease effect. On the other hand, Berg et al. (2007) and a subsequent IMF paper (2007a) find that, while the risks of a real exchange rate appreciation associated with aid inflows is a real concern, the empirical evidence of nine case studies of SSA countries (Burundi, Ethiopia, Ghana, Madagascar, Mozambique, Rwanda, Tanzania, Uganda, and Zambia) suggests that the risk of a Dutch disease effect from aid spending has not materialized. They argue that several simultaneous external shocks may have offset aid pressures on the real exchange rate.[3] More recently, Mongardini and Rayner (2009) find a negative relationship between aid and the equilibrium real exchange rate in a panel regression of 26 SSA countries, which suggests that aid boosts productivity in the recipient country and does not endanger macroeconomic stability in the long run.

The second line of inquiry discusses the administrative capacity constraints of the government to maximize the social return from aid (Gupta et al., 2006; Rodman, 2005, 2006; and World Bank, 2005). These constraints are related to aid planning, budgeting, and service delivery to achieve the economic and social goals the aid is intended to achieve. They include four key constraints: (i) institutional, such as administrative bottlenecks and lack of

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[3] IMF (2005b) also suggests that this may be due to the monetary authorities' resistance of a nominal appreciation, and the resulting squeeze in private spending offsetting the pressures for a real exchange rate appreciation.

coordination; (ii) governance, such as strength of accountability mechanisms, pace of information flows, and the stance of the recipient country's delivery mechanisms; (iii) sociocultural factors and the political landscape; and (iv) linkages with medium-term expenditure programs and capacity-building efforts. The concept of administrative capacity is therefore dynamic as it spans the lifetime of a specific project implementation. Further, administrative capacity constraints affect the social rate of return from aid spending: the lower a country's administrative capacity, the lower the marginal rate of return from aid. As illustrated by Rodman (2006), proliferation of aid projects imposes greater administrative burdens on some recipient governments, thus reducing the overall social rate of return.

So far, few empirical studies have sought to quantify the effects of administrative capacity constraints on the returns to aid. Gupta et al. (2006) state that the link between spending and growth reflects intermediate outputs (such as education, or health capital or public infrastructure) that are subject to diminishing returns to scale and supply constraint bottlenecks. Clemens and Radelet (2003) find that the marginal rate of return from aid is initially positive but then declines, as aid hits a critical level of administrative capacity. Gupta et al. (2006) underscore that assessing these potential constraints in individual sectors is key to making a realistic assessment of the impact of scaling up aid.

III. BENIN'S MACROECONOMIC CONDITIONS AND THE GLENEAGLES INITIATIVE

Benin faces significant economic development and poverty reduction challenges. Between 2002 and 2006, the headline poverty index increased 8.9 percentage points to 37.4 percent of the total population. At the same time, real GDP grew on average by 3.6 percent annually, underperforming other West African Economic and Monetary Union (WAEMU) countries. Benin's economy continues to perform below its potential.

Recent debt relief and continued prudent macroeconomic policies have widened the fiscal space in Benin.[4] Debt relief under the Enhanced Heavily Indebted Poor Countries (HIPC) Initiative in 2003 reduced Benin's external debt stock from 47.7 percent of GDP at end-2002 to 36.5 percent at end-2003. The Multilateral Debt Relief Initiative (MDRI) reduced Benin's external debt burden further to 12.5 percent of GDP at end-2007. Accordingly, the ratio of public debt service to fiscal revenue declined from 10.4 percent in 2002 to 3.5 percent in 2007. This has created a large fiscal space for the authorities to start implementing urgent infrastructure projects to reduce key growth bottlenecks that affect Benin's absorptive capacity, including the modernization of the Port of Cotonou, the improvement of electricity supply, and road rehabilitation. At the same time, prudent macroeconomic policies have been reflected in macroeconomic stability, higher growth, and strong revenue performance (Figure 2).

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[4] Appendix A provides detail on the baseline projection.

Figure 2. Benin: Fiscal Space and Economic Performance, 1997–2007

Debt relief provided significant fiscal space, which is further enhanced by revenue collection efforts ...
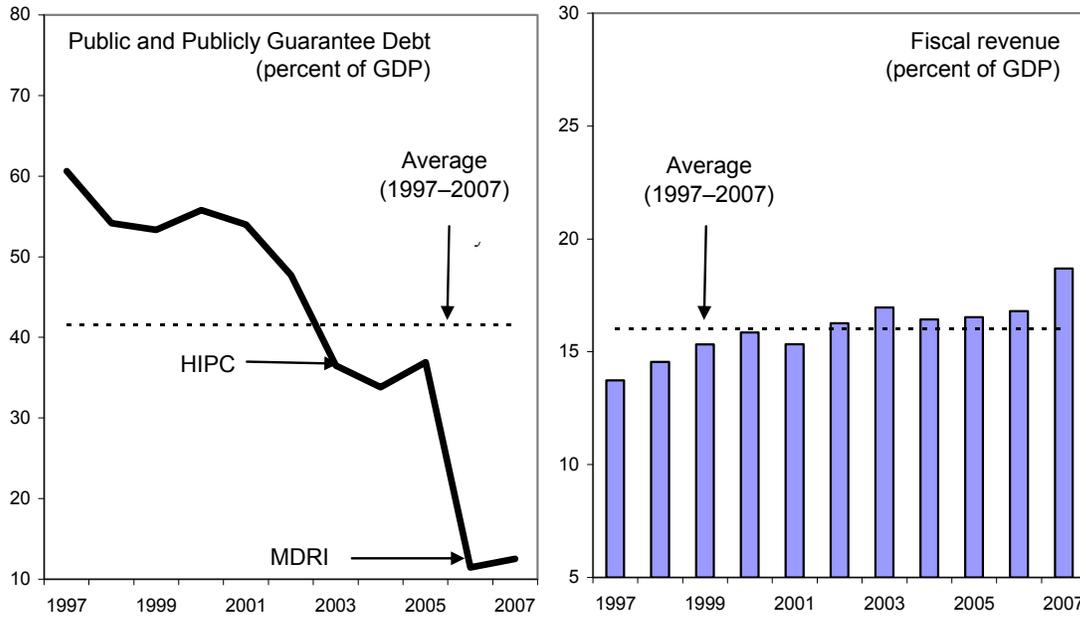
... along with a steady growth performance since 2006. However, aid inflows have declined in recent years.
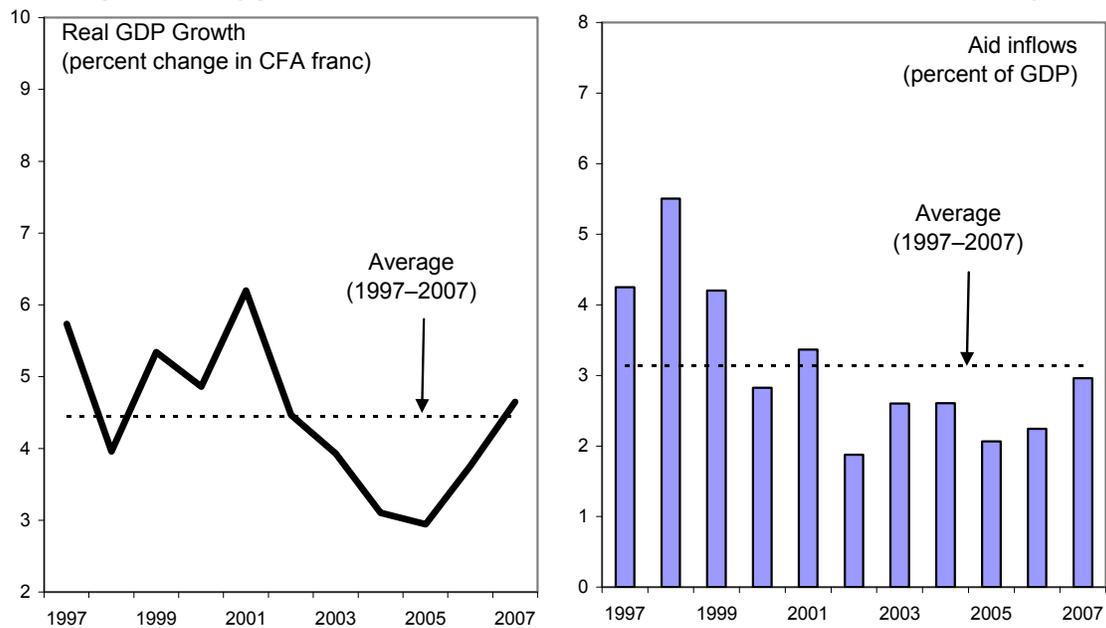
Source: Beninese authorities and Fund staff estimates.

Economic and social conditions in Benin clearly justify a scaling up of aid to make progress towards the MDGs. The recent IMF and World Bank Joint Staff Advisory Note (JSAN)[5] indicates that, at the current pace of economic and social progress, Benin would not be able to reach all the MDG targets by 2015. The challenge of reducing poverty in Benin is pressing, as more than one third of the population in 2006 was living below the poverty line of US$0.57 a day.[6] At the same time, Benin's access to capital markets and foreign direct investment are limited. In this respect, the Gleneagles commitments to double aid by 2010, together with continued macroeconomic stability, a further acceleration of growth, and a strengthening of public finance management, represent a significant opportunity to eradicate extreme poverty and improve living standards in Benin.

The Gleneagles commitment for Benin imply a doubling of aid inflows by 2010 and keeping them at the same nominal level of US$85 per capita thereafter.[7] Aid inflows were 5.9 percent of GDP in 2007, which is equivalent to US$42 per person as shown in Text Table 1.[8] Data in the table are expressed in differences relative to the authorities' baseline. For instance, the commitment of US$85 per person by 2010 would imply an additional external aid inflows of 3.8 percent of GDP in 2010, for a total aid inflow of 8.9 percent of GDP (the baseline scenario already includes aid inflows of 5.1 percent of GDP). The additional aid inflows would lead to higher economic growth, which in turn would generate additional revenues of 0.2 percent of GDP. The latter plus the additional aid would finance the total MDG spending requirements of 4.0 percent of GDP (3.8+0.2=4.0) in 2010. Overall, to reach US$85 per person, aid inflows would have to increase to 8.9 percent of GDP by 2010 and average 7.5 percent of GDP annually during 2011–15. Compared to the authorities' baseline macroeconomic projections, this implies additional aid inflows averaging 2.4 percent of GDP annually in 2008–10 and 2.0 percent of GDP annually during 2011–15.[9]

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[5] Available at http://www.imf.org/external/pubs/cat/longres.cfm?sk=22181.0

[6] National poverty line defined in 2006 US dollar.

[7] The Gleneagles scenario for the ten countries, including Benin, assumes 2007 as base year. Comprehensive data for 2008 are not yet available.

[8] The aid inflows presented in text table 1 refer to ODA (official development assistance), following the OECD DAC definition, i.e., grants or loans with a least a 25 percent grant element. These differ from the aid inflows presented in Figure 1 which only include grants recorded in the central government budget.

[9] It is assumed that, under the Gleneagles scenario, the additional aid would consist of both grants and loans with a combined grant element of 80 percent.

Text Table 1. Benin: The Gleneagles Commitments and Additional Aid, 2007–15
(Changes relative to the baseline in percent of GDP; unless otherwise indicated)

	2007 Act.	2008	2009	2010	2011	2012	2013	2014	2015	2008–10	2011–15	2008–15
						Projections						
											Average	
Fiscal revenue impact	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
MDG spending requirements	0.0	-1.2	-2.5	-4.0	-3.2	-2.6	-2.0	-1.5	-1.0	-2.5	-2.0	-2.2
Total additional financing needs	0.0	1.1	2.4	3.8	3.2	2.6	2.0	1.5	1.0	2.4	2.0	2.2
Additional/Gleneagles envelope	0.0	1.1	2.4	3.8	3.2	2.6	2.0	1.5	1.0	2.4	2.0	2.2
Memorandum Items:												
Gleneagles total commitment	5.9	6.6	7.7	8.9	8.4	7.9	7.4	7.0	6.6	7.7	7.5	7.6
or in US $ per capita terms	42.1	56.4	70.7	85.0	85.0	85.0	85.0	85.0	85.0	70.7	85.0	79.6
of which: Baseline commitment	5.9	5.5	5.3	5.1	5.2	5.3	5.4	5.5	5.6	5.3	5.4	5.4

Sources: Authors' own estimates.

Such large additional aid inflows on top of already high aid commitments are likely to have significant macroeconomic repercussions. Two reasons motivate the need for an assessment of the macroeconomic consequences of the new aid:

➢ Spending of the additional aid inflows on non-tradables could strain the already limited absorptive capacity in Benin, thus resulting in inflationary pressures, and a corresponding appreciation of the real exchange rate, which could further erode external competitiveness.

➢ To the extent that aid inflows are channeled through the government budget, they may also stretch the administrative capacity to manage additional public investment in Benin, and thus reduce the quality of public spending out of aid.

To simulate the macroeconomic impact of the Gleneagles commitments, the additional aid inflows are assumed to be allocated proportionately to each social sector, according to the authorities' latest Growth and Poverty Reduction Strategy Paper (GPRSP).[10] On that basis, about 70 percent of Gleneagles-related spending would go to education, health, agriculture and infrastructure (Text Table 2).

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[10] http://www.imf.org/external/pubs/cat/longres.cfm?sk=22180.0

Text Table 2. Benin: Aid-Funded Expenditures Under Gleneagles Scenario By Sector, 2007–15

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008–10	2011–15	2008–15
	Act.					Projections						
											Average	
Total												
In percent of GDP	6.3	7.2	9.5	12.0	12.8	13.3	13.8	14.3	14.9	9.6	13.8	12.2
Of which: Gleneagles total commitments	5.9	6.6	7.7	8.9	8.4	7.9	7.4	7.0	6.6	7.7	7.5	7.6
In billions of CFA francs	157.8	214.6	314.6	423.6	480.8	545.8	619.4	703.1	798.0	317.6	629.4	512.5
					(Percent share)							
Education	30.5	30.8	30.0	31.5	31.5	31.6	31.6	31.7	31.7	30.7	31.6	31.3
Health	18.1	18.9	20.1	19.3	19.3	19.4	19.4	19.5	19.5	19.4	19.4	19.4
Agriculture	9.0	15.0	14.9	15.0	15.1	15.2	15.3	15.4	15.5	14.9	15.3	15.1
Infrastructure	10.3	9.8	13.5	15.2	15.4	15.6	15.8	16.0	16.2	12.8	15.8	14.7
Other	32.1	25.5	21.6	19.2	18.8	18.4	18.0	17.6	17.2	22.1	18.0	19.5
Gender	0.9	1.1	1.0	1.2	1.3	1.3	1.3	1.3	1.3	1.1	1.3	1.2
Environment	15.9	12.0	12.3	10.6	9.9	9.4	8.9	8.4	7.9	11.6	8.9	9.9
Governance	12.0	10.8	6.3	5.7	5.8	5.8	5.8	5.8	5.8	7.6	5.8	6.5
Population and Social Protection	3.3	1.5	1.8	1.5	1.6	1.7	1.8	1.9	2.0	1.6	1.8	1.7
Other	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Sources: Authors' own calculations.

IV. MODELS AND RESULTS

Two DSGE models are employed to assess the macroeconomic impact of the Gleneagles commitments on Benin.[11] The first model developed by Sacerdoti et al. (2008; Model 1) employs a traditional macroeconomic model with a production function with human and physical capital and a set of macroeconomic identities and behavioral equations that identify a steady state for the economy that is shocked by exogenous aid inflows. The second model, based on Berg et al. 2009 (Model 2), is a micro-founded New Keynesian DSGE model with a production function that incorporates public and private capital and possible Dutch Disease, as well as nominal rigidities and a set of policy reaction functions of the central bank and the fiscal authorities. Both models are calibrated for the Benin economy in order to assess the impact of the higher aid inflows from the Gleneagles commitments on macroeconomic fundamentals.[12]

According to Model 1, aid inflows from the Gleneagles commitments will have the following macroeconomic implications (Text Table 3 and Figure 3):

➢ The incremental increase in aid in 2008–15, assuming it is effectively used, will boost growth annually by 0.8 percentage points on average relative to the baseline. As a result, per capita income would be 29.4 percent higher in 2015, reaching US$574 per person at 2007 constant prices—6 percent higher than in the baseline scenario.

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[11] While subject to significant uncertainty about calibration and long-term inference, DSGE models provide a consistent theoretical framework to estimating the impact of additional aid inflows. The simulation results in this paper should therefore be considered more qualitative than quantitative in nature, and are subject to a higher degree of uncertainty in the outer years of the simulation.

[12] See Appendix II for more detail on the two models properties.

➤ By allocating about half of the additional aid inflows to education and health, the ratio of human capital investment to GDP would rise to 4.7 percent of GDP in 2015 from 2.2 percent in 2008, averaging 3.9 percent for 2008–15. This suggests higher potential growth for Benin beyond 2015 as more skilled and healthier individuals enter the labor force.

➤ Additional resources devoted to infrastructure would result in the physical capital stock being 27.5 percent higher than in the baseline by 2015.

➤ The implications for inflation would depend on the composition of government spending out of aid. In the current scenario, where 80 percent of the increase in government spending is concentrated on local goods and services, inflation would be 4 percentage points higher in 2011 than in the baseline and would still be 1.8 percentage point higher by 2015. The impact on inflation would be lower if more of the additional government spending goes to imports.

Text Table 3. Benin: Selected Macroeconomic Indicators – Impacts of Additional Aid
Under the Gleneagles Commitments–Deviation from the Baseline, 2008–15

|	2008	2009	2010	2011	2012	2013	2014	2015	2008–10	2011–15	2008–15
						Projections					
										Average	
					(percent)						
Real GDP growth	0.1	0.2	0.5	0.7	0.9	1.1	1.2	1.4	0.3	1.1	0.8
GDP per capita	0.0	0.3	0.7	1.4	2.3	3.3	4.6	5.9	0.3	3.5	2.3
CPI Inflation	0.1	0.7	2.1	4.0	3.5	2.9	2.3	1.8	1.0	2.9	2.2
Real exchange rate	0.4	1.0	5.1	5.9	6.3	6.5	6.7	6.7	2.1	6.4	4.8
					(percent of GDP)						
Fiscal accounts											
Total revenue	1.2	2.5	4.0	3.2	2.6	2.0	1.5	1.0	2.5	2.0	2.2
Domestic revenue	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
ODA: Gleneagles	1.1	2.4	3.8	3.2	2.6	2.0	1.5	1.0	2.4	2.0	2.2
Total expenditure	3.0	2.4	3.1	3.5	3.6	3.4	3.3	3.2	2.8	3.4	3.2
Current expenditures	0.3	0.5	0.5	0.5	0.6	0.7	0.8	0.9	0.4	0.7	0.6
Public investment	2.7	1.9	2.7	3.0	3.0	2.7	2.5	2.3	2.4	2.7	2.6
Fiscal deficit 1/	1.8	0.0	-0.9	0.3	1.0	1.4	1.8	2.2	0.3	1.3	0.9
Current account (excl.grants)	0.4	0.5	2.7	3.0	3.3	3.5	3.3	2.9	1.2	3.2	2.5
Export of goods	-0.2	0.3	0.5	0.6	0.9	1.2	1.7	2.2	0.2	1.3	0.9
Import of goods	0.3	0.9	3.1	3.6	4.2	4.7	5.0	5.2	1.4	4.5	3.4

Source: Authors' own estimates.
1/ No additional interest payment is assumed during 2008–15

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[14] Figure 4 represents variables in terms of change (not cumulative). Also for real exchange rate, negative sign means appreciation.

Figure 3. Benin: Macroeconomic Impact of Aid Under
Gleneagles Commitment, 2007–15

**The additional aid from the Gleneagles commitments is expected to increase
growth and improve living standards, ...**

Impact of Aid on Human Capital, Capital
Stock and GDP: Percent Deviation from
Baseline

Impact on GDP
growth rate

Impact on H
growth rate

Impact K
growth rate

Income per capita in dollar

Gleneagles scenario
income per capita

Baseline income
per capita
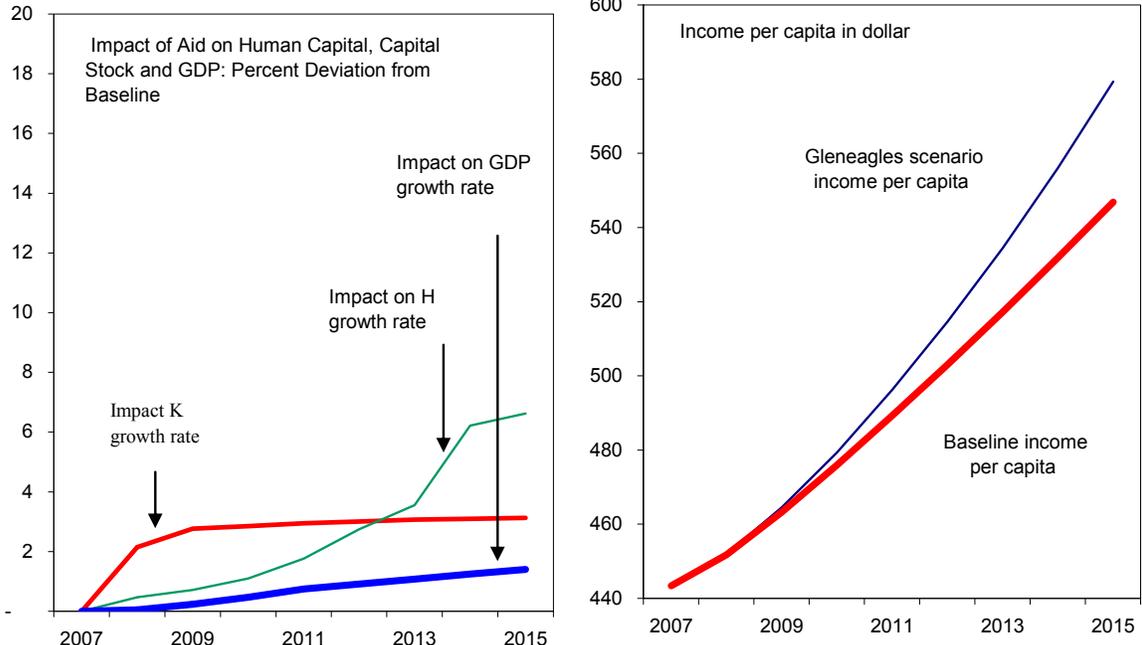
**... partly through higher human capital, while the impact on inflation and real exchange rate
would be moderate.**

Real GDP growth

Real GDP growth without
human capital effect after
Gleneagles

Real GDP growth with
human capital effect after
Gleneagles

Inflation and Real Exchange Rate
Relative to the Baseline

Impact on Real
Exchange Rate

Impact on
annual inflation
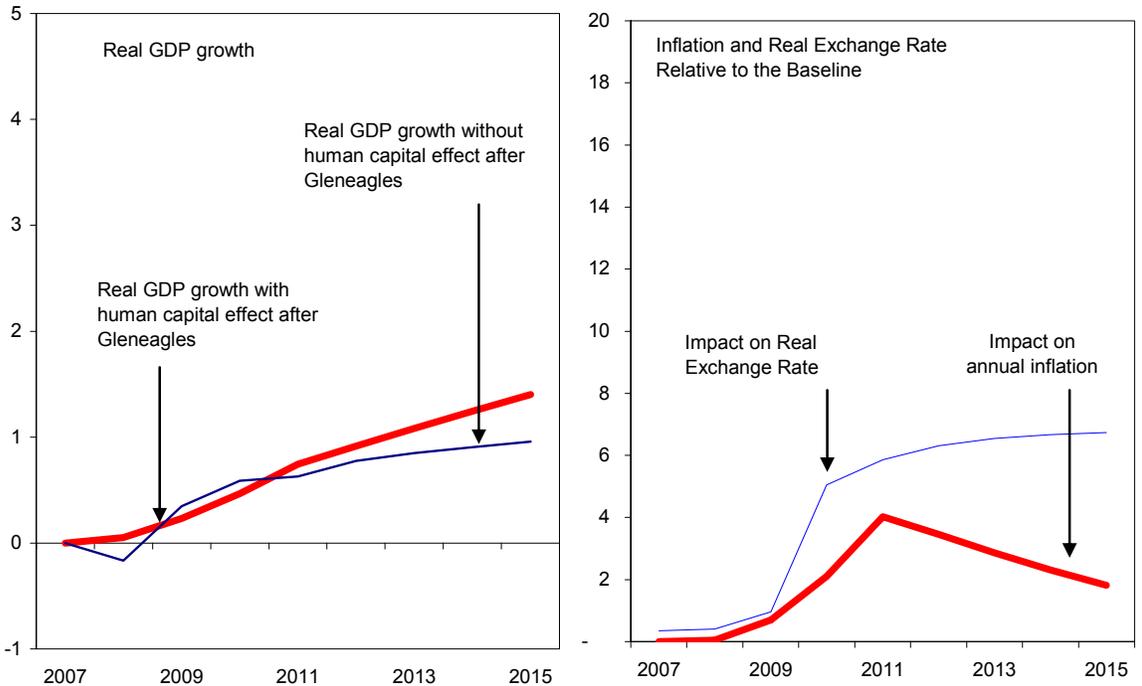
Source: Authors' estimates.

➢ Accordingly, the real exchange rate would appreciate relative to the baseline, given the peg of the CFA franc to the Euro. By 2011, the real effective exchange rate would be 5.9 percent higher than under the baseline scenario, further increasing to 6.7 percent by 2015. If the appreciation is not matched by a corresponding increase of productivity in the export sector, this could affect Benin's competitiveness.

➢ The external current account deficit (excluding grants) would widen compared to the baseline over the medium term, but exports are expected to pick up as productivity increases. The current account deficit (excluding grants) would widen by 3.0 percent of GDP in 2012, compared to the baseline, before narrowing back to 1.6 percent in 2015 as higher export growth starts offsetting the aid-related increase in imports. This is predicated on the effective use of the additional aid leading to higher productivity in the tradable sector.

Fiscal and debt sustainability will hinge on a number of factors. First, the short- and medium-term growth impact of the additional aid should improve the sustainability of government finances by reducing the debt payment burden and increasing fiscal revenues. This is critically predicated, however, on the productive use of aid. In addition, the increase in government investment could also have a significant recurrent component beyond the scaling up horizon, with potential implications for fiscal sustainability. For the Gleneagles scenario, it is assumed that such spending would be financed in the long run through higher revenues and a rationalization of spending. Most importantly, the highly concessional nature of the additional aid (assumed to have an 80 percent grant element) would limit the risk to debt sustainability. Lower concessionality of aid, however, would impact the debt profile over the medium- to long-run (see below).

Similarly for the chosen calibration, Model 2 predicts that the additional aid from the Gleneagles commitments will increase GDP growth by up to 0.5 percent annually (Figure 4).[14] As additional foreign aid is invested into both traded and non-traded goods, inflation will pick up and reach 6 percent in the first three years and remain 2.1 percent higher relative to the baseline until 2015. As a result, the real exchange rate will appreciate by a cumulative 7.3 percent by 2015.[15] This is because firms in the exporting sector are exposed to learning-by-doing effects, which would imply that a temporary contraction in exports—resulting from the real exchange rate depreciation— can have permanent effects (Dutch disease).

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[15]The model is calibrated by using structural parameters from the empirical literature on calibration and key ratios specific to Benin. A key feature of the model is that price elasticities of imports and exports to the real exchange rate help determine the required real appreciation in response to the increase in aid. For the chosen calibration, the price elasticity of imports is 1.5. Similarly, the reduced-form price elasticity of exports derived from the calibration is 1.2. A positive number in the model indicates an appreciation of the real exchange rate.

Figure 4. Benin: Model 2–Scaling Up Scenario, 2007–15[1]
(percent unless otherwise indicated)

GDP Growth

Investment (percent of GDP)

Inflation

Real Exchange Rate
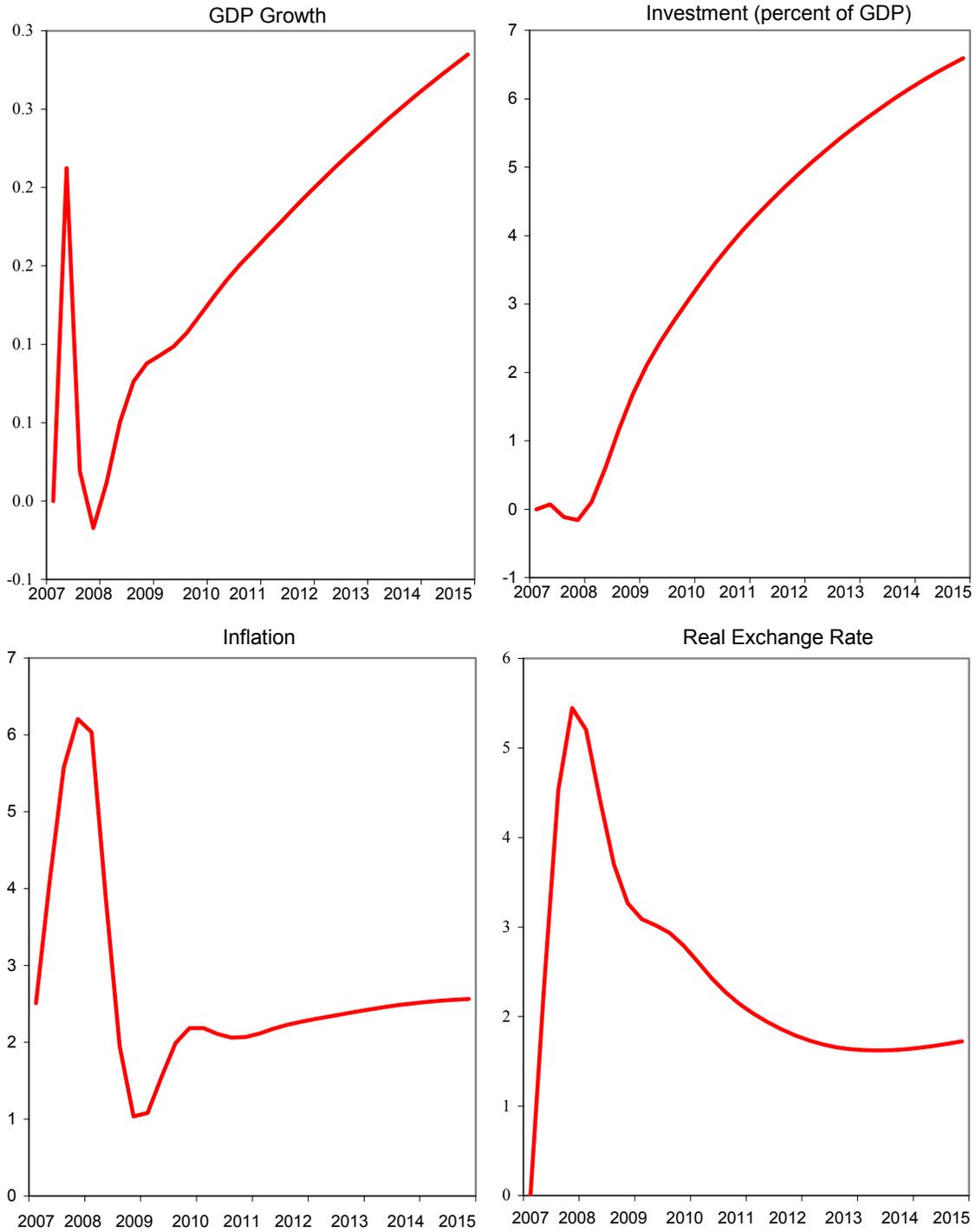
Source: Authors estimates.
[1]Relative to the Baseline.

Figure 4 (Continued). Benin: Model 2–Scaling Up Scenario, 2007–15[1]
(percent unless otherwise indicated, and time priod is quaterly)

Traded Output

Non-traded Output

Tradeable Inflation

Non-tradeable Inflation
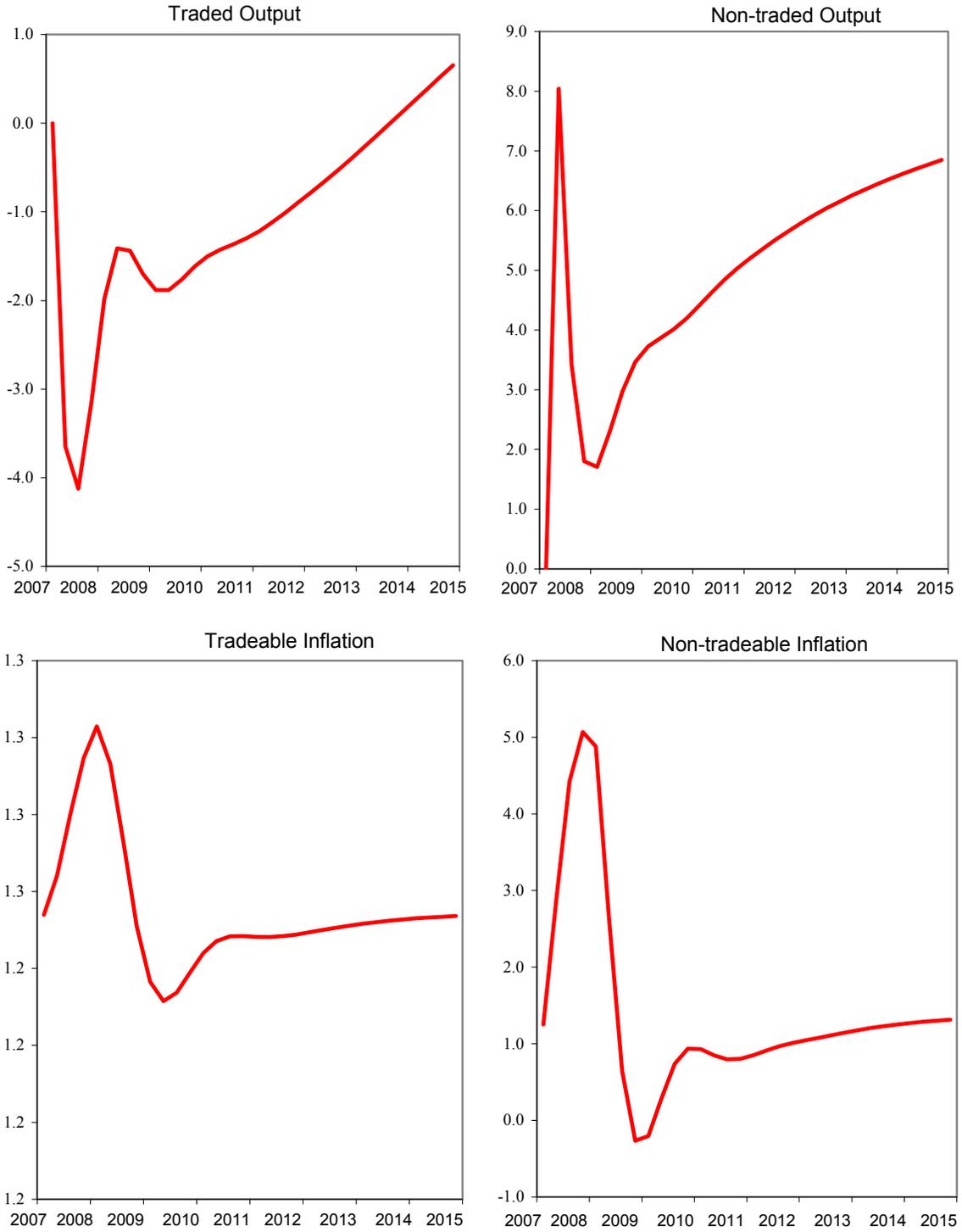
Source: Authors estimates.
[1]Relative to the Baseline.

Both model predictions are consistent with similar studies undertaken in the context of UN Africa Steering Group, including for neighboring countries Niger and Togo.[16] However, differences stemming from the extent of growth, inflation, and real exchange rate responses are related to the different underlying structure of the economies and initial conditions.

The two models point to similar qualitative results, while providing somewhat different estimates and dynamics of the impact of the additional aid inflows (Text Table 4). The impact of aid is relatively higher in model 1, while the real exchange effect is relatively limited in model 2, reflecting in part the fact that model 2 explicitly accounts for the price response of the private sector in the non-tradable sector. More importantly, the lower real exchange appreciation in Model 2 is associated with lower inflation over the medium term, reflecting a reduction in private sector demand for non-tradables.

Text Table 4. Benin: Model 1 and 2 Comparison – Impacts of Additional Aid
Under the Gleneagles Commitments–Deviation from the Baseline, 2008–15

	2008	2009	2010	2011	2012	2013	2014	2015	2008–10	2011–15	2008–15
						Projections					
										Average	
(percent)											
Real GDP growth											
Model 1	0.1	0.2	0.5	0.7	0.9	1.1	1.2	1.4	0.3	1.1	0.8
Model 2	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.1	0.3	0.2
CPI Inflation											
Model 1	0.1	0.7	2.1	4.0	3.5	2.9	2.3	1.8	1.0	2.9	2.2
Model 2	1.0	2.2	2.1	2.3	2.4	2.5	2.6	2.6	1.8	2.5	2.2
Real exchange rate											
Model 1	0.4	1.0	5.1	5.9	6.3	6.5	6.7	6.7	2.1	6.4	4.8
Model 2	3.3	2.8	2.1	1.8	1.6	1.6	1.7	1.8	2.7	1.7	2.1

Source: Authors estimates.

V. RISK TO THE GLENEAGLES SCENARIO

Absorptive capacity

One of the main risks to the Gleneagles scenario presented above is Benin's limited absorptive capacity. In the simulations above, the economy's ability to absorb the additional aid is based on the critical assumption that structural reforms will continue to be implemented to address any significant bottlenecks in the economy that could jeopardize the effective use of the additional aid. Two notable examples are worth mentioning here for Benin: 1) the public divestiture of the electricity sector to address the continued power shortages affecting daily economic activity in Benin; and 2) the effective management of the port of Cotonou, the main economic gateway for the country. Absent continued structural reforms to make Benin's economy more competitive and flexible, the additional aid inflows could have a significantly lower impact on growth over the medium- and long-term, while

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[16] See IMF Policy Paper "The Macroeconomics of Scaling-up Aid: the Cases of Benin, Niger, and Togo," available at http://www.imf.org/external/pp/longres.aspx?id=4283.

resulting instead in higher inflation that could jeopardize macroeconomic stability. The evidence on the impact of absorptive capacity in SSA countries however is mixed, with recent evidence (Mongardini and Rayner, 2009) showing that aid boosts productivity and does not therefore endanger macroeconomic stability. At best, therefore, this risk is minor for Benin.

Administrative capacity

Another risk to the Gleneagles arises from the authorities' limited administrative capacity to manage a large public investment program. As shown in the execution of the government's budget in recent years, the authorities have managed to implement only an average 80 percent of their annual public investment program. This mainly reflects limited administrative capacity and antiquated procurement regulations and procedures that have materialized in significant delays in the execution of capital projects. This is further corroborated by the World Bank's 2007 Country Policy and Institutional Assessment (CPIA) of Benin, which indicates significant inefficiencies in: (i) fiscal reporting, budget preparation, and execution; (ii) procurement and purchasing, including debt management, commitment of funds and payments management; and (iii) the extent of political support for the public procurement process and the authorities' public investment program.[17]

To illustrate the impact of the limited administrative capacity, an alternative scenario using the first model in the previous section was run assuming only an 80 percent effectiveness of aid stemming from weak public finance management (PFM). The lower effectiveness of aid could result from weak governance, as described in the latest JSAN. Under these assumptions, the average impact of aid on growth is reduced to an average 0.1 percent annually over 2008-2015 relative to the baseline (Figure 6). This is partly because public consumption increases faster than investment in this scenario and thus the contribution to physical and human capital accumulation is lower. In addition, the lower effectiveness of aid could jeopardize the expected pickup in productivity in the export sector, thus increasing the risk to fiscal and debt sustainability. Overall, this alternative scenario vividly demonstrates the importance of PFM reforms in order to increase aid effectiveness in Benin.

Debt concessionality

The additional aid inflows could pose significant risks to fiscal and debt sustainability if aid concessionality is low. To assess these risks, the debt profile implications of the Gleneagles commitment are simulated using an alternative scenario based on the first model presented in the previous section where the grant element of the additional aid declines (Figure 5). As the simulations indicate, a lower grant element of 35 percent—the program threshold for the PRGF arrangement—could lead to debt distress. For these reasons, a grant element for the

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[17] World Bank CPIA at: http://www.icgg.org/

Figure 5. Benin: Debt Vulnerability After Scaling Up Aid, 2007–28[1]

The concessionality of the additional aid under the Gleneagles commitments matters ...

NPV of debt-to-GDP ratio
(Threshold = 40 percent)

Gleneagles: 35
percent grant element

Staff Baseline

Gleneagles: 80 percent
grant element

NPV of debt-to-revenue ratio
(Threshold = 250 percent)

Gleneagles: 35 percent
grant element

Staff Baseline

Gleneagles: 80 percent
grant element

...irrespective of the debt indicator, and particularly for the NPV of debt-to-exports...

Debt service-to-exports ratio
(Threshold = 20 percent)

Staff Baseline

Gleneagles: 35 percent
grant element

Gleneagles: 80 percent
grant element

Debt service-to-revenue ratio
(Threshold = 30 percent)

Gleneagles: 35 percent
grant element

Gleneagles: 80 percent
grant element

Staff Baseline

...where it could lead to debt distress over the medium term.

NPV of debt-to-exports ratio
(Threshold = 150 percent)

Gleneagles: 35 percent
grant element

Staff Baseline

Gleneagles: 80 percent
grant element

Source: Authors estimates.

1/ The Gleneagles scenario (endogenously) integrates its scaling up impacts on
economic fundamentals, including growth, inflation, exchange rate, fiscal revenue, and
exports. It assumes an increase in aid from an estimate $42 per person in 2007 to $85 per
person by 2015. That would imply an additional aid of 2.4 percent of GDP on average in
2008–10, and 2.0 percent in 2011–15.

Figure 6. Benin: Macroeconomic Impact of Aid Under Gleneagles
Commitment and With Limited Domestic Capacity, 2007–15

With limited institutional capacity, the impact of the additional aid on growth
... and living standards in minimal ...
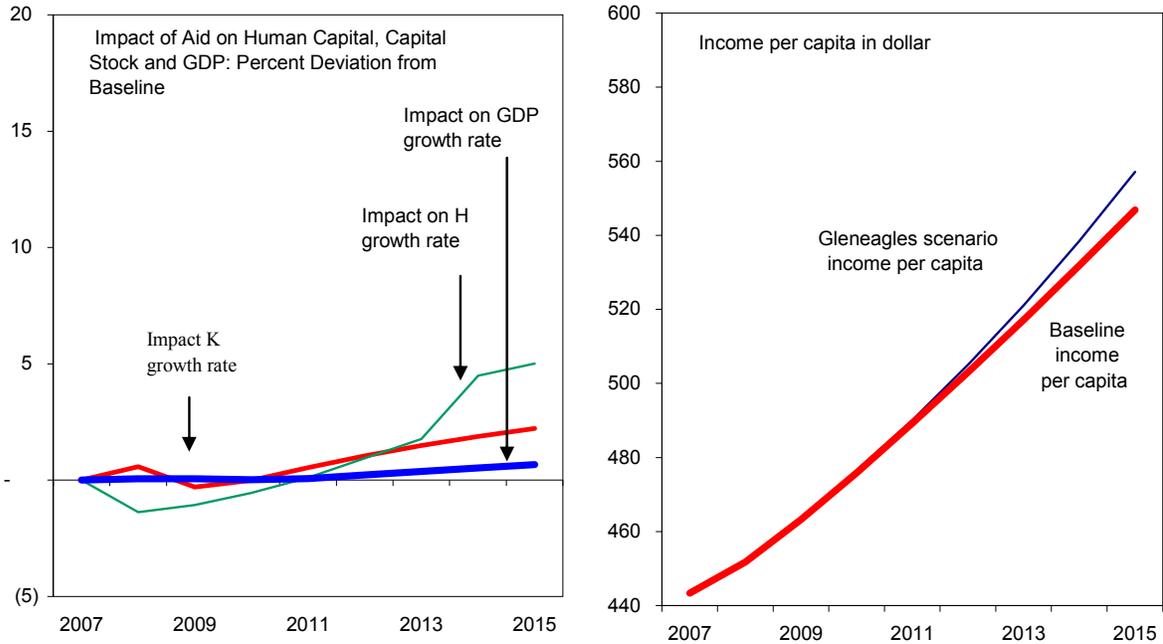
… even accounting for additional human capital ... while the impact on inflation and the real
exchange rate could still be significant.
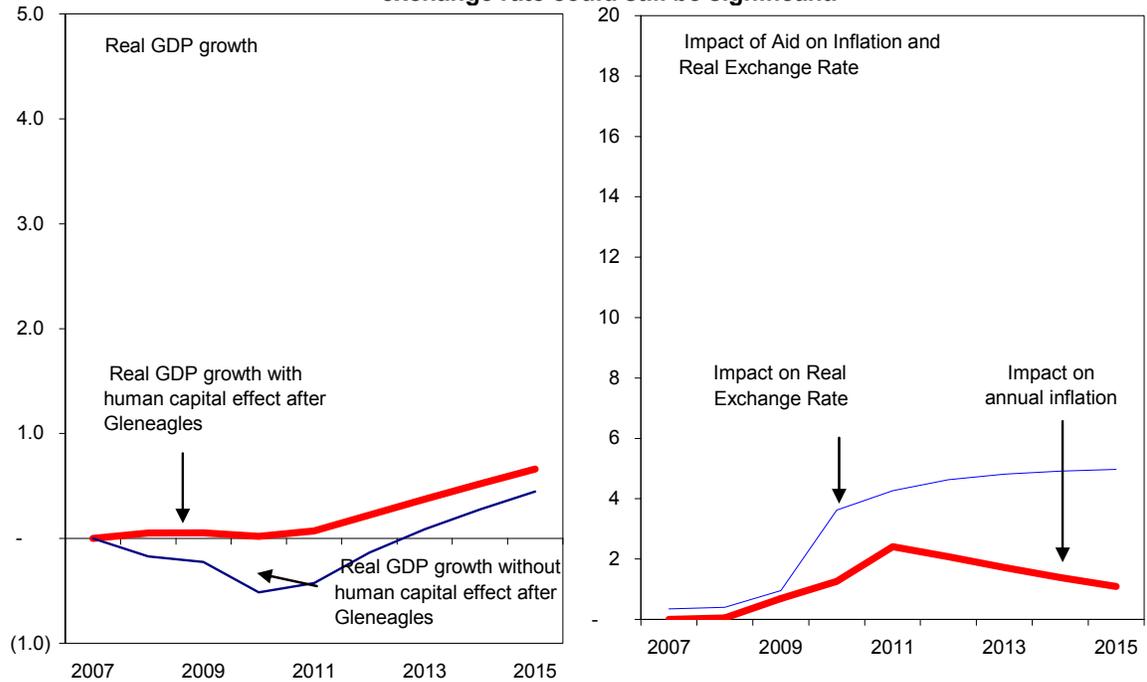
Source: Authors estimates.

Gleneagles aid of at least 80 percent or more is recommended in order to keep Benin within a moderate risk of debt distress.

The authorities' commitments to structural and PFM reforms under Fund-supported programs could help mitigate the above-mentioned risks to the Gleneagles scenario. As in past PRGF arrangements, the Fund–supported program provides time-bound commitments to address structural and institutional impediments to the effective use of aid. Such commitments are then monitored, and adapted if necessary, during semi-annual reviews that ensure effective implementation. Such flexible monitoring could help design necessary policy adjustments to mitigate both positive and adverse shocks.

VI. CONCLUSIONS AND POLICY RECOMMENDATIONS

The objective of this paper was to assess the impact on the Beninese economy of the proposed scaling up of spending under the Gleneagles commitment. The paper simulated this impact using two DSGE models, which are appropriate for a small open economy like Benin. The results of these simulations show that the scaling up can be accommodated under Fund-supported programs without jeopardizing macroeconomic stability. However, there are significant risks to achieving these results associated with the limited absorptive and administrative capacity in Benin , and the concessionality element of the aid.

These results point to important policy conclusions. First, the donor community should honor the Gleneagles commitment for Benin, as they are unlikely to jeopardize macroeconomic stability. Second, the scaling up of spending should go hand in hand with infrastructure investments aimed at improving Benin's absorptive capacity to use the aid effectively. Third, there is significant scope for technical assistance to improve the administrative capacity to handle the additional aid. Finally, such aid should be highly concessional in order to maintain fiscal and debt sustainability.

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Appendix I—Baseline Scenario for Benin

The Beninese authorities' baseline scenario is based on conservative assumptions drawn from the IMF–supported program with Benin and the long term assumptions on a steady state equilibrium consistent with Benin's growth potential given the current structure of the economy.[1] Key assumptions underlying the baseline scenario are as follows:

➢ The medium term growth (2008–13) is expected to reach an average of 5.8 percent. The Benin cotton sector is unlikely to reach full capacity because of slippages in reform implementation.

➢ The long-run growth assumptions are consistent with the World Bank's recent Country Economic Memorandum (CEM), which suggests that Benin long-run growth could reach about 6 percent. The macroeconomic fundamentals are expected to improve further. The baseline assumes only a selected number of structural reforms to be implemented that may not be sufficient to ensure that the country reaches its full potential. output is projected to grow at 6 percent annually for the period 2014–28, which is lower than what would be required to reach full potential by 2028. This fact, among others, suggests that the public sector will play a key role.[2]

➢ Inflationary pressures associated with the food and fuel crisis are projected to abate. Based on the current food and oil price shocks, CPI Inflation will reach 8.8 percent in 2008 and fall gradually to 2.8 in 2013 and thereafter as medium- and long-term supply responses will take effect.

➢ In line with the country's development needs, the primary fiscal deficit is projected to further deteriorate from 3.6 percent in 2008 to 4.2 percent in 2013 and beyond, despite expected strong revenue collection and prudent expenditure management. The deterioration in the primary fiscal deficit reflects the projected scaling up of public expenditure.

➢ The improved strong revenue collection is expected to consolidate further. Tax revenue is projected to rise to an average 17.7 percent of GDP annually in 2008–13, from 16.8 percent in 2007.

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[1] Estimates and projections are in CFA francs, unless otherwise indicated.

[2] A recent IMF working paper finds a positive correlation between public investment and growth through private sector involvement. See Samake (2008), ."Investment and Growth Dynamics: An Empirical Assessment Applied to Benin", IMF Working Paper No. WP/08/120, available at http://www.imf.org/external/pubs/ft/wp/2008/wp08120.pdf.

Appendix II—The Two Model Properties

Model 1:[1]

The model simulates the macroeconomic impact of the allocation of aid inflows across socio-economic sectors through time. Employing an augmented Solow production function, it accounts for the supply-side effects of these allocation on human capital. Depending on the beneficiary sector of aid, aid may have an "early" impact, "late" impact or "no" impact on economic growth. The model assumes: that (i) all aid is spent, implying an equivalent increase in government expenditures; (ii) aid resources are allocated efficiently across socioeconomic sectors; (iii) the short-run effect on growth is driven by the impact on aggregate demand, as 80 percent of the increase in government spending is assumed to be spent on local goods and services and the remainder on imports of goods and services ; (iv) any remaining foreign currency proceeds would finance additional demand for imports by the private sector; (v) the medium-run impact on growth is based on agriculture and infrastructure reforms; and (vi) the long-run incremental growth impact is based on improvements in education, health, gender representation, population, and social protection.

The model behavioral equations are defined on supply side and demand side, in addition, the use of aid in terms of "early" impact, "late" impact or "no" impact are then specified.

On the supply side, output is determined by the human-capital augmented Solow production function, with constant returns to scale.

$$Y_t^S = A_t K_t^\alpha H_t^\beta L_t^{1-\alpha-\beta} \tag{1}$$

K_t is the sum of private (K_p) and government physical capital (K_G). α and β are, respectively, the shares of output attributed to physical and to human capital. This refrains from assumptions that would significantly increase the impact of aid on growth, such as increasing returns to scale; Gottschalk (forthcoming) provides a comprehensive review of the growth effects of public investment using different assumptions. This equation, in log and first difference form is: given by:

$$\dot{y}_t = \dot{a}_t + \alpha \dot{k}_{t-1} + \beta \dot{h}_t + (1-\alpha-\beta)\dot{l}_t \tag{2}$$

Where the upper dot represents the time derivative; lower-case variables are in per capita terms. Note that we have assumed that private capital becomes productive with a one-year lag.[2] Next, the physical capital accumulation is given by:

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[1] It should be noted that the results of these models applied to low-income countries are subject to significant uncertainties since: (i) the quality of the data is weak; (ii) parameters are highly unstable through time; and (iii) elasticities are roughly approximated from cross-country calculations.

[2] This would imply that the supply function is contemporaneously independent from the demand side of the economy.

$$K_t = (1-\delta_K)K_{t-1} + I_{PK,t} + I_{GK,t}, \tag{3}$$

where δ is the depreciation rate, which is the same for private and government capital. Public investment spending in health and education (G_H), net of depreciation allow for the human capital formation equation:[3]

$$H_t = \frac{(1-\delta_H)}{(1+g)}H_{t-1} + I_{H,t}, \tag{4}$$

Where the investment in human capital $I_{H,t}$, is defined by:

$$I_{H,t} = \overline{w} * (\sum_{i=t-6}^{i=t-1} G_{H,i}) = \frac{1}{20} * (\sum_{i=t-6}^{i=t-1} G_{H,i}), \tag{5}$$

where g is the rate of population growth and w is the share of each school-graduating cohort in the labor force. G_H represents public expenditures in human capital formation.

On the demand side, the economy comprises a set of behavioral equations for private consumption (C_t), investment (I_t), government revenue (T_t) and expenditures (G_t), exports (X_t), and imports (M_t).

Private consumption $(Y_t - T_t)$ is positively correlated to the disposal income through the propensity to consume (6), and government tax (7) and private investments (8) are respectively define as a constant proportion of real GDP:

$$C_t = c_1(Y_t - T_t) \tag{6}$$
$$T_t = \tau Y_t \tag{7}$$
$$I_{P,t} = \rho_p Y_t \tag{8}$$

Public investment is allocated in human capital (I_{GH}) and physical capital accumulation (I_{GK}) and is financed through fiscal revenue and aid inflows:

$$I_{GH,t} = \rho_{GH} T_t + AID_{LIK,t} \tag{9}$$
$$I_{GK,t} = \rho_{GK} T_t + AID_{EI,t} \tag{10}$$

Export (X) and import (M) volumes are functions of real GDP and the real exchange rate. In addition, a proportion of aid spent through imports.[4] The positive link between exports and output is premised on the assumption that the expansion of exports is determined by the production capacity of the country while the world demand for its exports is unlimited. Furthermore, imports are directly influenced by foreign aid, as we assume that a share θ of aid is imported.

$$X_t = Y_t^{\psi_X} RER_t^{\sigma_X} \tag{11}$$

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[3] Baldacci et al (2004) present panel data evidence of a significant and direct impact of education and health spending on the accumulation of human capital in developing countries.

[4] For imports and exports the values of σ and ψ are obtained from Senhadji (1998a, 1998b)

$$M_t = Y_t^{\psi_M} RER_t^{\sigma_M} + \theta * AID_t \qquad (12)$$

Government budget is assumed balanced and total expenditures are fully financed by fiscal revenue and aid:

$$G_t = \gamma T_t + AID_{EIC,t} + AID_{LI,t} + AID_{NI,t} \qquad (13)$$

The use of aid flows follows Clemens, Radelet, and Bhagvani. (2004). The "early" impact aid (ΔAID_{EI}), the "late" impact (AID_{LI}), and "no" impact aid (AID_{NI})

$$AID_t = AID_{EI,t} + AID_{LI,t} + AID_{NI,t} \qquad (8)$$

Early impact aid finances mainly physical capital and is assumed to have an almost immediate effect on output. Late impact aid finances expenditures in human capital formation (G$_H$) as follows:

$$G_{H,t} = \gamma_{H,0} T + AID_{LI,t} \qquad (9)$$

The first term on the right-hand side is public expenditure on human capital, assuming it remains constant as a share of government revenue (T) with respect to its level before the aid increase. [5] The second term incorporates increased expenditures funded by additional late impact aid. We further distinguish late impact aid that finances capital goods (AID$_{LIK}$) from such aid that finances consumption goods (AID$_{LIC}$):

$$AID_{LI,t} = AID_{LIC,t} + AID_{LIK,t} \qquad (10)$$

Although we consider AID$_{LIK}$ as part of government investment in demand equations (Equation 18 below), its effect on the supply side is captured through human capital (Equation 7) rather than physical capital.

Closing the Model
The Model is closed by setting aggregate demand equal to aggregate supply in two equations:

$$Y^s_t = Y^D_t = C_t + I_t + G_t + (X_t - M_t) \qquad (11)$$

and the current account deficit equal to:

$$(X_t - M_t) = AID_t + KF_t \qquad (12)$$

---

[5] The coefficients of taxes are calibrated based on 2007 levels without filtering out public investment that was funded by foreign aid during that year. This simplification does not distort our post-2007 projections because we assume that both taxes and pre-2007 foreign aid keep growing at the same pace as GDP growth

where KF_t represents non-aid capital flows and is assumed proportional to GDP ($KF_t = kY_t$).

The steady state

Output is determined by physical capital (lagged one year) and human capital as well as TFP. Output is exogenously determined aid, which in turn, determine consumption, investment, government domestic revenue, and government consumption. The real exchange rate, through its impact on exports and imports, adjusts to ensure that the current account deficit is fully covered by new aid and non-aid capital flows. In the context of a fixed exchange rate regime like in Benin, movements in the RER results only from the price of non-tradable goods. Finally, note that in this model government always spends all aid flows while the central bank is implicitly assumed to sell to private agents any aid generated foreign exchange.

The model dynamics

The dynamics of the model are as follow. Consider an increase in foreign aid in year t. Aggregate demand increases that same year with the increase in government consumption, and investment leaks out only partially as imports. Because aggregate supply does not increase in year t, the increase in demand leads to price adjustments to equilibrate demand and supply: i.e., domestic inflation increases and the real exchange rate appreciates, reducing net exports and the current account balance. In year t+1, the increase in foreign aid boosts production through its effect on physical capital, and a few years later through its effect on human capital. The increase in production after year t+1 raises income, which in turn expands the main aggregate demand components, including investment. This implies that the increase in foreign aid crowds in private investment. The expansion of supply after year t+1 also eases the pressure on domestic inflation and the real exchange rate.

Calibration of the model

The model is calibrated by combining some Benin-specific parameters and others borrowed from cross-country studies. On the supply side, α is set at 0.35 (in line with estimates for sub-Saharan African countries) and β at 0.30 (in line with estimates by Mankiw, Romer, and Weil (1992). Data on physical capital are constructed from gross investment by applying the perpetual inventory method. Data on the labor force, which is only available from 1980, are extended back to 1960 by assuming that the labor force grew at the same rate as total population. Human capital is estimated as described in Appendix 1. On the demand side, the equations (11–15 and 18) are calibrated on national accounts data for 2006 and 2007. We assume that both imports and exports have an income elasticity of 1 and the set price elasticities of imports is 1.08 and of exports is 1.[6]

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[6] These price elasticities are the average for a large number of developed and developing countries as estimated in Senhadji (1998) and Senhadji and Montenegro (1998).

Model 2

The Berg et al. model attempts to answer two questions. First, it aims at revisiting the question of optimal monetary policy responses to aid shocks, qualitatively and quantitatively, for a calibrated model. The canonical question for the central bank in an aid-dependent country arises when the government receives foreign aid and spends the domestic currency counterpart on non-traded goods (if it spends the dollars directly on imports, there is no immediate monetary problem). Finally, on a related issue, how much of this monetary injection should the central bank sterilize through foreign exchange sales, and how much through domestic open monetary operations? The paper is built on the ground that despite earlier work, there remain several misperceptions regarding the implications of a spend-and-don't-absorb policy. It thus provide an in-depth articulation in the context of a DSGE model. The paper, typically, raises the question of how monetary and fiscal policies should be executed to engineer the desired degree of absorption in a world where the private sector may either compound or mute the effects of aid policies by varying its own foreign assets.

The model simulates a small open economy model, with three sectors (exports, non-traded goods, and imports), four economic agents (households, firms, government, and central bank) and three assets (government debt, foreign assets, and cash). Behavior are captured as follows: (i) household supply labor, save, hold financial assets, and consume goods (non-traded goods, exportable, and imports); (ii) firms demand optimal labor force level for each sector, investment and set good prices. They are subject to price adjustment costs in the non-traded sector, which, ultimately, leads to a new-Keynesian Phillips curve for non-traded goods inflation; (iii) there is a single labor market for all sectors where both competitive wages and employment levels are determined. Finally, wage- setting mechanism is also subject to adjustment costs. Government revenue consists of (standard) taxes and grants and receives seignorage revenue from the Central Bank. On expenditure side, government chooses to allocate aid transfer between public savings, consumption, or investment and whether to spend on local goods and services or imports. Central Bank (operates in a currency union) intervenes in domestic debt markets to accumulate reserves (on behalf of the union), sterilize foreign inflows, and ensure the fixed exchange rate and price stability. Finally, the model assumes limited international capital mobility and the has a steady-state solution. The model includes a financial sector with a central bank that ensures exchange market and price stability and coordinate with government on aid absorption.[7]

Optimizing consumptions

It is assumed that each consumer is optimizing its life-time utility which depends on consumption, real money balances and labor. All consumers own all the firms and all the assets in the economy. The consumption optimizing function has two features. First, the utility function displays habit persistence, i.e. lagged values of consumption decrease the instantaneous utility derived from current consumption. Habit persistence is necessary to

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[7] The model steady-state system consists of fifteen equations that will not be presented here in order to save pace.

allow for a gradual adjustment of consumption to real interest rate changes. The second feature is the introduction of sticky wages.

The model considers a proportion of non-optimizing consumers. These agents do not accumulate capital and therefore do not receive profits from firms. Their only source of income comes from their labor. In addition these agents do not hold real money balances. Their utility maximization is subject to a static budget constraint. Non-optimizing consumers' utility does not display persistence and, unlike their optimizing colleagues, they do not have power to set wages.

Consumption baskets and demands, price indices

Next, the model considers three types of goods traded in the economy (exportables, foreign imported goods, and non-tradable goods). Consumption sub-baskets of each type of goods aggregate consumption of individual products using a constant elasticity of substitution (CES) function. In the non-traded goods sector, the production function of the non-traded goods producers depends on labor and capital (public and private).

In the exportable goods sector, the model allows for the possibility that the tradable sector benefits from learning, i.e. that past levels of production can raise or lower productivity in the traded sector. This feature is often alluded to when discussing the potential pitfalls of allowing the currency to appreciate in real terms following a large transfer. It also measures the sensitivity of traded goods productivity to past levels of production.

Distribution/retail sector

As mentioned earlier, the model introduces a distribution/retail sector for traded goods. This allows for incomplete exchange rate pass-through into retail traded goods prices. The retail sector is assumed to feature monopolistic competition and price adjustment costs. Hence, provision of retail services drives a wedge between the CPI-based real exchange. The former will now represent a wholesale (or border) price of domestic (foreign) traded goods prices, while the latter represents the price faced by the consumers. An important implication of this addition is that real exchange rates will be almost as volatile as the nominal exchange rate (see Burstein, Neves and Rebelo (2003)).

The government

The government inter-temporal budget constraint suggests that the government can finance its spending through a variety of sources: taxes on labor income, using aid proceeds, central bank profits, drawing down on deposits held at the central bank, or issuing domestic debt (net of interest payments on the share of government debt that is held by consumers. It is also assumed that government spending can be either government consumption or public investment. Public capital is assumed to be a non-rival good, but is unequally accessible by the two productive sectors.

Government debt and deposits are held at the central banks including the amount of aid received. According to this setup, the government will always spend the average amount of

the aid. However, an aid shock that drives above or below its average may or may not be spent initially. A key parameter is modeled to measure the fraction of extra aid immediately spent by the government. It is assumed that the government targets a long run level of real debt and real deposits. The implication of such target is that, if aid is not immediately spent, it will initially accumulate as deposits but will be gradually spent over time.

The central bank

The central bank balance sheet consists of (i) reserve accumulation driven by the amount of foreign aid that is not sold to the private sector. It is assumed that the central bank always sells the average amount of aid, but may react directly to unexpected changes in the volume of aid; (ii) the nominal value of government bonds; (iii) government deposits at the central bank; and (iv) net foreign assets of the central bank measured in local currency. The valuation gains for reserves are transferred to the government as central bank profits.

The central bank sets up the rule for open market Operations. The specifics of the open market operations rule are chosen so that reserve money growth follows a well defined process. This allows the monetary policy to follow a growth rule for broad money, with possible deviations from the rule as a response to aid shocks. The open market operations is modeled somewhere along a continuum. On one end, it is assumed that the central bank purchases of government bonds follow a constant growth rate. At steady state, this process ensures that money grows at a constant rate (*g)*, which pins down the steady state level of inflation. Outside of the steady state however, this rule does not ensure a constant growth rate for reserve money, especially when aid is spent but not absorbed. In this sense, spending but not absorbing the aid generates a monetary injection (above what is expected from a constant nominal growth rule). It is referred to this end of the policy spectrum as "business as usual".

On the other end of the policy spectrum, it is assumed that open market operations adjust so that reserve money always grows at rate (*g)*. This such process implies that, in the event that aid is spent but not absorbed, open market operations would increase in order to fully sterilize the monetary injection that would follow. The purchases of government bond is modeled as falling somewhere along a continuum in between these two policies. At the steady state however, all policies along this continuum will imply the same growth rule.

Market clearing

The model is closed using: (i) the equilibrium in the non-traded goods sector; (ii) the equilibrium in the retail sector; and (iii) the labor market clearing condition.