

# Scaling up Aid or Scaling down

## The Global Economic Crisis and Rwanda's MDGs

*Hans Lofgren*  
*Hannah Nielsen*  
*Kene Ezemenari*

The World Bank  
Poverty Reduction and Economic Management Network—Africa Region  
Africa Technical Families  
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## Abstract

Rwanda is not on track to achieve most of the Millennium Development Goals at a time when hopes for scaled-up aid are mixed with concerns that, in the context of the global economic crisis, aid instead will be scaled down. This paper analyzes the effects of alternative scenarios for grant aid, government spending allocations (between infrastructure, agriculture, and human development), and government efficiency. The authors use an economy-wide model for development strategy analysis, Maquette for Millennium Development Goal Simulations. Under a plausible scenario for increased aid, annual growth in gross domestic product increases by as much as 0.6 percentage points relative to a baseline with a growth rate of 6 percent; by 2020, the headcount

poverty rate declines to 32 percent, 3 percentage points lower than for the baseline. A plausible scenario for reduced aid leads to a symmetric growth reduction but a more pronounced increase in poverty, at 40 percent in 2020. When aid increases, the most positive growth and poverty reduction impacts occur if spending increases are allocated to infrastructure and agriculture; progress in human health and education is significant but weaker than if additional spending is focused on these areas. Given synergies and diminishing marginal returns from expansion in a limited area, the scenarios that may appear most attractive and politically feasible have a broad and balanced expansion across government functions, promoting both growth and human development.

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SCALING UP AID OR SCALING DOWN:  
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Hans Lofgren, Hannah Nielsen and Kene Ezemenari\*

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## 1. Introduction

Like other low-income countries, Rwanda has committed itself to reaching the Millennium Development Goals (MDGs). Rapid real GDP growth since 2000 (at an average annual rate of 7.8 percent) and concerted government efforts have led to progress in some important areas, like primary schooling and health. Nevertheless, Rwanda is likely to fall short of achieving most of the MDGs. In terms of MDG 1 (the objective of halving the headcount poverty rate of 1990 by 2015), Rwanda has only made marginal progress in recent years, reducing the rate from 60.4 percent in 2000/01 to 56.9 percent in 2005/06.<sup>1</sup>

This reflects the fact that Rwanda faces severe constraints as it strives to accelerate its progress.<sup>2</sup> As a small landlocked country with poor infrastructure, the high cost of trade is a critical constraint – the need to invest in infrastructure has consequently been identified as a priority in the Country Economic Memorandum completed in 2007 (World Bank, 2007). Another major constraint, the lack of skilled labor, hampers development of both the private sector and the efficiency of government operations. The urgency of making progress in education is highlighted by Rwanda's Vision 2020, according to which the government has set itself the goal to transition to a knowledge-based economy. In the absence of any significant source of export earnings, foreign aid is a major source of foreign exchange inflows and government financing. In recent years, high-income countries committed themselves to major increases in aid to countries like Rwanda. However, as the global economic crisis has unfolded in recent months, the hope for more aid has been replaced by the fear of major aid cuts, making efforts to improve government efficiency ever more urgent.

Against this backdrop, this paper analyzes the effects of alternative scenarios for aid (with a significant scaling up and severe cuts as the two extreme cases), government spending allocations (between infrastructure, agriculture, and human development), and government efficiency. In terms of effects, we focus on the consequences for growth and the different MDG indicators.

An economically sound analysis of the above issues requires an economy-wide approach that in an integrated manner can simulate the effects on production, MDGs and other indicators from changes in aid, government spending, and government efficiency. With these analytical needs in mind, the World Bank has developed MAMS (Maquette for MDG Simulations), a tool for medium- to long-run development strategy analysis. The characteristics of MAMS are described in the following section; our analysis is focused on the period 2008-2020. In section 3, an overview of Rwanda's economy is given to facilitate the results of the simulation scenarios, which are explained in section 4. A baseline scenario serves as benchmark for comparison of the other scenarios that assume: (i) an increase in aid, allocated to different sectors, i.e. human development, infrastructure, agriculture as well as split between these sectors; (ii) an increase in government efficiency; and (iii) a downturn of the global economy. Our conclusions are summarized in section 5.

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<sup>1</sup> Data taken from EICV 1 and EICV 2, respectively (EICV = *Enquête Intégrale sur les Conditions de Vie de ménages de Rwanda*). See also Oxford Policy Management (2007).

<sup>2</sup> For a more detailed analysis, see World Bank (2007).

## 2. Characteristics of the MAMS framework<sup>3</sup>

MAMS is an economy-wide simulation model created to analyze development strategies. The model integrates a relatively standard dynamic recursive computable general equilibrium (CGE) model with an additional module that links government policies and other relevant indicators to poverty and other MDG outcomes. The relatively detailed treatment of government activities in MAMS makes this link possible. In contrast to narrow sectoral analyses, MAMS takes into account all flows in the economy. We will here describe the model as applied to Rwanda, referring to the disaggregation that is driven by the Rwandan database that we constructed.

The core CGE model includes a government sector that is disaggregated into 8 functions: three types of education (primary, secondary, and tertiary cycles), health, water-sanitation, agricultural services, (other) infrastructure, and other government services. Like other production activities, these government sectors use production factors and intermediate inputs to produce an activity-specific output (in the case of the government this means different types of services). The private sector is divided into agriculture, mining, other industry, and services.

The factors of production in the model include three types of labor: those with less than completed secondary education, with completed secondary education but incomplete tertiary, and with complete tertiary education. Each of these labor types is therefore linked directly to the education sectors/cycles, and thus the growth in the labor force will in part depend on the functioning of the education system in the model. The remaining factors of production include public capital stocks by government activity and a private capital stock.

The government finances its activities from domestic taxes, domestic borrowing, and foreign aid (borrowing and grants). The provision of education, health, and water-sanitation services contribute directly to the MDGs. Growth in the stock of public infrastructure capital contributes to overall growth by adding to the productivity of other production activities (both private and public); growth in the capital stock generated by government investments in agriculture contributes to productivity in the private agricultural sector.

The model includes a single household (an aggregate private domestic institution). The receipts of the household consist of factor incomes, transfers from the government and the rest of the world (including worker remittances) and interest on the domestic government debt. These receipts are allocated to direct taxes (reflecting government policy), savings (with a savings rate that responds to higher per-capita incomes), and consumption (using demand functions derived from utility maximization).

In its interactions with the rest of the world, Rwanda spends foreign exchange on imports and interest. Its receipts stem from exports, foreign transfers to the government and the household, government borrowing from abroad, and foreign direct investment. Domestic commodity supplies are imperfectly transformable between two destinations, domestic sales and exports; the ratios between sales to these two destinations respond to changes in the ratio between domestic sales and export prices. Similarly, commodity demanders view imports and domestic output as imperfect substitutes and respond to relevant relative price changes.

The model focuses on the subset of the MDGs that tend to be most costly and have the greatest interaction with the rest of the economy. More specifically, in the Rwanda application, the MDGs

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<sup>3</sup> This section draws on Bourguignon et al. (2008). For a detailed technical documentation see Lofgren and Diaz-Bonilla (2008).

covered and the indicators used are as follows: MDG 1 (halve the population share in poverty) – the headcount poverty rate (using the national poverty line);<sup>4</sup> MDG 2 (achieve universal primary education) – the net primary completion rate; MDG 4 (reduce child mortality) – the under-five mortality rate; MDG 5 (improve maternal health) – the maternal mortality rate; MDG 7 (ensure environmental sustainability) – two indicators: the population shares with access to (a) an improved water source and (b) improved sanitation.

These different MDGs are covered in an additional set of functions that link the level of each MDG indicator to a set of determinants (Table 1). For MDG 1, we compute the population share below the poverty line (which is adjusted for CPI changes) on the basis of per-capita household consumption, assuming that it follows a log-normal distribution. For MDGs 4, 5, 7a and 7b, the determinants include relevant services per capita (in health, and water-sanitation), household welfare (measured by household consumption per capita), the level of public infrastructure, and other MDG indicators; i.e. the formulation allows for the presence of synergies between MDGs. This is a key characteristic of MAMS. An improvement in the access to clean water and sanitation e.g. benefits the health of the population, thereby reducing child and maternal mortality while an improvement in the health of the young (proxied by reduced child mortality) in turn affects education outcomes positively. Government spending on different sectors should therefore not be considered as separate efforts.

In education, which is treated differently from other MDGs, the model tracks base-year stocks of students and new entrants through the three cycles. Annual student performance is indicated by whether the enrolled students in each grade successfully complete their grade and continue to the next, repeat it, or drop out; the share of the first primary year cohort that enrolls (the net intake rate); and the shares among primary and secondary level (or cycle) graduates that continue to the next level. At each level, educational services per student are viewed as the indicator of educational quality. Student performance indicators depend on educational quality, household welfare, the level of public infrastructure, wage incentives (expressed as the ratio between the wages for labor at the next higher and current levels of education for the student in question; an indicator of payoff from continued education), and health status (proxied by MDG 4). MDG 2 (the net primary completion rate) is computed as the product of the primary net intake and passing rates for the series of past years relevant to the student cohort that is due to graduate in the current year.<sup>5</sup>

**Table 1:** Determinants of MDG achievements in MAMS

MDG	Other determinants				
	Per-capita real service delivery	Per-capita household consumption	Wage incentives	Public infrastructure	Other MDGs
1 – Poverty		✓			
2 – Primary education	✓	✓	✓	✓	4
4 – Infant mortality	✓	✓		✓	7a, 7b
5 – Maternal mortality	✓	✓		✓	7a, 7b
7a – Access to water	✓	✓		✓	
7b – Access to sanitation	✓	✓		✓	

<sup>4</sup> Given the assumption of a fixed log-normal distribution, the poverty results assume that the gains in per-capita household consumption are distributed neutrally (including an unchanging value for the Gini coefficient).

<sup>5</sup> For example, for a six-year primary cycle (like Rwanda's), MDG 2 (the net primary completion rate) in 2008 is defined as the product of seven terms: the net intake rate in 2003 and the passing rates in 2003-2008 as the students move from grade 1 to grade 7. If the value is 1 for each term, the net primary completion rate is also one. However, a moderate short fall has a large impact on the MDG 2 value, for example,  $0.95^7$  is 0.70.

A MAMS country database is a synthesis of information from a variety of sources, structured to meet the requirements of the model. The model parameters are defined using this data. The main components of the database are a social accounting matrix (SAM) and other data that reflect the functioning of the economy with some emphasis on human development and infrastructure. More specifically, the information is primarily related to stock data (for labor and other production factors, students, and population) and elasticities (related to substitutability in production, consumption, and trade as well as to responses in MDG indicators various determinants). For the simulations, it is also necessary to provide assumptions about the evolution of policies and other factors that are exogenous to the model.

For the Rwanda MAMS database, several sources were used, including an existing SAM (with an agricultural focus), various International Monetary Fund publications (for macro and government data), the EDPRS, and household surveys. We also relied on several studies undertaken by the World Bank including a recent Country Economic Memorandum (World Bank 2007) and sectoral analyses such as the Public Expenditure Review for the education sector (Republic of Rwanda 2007c). Data for other countries that were considered similar in terms of relevant structural features was used when the required information was not available for Rwanda. This should not be seen as drawback of the analysis. Parameters that have been established in the literature<sup>6</sup> have been used that fall within the range of those for similar countries. Nevertheless, given data weaknesses and the simplifications that are inherent in any model, the results should be taken as approximate indicators of the effects of alternative policy options, to be considered in conjunction with other inputs to economic policymaking in Rwanda.

### **3. Overview of Rwanda's economy and development policy**

Rwanda's economy has recorded macroeconomic stability in the last years with robust growth, moderate inflation rates and a relatively stable exchange rate (Table 2). Food and fuel price increases, however, have led to significantly higher consumer prices and import bill in 2008. Rwanda has a very narrow export base, consisting mainly of coffee, tea and minerals. Imports exceed exports by a wide margin. The financing gap is primarily covered by foreign aid, although private remittances and small amounts of FDI also contribute to some extent. Despite the government's success in expanding domestic revenue collection, foreign aid represents close to half of its receipts, mainly in the form of grants. After a continuous improvement in the terms-of-trade over the past years, Rwanda experienced deterioration in the terms-of-trade in 2008 due to the surge in import prices.

The impressive growth performance in the past years has not yet translated into a substantial decrease in the poverty headcount, which has only been reduced by a small margin between 2000/01 and 2005/06. Inequality, measured by the Gini coefficient, even increased from 0.47 to 0.51 nationwide with larger increases in some of the districts. Bigsten and Isaksson (2008) show that the consumption growth pattern in Rwanda was not neutral, but rather skewed in favor of the higher consumption decile. This coincides with an increase in rural inequality as the main driving force of higher overall inequality. It also underlines the importance of the agricultural sector, which is the largest sector both in terms of its contribution to GDP and employment.

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<sup>6</sup> For suggestions of elasticities used for other countries, see Lofgren (2008).



**Table 2: Selected economic indicators, 2004-2008**

	2004	2005	2006	2007	2008 (prelim.)
<i>Annual percentage change</i>					
Real GDP	5.3	7.2	7.3	7.9	8.5
Inflation (CPI average)	12.0	9.0	8.9	9.1	15.4
Exports, f.o.b. (U.S. dollars)	55.3	28.7	16.9	20.1	25.3
Imports, f.o.b. (U.S. dollars)	13.1	28.2	26.2	30.2	42.3
Export volume	26.9	14.4	12.7	6.2	13.0
Import volume	6.7	26.1	27.0	31.0	24.9
Terms of trade	15.5	10.7	4.3	13.7	-2.6
<i>Percent of GDP</i>					
<b>Balance of Payments</b>					
Current account balance					
Including official transfers	-1.9	-1.1	-7.4	-4.9	-6.9
Excluding official transfers	-15.9	-15.6	-16.1	-15.5	-18.1
Gross official reserves (months of imports)	5.9	6.2	5.6	5.2	5.3
External debt stock (end of year)	84.9	63.0	16.9	16.8	15.4
<b>Public Finance</b>					
Total revenue (excl. grants)	12.9	13.5	13.3	13.6	14.2
Total expenditure	24.1	25.6	24.5	24.9	27.1
Fiscal deficit (excl. grants)	-11.2	-12.0	-11.1	-11.3	-13.0
Fiscal deficit (incl. grants)	-0.2	0.6	-0.4	-1.5	0.1
<i>Memorandum items</i>					
Exchange rate RwF/US\$ (average)	575	556	552	547	552
GDP per capita (USD, constant prices)	170	185	197	210	222
Nominal GDP (million USD)	1,981	2,398	2,833	3,412	4,230

Source: IMF.

These challenges are recognized by the Economic Development and Poverty Reduction Strategy (EDPRS), which is based on the foundation laid by Rwanda's first Poverty Reduction Strategy Paper (PRSP), covering the period 2002-2006, and focused primarily on the sectors that would yield immediate growth benefits and build the human resource and infrastructure base. The EDPRS refocused Rwanda's priority on growth and human development, with emphasis on decentralization, and a greater role for the private sector. The EDPRS provides the medium-term strategy for the next five years (2008-2012) in the context of achieving the Millennium Development Goals in line with Rwanda's Vision 2020, which states the objective that Rwanda reach middle-income status by 2020. More specifically, the review of the current situation as well as the recent socio-economic performance led to the following objectives for the EDPRS: increase economic growth, slow down population growth, tackle extreme poverty and ensure greater efficiency in poverty reduction.

**Table 3: MDG progress in Rwanda**

MDG indicator	2000	2006	Target 2015	Target 2020
MDG 1: Poverty headcount (% of population)	60	57	30	30
MDG 2: Primary school completion rate (gross, % of relevant age group)	22	52	100	100
MDG 4: Under-5 mortality rate (per 1,000 births)	196	152	50	50
MDG 5: Maternal mortality rate (per 100,000 births)	1071	750 <sup>a</sup>	268	200
MDG 7a: Access to safe drinking water (% of population)	64	64 <sup>a</sup>	82	100
MDG 7b: Access to improved sanitation facilities (% of population)	37 <sup>b,c</sup>	38 <sup>b</sup>	69	n/a

Source: EDPRS, September 2007 and Millennium Development Goals – Rwanda Country Report 2007;

<sup>a</sup> data from 2005, <sup>b</sup> World Bank estimates, <sup>c</sup> data from 1990.

The status of the MDGs analyzed within the context of the MAMS is given in Table 3. In addition to the targets for 2015 those for 2020 are included, as set in Vision 2020 (Republic of Rwanda, 2000). Good progress has been made in some areas, especially health and education, while other sectors, such as water and sanitation, show little recorded progress in terms of the MDGs between 2000/01 and 2005/06.

#### 4. Simulations

Using MAMS, we carried out a set of simulations to assess the effect of alternative policies and exogenous shocks on the macroeconomic and sectoral evolution of Rwanda's economy up to 2020. The likelihood and path of attaining the MDGs and the synergy effects between MDGs can be analyzed as well. The BASE scenario is used as a starting point, while for the subsequent scenarios only certain assumptions have been altered, such as the development of the world commodity prices or the amount of external aid available to the Government of Rwanda and its allocation. The scenarios are briefly described in Table 4.

**Table 4:** Simulation scenarios

Name	Description
BASE	Continuation of historical trends
AID-HD	Increase in grant aid, allocated to human development (education, health, water and sanitation)
AID-INF	Increase in grant aid, allocated to infrastructure
AID-AGR	Increase in grant aid, allocated to agriculture
AID-BAL	Increase in grant aid, allocated in a balanced manner across human development, infrastructure and agriculture
CRISIS	Global economic downturn
GOVEFF	Increase in government efficiency with a balanced allocation of the gains across human development, infrastructure and agriculture

*Note:* The increase in grant aid is assumed to move from US \$70 per capita to US \$85 per capita.

The base year of the underlying SAM is 2006. Wherever available, information for 2007 and 2008 has been incorporated into the model. Most importantly, the solution for 2008 was calibrated to a separate macro SAM (with the entries expressed as nominal GDP shares) that we constructed for this year using preliminary data. By construction, the scenarios yield identical results for the years 2007 and 2008 and differ from 2009 onwards. Our reports are focused on the period 2008-2020.

##### 4.1. BASE scenario

This scenario serves as benchmark for comparison with the other scenarios. The basic assumption is that the main variables of the economy develop in a manner that is similar to recent trends with little structural change. In selected areas (such as foreign aid flows and price developments), we incorporate additional information. We will here summarize the key features of this scenario.

Real GDP at factor costs is assumed to grow by 6 percent annually starting in 2006 (Table 5).<sup>7</sup> This growth rate is lower than the average of the previous years (2000-2007: 6.9 percent) and

<sup>7</sup> Real GDP growth is exogenous for the calibration of the model in the baseline scenario. The productivity growth rates of the factors (labor and capital) are adjusted in order to achieve the targeted GDP growth rate. The difference in GDP growth rates between the baseline and the following scenarios results from a change in other assumptions, which are specified for each scenario.

more conservative than that projected in the EDPRS of 8 percent, but can nevertheless be seen as a considerably high growth rate over the long term. The more conservative approach takes into account the potentially dampening effect of the global economic downturn in the next few years and assumes a slower implementation of structural reforms than envisioned by the government. The forecast is in line with the IMF's recent assessment of the Rwandan economy (IMF, 2009).

For the government, we assume that all receipts except foreign grants do not change as shares of GDP, imposing 2008 GDP shares (the most recent ones that are available) starting from 2008. Foreign grants are fixed in foreign currency on the basis of recent projections. On the spending side, transfers from the government to the household are also fixed as a share of GDP. In each period, government consumption in each area grows within the limits of the fiscal space that remains; government investment is driven by the need to expand the government capital stocks in proportion to the growth in government services. In the private or household sphere of the economy, incomes (from factors and transfers from government and the rest of the world) are allocated in roughly fixed shares to direct taxes, transfers, consumption, and savings. Private investment is driven by available financing (from private savings and FDI net of government domestic borrowing). The market for the private capital factor is cleared by its rent whereas, in the labor markets (one per labor type), the employers can hire as much labor as they wish at a reservation wage that moves upward as the labor market becomes tighter; at full employment, the labor market clears at the relevant wage.

As shown in Table 5, the real annual growth rates of the macroeconomic aggregates are in the range of 4-7 percent per year. In order to maintain balance in the external accounts, the real exchange rate depreciates at an annual rate of 1.8 percent. On the production side, the main contributor to growth is the services sector, followed by the agriculture sector (Table A-5), Panel 2). The shares of industry and services of GDP in 2020 have increased while that of agriculture has contracted. Import and export growth each averages about 6 percent per year. The rate of export growth reflects the success of export promotion strategies and diversification supported by a depreciation of the real exchange rate of about 2 percent per year. The shares of both exports and imports in GDP increase (Table A-1), leading to a more open economy. Imports, however, remain much larger than exports. Even though private remittances make up for some of the trade deficit, Rwanda remains highly dependent on aid (mostly in grant form).

**Table 5:** Real growth rates of selected macro indicators by simulation scenario  
(% annual growth from 2008 to 2020)

	BASE	Increased aid - allocated to				GOVEFF	CRISIS
		HD	INF	AGR	BAL		
GDP at market prices	6.0	6.2	6.6	6.5	6.4	6.2	5.4
Private consumption	6.2	6.5	6.8	6.8	6.6	6.3	5.1
Government consumption	7.3	8.3	8.3	7.4	8.3	8.1	7.1
Private investment	3.6	4.0	4.2	4.1	4.1	3.6	1.9
Government investment	4.4	5.7	6.9	7.6	6.2	4.9	3.6
Exports	5.7	3.6	5.1	4.7	4.2	5.9	5.3
Imports	5.7	6.5	6.8	6.7	6.6	5.7	3.3
Absorption	6.0	6.4	6.7	6.7	6.5	6.1	5.0
Real exchange rate (index)	1.8	0.8	1.2	1.2	1.0	2.0	4.6

Source: World Bank staff simulations with MAMS.

Under the BASE scenario substantial improvements are recorded for all of the MDGs (Table 6) relative to the situation in 2006 and 2000 (Table 3). However, with the exception of MDG 2 (gross primary school completion rate), none of the targets set in the Vision 2020 are met. The

poverty headcount is reduced from 57 percent of the population living below the poverty line in 2006 to 35 percent in 2020; for the full period, the implicit elasticity of the poverty rate with respect to per-capita household consumption is -0.65. Regarding the targets for 2015, the outcome is similar except for the target for MDG 7a (access to safe drinking water), which is fully achieved by then.

**Table 6:** MDG indicators by simulation scenario in 2020 (units see Table 3)

	2006	BASE	Increased aid - allocated to				GOVEFF	CRISIS
			HD	INF	AGR	BAL		
MDG 1	57	35	33	32	32	33	34	40
MDG 2 - net	5	30	50	37	31	46	41	28
MDG 2 - gross	52	106	115	110	107	114	113	104
MDG 4	152	112	106	108	112	106	107	114
MDG 5	750	617	599	607	615	601	603	623
MDG 7a	64	84	93	87	84	92	91	83
MDG 7b	38	63	76	66	63	74	71	61

Source: World Bank staff simulations with MAMS.

It should be noted that, in Table 6, we provide both the net and the gross primary completion rates. The gross primary completion rate is usually referred to as the MDG objective. In the model it is computed as the ratio between the number of students that complete the sixth year of primary school and the population of 12 year-olds. The net (on-time) primary completion rate, on the other hand, is defined as the share of the population of the relevant age cohort that graduates from primary school in the right (or theoretical) year. It is computed as the product of the share of the cohort that enters primary school and shares that pass each of the six grades in uninterrupted sequence. While the gross primary completion rate reaches a level of 106 percent in 2020, the net is substantially lower at 30 percent.<sup>8</sup>

The ongoing expansion in education leads to an increase in the share of the labor force with completed secondary and tertiary education at the expense of the labor force with less than completed secondary education (Table A-6). This is in line with Rwanda's objective to transform the country into a knowledge-based economy, although the transformation is taking place at a rather slow pace.

#### 4.2. Scenarios assuming increase in aid

Rwanda receives a substantial amount of official development assistance (ODA). Since 2004, following the presidential election in 2003 and the vote of the new constitution, ODA increased significantly (Chiche, 2008). Between 2004 and 2007, almost 50 percent of budget spending was financed by aid, increasing to about 55 percent in 2008 (IMF, 2008). Aid per capita stood at about USD 60 in 2008 (at 2006 prices). To achieve the MDGs, however, higher spending levels are necessary, requiring additional external financing as Rwanda's domestic resources are limited. According to the commitments made at the Gleneagles summit in 2005, aid flows to Africa are supposed to increase considerably to USD 25 billion a year in 2020, translating into about USD 85 per capita in real terms (again at 2006 prices). These scenarios therefore assume a gradual

<sup>8</sup> The gross completion rate is more widely used given data availability. However, it is not an ideal measure of system performance since, if there has been a large increase in enrollment in the past, this rate may be *decreasing* at the same time as the in-cohort entry rate (the net intake rate) and the promotion rates increase. The net completion rate is a better measure of performance and no more difficult to implement in a simulation context. However, 100 percent is an extreme upper limit for this indicator; low repetition rates may be desirable also in a successful school system.

increase in aid to USD 85 per capita in 2012 and up to USD 90 per capita until 2020, compared to USD 70 per capita in the baseline.

A main question faced by Rwanda's policy makers is to decide to allocate additional foreign aid to best address the challenges Rwanda is facing; the objective of the simulations in this section is to suggest likely consequences of alternative decisions. As mentioned above, there are several constraints holding back the development of Rwanda's economy. The 2007 Country Economic Memorandum (CEM) identifies three major areas of constraints to growth in Rwanda. They are (i) the poor condition of infrastructure, particularly electricity, transport and water; (ii) the low base of skilled labor; and (iii) low productivity in agriculture. It is clear that these constraints cannot be tackled individually, but their strong interdependencies and complementarities have to be taken into account, e.g. the necessity to improve the infrastructure and skills base in order to develop the industry and services sector. Due to the limited resources, however, the use of additional funds will have to be prioritized to maximize their benefit.

In the following scenarios, additional budget resources will be allocated to different sectors to compare the effect on the macroeconomic development and improvements of MDG indicators. Hence, depending on the simulation, the additional aid will be allocated to human development, encompassing the education, health and water and sanitation sector; infrastructure; agriculture; or be split between these three areas. In all other respects, the assumptions in these scenarios are the same as for BASE. Most importantly, for the sectors of non-targeted government spending, the real growth rates of the BASE scenario are left unchanged.

A general observation for all four scenarios with an increase in foreign aid until 2012 is that a surplus in the balance of payments leads to less depreciation of the exchange rate during that period, causing lower export growth and promoting imports, leading to a worsening of the trade balance (Table 5). This is in line with findings from Foster and Heller (2007), linking the increase in aid receipts in Rwanda since 2003 to a moderate exchange rate appreciation. The additional available funds enable government consumption and investment to expand, in turn permitting higher private consumption, investment and savings. Overall, GDP growth is accelerated by 0.2 to 0.6 percentage points compared to the BASE scenario. Foreign and domestic government debt to GDP ratios are smaller than in the baseline due to the higher GDP growth rate, the higher grant element in the overall level of debt, and the limited depreciation of the currency.

#### *4.2.1. Additional aid allocated to human development (AID-HD)*

Rwanda has already made substantial progress in human capital development during the implementation period of the first PRSP (2002-2006). Universal primary education has almost been realized in the sense that, with a net enrollment rate of approximately 94 percent already in 2005, almost everyone receives some primary education. However, so far, a much smaller share has completed the full primary cycle. In 2006, the gross completion rate stood at 52 percent while repetition and drop-out rates remained high and the quality of education low. Transition rates to secondary and tertiary education were low as well, but improving. Regarding health outcomes, under-five mortality has decreased by a large margin and vaccination rates improved. A community-based risk-pooling scheme (*mutuelles*) has been introduced with increasing coverage. Health centers have been utilized more due to improved infrastructure and equipment as well as more staff. Overall, health service delivery has been strengthened, but further funding is essential to continue and sustain these improvements. Rwanda is on track to reach the water and sanitation MDGs. Although not much progress has been made between 2000 and 2006 regarding access to

safe drinking water and sanitation facilities, spending on the water sector has increased substantially and private participation in the rural water supply has been successfully encouraged.

Further efforts are, however, necessary, particularly in the education sector, to achieve the objective set in Rwanda's Vision 2020, i.e. to create a knowledge based economy by 2020 and reach the envisaged middle-income status. Skills development is crucial to supply the industry and especially the services sector with well educated and trained labor.

As expected in this scenario, the additional aid leads to an increase in the growth rates for government consumption of education, health and water and sanitation services of 3.3 percentage points (Table A-3). Government investment in these sectors also increases (Table A-4), while real government consumption and investment growth for other sectors do not change. Regarding the contributors to GDP, the growth rate of agriculture and industry only change marginally, while the targeted government sectors expand, leading to higher growth rates of government and non-government services (Table A-5).

The MDG as well as the education indicators improve across the board compared to the BASE scenario (Table 6 and Table A-7). Gross and net primary school completion rate improve markedly, reaching 115 and 50 percent, respectively. As a result of the educational expansion, employment growth is more rapid for the more educated. However, the shares in the total labor force switch only quite slowly in favor of those with more education (Table A-6).

#### *4.2.2. Additional aid allocated to infrastructure (AID-INF)*

The lack of infrastructure, particularly electricity, transport and water, is one of the main impediments to growth and regional competitiveness as pointed out by the Country Economic Memorandum (World Bank, 2007), the Diagnostic Trade Integrated Study and the recently completed Investment Climate Assessment (ICA). The poor state of infrastructure has limited the development of all sectors of the economy and is a major factor lowering the returns to trade and exports. According to the ICA, over 70 percent of firms in the manufacturing sector reported electricity to be a major constraint. Almost 40 percent of firms in Rwanda said that transportation was a serious obstacle, higher than all comparators for the East African Community (EAC)<sup>9</sup>, except Kenya, where 53 percent of firms ranked transport as a serious obstacle. Finally, subjective ratings by transport operators in Rwanda were significantly lower than that of operators in the other EAC countries. In general, transport and energy costs tend to be higher in Rwanda than in neighboring EAC countries as well. Investment is necessary to improve the infrastructure in Rwanda, thereby enabling the development of many sectors of the economy.

In contrast to the previous simulation, where aid was used to expand spending on human development services, now increased aid is spent on infrastructure by investing and raising growth in its capital stock, accompanied by an increase in recurrent government infrastructure services, representing higher operations and maintenance costs. Generally, a larger infrastructure capital stock leads to a productivity increase in all activities as well as an improvement in MDG and education indicators since it is considered as a determining factor for those indicators as summarized in Table 1.

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<sup>9</sup> The member states of the EAC are Tanzania, Uganda, Kenya, Rwanda and Burundi. Rwanda became a full member of the EAC on July 1, 2007.

According to the results of this simulation, government investment expands more strongly than government consumption when compared to AID-HD. The expansion of infrastructure has a more positive impact on GDP growth, which increases by 0.6 percent compared to the baseline, as well as on absorption, private consumption and investment (Table 5). Given that the additional government demand is more intensive in traded commodities as opposed to government services, and given the higher growth, the exchange rate depreciates slightly more and the slowdown in export growth is milder while imports grow at a faster pace. In terms of contribution to GDP, all sectors expand more rapidly than in the BASE scenario while agriculture and industry grow faster than in AID-HD (Table A-5).

The development of the MDG and education indicators is less favorable than in the previous scenario (AID-HD), except for the poverty headcount, which declines to 32 percent compared to 33 percent in AID-HD and 35 percent in BASE. The human development indicators are, however, improved, when compared to BASE in spite of the fact that real government consumption and investment growth in the human development area did not increase. This emphasizes again the importance of infrastructure for the delivery of government services in education, health as well as water and sanitation (Table 6). Consequently, however, the switch towards a more educated labor force is less pronounced than in AID-HD, but stronger than in the baseline (Table A-6).

#### *4.2.3. Additional aid allocated to agriculture (AID-AGR)*

The development of the agriculture sector is crucial for faster poverty reduction as it employs the majority of the population in rural areas. It is also currently the main contributor to GDP (Table A-5, Panel 3). The analysis of the latest household survey (EICV 2) showed that poverty has fallen the most during the previous years in households that depend on agriculture. The low use of modern inputs (such as fertilizers and improved seeds), the lack of extension services as well as poor water management, however, hamper the development of the agriculture sector. The poor condition of the necessary infrastructure in addition limits the extent of growth and transformation in the sector.

This scenario assumes that additional donor financing will be spent on agriculture, investing and raising growth in its capital stock, again accompanied by increased growth in real recurrent expenditure (operations and maintenance). A possible example for such an investment would be the World Bank project on land husbandry, water harvesting and irrigation that is currently under preparation. The larger agricultural capital stock has a positive impact on productivity growth in the agricultural sector. MDG and education indicators may improve due to indirect effects via higher household incomes. However, in the model there is no direct effect on MDGs and educational indicators from spending on agriculture (as opposed to spending on infrastructure).

The simulation outcome in terms of macroeconomic effects is very similar to that of AID-INF, except for an even stronger bias of government spending on investment at the expense of government consumption (Table 5). Annual GDP growth averages 6.5 percent, with the agriculture sector consequently growing faster than in the previous scenarios, whereas growth rates of the industry and services sector are between those of AID-HD and AID-INF (Table A-5).

The development of the MDG and education indicators is less positive than in AID-INF and AID-HD, but nevertheless more positive than in the baseline. The poverty headcount declines to 32 percent in 2020 similar to AID-INF (Table 6), highlighting the indirect positive impact of

agriculture spending on poverty reduction by raising the general living standard of the population, reflected in higher real household consumption per capita. The shift towards a more educated labor force is also smaller than in AID-INF and AID-HD, but very close to BASE (Table A-6).

#### 4.2.4. *Additional aid allocated to all sectors (AID-BAL)*

In this scenario, additional external financing is split between spending on human development, infrastructure and agriculture. The aid is allocated in a balanced fashion so that, in each year, the growth increase in percentage points is uniform across the government functions related to these three areas; the size of this growth increase is such that the available fiscal space is fully utilized. AID-BAL combines the effects of the previous three scenarios and helps to assess synergies and interdependencies between the sectors.

As expected, the changes compared to BASE for this balanced scenario are less extreme in the areas that were more strongly targeted in one of the previous scenarios. However, in terms of the real growth rates that have the strongest bearing on production capacity and welfare (GDP at factor cost, absorption, private consumption and private investment), the outcomes are very close to the most successful of the other scenarios. Regarding MDG and education indicators, the results are more positive than those of AID-INF and AID-AGR and close to but slightly weaker than the outcome of AID-HD. The government services in the targeted areas expand more moderately than when any of these functions is targeted on its own.

The growth of value added among targeted government sectors reflects the acceleration in government consumption, while among non-government sectors the outcomes are weaker than under production-oriented scenarios, but significantly stronger than for AID-HD. A balanced increase in aid to production-oriented and human development oriented sectors seems to combine the positive effects on the economy as well as on MDG and education indicators.

This relatively favorable outcome reflects the model result (and the usual economic condition that beyond the optimized level of government spending) the marginal benefits from government expansion in any single area tend to decline while its marginal costs tend to increase. Marginal cost increases tend to reflect higher prices (including wages) for inputs (including specific labor types) that are used intensively by the specific sector (government or private) that expands. Marginal benefits tend to decline as prices decline in the markets served by expanding sectors; e.g. markets for agricultural outputs and educated labor in response to rapid agricultural expansion or rapid expansion of tertiary education, respectively.

#### 4.2.5. *Comparison of MDG indicators for scenarios with increase in aid*

In Figure 1 a comparison of the development of MDGs for the four scenarios assuming an increase in external assistance is given. The progress for each MDG indicator is measured as percent of the target set for 2020 that has been achieved.<sup>10</sup> In terms of poverty reduction, spending on productive sectors (AID-INF and AID-AGR) yields the best results while AID-HD dominates the outcomes for the human development indicators. It is also evident, that the balanced approach outperforms the results from spending on only the productive sectors regarding the human development indicators as well progress made in poverty reduction by

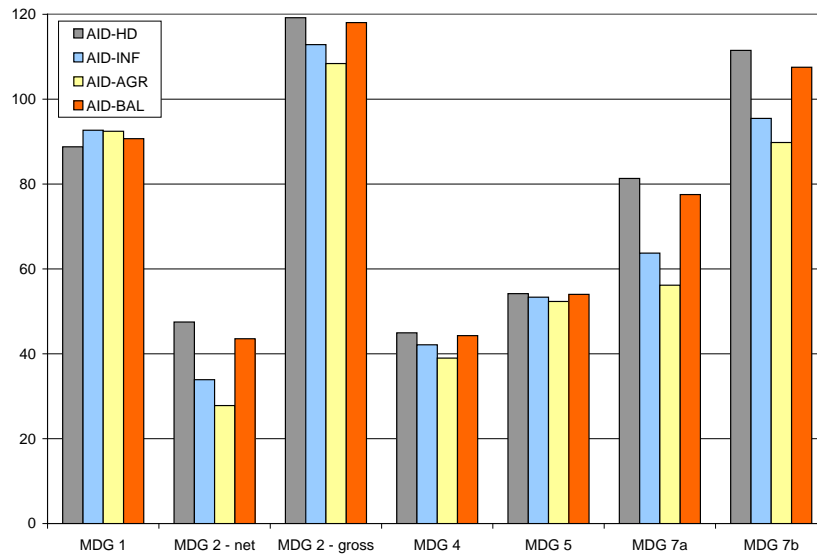
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<sup>10</sup> The measure of achievement used for this calculation is the percentage of the gap between the value in 1990 and the target in 2020 that has been closed in 2020, e.g. for MDG 2 that measure is: Percent of target achieved for MDG 2 in 2020 =  $100 * (\text{Outcome for MDG 2 in 2020} - \text{Value for MDG 2 in 1990}) / (\text{Target for MDG 2 in 2020} - \text{Value for MDG 2 in 1990})$ .



investing only in human development. This reinforces the conclusions drawn in the previous section that a balanced allocation of additional aid to all sectors leads to a better development in all areas than isolated increases in spending on just one sector.

**Figure 1:** Comparison of MDG indicators for aid scenarios (percent of target achieved)



Source: World Bank staff simulations with MAMS.

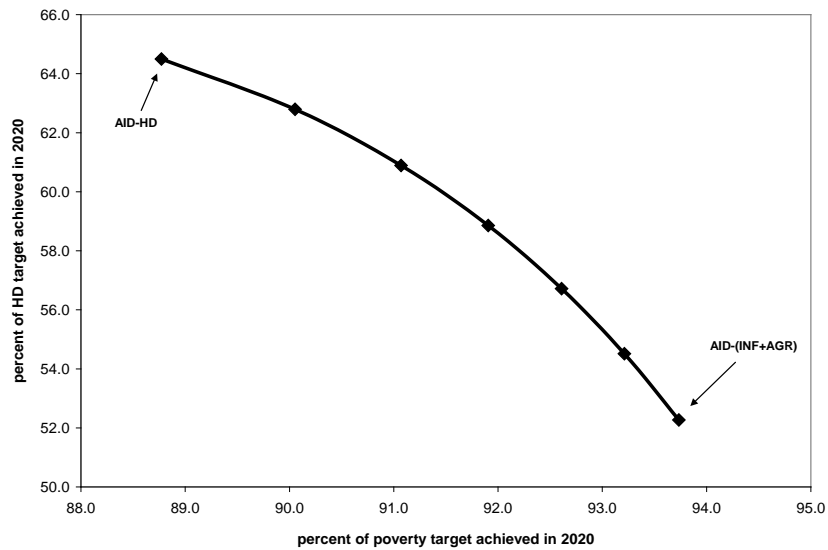
The trade-off between the allocation of additional resources to human development and productive sectors is illustrated in Figure 2. It depicts the extent to which the poverty target (MDG 1) can be achieved under different scenarios versus progress made in human development.<sup>11</sup> The indicator for human development is derived as a weighted average of the other five MDGs, defined so that education, health, and water-sanitation get equal weights.<sup>12</sup>

It becomes clear that the allocation of all additional aid to human development delays the achievement of MDG 1. Spending only on productive sectors (infrastructure and agriculture) in turn lowers the poverty headcount more rapidly, but leads to less progress in health, education and water and sanitation. This underscores once more the benefits of a balanced approach that is inclusive of all sectors in order to balance progress made in different areas. This approach may also have the additional advantage of maximizing cross-sectoral linkages in support of growth and poverty reduction.

<sup>11</sup> Seven different scenarios have been implemented to simulate the continuum between spending all additional resources on human development, AID-HD, and on productive sectors, i.e. infrastructure and agriculture, AID-(INF+AGR).

<sup>12</sup> The net primary school completion rate has been considered as measure for MDG 2.

**Figure 2:** Trade-off between poverty and HD targets in 2020



Source: World Bank staff simulations with MAMS. Note: In 2008, Rwanda had achieved 28 percent of the poverty target and 21 percent of the HD target.

#### 4.3. Increase in government efficiency (GOVEFF)

In Rwanda, as in most other countries, another way of improving economic and MDG indicators is through improved efficiency of the public sector. This route is especially important as Rwanda is highly dependent on foreign aid and improved efficiency in spending could help to expand what can be achieved with a given level of available resources. Accelerated structural reforms to improve public sector efficiency and effectiveness have also recently been identified as one of the challenges in addressing development needs while maintaining macroeconomic stability (IMF, 2009). To this end, Rwanda is already engaging in public sector reforms, such as the implementation of the public financial management reform strategy and action plan completed in September 2008, institutional reforms of the organizational structure of a number of ministries and a revision of their roles with the aim to improve staff incentives and retention, and delivery of services, as well as reforms to improve the efficiency of tax administration.

It is clearly difficult to measure government productivity growth and assess the extent to which it is likely to increase as a result of government reforms. In this scenario, we assume that the productivity of government labor and capital grows at an additional one percentage point annually compared to the baseline starting from 2009. This productivity increase applies to all government functions. The gains from the increased efficiency are used to uniformly expand growth (in terms of percentage points) for government services in human development, infrastructure, and agriculture; i.e. the gains are allocated in the same way as under the previous scenario (AID-BAL).

Increased efficiency leads to an increase of real GDP growth by 0.2 percentage points to 6.2 percent compared to the baseline, which is similar to AID-HD (Table 5). Regarding the MDG indicators, the levels reached are all better than in the BASE scenario. The poverty reduction achieved is less than in the scenarios assuming an increase in aid, but the outcome of most other indicators can be ranked between those of AID-BAL and AID-infrastructure, thereby outperforming AID-INF and AIF-AGR in these areas (Table 6).

#### 4.4. Global economic downturn (CRISIS)

Although at present, the global economic downturn has had a limited effect on Rwanda's economy, a continued global slowdown may have more pronounced negative effects. Given widespread poverty, Rwanda is also considered to be highly exposed to the poverty effect of the crisis while its capacity to cope with the impacts of the crisis on poverty is limited (World Bank, 2009). It is therefore critical to assess the impact of the global economic downturn on the macroeconomic as well as MDG indicators of the country. The main transmission mechanisms are expected to be decreases (or slower growth) in grants and, to a lesser extent, private remittances. Large volatility in commodity prices may (or may not) lead to negative terms-of-trade effects. Increased protectionism in export markets may stifle promising sectors. The effect of a negative terms-of-trade shock was felt in 2008 as the surge in fuel and food prices led to a widening of the current account deficit (see Table 2). Commodity prices have, however, started to decline towards the end of 2008, a trend which is expected to continue in 2009 and in the medium-term.

In contrast to the BASE scenario, where world prices remain unchanged from 2009 onwards, this scenario assumes a decrease in export prices of 5 percent (at constant prices) per year until 2015 and stable prices thereafter.<sup>13</sup> Import prices are assumed to remain constant after a decrease in 2009, reflecting a possible increase in fuel prices compensated by a decrease in food prices, the two main imported goods.<sup>14</sup> It is assumed in this scenario that development partners reduce their aid contributions to Rwanda, leading to a decline in foreign aid per capita to USD 50 starting from 2012 compared to USD 70 in the baseline.

The effects of the assumed developments due to the global crisis are quite pronounced. GDP growth is at 5.4 percent annually, 0.6 percentage points lower than in the BASE scenario. Given that government policies are unchanged, the required decline in absorption growth is absorbed by the private sector, with a slowdown of both private consumption and investment. Given the deterioration of the terms-of-trade (i.e. export prices decline more than import prices) and lower grant aid, the real exchange rate has to depreciate more than in the BASE scenario to maintain external balance (between inflows and outflows of foreign exchange). In response to the decline in export prices, the real exchange rate depreciates, mitigating the domestic price decline for exports and the incentive to reduce exports while discouraging imports. Compared to the BASE, the ultimate effect is slower growth for both exports and imports.

The growth path of the MDG indicators is significantly affected. The development of all indicators is worse when compared to the BASE scenario (Table 6). The share of the population living below the poverty line drops only to 40 percent. Wages as well as employment levels grow by less than in the other scenarios as well.

## 5. Conclusions

In this paper, we used a Rwandan version of MAMS to simulate alternative scenarios for grant aid, world prices, government efficiency, and adjustments in government spending in response to changes in fiscal space. Given uncertainty about parameters and the detailed functioning of the Rwandan economy, the results should only be viewed as approximate indicators.

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<sup>13</sup> The BASE scenario does, however, take the global economic downturn into account by assuming a conservative growth rate.

<sup>14</sup> The limitation to a change in only two instead of three variables also enables a clearer interpretation of the effects.

A major finding is that aid matters: an increase in grant aid (if utilized without a loss in government efficiency) may have a significant positive impact on MDGs, over-all living standards, and long-run growth. The simulation results indicate that, compared to the baseline scenario, higher aid flows can lead to an increase in economic growth by up to 0.6 percentage points and a 2020 poverty rate that is 3 percentage points lower. The most positive growth and poverty reduction impacts occur if the spending increases that are made possible by higher aid are allocated to production-oriented sectors (infrastructure and agriculture). Moreover, all non-poverty MDG indicators show significant improvements when aid increases, particularly when additional spending is allocated to human development. The development of the MDG indicators, however, improves for all scenarios with an increase in aid, also when the additional aid is allocated to production-oriented sectors. Such an outcome points to the important indirect effects from spending on these sectors on human development indicators through improved government service delivery and higher household incomes as well as synergies between MDGs.

In terms of how additional aid is used, the scenarios that may appear most attractive and politically feasible have a broad and balanced expansion across government functions that promote both growth and human development. The rationale for such an approach is that marginal returns are likely to decrease while marginal costs increase when expansion is pushed strongly in a single area. There may also be broader reasons for a relatively balanced expansion across different areas. From a political economy perspective, it may be difficult to exclude sectors, especially those that would appear to have a positive impact on important objectives. It is also likely that government efficiency would suffer if expansion is very strong in single government functions. A separate simulation with improvements in government efficiency suggests that it may have a significant impact on economic performance and that efforts to improve it could significantly increase what could be achieved with a fixed level of resources.

On the other hand, a final scenario indicates that, if aid were to decline in the context of the global economic crisis, the outlook is not surprisingly much less favorable, with considerably lower growth, higher poverty rates and worsening of the development of the other MDG indicators. The first round effects are not yet visible in Rwanda's macro-economic indicators. However, simulations here indicate that there could be a significant drop in medium-term growth, by as much as 0.6 percentage points compared to the base scenario. Most of this effect is caused by a substantial reduction in foreign grants. In order to mitigate adverse effects of a potential reduction in aid, the government should intensify its efforts to improve spending efficiency. Such a conclusion underscores the importance of the public financial management and civil service reforms that currently are being undertaken. Another action government can take is to identify critical programs that should be protected from cuts, including primary and secondary schooling, primary healthcare, key social protection programs, programs to raise agriculture productivity, as well as rural public works and road maintenance. This type of action is particularly important because studies show that economic shocks often cause negative shocks and rapid deterioration in poverty-related indicators that are not fully recovered (or take longer to recover) once economic conditions improve. Protecting those sector programs that have a more direct impact on the MDGs and poverty will provide the minimal investments to maintain past gains and build a base for increased absorptive capacity once economic conditions improve.

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## A. Appendix: Tables

**Table A-1:** Real macro indicators by simulation in 2020 (% of nominal GDP)

	2008	BASE	Increased aid - allocated to					GOVEFF	CRISIS
			HD	INF	AGR	BAL			
Private consumption	86.8	88.4	87.3	87.3	87.4	87.3	87.9	90.3	
Government consumption	11.3	13.7	15.2	14.4	13.4	14.8	13.8	14.6	
Private investment	12.7	10.7	10.6	10.6	10.6	10.6	10.7	10.9	
Government investment	9.5	8.7	9.8	10.8	11.8	10.2	9.2	9.4	
Exports	8.0	8.3	5.7	6.9	6.6	6.1	8.5	8.8	
Imports	-28.3	-29.9	-28.6	-29.9	-29.8	-29.1	-30.1	-33.9	
Absorption	120.3	121.6	122.8	123.1	123.2	122.9	121.6	125.2	
Foreign government debt	15.5	17.0	14.8	15.0	15.1	14.9	17.0	25.6	
Domestic government debt	8.9	8.4	8.2	8.1	8.1	8.1	8.4	9.4	

Source: World Bank staff simulations with MAMS

**Table A-2:** Government accounts in 2008 and by simulation in 2020 (% of nominal GDP)

	2008	BASE	Increased aid - allocated to					GOVEFF	CRISIS
			HD	INF	AGR	BAL			
Revenues and grants	27.3	27.6	30.2	30.4	30.5	30.3	28.2	29.0	
Direct taxes	4.9	4.5	4.9	4.9	4.9	4.9	4.9	4.9	
Import tariffs	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Other indirect taxes	6.9	6.7	6.9	6.9	6.9	6.9	6.9	6.9	
Foreign transfers	14.1	15.0	17.0	17.2	17.3	17.1	15.0	15.7	
Total expenditure	27.3	28.9	31.4	31.5	31.7	31.4	29.5	30.6	
Consumption	11.3	13.7	15.2	14.4	13.4	14.8	13.8	14.6	
Fixed investment	9.5	8.7	9.8	10.8	11.8	10.2	9.2	9.4	
Private transfers	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Domestic interest payments	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Foreign interest payments	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.6	
Overall balance / Financing	0.1	-1.2	-1.1	-1.1	-1.2	-1.1	-1.2	-1.6	
Domestic borrowing	-1.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Foreign borrowing	1.6	0.8	0.7	0.7	0.7	0.7	0.8	1.2	
<i>Memorandum item:</i>									
Foreign aid per capita (US\$)	59.6	70.0	90.0	90.0	90.0	90.0	70.0	50.0	

Source: World Bank staff simulations with MAMS

**Table A-3: Government recurrent expenditure**

Government recurrent expenditure -- annual growth from base year to final year (%)								
		BASE	Increased aid - allocated to				GOVEFF	CRISIS
			HD	INF	AGR	BAL		
Primary education		7.3	10.6	7.3	7.3	9.7	9.3	7.1
Secondary education		7.3	10.6	7.3	7.3	9.7	9.3	7.1
Tertiary education		7.3	10.6	7.3	7.3	9.7	9.3	7.1
Health		7.3	10.6	7.3	7.3	9.7	9.3	7.1
Water and sanitation		7.3	10.6	7.3	7.3	9.7	9.3	7.1
Infrastructure		7.5	7.5	16.6	7.5	9.9	9.4	7.4
Agriculture		7.5	7.5	7.5	18.5	9.9	9.4	7.4
Other government		7.3	7.3	7.3	7.3	7.3	7.3	7.1
Total recurrent expenditure		7.3	8.3	8.3	7.4	8.3	8.1	7.1

Government recurrent expenditure -- share of GDP in 2020 (%)								
	2008	BASE	Increased aid - allocated to				GOVEFF	CRISIS
			HD	INF	AGR	BAL		
Primary education	0.4	0.5	0.7	0.5	0.5	0.6	0.6	0.5
Secondary education	0.7	1.1	1.5	1.0	1.0	1.3	1.3	1.1
Tertiary education	0.7	0.9	1.3	0.9	0.9	1.2	1.1	1.0
Health	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Water and sanitation	0.8	1.0	0.9	2.4	0.9	1.2	1.1	1.0
Infrastructure	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1
Agriculture	7.1	8.2	7.9	7.7	7.9	7.8	7.6	8.8
Other government	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total recurrent expenditure	10.0	11.8	12.6	12.6	11.7	12.4	11.7	12.7

Source: World Bank staff simulations with MAMS

**Table A-4: Government investment**

Government investment -- annual growth from base year to final year (%)								
		BASE	Increased aid - allocated to				GOVEFF	CRISIS
			HD	INF	AGR	BAL		
Primary education		5.0	8.5	5.1	5.1	7.7	6.0	4.1
Secondary education		2.5	6.6	2.5	2.5	5.8	3.9	1.7
Tertiary education		2.4	6.5	2.4	2.4	5.6	3.8	1.6
Health		7.7	10.3	8.0	7.8	9.8	8.1	6.6
Water and sanitation		10.7	15.1	10.7	10.7	14.2	12.2	9.8
Infrastructure		4.9	4.9	16.3	4.9	8.2	8.3	4.2
Agriculture		4.9	4.9	4.9	19.7	8.2	8.3	4.2
Other government		4.1	4.1	4.1	4.1	4.1	1.9	3.3

Government investment -- share of GDP in 2020 (%)								
	2008	BASE	Increased aid - allocated to				GOVEFF	CRISIS
			HD	INF	AGR	BAL		
Primary education	0.4	0.3	0.5	0.3	0.3	0.5	0.4	0.4
Secondary education	1.6	1.3	1.9	1.2	1.2	1.7	1.5	1.2
Tertiary education	0.4	0.6	0.7	0.6	0.6	0.7	0.6	0.6
Health	0.2	0.3	0.4	0.3	0.3	0.4	0.3	0.3
Water and sanitation	1.2	1.2	1.1	3.7	1.1	1.6	1.7	1.3
Infrastructure	1.0	1.0	0.9	0.9	4.5	1.3	1.4	1.1
Agriculture	4.4	3.8	3.6	3.6	3.6	3.6	2.9	4.1
Other government	27.3	28.9	31.4	31.5	31.7	31.4	29.5	30.6
Total investment	36.5	37.3	40.7	42.0	43.2	41.2	38.3	39.6

Source: World Bank staff simulations with MAMS

**Table A-5: Development of GDP at factor cost**

Real GDP at factor cost -- annual growth from base year to final year (%)								
		BASE	Increased aid - allocated to				GOVEFF	CRISIS
			HD	INF	AGR	BAL		
Agriculture		6.1	6.2	6.6	6.7	6.4	6.2	5.5
Industry		5.7	5.3	6.1	5.8	5.6	5.8	5.3
Services		6.1	6.6	6.8	6.6	6.7	6.4	5.5
Government		7.2	8.2	8.1	7.3	8.1	8.0	6.9
Non-Government		5.8	6.1	6.4	6.4	6.3	6.0	5.1
Total		6.1	6.2	6.6	6.5	6.4	6.2	5.5

Real GDP at factor cost -- contribution to GDP growth (%)								
		BASE	Increased aid - allocated to				GOVEFF	CRISIS
			HD	INF	AGR	BAL		
Agriculture		2.3	2.3	2.5	2.5	2.4	2.4	2.1
Industry		0.9	0.8	0.9	0.9	0.8	0.9	0.8
Services		2.9	3.1	3.2	3.1	3.2	3.0	2.6
Government		0.6	0.8	0.7	0.6	0.7	0.7	0.6
Non-Government		2.2	2.4	2.5	2.5	2.4	2.3	2.0
Total		6.1	6.2	6.6	6.5	6.4	6.2	5.5

Real GDP at factor cost -- shares in 2020 (%)								
	2008	BASE	Increased aid - allocated to				GOVEFF	CRISIS
			HD	INF	AGR	BAL		
Agriculture	42.7	33.1	32.6	32.7	31.6	32.4	32.9	33.0
Industry	14.8	15.7	14.6	15.4	15.6	15.0	15.9	16.2
Services	42.5	51.2	52.7	51.9	52.8	52.7	51.2	50.8
Government	7.9	9.2	10.5	9.6	9.2	10.2	8.8	9.3
Non-Government	34.6	42.0	42.2	42.3	43.6	42.5	42.4	41.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: World Bank staff simulations with MAMS

**Table A-6: Impacts on labor and capital**

Real wages by factor -- annual growth from base year to final year (%)								
	2008	BASE	Increased aid - allocated to				GOVEFF	CRISIS
			HD	INF	AGR	BAL		
Labor (< secondary education)	11.3	2.1	2.4	2.6	2.5	2.5	2.2	1.0
Labor (secondary education)	57.6	3.2	3.8	3.8	3.7	3.8	3.1	2.1
Labor (tertiary education)	180.0	1.0	0.9	1.5	1.5	1.1	0.6	0.0
Private capital	0.3	4.6	4.7	4.9	5.0	4.8	4.7	3.8

Employment by factor -- annual growth from base year to final year (%)								
	2008	BASE	Increased aid - allocated to				GOVEFF	CRISIS
			HD	INF	AGR	BAL		
Labor (< secondary education)	4.5	2.7	2.6	2.8	2.8	2.6	2.6	2.4
Labor (secondary education)	0.2	3.5	3.8	3.7	3.7	3.8	3.5	3.2
Labor (tertiary education)	0.1	6.7	7.4	7.1	6.9	7.3	7.0	6.3
Private capital (Index)	100.0	1.8	2.0	2.1	2.0	2.0	1.8	1.3

Educational composition of the labor force -- shares in base year and final year (%)								
	2008	BASE	Increased aid - allocated to				GOVEFF	CRISIS
			HD	INF	AGR	BAL		
Labor (< secondary education)	94.3	93.4	93.0	93.3	93.4	93.1	93.2	93.4
Labor (secondary education)	4.4	4.5	4.7	4.6	4.5	4.6	4.6	4.5
Labor (tertiary education)	1.3	2.1	2.3	2.1	2.1	2.3	2.2	2.1

Source: World Bank staff simulations with MAMS



**Table A-7:** Gross enrollment rates (GER) and gross completion rates (GCR) by cycle - summary

	2008	BASE	Increased aid - allocated to				GOVEFF	CRISIS
			HD	INF	AGR	BAL		
GER-primary	166.2	115.0	111.1	113.6	114.8	111.9	112.9	115.5
GER-secondary	15.7	38.6	48.2	41.4	38.9	46.4	44.3	37.8
GER-tertiary	3.5	8.8	11.9	9.6	8.8	11.3	10.5	8.6
GCR-primary	62.3	106.0	115.0	110.0	106.6	114.1	113.0	104.2
GCR-secondary	6.5	16.2	21.8	17.6	16.3	20.6	19.1	15.8
GCR-tertiary	3.6	6.4	8.7	7.0	6.4	8.2	7.7	6.2

Source: World Bank staff simulations with MAMS