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Absorptive Capacity and Achieving the MDGs: The Case of Ethiopia[1]

1. Introduction

Attention to aid effectiveness and absorptive capacity have gained increasing attention as efforts have grown to raise new and large-scale financial resources, beyond the 2000 Monterrey commitments, to help developing countries achieve the Millennium Development Goals. Estimated annual costs of achieving the MDGs range from around $50 billion to $66 billion initially rising to $126 bn by 2015 in incremental MDG spendng requirements, on top of current aid flows.[2] This represents a major increase in Official Development Assistance (ODA) flows to developing countries as a share of OECD-DAC country gross national income. At the level of the individual country this implies a large increase in ODA flows, in some cases tripling or quadrupling of current flows to countries already receiving high levels of aid. A basic question is whether low-income countries can implement MDG programs and effectively 'absorb' much higher levels of aid and efficiently use them for the purpose of achieving the MDGs. Some have argued that the MDG targets are overly ambitious 'stretch targets', the achievement of which has no historical precedent (Clemens et al, 2004). Others argue that given the right environment and level of external support, the MDGs are certainly within reach (for example, the Millennium Project Report 2005). All agree, however, that building adequate absorptive capacity is a central requirement. This paper takes the case of Ethiopia and examines the main constraints the country faces to aid absorption, and more generally the macroeconomic issues that may impede efforts to employ large ODA levels to pursue the MDGs.

Ethiopia is a good candidate for a country case study that examines the ramifications of scaling up aid flows since considerable work has been done to assess Ethiopia's needs, limitations, and capacity. A 2003 Development Committee report for the annual meetings of the World Bank and IMF included a case study of Ethiopia—one of 18 low-income countries with relatively good policies—that examined country capacity to absorb significantly higher aid flows in pursuit of the MDGs. It concluded

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[1] Mark Sundberg, Hans Lofgren, and Francois Bourguignon. This work is part of a larger effort in the Development Economics Department of the World Bank (DECVP) to examine the financing requirements and economic impact of aid flows to support MDG-based Poverty Reduction strategies. See Bourguignon et al (2004, 2005) and Lofgren and Diaz-Bonilla (2005). The views expressed in this paper are strictly those of the authors and do not represent the World Bank.

[2] Lower estimates are from the World Bank and various Development Committee papers (see Global Monitoring Report, 2004), higher estimates from Millennium Project Report, 2005.

that a large increase in aid (60 percent to 100 percent) could be effectively absorbed, provided that successful capacity building efforts and accelerated structural reforms were in place. This would allow Ethiopia to reach most of the core MDG targets (Development Committee, 2003). Ethiopia was also one of the pilot countries for work on Harmonization and Alignment of donor practices, and has made significant progress towards coordinating assistance and harmonizing ODA flows. Work for Britain's Overseas Development Institute on Ethiopia and other African countries argued that a doubling of aid flows to Ethiopia over the next five years is realistic (Foster and Keith, 2003). An MDG 'needs assessment' has been prepared for the government (Geda et al, 2005), and is being integrated within the revised Sustainable Development and Poverty Reduction Program (SDPRP)—the Government's Poverty Reduction Strategy. As inputs to this process, both a World Bank team and a Millennium Project team have been assisting the government to develop the methodology and provide a consistency framework for their medium term MDG-focused forecasts. The World Bank's Maquette for MDG Simulations (MAMS) has been one of the instruments for this purpose.[3] Moreover, the recently published *Commission For Africa Report* by the British Government also examines the potential for Ethiopia to scale up spending for the MDGs and argues a doubling of aid flows over the coming three to five years is feasible.

Large increases in aid clearly pose important macroeconomic risks and raise questions about the underlying ability of the economy to effectively absorb much higher resource flows. This paper examines these issues for Ethiopia, and explores some of the major macroeconomic challenges facing the country: Is absorptive capacity adequate and where will capacity building need to focus; what is the likely impact of a tripling of aid flows on relative prices and export competitiveness?; What are the implications for sequencing of public investment?; and are the micromanagement challenges likely to be manageable? The paper draws on simulations with the economy-wide MAMS model developed at the World Bank to analyze MDG scenarios. Economy-wide analysis of MDG strategies is a necessary complement to sectoral studies given that many of the policies and the foreign aid flows that target MDGs have strong effects throughout the economy (via markets for labor, goods and services, and foreign exchange) and that feed back on the MDG indicators themselves. Section 2 of the paper provides a very brief overview of Ethiopia's macroeconomic performance and main challenges. Section 3 briefly presents an overview of the MAMS approach, which is used in Section 4 to present the main MDG simulation results over the period from 2005 to 2015. Finally, Section 5 summarizes the main conclusions.

2. Overview of Ethiopia's Economic and MDG Challenges

Ethiopia faces macroeconomic challenges characteristic of several low-income Sub-Saharan African economies. Historically it has experienced low growth rates, is deeply indebted (a HIPC country), is highly dependent on the agricultural sector and agricultural exports (coffee), and growth has historically been volatile due to frequent

[3] See Bourguignon et al (2004) and Lofgren (2004).

external shocks (mainly from drought and terms of trade shocks). Table 1 summarizes the main macroeconomic indicators for Ethiopia.

GDP growth in the 1980s was very low under Ethiopia's socialist Derg regime, which was overthrown in 1991, ushering in multi-party elections first held in 1995 and a period of transition towards market mechanisms, with reforms that helped to significantly strengthen growth performance. During the 1990s growth accelerated, reaching 4.7 percent p.a. for the decade from 1993 to 2003 (Table 1). Growth has remained highly volatile throughout this period, however, and in 2003 growth fell by nearly 4 percent due to drought that deeply damaged agriculture output. In 2004 preliminary estimates indicate the economy expanded at a rate of nearly 11 percent. Following years of extremely weak performance during the 1980s and early 1990s, per capita incomes are today roughly at the same level that they were at in the early 1970s.

The Ethiopian economy remains highly dependent on the agricultural sector, which accounts for over 40 percent of GDP, and over 85 percent of the population still depends on agriculture for their livelihood. This leaves a large part of the population at risk of famine due to low yields and vulnerability to frequent drought, a situation made worse by the weak rural infrastructure. The national infrastructure overall is very poor, with far lower average road density than the average for sub-Saharan Africa, and with relatively little of the countries arable land under irrigation. Poverty rates fell between 1995 and 2000 by between 1 and 5 percent, to a level of over 40 percent.

Table 1: Ethiopia -- Main Economic Indicators (1983-2003)

Average annual growth rate	**1983-93**	**1993-2003**	**2002**	**2003**
GDP	0.9	4.7	2.7	-3.7
Agriculture	1.8	1.6	-2.3	-12.6
Industry	-3.0	4.8	5.8	4.6
Services	1.6	7.4	4.6	2.3
Exports of goods and services	-0.8	11.4	13.1	18.9
Imports of goods and services	1.2	7.8	10.0	17.1
ODA flows	24.5	3.4	17.1	15.1
Key ratios and indicators	**1983**	**1993**	**2002**	**2003**
Current government revenu (% of GDP, includes current grants)	18.6	12.7	22.6	25.4
Overall surplus/deficit (% of GDP, includes current grants)	-11.6	-6.9	-11.3	-10.5
Exports of goods and services (% of GDP)	9.1	8.1	16.2	17.1
Imports of goods and services (% of GDP)	15.9	20.2	34.2	36.5
Trade (goods and services) balance (% of GDP)	-6.8	-12.1	-18.0	-19.4
Total debt (% of GDP)	63.5	155.3	107.6	98.5
Total debt service (% of exports)	18.3	17.9	10.3	9.9
Reserves including gold as months imports	2.5	3.9	3.8	4.6
Consumer price (% change)	3.8	10.0	-7.2	15.1
Terms of trade (1995=100)	79.0	70.0	47.0	42.0

Source: "Ethiopia at a glance", The World Bank.

Ethiopia currently has a debt to GDP of around 100 percent, and debt service of around 10 percent of total exports. It was one of the early HIPC countries, and has been a beneficiary of debt reduction. Last year Ethiopia reached its HIPC completion point and has exited from the enhanced HIPC program on a stronger basis. Still, it remains highly vulnerable to export shocks, and with extremely limited capacity to undertake any new borrowing. Stress tests using the IMF DSA scenarios suggest debt service indicators are highly sensitive to the terms of new borrowing and negative export shocks (IMF, 2004).

Despite these challenges, fiscal policy has been well managed since the early 1990s: there has been little reliance on domestic financing of the deficit, monetary and exchange rate policies have kept inflation to moderate levels, and domestic tax and non-tax revenues have been relatively high, mobilizing around 20 percent of GDP in recent years. The real exchange rate has been relatively stable since the early 1990s, using a 'tightly managed float', and holding close to the dollar in recent years, depreciating against the Euro (IMF, 2005a). Export competitiveness has been maintained, and reserves built up and maintained at prudent levels. Aid has been an increasingly important source of financing, rising as a share of GDP from the mid-1990s, and then declining as the conflict with Eritrea erupted, before rising again after the conflict ended. While aid is fairly high as a share of GDP[4], in per capita terms—of between US$15 and US$20 per capita in recent years—aid levels are much lower than many sub-Saharan African countries.

Table 2: Government Finance, 1998/99-2003/04
(in percent of GDP)

	1998/99	1999/00	2000/01	2001/02	2002/03 Est.	2003/04 Proj.
Revenue	18.0	17.9	18.8	20.0	19.5	18.6
Tax revenue	11.3	12.2	13.7	15.3	14.4	14.8
Nontax revenue	6.6	5.7	5.0	4.8	5.1	3.7
External grants	3.6	3.2	4.8	4.7	8.0	7.8
Expenditure and net lending	31.7	32.3	28.4	32.1	34.8	30.3
Fiscal balance, including grants (cash basis)	-10.1	-11.2	-4.8	-9.3	-9.7	-4.8
	1998	1999	2000	2001	2002	2003
ODA total	10.1	9.9	10.6	17.1	21.6	22.7
Multilateral	5.6	5.0	5.8	5.6	8.1	15.6
DAC	4.3	4.7	4.6	11.1	12.9	6.6

Sources: IMF Staff Report (2004a); OECD Development Assistance Committee, 2004.
Note: ODA data and fiscal data are not on comparable basis.

Ethiopia is far from achieving many of the MDG targets, and will need to accelerate progress rapidly if it is to reach them. Table 2 shows the historic trends

[4] OECD Development Assistance Committee data on ODA to Ethiopia shows total ODA rising to nearly 23% of GDP in 2003, which is not consistent with Ethiopian fiscal accounts. It is difficult to reconcile ODA data since there are many items, such as administrative costs, technical assistance, and aid channeled through NGOS, which DAC countries report but do not pass through the recipient government's budget.

between 1995 and 2000. Depending on how poverty is measured, the rate of reduction in the head count index will need to increase substantially. Gross primary enrollment rates increased rapidly in the 1995-2000 period, and appear relatively on track. By contrast, success in reducing the under-five mortality rate and increasing access to clean water has been far less impressive and will have to accelerate dramatically to achieve the MDGs.

Table 3: Historic and required rates of change in key MDG indicators.

	Recent trend, 1995-2000 (% p.a.)	Required rate of change to reach MDG (% p.a.)
Poverty head count rate	-0.73	-3.8
Food poverty head count index	-2.4	-3.2
Gross primary enrollment rates	12.4	3.8
Under five child mortality	-1.0	-7.0
Access to clean water	1.0	6.5

Source: World Bank Country Assistance Strategy Progress Report, 2004.

These conditions make Ethiopia a strong candidate for international efforts to support the country's Sustainable Development and Poverty Reduction Program, which aims at accelerating achievement of the MDGs. They also place Ethiopia at significant risk to many of the macroeconomic and microeconomic hazards that can arise from sharp increases in aid flows.[5] While aid flows have been volatile and have shown large swings due in large measure to underlying political regime changes and periods of conflict, there is little evidence that high aid flows have resulted in the Dutch disease problems that are evident from other country studies or large cross country regressions. Recent empirical analysis by the IMF finds that the relationship between aid and the real exchange rate is inconclusive. However, in the period after 1991 when there was a regime change and structural reforms were initiated, foreign aid has had a *positive* impact both on Ethiopia's non-coffee exports (which are driven by international prices and less sensitive to exchange rate movements), and on their share in total exports (IMF, 2005c). This result is interpreted as possibly arising due to the positive impact of foreign aid on infrastructure and capital investment, and the reduction in logistical and transactions costs that are associated with these investments. This suggests that the use of aid and its impact on underlying infrastructure and economic productivity are important determinants of whether aid is associated with Dutch disease effects, a point we return to below.

The next section further examines some of these issues, focusing in particular on absorptive capacity in the context of rapidly scaling-up spending in MDG services.

[5] Heller and Gupta (2002) provide a useful overview of macro risks—inflation, exchange rate appreciation and a weakening trade balance (Dutch disease), crowding out of private investment, disincentives to revenue collection, fiscal uncertainty and aid volatility; as well as micro risks—strained capacity, aid-dependence, weakening of accountability, rent-seeking, etc.

3. Absorptive capacity and the MAMS approach.

For most sub-Saharan countries the magnitude of external assistance required to meet the MDGs in 2015 is unprecedented. Many of these countries, like Ethiopia, are already highly dependent on ODA flows, and accelerating progress toward the MDGs is expected to require doubling or even quadrupling aid flows. In this section we examine the impact of aid flows targeted at the MDGs on Ethiopia's absorptive capacity, using a modeling framework that has been developed in the World Bank to address macroeconomic and microeconomic linkages, and aid flows that target specific MDG outcomes.

A concern of many donor governments is whether aid recipients, particularly the poorest ones, lack sufficient structural and institutional capacity to absorb more aid—that they lack adequate 'absorptive capacity.' Rarely is the issue carefully spelled out, and in particular there is not much clarity over the level of absorptive capacity sufficient to meet donor concerns, nor how it can be built. The literature on aid and growth usually considers that a country has reached its absorptive capacity limit for foreign aid when the rate of return on aid falls to some minimum acceptable level (eg. Radelet, 2003, p. 136). There is ample evidence that many low-income countries suffer from capacity constraints and that large aid flows often fail to alleviate these constraints, and fail to meet their intended objectives. Several empirical cross-country studies (Collier and Dollar 2002, Hansen and Tarp 2001, Radelet et al 2004) show that after a certain level additional aid to GDP has little or no effect on growth. This 'saturation point' is a function of different proxies for absorptive capacity arising from macroeconomic, institutional, infrastructure, human capital, or socio-cultural constraints (World Bank, 2004b). There is an extensive literature in particular on the role of the policy environment, emphasizing 'good policies and institutions' as a determinant of effective use of aid.[6]

There is less clarity, however, on the causes of the complex phenomenon of declining returns and few country specific examples on the nature of constraints, or when and how they inhibit absorptive capacity and aid effectiveness. To clarify concepts, it is helpful to distinguish between these broad factors affecting aid effectiveness and the issue of absorptive capacity. Aid effectiveness should be seen in terms of the total return to aid for any given level of aid, which will vary depending on several initial conditions, working in isolation or together. It represents 'what aid can buy' in the recipient economy. Aid effectiveness may different widely between countries; indeed one country may be able to utilize aid more effectively than another at any given level of aid due to a combination of endowments, institutions and policies.

Absorptive capacity, on the other hand, is about the *marginal rate of return* to aid, which tends to decline as the amount of aid increases. As binding constraints on capacity are reached – skilled labor costs rise, physical infrastructure congestion raises

[6] See World Bank (1998, 2004), Dollar and Burnside (2000), Goldin, Rogers, and Stern (2002); and recent work on the link between aid effectiveness and the policy environment (Burnside and Dollar 2004, Hansen and Tarp 2001; Easterly, Levine, and Roodman 2003, Radelet et al 2004).

logistical costs, administrative bottlenecks become overwhelming – and the returns to aid fall. The limit of absorptive capacity is reached when the marginal rate of return falls below some minimal acceptable level. In the extreme this may be at a point below which any positive return is acceptable, or more realistically it is some point with a positive marginal rate of return relative to some opportunity cost of funds. Even in countries with lower overall aid effectiveness, absorptive capacity will vary with the amount of aid provided and warrant aid up to some threshold.

Absorptive capacity is clearly a dynamic process linked to underlying forces of economic, social and institutional development. The adoption of international development goals – the MDGs – affects the debate over intertemporal aid allocation in some basic ways. First, the MDGs are targets that have been adopted for all developing countries, and therefore implementation strategies are required across countries with widely differing levels of aid effectiveness. Second, the MDG targets are clearly defined by their end-point. How should resources be allocated to reach the MDG targets by 2015? Yet the question remains quite complex since there is potentially any number of different paths towards reaching the MDGs.

The approach used here to shed some light on this question focuses on aid requirements to reach the MDGs in the case of Ethiopia. It abstracts from several vital aspects of absorptive capacity that are widely acknowledged as instrumental to the development process: governance, institutional capacity, ownership, social and political stability, etc. It also abstracts from several very real constraints that face Ethiopia today: severe financing constraints, frequent exogenous shocks (particularly from weather and the terms of trade), and unpredictable and volatile levels of foreign aid, etc. But the framework we use below helps clarify the role of aid timing, sequencing, and the magnitudes and trade-offs they pose in meeting the MDGs.

A Brief overview of the MAMS model.

The MAMS (Maquette for MDG Simulation) is a dynamic computable general equilibrium (CGE) model which has been extended to include a module that covers MDGs related to poverty, health, education, and water-sanitation. As noted in the Introduction, the rationale for the use of a model of this type is that the pursuite of MDG strategies has strong effects throughout the economy via markets for foreign exchange, factors (esp. labor), goods and services, with feedback effects that may significantly alter the findings of more narrow sectoral analyses. For example, the amount of real health or education services that a dollar in aid can purchase may change significantly in light of changes in exchange rates, prices and wages. In addition, existing relationships between different MDGs (e.g. health and education) may influence the expansion in real services that is required – improvements in water and sanitation may reduce the expansion in health services that is required to reach health MDGs.

In the application described here, the model is applied to an Ethiopian database and solved for the period 2002-2015.[7] More specifically, building on the recent literature and sector studies on health and education outcomes, MAMS considers the following MDGs: (MDG1) halving, between 1990 and 2015, the headcount poverty rate; (MDG2) Achieve universal primary education (100% completion rate by 2015); (MDG4) reducing by two-thirds the under-5 child mortality rate by 2015; (MDG5) reducing by three-fourths the maternal mortality rate, and (MDG7) reduce by half the number of people without access to safe water and basic sanitation. The model has relatively detailed treatment of government activities related to the MDGs. Government consumption, investment and capital stocks are disaggregated by function into four education sectors, three health sectors, sectors for water and sanitation, public infrastructure, and other government activities. The major government revenue sources are taxes (direct and indirect), foreign borrowing, and foreign grants. The non-government economy is represented by a single activity. The primary factors of production are divided into public capital, private capital, and three types of labor (unskilled, skilled, and highly-skilled). GDP growth is a function of growth in the stocks of labor and capital and productivity growth. The composition and overall growth of the labor force depends on the evolution of the education sector whereas capital stock growth depends on investments. Productivity growth is also endogenous, depending on growth the stock of public capital in infrastructure.

The core MDG module specifies how changes in the different MDG indicators are determined. To the extent possible, it is parameterized on the basis of detailed sector studies on Ethiopia. In the module the government has an annual primary education budget covering teacher salaries, recurrent operations and maintenance costs, and capital investment (for example, in new classrooms). Recurrent expenditures and the capital stock in primary education together determine the supply side.[8] Demand for primary schooling and student behavior – the population share that enrolls in the first grade, graduation shares among the enrolled, and the shares of the graduates that choose to continue to next grade – depend on the quality of education (student-teacher and student-capital ratios), income incentives (using current wages as a proxy, the expected relative income gain from climbing one step on the salary ladder), the under-five mortality rate (a proxy for the health status of the school population), household consumption per capita, and the level of public infrastructure services.

This specification of sector demand and supply captures lags between investment and outcomes, which is one of strength of the approach. Based on sector studies, the lags between increased enrollments and outcomes at different education levels are related to the number of years required for completion, and actual completion rates.

[7] The model is presented in detail in Bourguignon et al (2004), and Lofgren (2004). Preliminary applications to Ethiopia are discussed in (Lofgren and Diaz-Bonilla 2005, Bourguignon et al 2005). This remains work in progress.

[8] Private supply of education services has not been separately included since this is relatively small in Ethiopia, but this could be elaborated for countries where it is important.

The specification of health services draws on a World Bank health sector strategy report for Ethiopia. Improvement in under-five and maternal mortality rates (MDGs 4 and 5) are determined by the level of health services per capita (public and private services), per-capita consumption, and the population shares with access to improved water and sanitation services (MDG 7). The package of health services that achieves MDGs 4 and 5 also includes HIV/AIDS prevention services sufficient to halt its spread (part of MDG 6). For water and sanitation, the population share with access to improved services are modeled as functions of per capita household consumption and provision of government water and sanitation services.

The provision of the additional government services needed to reach the MDGs clearly requires additional resources – capital, labor, and intermediate inputs – that become unavailable to the rest of the economy. The effects of a program depend on how it is financed—from foreign sources, domestic taxes (which reduce consumption), or domestic borrowing (which crowds out private investment). Even with 100 percent foreign grant financing for additional services, which minimizes domestic resource costs, the rest of the economy is affected through two main channels—labor markets and relative prices. Expanding provision of health or education services increases demand for teachers and doctors, reducing the number of skilled workers available in other sectors. Increased school enrollment also reduces the size of the over-all labor force (since it removes a larger part of the school-age population from the labor force), though in the medium run it adds to the share of skilled labor in the labor force. Two forces drive changes in relative commodity prices. First, domestic demands switch toward MDG_related government services with impacts on production costs and prices throughout the economy. Secondly, increased aid flows lead to an appreciation of the real exchange rate, manifested in increased prices of non-traded relative to traded outputs. These manifestations of the Dutch disease can bring about long-lasting changes in the structure of production, which is diverted from exports and competition with imports.

The limitations on absorptive capacity are captured through three main channels—the two channels just mentioned, through labor market and through changes in the real exchange rate (relative price of the domestic good and international prices). The third channel is represented by potential infrastructure bottlenecks, particularly in transport and energy infrastructure. Large investments in education services, for example, will tend to reduce further absorptive capacity as skilled labor is diverted to education, as the relative price of non-tradables rises (eg. real wages are bid up reflecting the Dutch disease effect), and if infrastructure bottlenecks reduce the efficiency of public service delivery. Moreover, the impact will not be limited to the education sector but affects costs throughout the economy, including other public services and the private sector.

Policy makers thus face important trade-offs: increased investment in public service delivery is essential for improved MDG outcomes, but beyond some point the unit costs begin rising, along with indirect costs to other sectors. The challenge is to keep costs down while also targeting social outcomes over time. Building absorptive capacity is clearly a central element to this process.

There are also important complementarities across spending on different MDGs, in our modeling framework represented by cross-elasticities, where progress for one MDG may contribute to progress for other MDGs. For example, progress in the provision of improved water and sanitation services has a positive impact on heath outcomes. Another example is education: provision of primary and secondary education helps to expand the skilled workforce needed to both increase productivity of the private sector, and work in publicly funded schools and clinics. These will also be examined in the next section.

4. Simulation results from the Ethiopia MAMS model

These simulation results build on work that the World Bank is doing, together with Ethiopian government authorities, to provide analytic inputs for Ethiopia's development strategy framework—the SDPRP. The model used for this purpose has been calibrated around an Ethiopian country database for 2002, and a basic Social Accounting Matrix prepared for Ethiopia, and supplemented with more detailed sector studies relevant to the MDGs, as described above. The simulations help to identify ODA magnitudes required to scale up public service delivery to achieve the MDGs, illustrate some of the major macro-economic impacts under different financing and sequencing scenarios, and help quantify some of the key trade-offs that face policy makers. The following basic simulations draw heavily on Lofgren and Diaz-Bonilla (2005). We first examine the base case and variants on it, and then discuss the issue of Dutch Disease and its relevance for Ethiopia, front-loading and the implications of front loading for costs and outcomes, and then briefly discuss the important role of governance and institutional reform in capacity building.

The reference point used to compare results is a 'business-as-usual' **base case**, under which Ethiopia continues to receive external assistance and to perform along current trends; due to increased grant financing (annual foreign borrowing does not increase over time), external aid as grant financing is assumed to expand at an average rate of 1.5 percent per year from its level in 2002, to reach $19 per capita in 2015, while foreign loans remain at their 2002 level.[9] The different areas of government services as well as GDP all grow at an annual rate of around 4 percent. This performance is similar to the long-run growth trend for Ethiopia's economy.

This base-case scenario is contrasted with three other scenarios which include additional ODA levels directed towards (1) strengthening Ethiopia's basic national infrastructure and 'connectivity' (Base + Infrastructure), (2) additional ODA flows targeted to reach each of the five education, health and sanitary MDGs in the model, and (3) ODA flows targeted to meet these social MDGs, but without the underlying

[9] ODA here refers to *official development assistance to government* only, excluding flows to 'other official entities', and hence differs from data on total ODA.

infrastructure financing. Using these four scenarios allows comparison across different levels ODA inflows with different objectives and economic impact. Figure 1 shows the different foreign grant financing paths underlying each scenario. In each of these scenarios the financing gap (arising as government spends more to reach the MDGs) is covered through foreign grants.

Ethiopia's basic infrastructure requirements have been separated out from investments necessary to reach the key social MDG targets since these investment streams are quite distinct, and raising infrastructure spending is considered particularly critical to improving growth performance. Growth in household incomes and consumption, is essential to meeting MDG1, to reduce national poverty to half of its 1990 level by 2015. The importance of infrastructure to national growth prospects is discussed in detail in a recently completed Country Economic Memorandum on Ethiopia. More than other areas of public investment, improving the basic transport system and expanding power generation and distribution, to link the urban, peri-urban and rural economies, while investing in large-scale water management and irrigation systems to improve agricultural productivity—all are considered core elements of Ethiopia's national growth strategy.[10]

Under the second scenario, Base-Infra, the government embarks on a major effort to improve Ethiopia's infrastructure (roads, energy, and irrigation), thereby linking producers and consumer to national and international markets to capture important network effects and enhance growth. Another avenue is through infrastructure investments helping reduce the indirect costs (affected by factors such as reliability of power, transport logistics and timing, etc.) and losses related to the business-environment that depress firm productivity, as highlighted in recent work on African economies by Eiffert et al (2005). Higher infrastructure spending (both recurrent and investment) is assumed financed through additional foreign grants. Under this scenario, provision of infrastructure services grows at annual rate of 10 percent between 2003-2009 and decelerates to an annual rate of 5 percent thereafter.[11] This requires an increase in grant financing relative to the base case by around $10 per capita to $24 per capita at its peak in 2008. The productivity response of the private sector to the larger public capital stock in infrastructure is raised starting from 2009, reflecting the impact of network effects when the capital stocks exceeds a critical threshold.[12] As a result, the annual growth of real GDP rises by about 1.3 percent above the base-case trend to 5 percent.

The **third scenario (MDG),** examines the level and impact of investments calibrated to expand delivery of the MDG-related public services to just meet each of the targets (MDGs 2, 4, 5, 7A, 7B), as discussed above, but *without* the underlying

[10] World Bank Ethiopia CEM (2005). The three priorities for the growth agenda identified are (1) public investment focused on infrastructure to support urban rural linkages, (2) reduce risks to agricultural producers through investing in improved water management, social safety nets, and security of land tenure, and (3) improve the investment climate and reduce risk facing private producers and investors.
[11] Note the sudden drop in financing is a result of both lower growth in infrastructure services and to the increase in growth, which raises government revenues and reduces external grant financing needs).
[12] The underlying rationale for this is described in greater detail in Lofgren and Diaz-Bonilla (2005) and more generally in World Bank 2005.

investment in infrastructure, and hence does not support the productivity gains from improvements in basic economic infrastructure. The expansion of public spending includes capital investment in service-specific infrastructure (schools, clinics, water sanitation) as well as recurrent costs to deliver and maintain the higher service levels. This requires a much larger expansion of public spending, rising to over $70 per capita or nearly half of GDP by 2015. The higher financing requirement is fully met through external grants.

The final scenario (Full MDG) combines external financing on both the infrastructure and MDG services. This is the main scenario that illustrates the impact of full external grant financing to achieve both the required growth improvements to reduce poverty to the MDG1 levels and reach the social MDGs. The combined external financing requirements, rise to around $60 per capita by the end of the period, or approximately 40 percent of GDP as compared with current levels of just below 20 percent. Note that the cost of the Full-MDG scenario is less than the case where MDGs are met without infrastructure financing ($60 versus $70 per capita). This is due primarily to the additional growth and productivity generated by basic infrastructure investment, less erosion of trade competitiveness, and the additional boost to government revenues that accompanies higher growth. Together these reduce overall aid requirements.

Meeting the MDGs. The simulation results suggest that, under a set of specific conditions, *it is possible to achieve the MDGs by 2015*. One condition is that a predictable flow of external grants aid is available as needed in each simulation. The progress towards select MDGs is shown in Figures 2 to 4, and reveals the different contributions made by these investments in basic infrastructure and direct investment in the MDGs. The contribution of investment in basic infrastructure, which helps accelerate the growth rate relative to the base case by around 1.5 percent annually, is very important for achieving MDG1—halving the incidence of poverty from its 1990 level of 36 percent of the population (using the national poverty line). Growth in household consumption[13] helps to drive poverty down to around 22 percent by 2015 (using a poverty elasticity of –1 with respect to mean household consumption per capita). Spending on MDG-related sectors also helps to increase growth and household consumption levels, mainly by raising the supply of skilled labor and through employment generated by higher public investment.[14] Relative to the investment share, however, the contribution from basic infrastructure is much greater. In the Full-MDG scenario, where both investments are taken together, the MDG1 target to halve the incidence of extreme poverty to around 19 percent is just met.

[13] Income growth is assumed to be distributionally neutral across household income groups. Ongoing work with MAMS disaggregates the economy by major sectors—agriculture, services, and manufacturing—allowing greater refinement in the treatment of sector growth rates, intersectoral migration, and more differentiated returns to labor.

[14] An additional factor is through the exchange rate effect of appreciation of the currency helping to increase average real purchasing power.

Raising the underlying rate of GDP growth rate of the economy is clearly critical to meeting MDG1. However, as a result of lacking employment opportunities, the economy may fail to generate higher growth rates, in spite of high levels of spending on human-capital MDGs and a significant improvement in health and education standards. Capacity is raised, but opportunity is withheld. Put another way, as some argue (Millennium Project 2005; World Bank 2005), failing to raise growth, generate higher household and public savings, and reduce risk-averse behaviors associated with agrarian poverty, will fail to lift Ethiopia out of the 'poverty traps' which currently impede more rapid growth.

The converse of this is that growth alone will not achieve the human development MDGs unless accompanied by massive investments to expand public services. Figures 3 and 4 show the progress made towards meeting the primary school completion target of 100 percent and reducing the under-five child mortality rate by two-thirds. The dip seen in the first 5 years for primary school completion reflects rapid expansion in out-of-cohort enrollment, reducing educational quality and enrollment for within-cohort children. After this initial period, growth in primary school services is sufficiently rapid to improve quality while absorbing growing shares of within-cohort children.

Without targeted investment to achieve the MDGs, little progress will be achieved beyond the business-as-usual base case. Investment in building up basic infrastructure is important for raising income and consumption growth rates, but the MDG outcomes are little different from the base case. The small differences in completion rates induced by infrastructure investment and higher growth (in Base-Infra) arise mainly from higher government revenues, a portion of which is then directed to the MDGs, and demand side factors.

Dutch Disease. A major concern across the MDG scenarios is over the possible adverse impact of large aid flows on domestic demand, relative prices, and the real exchange rate. Aid flows permit a much larger trade deficit, draw resources to non-traded sectors, and place upward pressure on the real exchange rate, reducing competitiveness and resources flowing to traded goods and services. These concerns are well recognized.[15] As stressed in Bevan (2005), the extent to which aid flows are associated with the problem of real exchange rate appreciation depends largely on the relative impact on demand and supply. The supply response, depending on the effects of aid on productivity across sectors, largely determines the depth and duration of adverse effects following the surge in aid.

In all of the scenarios there is evidence of exchange rate appreciation, rising real wage rates, and a deterioration in the trade balance as imports surge and export performance deteriorates. Differences in the level of external financing and the way in which it is invested determine the impact on the exchange rate, real wages, and trade performance, as shown in Figures 5 through 8. The effects are more pronounced for the full MDG case through the first half of the period, and for the case of the MDGs without infrastructure financing in the second half since it requires much larger ODA flows.

[15] Heller and Gupta (2004), provide a clear overview of the issues and cite several country studies.

The pressure on real wages is greatest in the first half of the period before investment in expanding education and the skilled labor base begins to yield results, with a lag of several years. Wages of workers with a secondary education grow most rapidly until 2009 and thereafter stabilize as the number of graduates coming onto the labor market increases, mitigating wage pressures. Wages for workers with less than a high school education, by contrast, continue to rise through 2015 as supply is outpaced by demand from the growing economy.

Dutch disease effects are clearly a serious concern. Aid induced appreciation of the exchange rate and the collapse in exports are severe. Under the full MDG scenario exports fall from around 14 percent of GDP to 8 percent by 2015, and the real exchange rate appreciates by close to 20 percent. The impact on real GDP growth, which is driven by factor supplies and productivity, is quite limited however.

Public spending on infrastructure and MDG services differ in their effects on the supply side and in their import intensities. Infrastructure spending has a positive but lagged impact on productivity, whereas spending on MDG services has only a very modest impact on productivity in the short run, but affects supply through adding to the stock of skilled labor. Infrastructure spending initially causes some exchange rate appreciation, until productivity improvements raise growth GDP, incomes, and demand, with a significant import component. In the process, government revenues also improve. The import intensity of basic infrastructure in a country with limited domestic capacity is also high, reducing the adverse price and resource switching effects of the Dutch disease, as opposed to public social services, which have a far higher non-traded content, primarily labor.

By contrast, investment in social services takes much longer to impact on productivity, placing greater pressure on the exchange rate. In the case of ODA support for the MDGs without basic infrastructure investments, the real exchange rate has appreciated by about 30 percent, and exports have declined to less than half their initial share of GDP by 2015. Note that appreciation of the real exchange rate (the change in relative prices of the domestic good) also reduces the purchasing power of foreign grants, requiring larger flows to drive the MDG investments.

The simulations suggest that while the large surge in aid required for investment in the MDGs will help to sharply reduce income poverty incidence and dramatically raise human development outcomes, it also poses serious risks to future capacity for growth after 2015. The country will still be highly dependent on aid flows to maintain the MDG levels of public services (let alone raise them), although considerably less so than their peak level. Moreover, production capacity for exports and import-competing goods may have been significantly eroded and the country may not be prepared to rapidly adapt itself to a situation with less foreign aid and lower trade deficits. This points to the importance of only a gradual reduction in aid levels after 2015, giving the country sufficient time to improve international trade access, reduce behind-the-border barriers to trade, and pursue

other reforms to attract investment and improve competitiveness of traded goods and services.[16] Aid and trade can be key complements.

Front loading aid for the MDGs. An issue that arises regarding accelerating aid disbursements for the MDGs is how much aid should be 'frontloaded', i.e. disbursed up front,[17] and how much should wait until there is more absorptive capacity in place. Discussion of 'fast-tracking' countries with a demonstrated commitment to poverty reduction and a 'good' policy environment poses these questions of how much aid and how fast. The simulation results shed light on this. Consider the case where aid disbursements climb sharply in the first two years, effectively increasing growth in service provision ten times as rapidly as in subsequent years. Underlying infrastructure investment remains unchanged. This is an extreme case that more clearly illustrates the trade-offs from frontloading disbursements. Aid per capita quickly climbs to $55 per capita, and thereafter declines to an average of $40 per capita through 2015.

The impact of frontloading on the profile of two of the MDGs–net primary education completion rates and access to potable (improved) water—which are shown in Figures 9 and 10. Relative to the full MDG case, supply initially increases more rapidly and after this it stays at a higher level throughout the simulation period. As a result of the surge in aid, the exchange rate appreciates sharply early on, real wages to rise strongly as skilled labor is pulled from the private sector, and the trade balance to deteriorate sharply. With lower subsequent aid flows in the remaining years to 2015, these changes are mitigated, leaving the economy in a more favorable position.

Note that the extent of real wage pressure and rising costs for skilled labor is a function of the sector parameters of the model, and alternative specifications can help to further illuminate policy choices. The model has used a 40:1 student-teacher objective, (current rates are around 75:1) taken from the Education for All targets as a quality standard to strive for, and requires teachers to have 10 years of schooling plus three more years of teacher training. Some argue that relaxing these standards—allowing for example higher student teacher ratios, and requiring just eight years of schooling for primary school teachers—could tap more abundant local labor resources, lower wage costs, and free up resources to be used elsewhere. More innovative solutions where resources are scarce can clearly help to get around absorptive capacity constraints.[18]

Frontloading aid sharply increases total foreign grant financing required to achieve the MDGs by 2015. In present value terms, grant financing requirements above the baseline (discounted at a rate of 5 percent) increase by nearly one-fifth. As absorptive capacity constraints become more binding, unit costs for services rise. Although the more gradual acceleration in disbursements lowers costs while capacity is built up over time, one cannot say this is necessarily better since the path of service delivery is clearly

[16] IMF (2005) also stresses the importance of further trade liberalization and opening up the economy in response to likely real exchange rate pressure rate from higher ODA inflows in Ethiopia.
[17] Frontloading as used here should not be confused with frontloading of ODA *commitments*.
[18] Discussion of alternative approaches to overcoming labor constraints in education are elaborated in Education in Ethiopia (World Bank, 2005b).

quite different. With frontloading, fewer mothers and children have died, and the labor force is better educated by the time the full MDGs are reached in 2015. A comparison of these outcomes therefore requires a welfare function to weigh outcomes across the MDGs, including income poverty. A very simple approximation of this to help illustrate this can be done with an index of 'welfare' based on a weighted sum of the share of the required change for each MDG since 1990 that has been accomplished, with equal weights for each MDG that is covered (1, 2, 4, 5, 7a, and 7b). This index suggests that 'welfare' in the frontloaded case is significantly higher, by roughly one-fourth. Although it is hard to use this as a metric to guide optimal front-loading, it suggests that some level of frontloading may be desirable (if foreign resources indeed are available up to the levels indicated in the simulations).

In this example of frontloading, underlying infrastructure investment was unchanged. Infrastructure expenditures have, however, already been front-loaded, as seen from the higher growth rate over the initial five years. This was done for the reason that to achieve network effects and spur higher productivity growth, it is argued that a certain threshold of infrastructure services must be reached. By simple analogy, until a basic railway network is completed it cannot have a major impact on reducing transport and logistical costs across markets.

This points to the important policy point that *sequencing* of investments is important to minimizing costs and maximizing efficiency over time. Frontloading of infrastructure investment is a case in point, which is specified to recognize a threshold level of national infrastructure that must be met before productivity gains can be realized. The threshold level should ideally be estimated based on detailed infrastructure sector studies.

Among the MDG services, priority is needed for investment in education services, since skilled labor can only be produced with a lag, and since skilled labor is a key input to expanding the supply of all the MDG services. In addition, sequencing priority should be accorded to investment in public services that generate positive externalities, and in so doing can help lower the investment cost of other MDGs. If access to improved water is a key element of reducing under-five mortality, then investment in developing and maintaining potable water supplies must precede or accompany other child health related investments. Reversing this order of sequencing: the other MDGs before investment in water, education, and basic infrastructure services, would have clear consequences for total costs and ability to meet the MDGs by 2015.

To explore the question of frontloading more deeply, Figure 12 shows the present value of additional grants (i.e., of grants in excess of those received under the scenario Base+Infra) required to reach the MDGs as the shares of expenditures that are frontloaded vary. Rather than considering frontloading for only two years, here the two periods considered are over five-year periods, dividing the share of total outlays between the two periods.[19] The resulting 'U-curve' shows how the present value of total costs

[19] Because the model has been parameterized around 2002, the actual simulation periods correspond to 2003-2009, and 2009-2015, however the general illustration is identical.

falls as the share frontloaded increases from very low levels below 20%, costs are minimized at around 20 percent, and thereafter costs rise at an accelerating rate as capacity constraints are increasingly binding—labor costs rise, exchange rate appreciation reduces the purchasing value of aid, and congestion costs from infrastructure bottlenecks. In the extreme, at some point above 70 percent frontloading, costs become effectively infinite and reaching the MDGs is not possible.

It is important to be cautious in interpreting this result, however. First, while this suggests that total present value costs are minimized at around 20% of outlays, different points along the curve show very different welfare outcomes. As more resources are frontloaded, MDG outcomes are also frontloaded and welfare, measured by the simple MDG index, clearly improves. Second, underlying exchange rate and wage dynamics are very different along the curve, with consequences for competitiveness of traded goods and sharp wage differentials. Our point is not to suggest an optimum, but rather to illustrate real consequences of frontloading which require consideration when countries plan aid-financed long-term public investment programs.

Governance and institutional reforms. The model does not address the critical question of how the underlying institutional capacity and governance in Ethiopia can be improved. The broad range of issues that this encompasses is at the heart of most adjustment programs and Poverty Reduction Strategies– improving expenditure management, strengthening accountability mechanisms, reducing leakages through 'capture' and corruption, deregulation of excessive government controls often associated with rent-seeking, privatization and strengthening the environment for private business, and so on. In Ethiopia particular importance has been placed on decentralization in the government's reform program, with selective devolution of resources and responsibilities to Ethiopia's nine regions, including important responsibilities over public service delivery.[20] Successful implementation of the decentralization program is recognized as a key element of the country's poverty reduction strategy (SDPRP).

Taken together, governance and institutional reforms can be thought of as measures to improve the efficiency of public resource utilization. In terms of the model, they affect the underlying productivity of public activities and reduce unit costs of achieving the MDGs—falling teacher absenteeism, reduced waiting times for processing legal cases, licensing, and regulatory issues, less leakage in the use of central government resources for delivery of services to end-users. Sometimes simple reforms can have major consequences.[21]

To reflect further on this, we consider the effect of introducing governance and institutional reforms in the form of improvement in the underlying efficiency of public services at the rate of 2 percent compounded annually, and independent of the rate of

[20] As Heller and Gupta (2002) note, decentralization to channel resources through local governments in particular runs the risk of administrative constraints and deficiencies in expenditure management..

[21] One frequently cited example is the Ugandan newspaper campaign to boost schools' and parents' ability to monitor local officials' handling of school grants. Through greater public awareness, 'capture' or leakage of budget resources fell from 80% to 20% between 1995 and 2001 (Reinikka and Svensson 2003).

public investment. Introducing this to the model and recalculating the 'U-curve' in Figure 12 suggests several effects that emerge from this. First, the productivity gain in public services significantly reduces the cost of achieving the MDGs along all points of the curve and 'flattens' the curve, reducing the total variation in costs. The total cost of achieving the MDGs by 2015 in present value terms falls by around one-third.

Second, the new point of cost minimization leans slightly towards greater frontloading contrary to the expectation that it would shift towards the left (less frontloading as productivity levels are higher and unit costs are lower during the second period). The ambiguity in this outcome arises from two underlying effects that push in opposite directions. Behavioral effects would tend to push towards delaying investment and reduce front loading since it is more efficient to wait and take advantage of productivity gains. On the other hand, there is a change in relative prices between periods with no behavioral shift since the present value of expenditures in period 1 falls by less than the present value of expenditures in period 2.

One implication of this analysis is that anticipated incremental gains in underlying governance or productivity should not be a reason to delay public expenditures towards capacity building and service delivery. Even if there are underlying efficiency gains that reduce costs over time, this does not constitute a reason to delay investment in the MDGs, but rather suggests that the same constraints to absorptive capacity – labor costs, macroeconomic constraints, infrastructure congestion, guide the investment path.

5. Conclusions

One of the major concerns to governments over disbursement of aid to achieve the MDGs is whether the large levels of aid required can be effectively absorbed. There are both macro and microeconomic constraints to aid absorption that are well recognized in the literature. This paper focuses on selective aspects of this question related to the level, sequencing, and frontloading of aid necessary to fulfill the MDGs. If external financing is not the constraint, it poses the question of what major absorptive capacity constraints will guide identification of a cost-minimizing path to reach the targets. In particular it looks at labor market constraints, macro-economic (Dutch disease) constraints, and basic infrastructure constraints. In order to address these questions, we use a modeling approach that combines a relatively standard and highly aggregated CGE model with an MDG module that links MDG performance to the provision of different public services (in health, education, and water-sanitation), public infrastructure, per-capita income, and other economic indicators. The MDG module draws on detailed sector studies undertaken by the Government and the World Bank.

Model simulations are used to examine as set of alternative scenarios for expansion in public infrastructure and MDG-related services, with external grants covering the financing gap. Meeting the first MDG—to reduce by half the incidence of income poverty in 2015 from 1990 levels—will require higher economic growth. We argue that one key to raising growth is substantial investment in basic infrastructure, particularly roads, energy, and water control. Reaching the other human development

MDGs will require spending to boost the quality and quantity of public MDG-related supply of services. According to model simulations, for the main scenario, which achieves the different MDGs via a combination of front-loaded expansion in infrastructure spending and growth in MDG services at a constant rate, foreign grant financing requirements will rise from around 16$ per capita at present, to around $60 per capita in 2015, or nearly 40 percent of annual GDP in foreign grants. This is roughly twice the average level of ODA per capita in sub-Saharan Africa that was reached during the early 1990s.

On the basis of our analysis of the simulation results, we draw four other main conclusions from the simulations presented. First, careful sequencing of public investment is important for minimizing the total cost of reaching the MDGs. From the outset priority investment is needed in basic infrastructure to generate the basis for higher productivity growth and network effects improving linkages across and within regions and sectors. Among the MDG services, accelerating education spending is a priority since skilled labor can only be produced with a lag and is a binding constraint on absorptive capacity. Priority in sequencing should be accorded to public investment in services that generate important positive externalities, and in doing so lower investment costs of other MDGs.

Second, the macroeconomic impact of large aid flows on the tradeables sector, through pulling resources into non-tradeables and exchange rate appreciation (Dutch disease) is a serious concern at aid levels necessary to meet the MDGs. The danger is that the MDGs may be met, but at the cost of severely diminished export sector, which potentially is a vital source for future growth. This poses a potentially serious tradeoff for MDG oriented poverty reduction strategies, and more importantly underscores the importance of pushing further trade liberalization, market access in OECD countries, as well as addressing behind-the-border barriers to trade.

Third, large-scale frontloading of aid disbursements (other than infrastructure) is costly as it pushes against absorptive capacity constraints, intensifies the premium on skilled wages, bids labor away from the private sector (depressing growth), and incurs more serious Dutch disease effects. Comparing the present value of additional MDG grants while varying the share of total aid disbursed in the first five years suggests costs are minimized when around one-fifth of additional resources are used in the first five years. On the other hand, front-loading also has different welfare implications: greater frontloading secures earlier success to social outcomes, the marginal benefits from which may outweigh rising costs.

Fourth, improvements in the underlying governance and institutional structures may have the effect of securing broad productivity improvements in public service delivery. Whether such gains suggest more or less frontloading of expenditures depends on the relative weight of behavior and price effects on supply. This does not constitute a reason to delay public investment, however, pending efficiency gains. Rather, it suggests that the same constraints to absorptive capacity – labor costs, macroeconomic constraints, infrastructure congestion—help guide the investment path.

We are not suggesting that simply tripling or quadrupling aid can achieve the MDGs in Ethiopia. Several other conditions, which may be even more important, must also be met, including improvements in governance, strengthening institutions, and improving the business climate, as are serious steps by donor countries to improve the quality and alignment of aid with national strategies, and the harmonization of administrative procedures.

Figure 1. Foreign grant financing (US$ per capita)

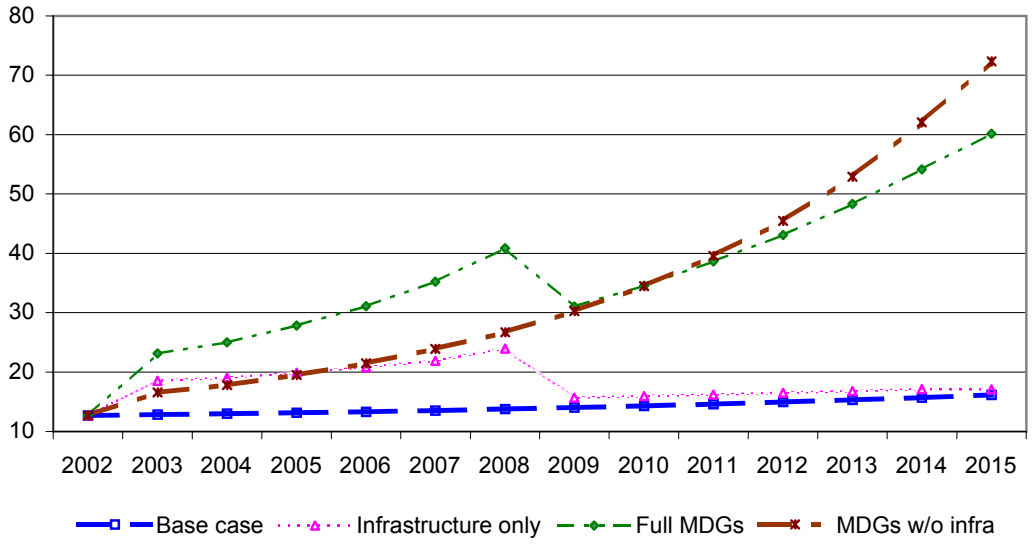


Figure 2 MDG1--Share of Population Living on $1 (PPP) per day or less (%)

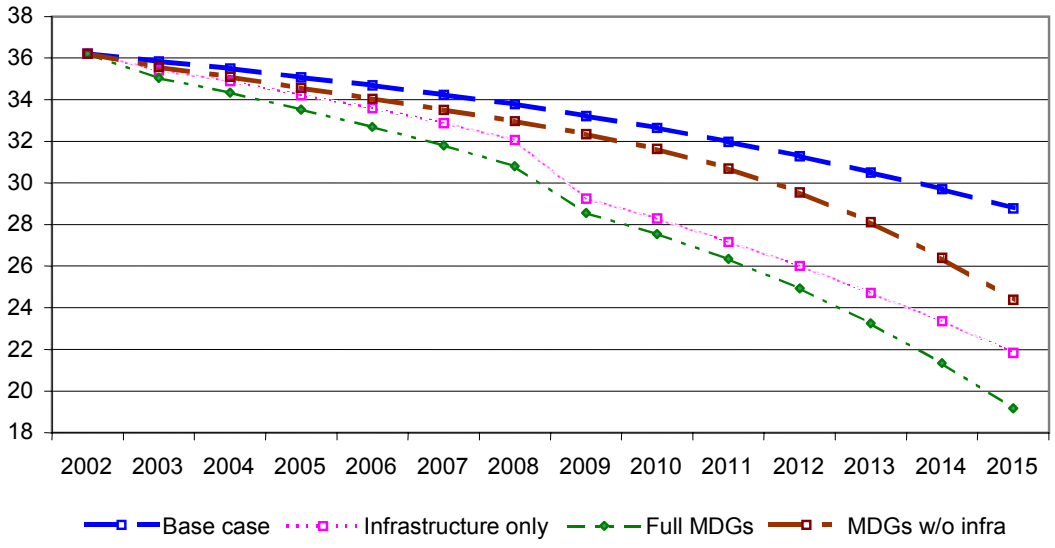


Figure 3: MDG 2 - Net Primary School Completion Rate (%)

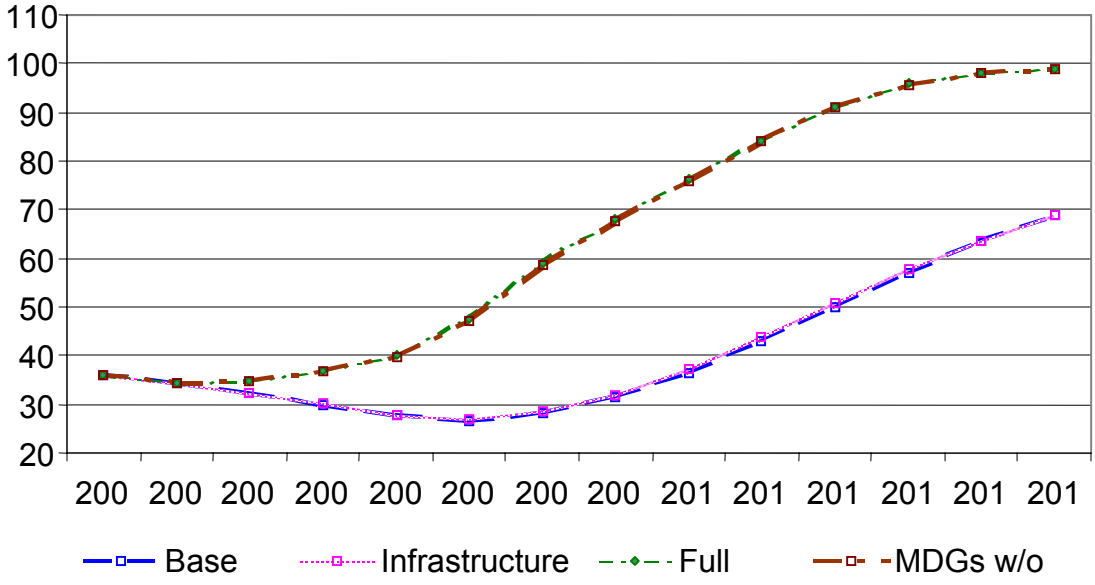


Figure 4: MDG 4-- Under-Five Mortality per 1,000 Live Births

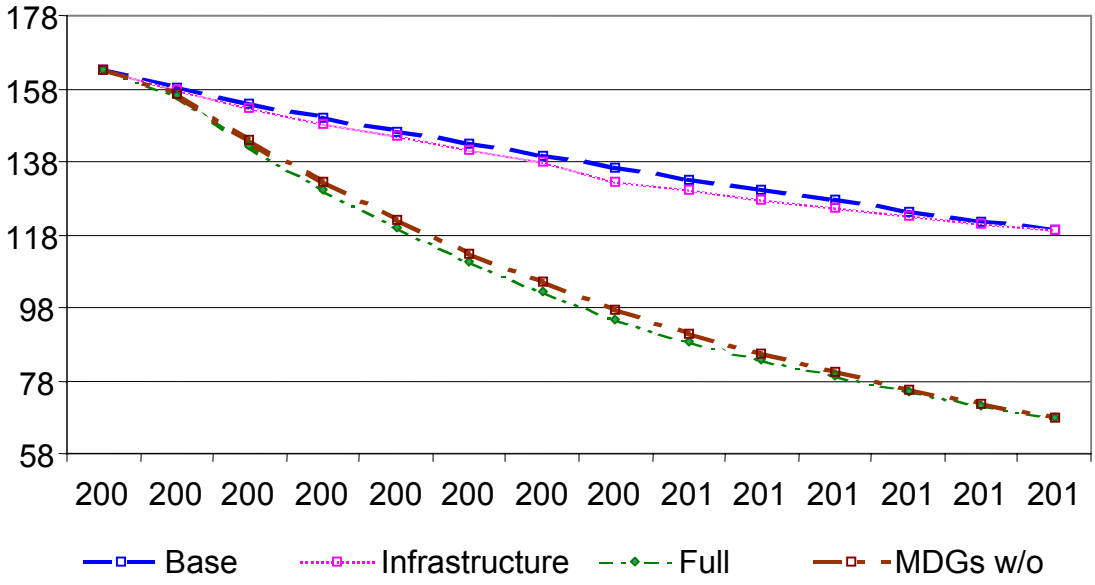


Figure 5: Real exchange rate

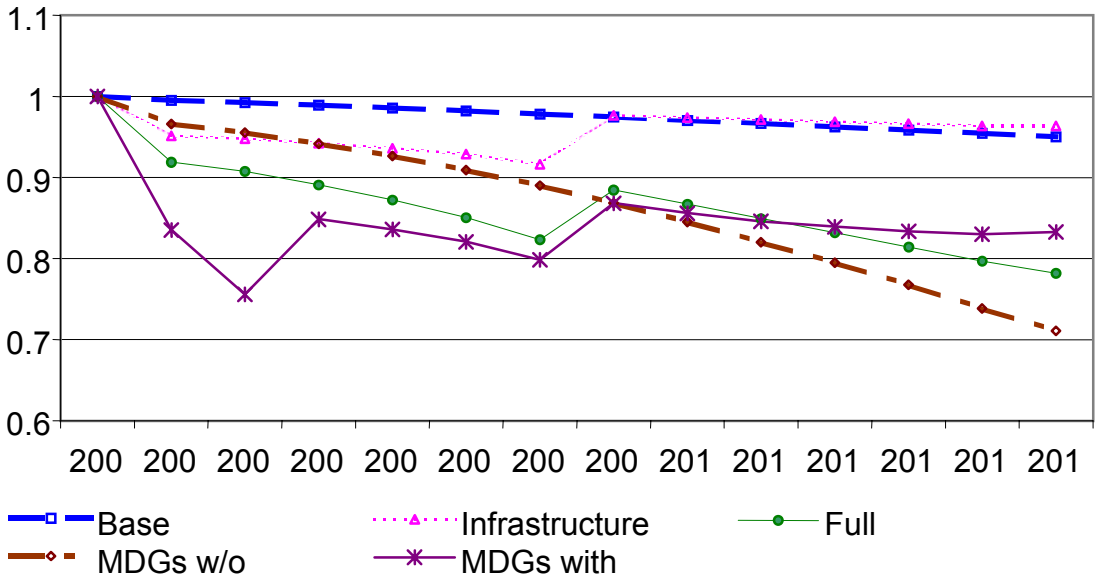


Figure 6. Real Wage for Workers with High School Completed

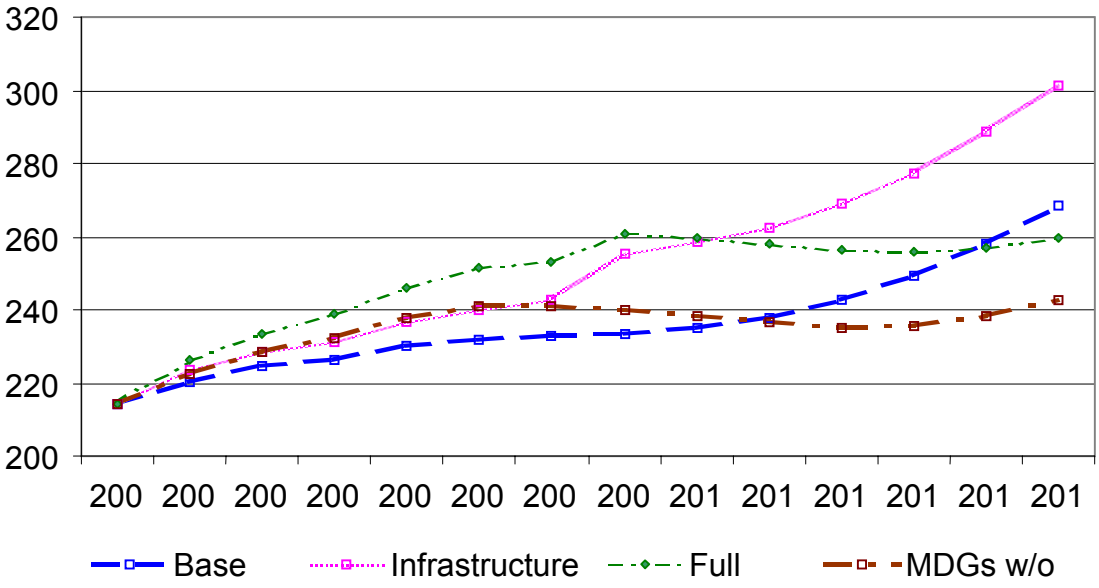


Figure 7: Trade balance as a share of GDP

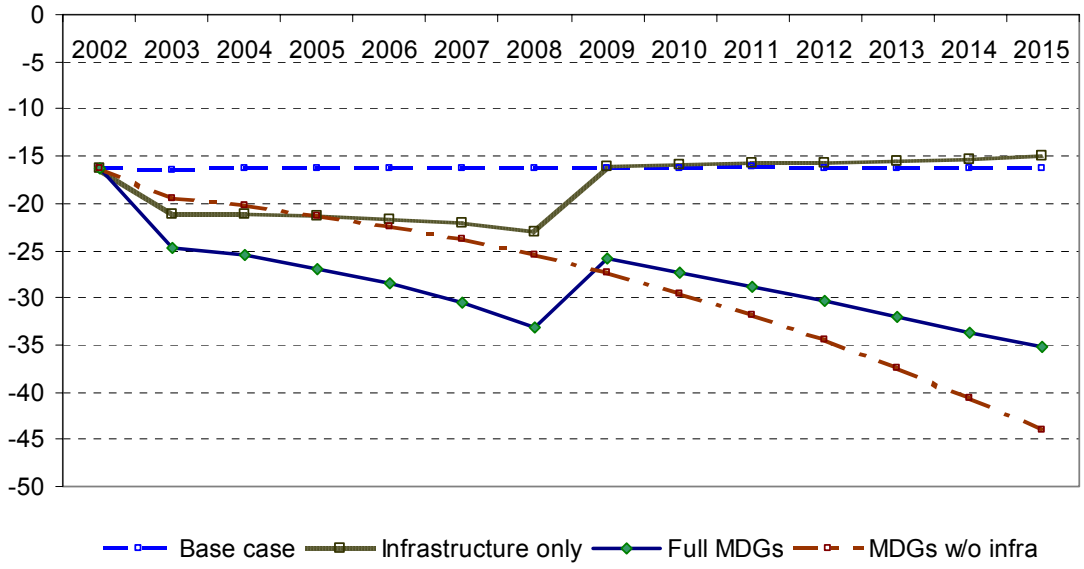


Figure 8: Export as a share of GDP

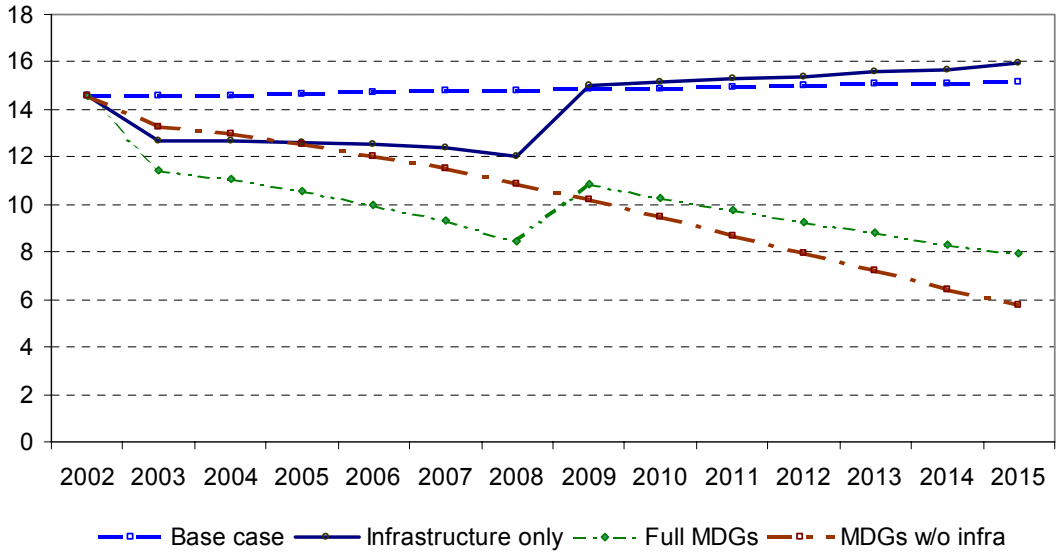


Figure 9: MDG 2 -- Net Primary School Completion Rate (%)

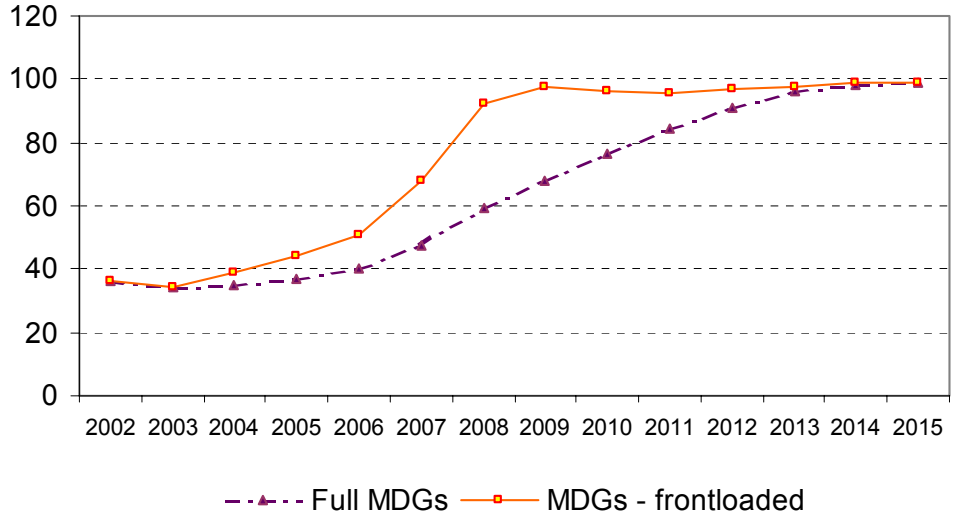


Figure 10: MDG 7a --Share of Population with Access to Improved Water (%)

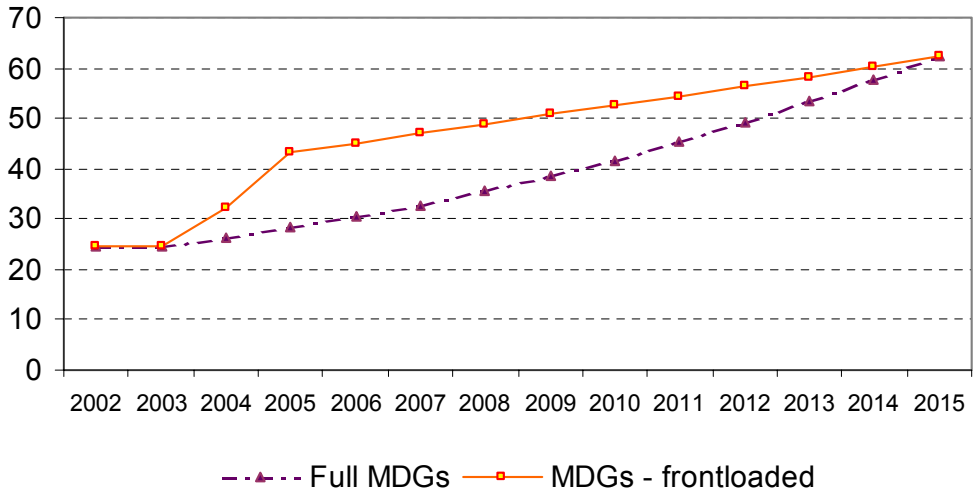


Figure 11: Real exchange rate with front-loading (2002 = 1.00)

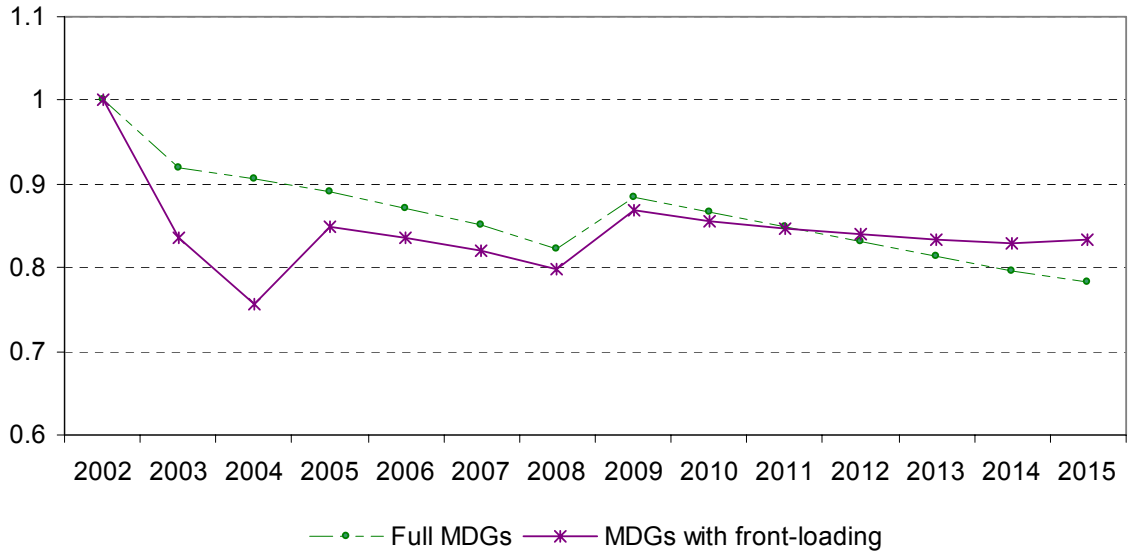
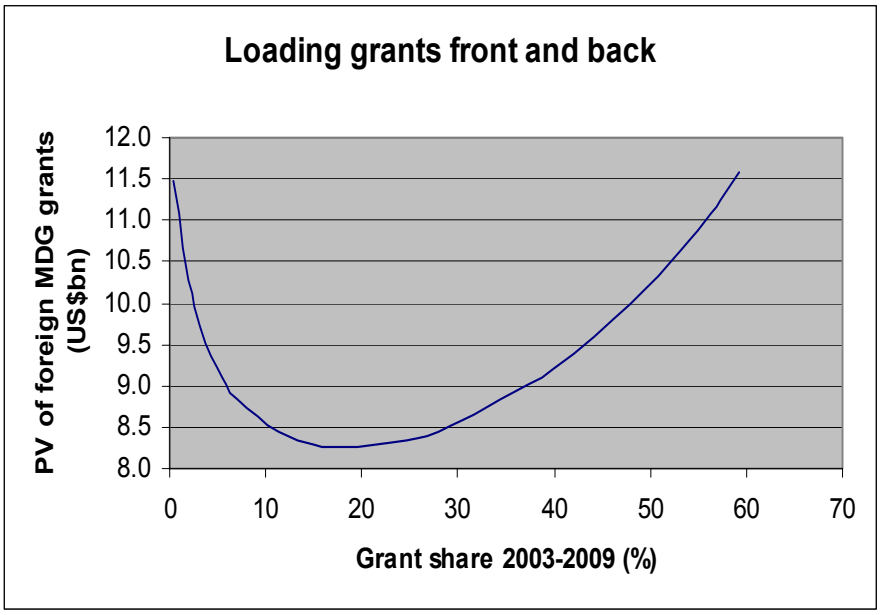


Figure 12: Costs of frontloading different shares of total aid for MDG services



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