

Millennium Development Goals for Honduras: current achievements and forthcoming challenges

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Abstract

The progress on many Millennium Development Goals (MDGs) in Honduras lags behind other countries in Latin America, and, if current trends continue, none of the MDGs are likely to be reached by 2015. Using a dynamic general equilibrium model extended to include explicit ‘production functions’ for MDGs (the MAMS model), a baseline scenario is contrasted with several alternative scenarios. The baseline case shows only modest improvements in the poverty, education, health, and water-sanitation MDGs, despite assuming per capita growth rates well above the past decade averages and significant expansion of public provision of social services. Our simulations demonstrate that reaching the MDGs will require public expenditure in related service categories to more than double from baseline levels, although significant cost savings are likely to be realized from various synergies across the MDGs. The vast increase in government spending has a number of economy-wide effects, including crowding out the private sector and a widening wage gap due to increased demand for skilled labor. At the same time, the achievement of the education MDG has important effects on the composition of the labor supply. The source of MDG financing determines whether the economy suffers from pronounced Dutch disease effects (foreign grant financing) or whether private consumption and growth are seriously penalized and poverty rises (domestic tax financing).

The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the view of the World Bank, its Executive Directors, or the countries they represent.

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1 Introduction

In the last ten years, Honduras has achieved important results in terms of education attainment and provision of basic social infrastructure. This augurs well for the possibility of accomplishing the Millennium Development Goals (MDGs). Yet, compared to other countries in the Latin America and Caribbean region, Honduras lags behind in growth and remains off track in terms of achieving the goal of halving poverty by 2015. Without a significant acceleration in per capita growth rates over the next decade, attaining the MDGs is likely to be very difficult because growth and MDG achievements in the Human Development (HD) area reinforce each other. Improved health and educational outcomes can increase productivity, with positive synergies when service access improves simultaneously in different areas (health, education, water, and sanitation). At the same time, growth and higher incomes can generate increased funding for services and raise service demand, creating a virtuous circle of growth and HD.

Improving service delivery is only one part of the challenge—it is also necessary to consider demand-side incentives and capabilities. In a stagnant economy with virtually no growth in per capita income, as Honduras has been in the last decade, large programs aimed at expanding social services may not work as effectively as in a faster-growing economy. In fact, the need to finance investments in HD services may crowd out investment and growth in other parts of the economy. Progress in the HD area may also be slowed by the increasing marginal resource requirements as governments reach out to populations that are more difficult to reach physically due to geography (for example populations residing in remote areas with underdeveloped infrastructure) and/or that are less capable of making use of services due to low incomes and a low level of initial HD. Inefficiencies in service delivery due to rapid scaling up may add to marginal resource requirements.

In this study, we explicitly consider the above mechanisms and, by using a dynamic general equilibrium model, provide estimates of the resources required to reach the MDGs and evaluate different strategies for their achievement. The paper is structured as follows. The next section describes the current macroeconomic and MDGs

performance in Honduras. A brief assessment of the forthcoming challenges for the expansion of social services and their (partial equilibrium) costs estimation are also provided. Section 3 describes the methodology we use. Section 5 discusses alternative model-simulated scenarios. In particular, it contrasts a baseline simulation where Honduras continues on current trends and does not achieve the MDGs against a scenario where increased HD spending helps reach MDGs but still falls short on the poverty target. Section 6 offers concluding remarks.

2 Current MDGs situation and preliminary cost estimates of a full achievement

2.1 Brief introduction of macroeconomic/growth performance of Honduras

Between 1990 and 2004, Honduras' real GDP has grown at an average of 3.3%, slightly higher than in the decade of the 1980s but not enough to produce a sustained per capita growth. In fact, household per capita consumption expenditure has remained almost unchanged for the last two decades, which explains the slow pace of poverty reduction. Expansions of government expenditures, both recurrent and capital, have been limited by the slow growth of the economy, the current account financing needs and the large public debt. From the 1980s to 2004, total debt has fluctuated well above the 80 per cent of gross national income and servicing this debt has represented close to a third of total exports of goods and services. Thanks to the HIPC initiative, the debt situation should improve in the near future and that should free up some resources for the large infrastructure and social spending the country urgently needs if it wants to achieve the objectives of the Poverty Reduction Strategy (PRS) and Millennium Development Goals (MDG).

Table 1: Honduras 1980-2004 Macroeconomic performance

	1980	1990	2000	2004
GDP at market prices (millions 2000 US\$)	3,393	4,313	5,963	6,798
Household consumption per capita (units, 2000 US\$)	680	633	652	..
Population (millions)	3.57	4.87	6.46	7.13
General gov. consumption (millions 2000 US\$)	617	727	944	877
Gross Investment, public sector (millions 2000 US\$)	313	242	350	293
Average yearly growth rates		1980-1990	1990-2000	2000-2004
GDP		2.4	3.3	3.3
Household consumption expenditure per capita		-0.7	0.3	0.6
Population		3.2	2.9	2.5
General gov. consumption		1.7	2.6	-1.8
Gross Investment, public sector		-2.5	3.8	-4.4
% shares of GDP (unless indicated), period averages				
General gov. consumption		13.5	11.3	14.5
Gross Investment, public sector		7.7	8.3	5.8
Trade		60.3	86.6	92.5
Agriculture, value added		21.6	20.7	14.3
Total debt (EDT)/GNI		81.9	118.6	86.0
Debt service (TDS)/Exports of goods and services		26.9	26.8	12.0
Current account balance/GNI		-6.7	-6.2	-4.5
Remittances received/GNI		0.6	3.9	10.0

Within these small margins of maneuver, the government of Honduras has also had to respond to large shocks such as the 1994 internal energy crisis¹, the 1998 hurricane Mitch and different waves of coffee price reductions. On the positive side, recent policies have been implemented to facilitate the important resource inflow represented by the remittances sent by Hondurans working abroad. In 2004 this financing source represented about 10% of GNI, up from the 4% yearly average of the 1990s. The country has also joined with the rest of Central America the DR-CAFTA (Dominican Republic - Central American Free Trade Area) agreement with the US and the resulting increased integration with this important commercial partner is likely to provide increased export opportunities and potentially larger inflows of FDI.² Table 1 above shows that Honduras openness has increased considerably, up to 90% in 2004 from the already high level of

¹ The country is extremely oil dependent and the recent rise in oil prices is already straining government finances and does not bode well for the future.

² There are plenty of reasons to be cautious about DR-CAFTA's potential to provide increased export opportunities for Honduran producers. The reason is that the overall level of US protection faced by Honduran exporters is very low, and the agreement primarily locks in the existing CBA (Caribbean Basin Initiative) and GSP (Generalized System of Preferences) preferences rather than open new US sectors for competition. On the other hand, increased investment inflows could result in new opportunities and facilitate transition to higher value-added activities. For a more detailed discussion of the economy-wide consequences of DR-CAFTA accession for Honduras, see Medvedev (2006).

60% in 1980, and that at the same time, agriculture is becoming a smaller (but still relevant) share of the nation's GDP.

2.2 Millennium Development Goals

Honduras is the third poorest country in Latin America and the Caribbean after Haiti and Nicaragua. Its 2004 per capita GDP is just 952 USD (at constant 2000 prices), compared with 3,935 USD per capita for the region as a whole, and more than 64 percent of the country's population is below the national poverty line, while almost 45 percent live in extreme poverty. Slow per capita economic growth, unequal distribution of income and resources, and low labor productivity are some of the most relevant culprits of the continued high poverty incidence. On the other hand, despite the disappointing recent performance in poverty reduction, the progress towards other MDGs has been closer to that of the rest of the region (see Table 2).

Table 2 MDG attainment in Honduras and Latin America

	Honduras			Latin America and Caribbean		
	1990	2004	2015 (Target)	1990	2003	2015 (Target)
MDG 1: People living on less than \$1 (PPP) a day (% of population)	38	21	19	11	10	6
MDG 1: People living below the national poverty line (% of pop.)	84	64	42			
MDG 2: Primary completion rate (% of relevant age group)	65	76	100	57	97	100
MDG 4: Under-five mortality rate (per 1,000 births)	59	41	20	53	33	18
MDG 5: Maternal mortality rate (per 100,000 live births)	280	108	70		193	
MDG 7a: Access to an improved water source (% of population)	73	82	87	82	89	91
MDG 7b: Access to improved sanitation facilities (% of population)	66	77	83	68	75	84

Note: MDG 2 is shown as net completion rate for Honduras, and gross completion rate for the LAC aggregate. For the LAC aggregate in 2003, MDG 1 and MDG 5 are 2000 values.

While the table lists the MDG levels and targets as defined in the UN Millennium declaration, the Government of Honduras has set more ambitious targets for several indicators. For example, the water and sanitation coverage is to be expanded to 95 percent of the population, significantly exceeding the MDG of improving access by one-half. Similarly, using the national poverty line as the MDG1 indicator, poverty is to be reduced from 64 percent in 2004 to 42 percent in 2015. Finally, the child mortality rate target is set slightly higher at 24 instances per 1000 live births.

Source: www.developmentgoals.org, www.sierp.hn

Several positive signs have been recorded for the *education* goal: the rate of alphabetization of the young has increased from 79.7% in 1990 to 85.5% in 2001 and the coverage rates for primary education have reached 89.3% in 2004, showing a positive trend which, however, may be insufficient for the achievement of universal primary education completion. Additionally, no apparent gender gap is recorded in the data for primary education with boys and girls having almost identical access and completion rates.

Despite these successes, a number of studies have questioned the quality of education received by many Honduran pupils and the efficiency public education spending. For example, World Bank (2001) cites a study assessing language and math skills in the third and fourth grades of education, where, out of twelve Latin American countries participating in that study, Honduras ranked last in language and next-to-last in math. World Bank (2004a) claims that recent expansion in public spending on primary education was accompanied by declining efficiency: even though spending on primary education per student “increased from US\$ 89 in 1998 to US\$151 in 2002, two key education achievement indicators – the sixth grade completion rate and test scores – have been stagnant or decreasing over the same period.”

As far as the *health* goals are concerned, between 1990 and 2001, the under-five mortality rate decreased from 59 to 41 per thousand births and the infant mortality rate was reduced from 47 to 31 per thousand. In the same period, the maternal mortality rates reduction from 280 to 108 per 100 thousand live births confirms a positive tendency in the health sector. The percentage of childbirths taken care by specialized personnel in health institutions has fluctuated during the 1990s, but has followed an upward trend rising from 45.6% in 1990/91 to 61.7% in the 2001. Although not large, there still exists a gap between the shares of urban (85.5%) and rural (80.7%) mothers receiving prenatal control. And this gap is much larger for medically assisted childbirths: in 2001, in the urban areas 82.4% of the childbirths were taken care of in institutions with specialized sanitary personnel, as opposed to only 37.5% in the rural areas. An effective route to reduce maternal mortality is to improve the access, the use and the quality of the services for the treatment of the complications during the pregnancy and the childbirth. However, crucial information on the availability and coverage of the obstetrical care is not frequently updated and needed corrective measures based on this information may not be adopted.³

³ The Secretariat of Health has initiated a study to determine the availability and the use of the obstetrical services in Honduras.

Overall, the 2015 Millennium health goals do not seem unattainable⁴ and clearly some of the measures adopted to promote the delivery and efficiency of health services – such as programs aimed at expanding ambulatory and hospital care and at strengthening the country’s epidemiologic capacity to respond to emerging and other infectious diseases – have produced the expected results. Honduras has also recently started an initiative targeted at improving maternal-infantile health which includes the elaboration of a national legal framework to regulate the sector delivering mothers and infants-specific health services, the expansion of the services of the Atención Integral a la Niñez (Integral Care to the Childhood) network, and the implementation of a program for the monitoring and analysis of maternal and infantile deaths.

The national coverage for potable *water* went from 73% to 82% in the period 1990-2004, and that of *sanitation* from 66% to 77%. However, large disparities in coverage rates are observed between rural and urban areas, and even between large and smaller cities. Besides, due to the continued high growth rate of its population, Honduras will face severe challenges to reach its ambitious coverage rates by 2015. According to the government’s forecasts, reaching a 95% coverage rate for water and sanitation in 2015 (a goal which is above that set by the Millennium declaration) means providing access to water for an additional population of 2.6 million in total – 1.2 million in rural areas and 1.4 million in urban areas – and supplying sanitation services to an additional population of 3.5 million in total, distributed between 1.3 and 2.2 million in rural and urban areas respectively. Although the size of the investments required is large, the government realizes the importance of starting these as soon as possible given the key externalities generated by universal access to these services.

2.3 Meeting the goals: how much will it cost? A sectoral (partial equilibrium) view

A simple calculation which assumes that the current developments in education, health, water and sanitation, and in the other social sectors, are projected (unchanged) towards the future – even with a significantly improved macroeconomic growth performance – is

⁴ In this study we do not consider some of the other important health goals, such as Malaria and HIV/AIDS. In Honduras, several efforts to fight these and other diseases are being currently financed through the Global Fund, which supports the consolidation of the National Program against Tuberculosis and Malaria, executed by the Secretary of Health executes.

enough to show that Honduras will not be able to achieve its Millennium goals. It will be closer to some (health and education MDGs) but will present significant gaps for others (water and sanitation and poverty MDGs, see below).

Aware of this situation, the government of Honduras, in conjunction with the civil society and the international donors' community, has focused its effort in the elaboration of long term sectoral plans in order to quantify needed additional resources as well as to obtain greater effectiveness and efficiency in the allocation of public resources and external aid. In June 2004, a Consultative Group started planning and evaluating costs of programs in six sectors: Education, Health, Agro-Forests, Water and Sanitation, Infrastructure, and Security and Justice. This Group also realized that no sectoral program, no matter how comprehensive and well thought, could succeed in a deteriorating economic environment and decided to include in the planning strategy some key cross-cutting issues, such as economic growth, macroeconomic management, trade and competitiveness, and decentralization and environmental management. The preliminary results of the various sectoral studies were merged in a single government document⁵ and its main costing estimates are summarized below.

Table 3 Infrastructure and MDG-related required expenditures (10⁶ 2004 Lempiras)

	2004	2004 as % of total Gov Exp	2015	2004-2015	gap	average yearly growth rate
Infrastructure						
PRSP/MDG government Plan						
Housing	5	0.0	806	4,971		72
Credit to Small and Micro Enterprises	257	0.8	275	4,349		6
Roads	1,523	5.0	4,162	44,744		15
Electricity	291	1.0	786	8,833		16
Telecommunication	143	0.5	663	6,632		23
Total Infrastructure	2,219	7.3	6,693	69,528		16
Base Line	2,219	7.3	3,795	35,318	34,211	5
Primary education						
PRSP/MDG government Plan	4,978	16.4	14,528	149,396		16
Base Line	4,978	16.4	8,515	79,240	70,157	5
Health						
PRSP/MDG government Plan	3,733	12.3	11,101	102,282		14
Base Line	3,733	12.3	6,385	59,425	42,857	5
Water and Sanitation						
PRSP/MDG government Plan	690	2.3	1,658	18,927		14
Base line	690	2.3	1,181	10,990	7,937	5

⁵ Government of Honduras - Grupo Consultativo, "Avanzando en la planificación sectorial de mediano plazo. Plan Pluriennal de Ejecución de la ERP", Tegucigalpa, Honduras, May 2005

The first column shows the total recurrent and capital expenditures the central government of Honduras spent in 2004 for the key MDG and Infrastructure sectors. For the same year, their aggregate value represents almost 40 per cent of total government expenditure, and primary education and health are the sectors absorbing the largest shares of government resources. The third column represents the amounts the government should spend in 2015 if the sectoral plans conceived to reach the MDG and infrastructure objectives were strictly followed; the rows labeled “Base line” represent instead the amounts spent in a scenario where public HD expenditure grows at five percent per year. The fourth column shows the total amount of spending for the whole period. This total amount was estimated by sectoral experts and it is represented in ‘real’ values, i.e. the costs were evaluated at constant prices in 2004 Lempiras. These costs can thus be interpreted as the costs required for the expansion of the ‘real’ services delivered (i.e. quantities supplied) by the public sector: this expansion is shown by the growth rates of the last column. The methods used to cost the required interventions and investments vary slightly in each sector, but mainly consist of an estimation of the additional demand due to the increased coverage rates and a growing population. The ‘technology’ of delivering services is not supposed to vary throughout the 10 years of the planning period, nor potential economies (or dis-economies) of scale or externalities among investments are considered.⁶ Table 3 shows that the yearly growth rates required to reach the MDGs are considerable and, perhaps not surprisingly, similar across sectors. According to these estimates, a baseline growth rate of service delivery of 5% per year is well below the needs.

The figures in Table 3 include exclusively the public sector. Private provision of many social services and private infrastructure investments are considered in the sectoral studies, however, in the key MDG sectors we focus our attention, the contribution of private services is not very large. For example, World Bank (2004a) shows that private education providers account for 5-10 percent of total enrollment at the primary level, and less than 20 percent of enrollment at the tertiary level.⁷ Moreover, private schools are

⁶ For details on the sectoral estimates see Government of Honduras, 2005.

⁷ However, private schools account for approximately one-half of enrollment at the secondary level.

located almost exclusively in the urban areas, so that service delivery to the rural population is handled entirely by the public sector. Finally, even when private provision is more significant it usually supplies the wealthier parts of the population.

The delivery of public social services requires different inputs in terms of labor, intermediates, capital and investments, and Table 4 presents the total spending figures of Table 3 disaggregated according to these inputs. Expanding provision of infrastructure and social services results in additional inputs demand that are quite different across sectors. Public infrastructure and water and sanitation have a much higher investment component, above 60% of total costs; labor inputs account for the largest cost item in the education and health sector, with the latter being biased towards a bigger share of highly skilled workers.⁸ Recurrent non wage expenditures are also a significant cost item for infrastructure and health. Although the input mix may change with the adoption of new technologies, this initial representation of cost structure provides important information on the potential difficulties and bottlenecks Honduras may face when it pursues its MDGs. The “Lempiras per capita” column also shows a broad measure of relative costs (and potentially of the efficiency of spending) across services and can be used as a quick unit cost reference.

⁸ Note that this bias is relative to the other HD sectors. Overall, the proportion of highly skilled workers employed in health and education is below average for Latin America.

Table 4 Social spending on MDGs in Honduras, 2004

		Mn lempiras	%	Lempiras per capita	% of GDP	Lempiras per student
Public infrastructure	Intermediates	685	31	96	0.5	
	Labor	114	5	16	0.1	
	Unskilled	30	1	4	0	
	Skilled	21	1	3	0	
	Tertiary	63	3	9	0	
	Investment	1,419	64	198	1	
	Total	2,219	100	310	1.6	
Water and sanitation	Intermediates	96	14	13	0.1	
	Labor	168	24	23	0.1	
	Unskilled	168	24	23	0.1	
	Skilled					
	Tertiary					
	Investment	427	62	60	0.3	
	Total	690	100	97	0.5	
Health	Intermediates	965	26	135	0.7	
	Labor	2,625	70	367	1.9	
	Unskilled	1,219	33	170	0.9	
	Skilled	563	15	79	0.4	
	Tertiary	843	23	118	0.6	
	Investment	143	4	20	0.1	
	Total	3,733	100	522	2.8	
Primary education	Intermediates	280	6	39	0.2	239
	Labor	4,544	91	635	3.3	3,877
	Unskilled	1,724	35	241	1.3	1,470
	Skilled	2,148	43	300	1.6	1,832
	Tertiary	673	14	94	0.5	574
	Investment	154	3	22	0.1	131
	Total	4,978	100	696	3.7	4,247

In practice, the costing approach summarized in Table 3 and Table 4 is essentially a partial equilibrium exercise and although it provides detailed information on how a sector works, it does not account for important feedbacks and indirect effects captured in a general equilibrium settings. In particular, this partial equilibrium setting does not allow for synergies across various goals, despite the available evidence to their existence.⁹ Additionally unit costs are most likely not constant, or, in other words, production of social services employs a decreasing returns to scale technology. Reaching two thirds or even three quarters of the relevant population may be relatively easy however, providing services for the last additional fraction needed to reach full coverage is most likely costlier. The last non-covered fraction usually consists of poorer, harder to reach, remote communities and at times not only increased service supply but also demand subsidies

⁹ See the following section on the structure of the MAMS model for a more detailed discussion of cross-MDG synergies.

may be needed. In the MAMS model—briefly described in the following section— these important factors are explicitly taken into account.

3 A General Equilibrium Model approach and costing

The purpose of the MAMS model is to provide a quantitative assessment of the economy-wide effects of alternative policies to achieve selected MDGs. The MAMS model goes beyond ‘static’ costing of individual interventions in MDG sectors and instead recognizes that marginal costs of interventions, and correspondingly marginal rates of return to MDG spending, are not constant throughout the planning horizon for the MDGs. In order to capture these effects, MAMS integrates a standard open economy (recursive) dynamic general equilibrium (GE) model with an MDG module that links specific MDG-related interventions to MDG achievements. In order to keep the analysis simple and focused on the salient points, the model’s MDG scope is constrained to goals which are likely to be most costly and have the largest effects on the rest of the economy: universal primary school completion (MDG 2), reduced under-five and maternal mortality rates (MDGs 4 and 5), and increased access to improved water sources and sanitation (part of MDG 7). To the extent that a package of interventions that curtails child mortality contributes to reducing the incidence of major diseases other than HIV/AIDS, the model also implicitly tracks MDG 6. In addition, we address achievements in terms of poverty reduction (MDG 1), although the model does not contain mechanisms for specific MDG 1-related interventions.

The model disaggregation is shown in Table 5. Given that our primary focus is on government policies related to MDG achievement, we maintain a simple structure for the rest of the economy by aggregating all private activities into three sectors: agriculture, manufacturing, and services. Following standard practice, households maximize utility and producers minimize costs, and prices clearing behavior is assumed. Commodity prices and factor returns are determined in competitive markets and traded (exported or imported) and non-traded commodities are imperfect substitutes. In contrast to the private sector, the production structure in various MDG sectors is quite detailed: government commodities/activities include primary, secondary, and tertiary education, health, water and sanitation, and public infrastructure—all of which are produced using a combination

of labor inputs of varying skill levels and sector-specific capital stocks. The government finances its activities from domestic taxes, domestic borrowing, and foreign aid (borrowing and grants). Provision of education, health, and water-sanitation services contribute directly to the MDGs.

Table 5 Model sectoral structure

Activities/commodities
Private (3)
Agriculture
Manufacturing
Services
Public (7)
Primary education
Secondary education
Tertiary education
Health
Water and sanitation
Infrastructure
Other government
Factors (11)
Unskilled labor--workers who have not completed secondary school
Skilled labor--workers who have completed secondary school
Tertiary-skilled labor--workers who have completed tertiary education
Capital (8)--one stock for each model activity
Institutions (3)
Household
Government
Rest of the world

The MDG module is a core component of the model. For goals other than MDG 1, the level of each MDG indicator is determined as the outcome of a production function featuring inputs relevant for each particular MDG; this production function explicitly recognizes that marginal returns to MDG spending diminish as the economy approaches the target level.¹⁰ One of the key features of our analysis is the presence of synergies between MDGs, i.e. the fact that achievements in terms of one MDG can have an impact on other MDG outcomes. Thus, improvements in the water and sanitation targets, expressed as service delivery relative to the size of population, are a function of the

¹⁰ Mathematically, a two-level structure is used in the MDG production block. At the bottom level (i), intermediate variables are defined in a set of constant-elasticity (CE) functions. At the top (ii), each intermediate variable is fed to a logistic function with diminishing marginal returns in the intermediate variable (and, indirectly to the arguments of the underlying CE function).

growth in public per capita spending on water and sanitation, growth in government spending on public infrastructure, and growth of per capita consumption. Achievement of health MDGs depends on growth in public per capita spending on health, public expenditure on infrastructure, growth in per capita consumption, and improvements in water and sanitation service delivery. Although improvements in public infrastructure are not part of the MDGs, they serve as a key input in the MDG production function, and also contribute to overall growth by adding to the productivity of other production activities.

The treatment of the education sector slightly differs from other MDGs. The model explicitly tracks base-year stocks of students and new entrants through the three education cycles. In each year, students will successfully complete their grade, repeat it, or drop out of their cycle. Student performance depends on educational quality (growth in spending per student), improvements in household welfare (per-capita household consumption, which captures the demand side), growth in public infrastructure spending, wage incentives (the economy-wide wage premium of completing the next cycle of education), and health status (proxied by MDG 4).¹¹ The achievement of MDG 2 requires that all students in the relevant age cohort enter the primary cycle and successfully complete each year within this cycle. In the model, this is translated into requiring that the rates of 1st grade entry, graduation, and continuation to next grade within the primary cycle are at or very close to 100 percent for a five-year period prior to 2015.

The MAMS model does not explicitly track the progress of MDG 1. A simple approach to follow the progress on poverty reduction is to use a poverty elasticity of the growth in household per capita consumption. This study takes a more sophisticated path by utilizing a macro-micro approach, where a set of aggregate results from MAMS are passed on to household survey data by means of a micro-simulation module. The data for our micro-simulations come from the 2001 Encuesta Permanente de Hogares de Propósitos Múltiples (EPHPM) survey, which allows us to identify employment and wages by skill and sector. The simulations then apply changes in employment, relative

¹¹ A large micro-econometric literature exists on how to model the production and the demand for education. Our approach simply summarizes the most salient points of this literature in a simple reduced form equation. The main advantage of our approach is its general equilibrium method but it is not at all a substitute to more detailed sectoral analyses.

wages, and consumption per capita from MAMS to each individual in the survey, producing a new distribution of income and translating the evolution of macro variables into poverty outcomes. Unlike the simpler poverty elasticity-based methods, the micro-simulation approach allows for four main avenues of escaping poverty: moving from agricultural employment to non-farm activities where the wages tend to be higher, upgrading individual skills (through schooling), changes in relative wage changes, and an economy-wide growth component that equally benefits all households.

The production functions for education and the other MDGs have been calibrated to assure that, under base-year conditions, base-year performance is replicated and that, under a set of other conditions identified by sector studies, the relevant targets are fully achieved. This approach also implies that the modeling of MDG production does not mechanically link more inputs, i.e. increased production of social services, to higher attainments, but reproduces, in reduced form, the functioning of the sectors and the interactions of demand and supply within them. Thus, the model consolidates knowledge from sector studies and incorporates various bottlenecks that are likely to hinder MDG achievement.

A major advantage of MAMS is its ability to simultaneously determine MDG progress, supply and demand of private goods and services, and factor markets equilibrium. In the model, this is accomplished through several links between the MDG module and the rest of the economy. Firstly, the increase in government service provision needed to reach the MDGs requires additional resources—capital and investment, labor, and intermediate inputs—that become unavailable to the rest of the economy. As an example, this link allows the model to capture the wage hikes for skilled labor that may stem from the combination of its small supply and rapid demand expansion (from MDG services that are intensive in skilled labor). These demand increases are likely to reduce the number of skilled workers available to the private sector even as increased school enrollment reduces the overall labor force. On the other hand, by allocating graduates and dropouts from the education system to different segments of the labor force (as a function of the highest degree achieved), MAMS captures the supply side of expanding education services, which works in the opposite direction by depressing relative wages of labor categories with the most rapid growth. If government services rely heavily on these labor

types, government costs and financing needs decline. Moreover, a higher average level of education raises the productivity and the wages of the labor force, with a positive feedback on growth, private incomes, government revenues, and MDG achievements.

The effects of any program depend on its source of financing, be it from foreign donors, domestic taxes, or from domestic borrowing. Other things being equal, higher taxes reduce private savings and consumption spending and have an immediate negative impact on efforts to reduce poverty and stimulate growth. On the other hand, increased domestic borrowing crowds out private investment with little direct impact on private consumption, but is likely to spell pronounced negative long-run consequences for private capital accumulation and growth. Financing from foreign sources is also not free from perils, as increased foreign aid may lead to exchange rate appreciation with economy-wide repercussions, including a loss of competitiveness in export sectors ('Dutch disease') and incentives for consumers to switch from domestic outputs to imports. At the same time, the pursuit of the MDGs generates additional resources as it influences the composition of the remaining labor force, raising the shares of skilled and tertiary-skilled workers. The performance of the rest of the economy will also influence the ease with which different MDGs can be achieved. Higher private disposable incomes provide the additional resources that enable private households to draw more benefit from government health and education programs. More rapid growth raises government revenues, strengthening the ability of governments to finance and operate efficient programs.

The dynamic structure of the MAMS model allows it to capture the various time lags and sequencing issues with regards to MDG achievement. Expansion of MDG services may be designed with different paths, reaching required target levels at constant growth rates or doing so with different degrees of front- or back-loading. The model accounts for population growth, the age structure of the population, the multi-year duration of the various education cycles, and the time lags between expansion in the number of students and graduates at low levels of education and changes in the structure of the labor force.

4 Social accounting matrix and other data

Discussion in the previous section makes it clear that the data requirements of the MAMS model are quite substantial. Section 2 above has already mentioned the sources of information for the current state of MDG achievement and the required expansion in public service delivery to reach the targets by 2015. However, many other data are needed to set up and calibrate the MAMS model. These include a social accounting matrix (SAM) that provides a break-down of public activities by the relevant MDG sectors (primary education, health, etc), detailed data on education including graduation, drop-out, and repetition rates by cycle, the volumes of workers and students at each education level, and various elasticity parameters. The following discussion briefly touches upon each of these data components.

The starting point for our disaggregated SAM (which has the dimensions listed in Table 5) is a macroeconomic SAM for Honduras in 2004, constructed by the authors from national accounts data. In order to disaggregate the SAM, we rely on various sources including detailed information on public expenditure by activity provided by the finance ministry, wage data from the household survey (2004 EPHPM), trade and protection statistics from UN COMTRADE and UN TRAINS, and to a lesser extent an earlier 1997 SAM described in Cuesta (2004). The data on labor volumes comes from the household survey, while the data on stocks of students was downloaded from EDSTATS. The repetition, graduation, and drop-out rates were obtained from background information for the education indicators published by SIERP.

Since no elasticity values (MDG or otherwise) are available for Honduras and their estimation is problematic due to data constraints, the values of key model elasticities have been borrowed from other studies. Although this introduces a certain degree of imprecision in the model results, we believe this approach is justified for two main reasons. First, our elasticity values are within a reasonable range (established in the existing CGE literature) and are close to the elasticities used in other Central American MDG studies (e.g. the Dominican Republic). Second, the conclusions of this study are not meant to be taken as definitive statements about the resource scale-up requirements to reach the MDGs in Honduras. Instead, the purpose is to highlight the relative importance of various determinants of MDG outcomes and, within a consistent economy-wide

framework, discuss the relative merits of various sources of financing and the implications of a targeted pursuit of MDGs on the rest of the economy.

5 Simulations and results

5.1 Baseline scenario

Our baseline simulation defines a backdrop against which other scenarios will be compared. Under base conditions, real GDP per capita grows at 2.1 percent per year—consistent with IMF and Government of Honduras growth projections, but much faster than the 0.5 percent average annual growth recorded over the 1990-2004 period (see Table 6, which documents the levels and growth in this as well as other key macro variables). No targeted MDG policies are implemented in the baseline scenario—instead, the level of government service provision in public infrastructure, water and sanitation, health, and education sectors grows exogenously at 5 percent per annum (slightly faster than real GDP). Spending in the general government sector is also set to grow exogenously at 5 percent per year, so that both public consumption and investment grow at the same rate in the baseline.

Table 6 Baseline macro variables

		2004	2010	2015	Annual growth
Nominal GDP	(bn lcu)	135.7	181.2	220.2	4.5
Real GDP at factor cost	(bn lcu)	120.5	158.5	188.7	4.2
Real GDP	(bn lcu)	135.7	178.4	212.1	4.1
Private consumption	(% of GDP)	85.5	85.6	85.8	4.2
Government consumption	(% of GDP)	12.3	12.6	13.5	5.0
Investment	(% of GDP)	26.2	26.6	27.7	4.7
Private	(% of GDP)	20.9	21.2	21.8	4.6
Public	(% of GDP)	5.4	5.5	5.9	5.0
Exports	(% of GDP)	42.3	41.5	40.1	3.6
Imports	(% of GDP)	66.3	66.3	67.0	4.3
Real GDP per capita	(lcu)	18,972	21,969	23,860	2.1
Exchange rate	lcu per USD	1.00	0.99	0.97	-0.3
Trade-to-GDP	(%)	108.5	107.9	107.1	-0.1
Investment-to-absorption	(%)	21.2	21.2	21.4	0.1
Prv. Investment-to-absorption	(%)	16.8	16.8	16.8	0.0
Gov. Investment-to-absorption	(%)	4.3	4.4	4.5	0.4
Gov. current spending-to-absorption	(%)	9.9	11.0	12.6	2.2
Gov. total spending-to-absorption	(%)	14.3	15.3	17.2	1.7

Government financing needs are determined by its current and capital expenditures on MDGs and the rest of the public sector. The balance between government income and current public spending is cleared by a flexible direct tax rate, which changes uniformly for all domestic institutions. The stock of public debt to households (bond issues) and the Central Bank grows exogenously at two percent per year and determines the domestic borrowing needs. Foreign borrowing (in domestic currency units) remains fixed at the base year level, when it amounted to 2.1 percent of GDP. Foreign grants are also fixed at the base year level (zero), and flexible government saving clears the public capital account. Flexible foreign exchange rate assures equality between inflows and outflows of foreign currency. Due to increasing inflows of foreign currency (through foreign borrowing), the exchange rate slightly appreciates, leading to a small decrease in the domestic currency value of foreign borrowing. The detailed behavior of government investment financing is shown in Table 7.

Table 7 Baseline public saving-investment balance

		2004	2010	2015	Annual growth
<i>Outflows</i>	(% of GDP)				
Investment		5.4	5.5	5.9	5.0
<i>Inflows</i>	(% of GDP)				
Saving		2.4	3.1	3.8	8.4
Income from bonds		0.4	0.5	0.4	3.5
Income from CB		0.4	0.5	0.4	3.5
Foreign borrowing		2.1	1.5	1.3	-0.3
Foreign grants		0.0	0.0	0.0	
<i>Memo: Foreign grants per capita</i>	(USD)	0.0	0.0	0.0	

Beyond the major macro indicators, the main variables of interest in the baseline are the levels of MDG attainment and the behavior of the labor market. Since the growth of social spending on MDGs falls short of the requirements identified by sector studies, none of the goals are attained (see Table 8). Furthermore, although the growth rates in our baseline significantly surpass historical averages, 2 percent per capita income growth is not sufficient to assure that Honduras reaches the poverty target. Comparing this baseline performance with the targets in Table 2 reveals that MDG performance under baseline conditions varies across different goals: the biggest improvements (more than 60 percent distance to target) are observed for the education goal. The progress towards health goals is also significant (approximately 50 percent of distance to target), while the

water, sanitation, and poverty targets remain mostly out of reach (23, 26, and 19 percent of distance to target is covered in the baseline).

Table 8 MDG achievement in baseline

		2004	2010	2015	Annual growth
Poverty headcount	(%)	64	55	60	-0.6
Primary completion rate	(%)	76	80	91	1.6
Under-5 mortality	(per 1,000)	41	36	33	-2.1
Maternal mortality	(per 100,000)	108	97	90	-1.7
Access to safe water	(%)	82	84	85	0.3
Access to sanitation	(%)	77	79	81	0.5

One of the more interesting general equilibrium effects of MDG policies in Honduras is the impact of the progress in education on the labor markets. The demographic distribution of Honduras is heavily skewed towards younger age groups—almost 45 percent of the total population is 16 years old or younger. Any education policy aimed at keeping children in school and encouraging them to continue their education at the next level is bound to have large distributional and temporal effect on the labor force in Honduras—first, as enrollment, completion, and continuation to the next education cycle rates rise, the relative share of unskilled labor will decline in favor of more skilled categories, and second, increasingly larger parts of the labor force will leave the labor market (to go to school) and return after having completed their education. These impacts are already seen in the baseline scenario, even though MDG2 remains unattainable.

Due to the success of previous education policies, secondary school enrollment in Honduras is large relative to the stock of its secondary school educated labor (almost 70 percent of secondary-skilled employment in 2004). Furthermore, the improvements in primary education in the baseline scenario encourage more young adults to continue their education at the secondary level. The combination of these two factors causes skilled labor to grow slightly faster than unskilled labor, even after assuming that only four-fifths of secondary school graduates find skilled jobs. The growth in the stock of skilled labor could be even larger, but the expansion in the number of secondary-skilled workers is mitigated by the increased number of secondary drop-outs. Although part of this increase is due to the declining quality of the secondary education system (which faces a growing number of new entrants while its budget increases at a constant rate), this effect is mainly

driven by fast growth in secondary enrollment and a consequent increase in the absolute number of secondary drop-outs. At the same time, since the volume of public demand for social services grows one percentage point faster than real GDP—and these services are relatively skill-intensive—demand for skilled labor also rises, which explains the widening of the skilled-unskilled wage gap by 2015.

5.2 MDG scenario

Our second scenario explicitly targets the attainment of MDGs 2, 4, 5, 7a and 7b through large expansion in the primary education, health, water and sanitation, and public infrastructure services. As mentioned earlier, we do not explicitly model the achievement of MDG 1, but instead track its progress by means of micro-simulation techniques described in the earlier section. In order to reach the MDGs, we use the growth rates in various categories of government expenditure provided by the sector studies as a starting point, which is then adjusted by the model to account for cross-MDG synergies and other general equilibrium effects. We assume a constant rate of improvement in the water and sanitation, health, and education targets, and use the information above to calculate the required volume of public expenditure necessary to attain these goals over the model horizon (2005-2015). In the education sector, the growth rate of primary school expenditure is such that graduation rates reach 100 percent by 2010,¹² while expenditure on secondary and tertiary schooling is maintained at baseline levels. Since the sectoral studies referenced in the earlier sections explicitly considered improvements in infrastructure as a key part of the government’s MDG strategy, our MDG simulation also incorporates faster growth in public infrastructure spending. As a best-case benchmark scenario, we consider the possibility that all of the additional MDG expenditures are financed by foreign donors—that is, domestic taxes are fixed at the baseline levels and any budgetary shortfall is made up by flexible foreign grants finance the increased public expenditures necessary for MDG achievement. The MDG results and the government expenditure required to reach them are shown in

Table 9.

Table 9 MDG performance: MDG achievement scenario

		2004	2010	2015	Annual growth
Poverty headcount	(%)	64		55	-1.3
Primary completion rate	(%)	76	91	99	2.5

¹² This requirement is due to the length of the primary education cycle and the definition of MDG 2. If the target is defined as reaching (close to) 100 percent primary school completion in 2015 and the length of the primary education cycle is 6 years, achievement of MDG 2 implies that 100 percent of children of primary school age must enter the first grade in 2010 and complete grades 1 through 6 at 100 percent rates.

Under-5 mortality	(per 1,000)	41	28	24	-4.8
Maternal mortality	(per 100,000)	108	81	70	-3.9
Access to safe water	(%)	82	88	95	1.3
Access to sanitation	(%)	77	86	96	2.1
<i>Government current expenditure</i>					
Primary education	(% of GDP)	3.6	6.4	5.1	7.7
Secondary education	(% of GDP)	1.4	1.5	1.6	5.0
Tertiary education	(% of GDP)	1.1	1.1	1.2	5.0
Health	(% of GDP)	2.6	4.2	6.3	12.6
Water and sanitation	(% of GDP)	0.2	0.3	0.5	12.8
Public infrastructure	(% of GDP)	0.6	1.1	2.0	16.3
<i>Government investment</i>					
Primary education	(% of GDP)	0.1	0.4	0.0	30.8
Secondary education	(% of GDP)	0.0	0.0	0.0	5.0
Tertiary education	(% of GDP)	0.0	0.0	0.0	5.0
Health	(% of GDP)	0.1	0.3	0.5	19.4
Water and sanitation	(% of GDP)	0.3	1.0	1.5	19.8
Public infrastructure	(% of GDP)	1.0	4.6	8.3	25.7

The results of the MDG scenario show that a large, sustained increase in government spending over the baseline level is required in order to reach the targets by 2015. In all instances, the required growth in current spending is more than twice the baseline growth, and investment in various sectors needs to grow by more than three times the baseline rates.¹³ Due to a large increase in government spending, per capita GDP growth also accelerates to 3.2 percent per year, but this growth is still not sufficient to reach the poverty MDG where the target headcount is 42 percent of the population. In fact, even under these favorable growth conditions the gap between the 2004 poverty levels and the MDG target is reduced by less than one half.

Comparing the growth rates in government expenditure with the results of sectoral studies (see Table 3) reveals the importance of cross-MDG complementarities in assessing the costs of reaching multiple MDGs. In our modeling approach, spending on public infrastructure facilitates production of the MDGs, therefore lower sector-specific expenditures are needed with higher levels of infrastructure spending; additionally, progress in water and sanitation exerts a positive influence on health and thus allows for savings in the production of health services; finally, a healthier students population more easily achieves completion of its school cycles. Another important factor that enters the

¹³ Note that investment growth in education is reported for the 2004-2010 period, since the primary education system is assumed to reach its full potential by then and any future expenditure is directed towards maintaining the 2010 schooling levels.

‘production’ of MDGs is the household per capita consumption. When the government expands its activities (depending on the way it finances its spending and on other macro conditions, such as the movements in the real exchange rate) it can crowd out private consumption, at least in the time frame analyzed here. This effect is fairly small, as per capita consumption over the 2004-2015 period grows only 0.15 percentage points slower than GDP per capita. Moreover, this growth is still faster than the consumption growth rate considered for MDG costing projections, which has positive spill-over effects for MDG attainment and the level of public expenditures required to reach the targets.

As an example, consider the water and sanitation sector, which benefits from positive externalities due to the expansion of public infrastructure services and faster growth in household consumption. Consequently, the growth rate of current spending in the water and sanitation sector is below to the growth identified in partial-equilibrium studies (compare the 13% in Table 9 with the 14% of Table 3). The required growth in health, and to a larger degree primary education, is also significantly below the estimates of sector studies—reflecting the positive “multiplier” effect of several cross-MDG synergies.

The education sector results deserve a more detailed examination, due to the critical importance of the education system as a source of new labor market entrants. Due to the increased rates of enrollment, graduation, and continuation to the next education cycle, the 2015 labor force in the MDG scenario is four percent below the 2015 labor force under baseline conditions. Furthermore, the structure of the labor force also changes across the two scenarios: in the MDG simulation, the volume of unskilled labor in 2015, compared to the BaU case, falls by more than one-third, while the stock of skilled labor rises by 24 percent and that of tertiary labor by 7 percent. The decrease in the number of unskilled workers is driven by two factors: first, the number of out-of-system entrants into the unskilled labor force¹⁴ falls to almost zero by 2010, and second, the number of primary school graduates who do not continue their education at the secondary level falls to zero by 2012. However, the large influx of new students at the secondary level without

¹⁴ These are the children who never enter the school system and instead join the labor force by the time they reach secondary school age. In order to reach the education MDG, the net entrance rate for primary school age children must rise to 100 percent by 2010—therefore placing all relevant children in school and eliminating the out-of-system entrants.

a significant increase in spending places severe constraints on the secondary system's ability to provide a quality education. Therefore, the rates of graduation and continuation to the next cycle remain stagnant through the planning period, and, although the absolute number of graduates increases, the number of drop-outs who enter the unskilled labor market also goes up.

A major general equilibrium effect of improved primary education performance is the growth penalty of a smaller total labor force, at least during the transition phase when potential unskilled workers do not work and go to school.¹⁵ Although per capita GDP grows faster than the baseline, it is significantly below what would be expected had the labor supply been growing at the baseline rates. Therefore, additional government education expenditure growth is necessary to offset the lower growth in consumption per capita. Obviously, a better educated labor force would contribute to stronger growth rates in the future. However, in the initial transition phase, Honduras is faced with an important trade-off similar to that faced by poor households who have to decide whether to send their young members to school and forgo their incomes or get them to work but deprive them of potentially higher earnings in the future.

Another key effect is the interaction between labor supply and labor demand. In the MDG scenario, as the supply of unskilled labor declines while the supply of skilled labor rises, the skilled-unskilled wage gap narrows by 14 percent relative to the base year (see Table 10). The small magnitude of this change is somewhat surprising, given the large changes in labor force composition described in the previous paragraph. The reason is that the public sector in general, and MDG-related public services in particular, are much more skill-intensive than the rest of the economy. As the demand for MDG services increases, the public sector demands more skilled and tertiary-skilled workers, and their wages increase. Therefore, the demand effects somewhat offset the influence of the changing composition of labor and moderate the reduction in the skill premium. This is more easily seen for tertiary-skilled workers, who, despite growing faster than in the

¹⁵ The model version used in this paper does not allow for changes in labor force participation rates between 2004 and 2015. As unskilled wages rise (because unskilled labor is relatively more scarce—see Table 10 and the accompanying discussion) more unskilled workers may choose to enter the labor force. However, this effect could be mitigated by difficulties in finding employment, which could include formal barriers to labor mobility (such as prohibitive hiring costs), specificity of human capital required for certain tasks, and location challenges (e.g. moving from remote rural areas to cities).

baseline, earn significantly higher wages. Higher wages for these workers also mean higher production costs for the whole economy and affect, together with other variables, its macroeconomic performance.

Table 10 Factors and factor payments in MDG scenario

		2004	2010	2015	Annual growth
Unskilled labor	(thou)	1,787	2,095	2,328	2.4
Skilled labor	(thou)	492	633	810	4.6
Tertiary-skilled labor	(thou)	172	191	200	1.4
Private capital		263	380	521	6.4
Unskilled wage	(thou)	23.5	26.4	30.4	2.7
Skilled wage	(thou)	54.5	61.4	60.6	1.0
Tertiary wage	(thou)	125.1	214.4	274.0	8.0
Capital rent		0.1	0.1	0.1	-2.3

The behavior of model macro variables is summarized in Table 11. We have already mentioned that per capita GDP grows faster than the baseline, although still not fast enough to reduce poverty by one half from the 1990 levels. Private consumption and investment grow significantly faster than the baseline due to higher overall growth. Government consumption growth is more than 70 percent above baseline, while public investment growth is more than twice the baseline level, leading to a doubling of public investment as a share of GDP. At the same time, this growth is significantly below the average growth in MDG services, reflecting the fact that government services not directly related to MDG production continue to grow at baseline rates. As a consequence of large foreign grant inflows required to finance the growth in MDG sectors, the exchange rate appreciates much more rapidly than the baseline. This erodes the competitiveness of Honduran producers, reducing exports growth by 10 percent and boosting the growth of imports by just under 50 percent.

Table 11 Macro variables: MDG scenario

		2004	2010	2015	Annual growth
Nominal GDP	(bn lcu)	135.7	197.6	262.3	6.2
Real GDP at factor cost	(bn lcu)	120.5	166.1	214.4	5.4
Real GDP	(bn lcu)	135.7	185.8	239.4	5.3
Private consumption	(% of GDP)	85.5	85.3	83.9	5.1
Government consumption	(% of GDP)	12.3	16.8	17.4	8.7
Investment	(% of GDP)	26.2	33.3	37.1	8.7
Private	(% of GDP)	20.9	23.5	24.4	6.8
Public	(% of GDP)	5.4	9.8	12.7	13.9
Exports	(% of GDP)	42.3	35.3	34.2	3.3
Imports	(% of GDP)	66.3	70.7	72.6	6.2
Real GDP per capita	(lcu)	18,972	22,880	26,934	3.2
Exchange rate	lcu per USD	1.00	0.91	0.89	-1.1
Trade-to-GDP	(%)	108.5	106.0	106.8	-0.1
Investment-to-absorption	(%)	21.2	23.9	25.6	1.7
Prv. Investment-to-absorption	(%)	16.8	16.8	16.8	0.0
Gov. Investment-to-absorption	(%)	4.3	7.0	8.8	6.6
Gov. current spending-to-absorption	(%)	9.9	14.5	16.0	4.4
Gov. total spending-to-absorption	(%)	14.3	21.6	24.8	5.1

The financing requirements to reach the MDGs are very large (Table 12). Since direct tax rates are fixed in the MDG scenario, government saving is driven into negative territory. In order to make up the shortfall in the public budget, foreign grants rise from zero to 15 percent of GDP by 2015. In per capita terms, this increase translates to US\$190 for each resident of Honduras.

Table 12 Government's financing requirements to reach MDGs

		2004	2010	2015	Annual growth
<i>Outflows</i>	(% of GDP)				
Investment		5.4	10.2	14.4	13.9
<i>Inflows</i>	(% of GDP)				
Saving		2.4	-3.1	-2.4	
Income from bonds		0.4	0.5	0.4	3.5
Income from CB		0.4	0.5	0.4	3.5
Foreign borrowing		2.1	1.4	1.2	-1.1
Foreign grants		0.0	11.0	14.7	
<i>Memo: Foreign grants per capita</i>	(USD)	0.0	130.8	190.1	

5.3 Pursuit of individual MDGs—the role of cross-complementarities

The results and discussion in the previous sections have heavily emphasized the fact that cross-MDG complementarities are a key feature of the MAMS model. This innovation

follows the existing empirical evidence that access to clean water and sanitation improves health indicators and that improved health is beneficial for completing primary school. It also implies that simply costing each intervention and adding up the individual components could lead to serious double-counting. We have seen evidence of this in the previous section, where the required growth rates in MDG service provisions were lower than those suggested by partial equilibrium sector studies. In order to assess the effects of ignoring these complementarities, this section implements three sensitivity-type simulations—each of them targeting one set of MDGs (water and sanitation, health, and education) and making no progress on the others. In each scenario, public infrastructure growth is maintained at the level required for MDG achievement (i.e. infrastructure spending grows at the same rate as the full MDG scenario).

Table 13 MDG performance: targeting MDG 7a-b only

		2004	2010	2015	Annual growth
Poverty headcount	(%)	64		57	-1.1
Primary completion rate	(%)	76	81	93	1.8
Under-5 mortality	(per 1,000)	41	35	30	-2.7
Maternal mortality	(per 100,000)	108	95	85	-2.1
Access to safe water	(%)	82	88	95	1.3
Access to sanitation	(%)	77	86	96	2.1
<i>Government current expenditure</i>					
Primary education	(% of GDP)	3.6	3.6	3.9	5.0
Secondary education	(% of GDP)	1.4	1.5	1.6	5.0
Tertiary education	(% of GDP)	1.1	1.1	1.2	5.0
Health	(% of GDP)	2.6	2.7	2.9	5.0
Water and sanitation	(% of GDP)	0.2	0.3	0.5	12.9
Public infrastructure	(% of GDP)	0.6	1.1	2.0	16.3
<i>Government investment</i>					
Primary education	(% of GDP)	0.1	0.1	0.1	5.0
Secondary education	(% of GDP)	0.0	0.0	0.0	5.0
Tertiary education	(% of GDP)	0.0	0.0	0.0	5.0
Health	(% of GDP)	0.1	0.1	0.1	5.0
Water and sanitation	(% of GDP)	0.3	1.0	1.5	19.9
Public infrastructure	(% of GDP)	1.0	4.6	8.3	25.7

Table 13 shows the results of implementing a scenario where only the MDG 7a-b are targeted. Despite the fact that growth in government expenditure categories other than infrastructure and water-sanitation is kept at baseline levels, significant improvements are seen across all MDGs. By 2015, the poverty headcount is 4 percent lower than the level recorded in the baseline, primary completion rate is 2 percent higher, and the child and

maternal mortality indicators decline by 3 and 5 percent, respectively. The growth in water and sanitation service provision remains the same as in the full MDG scenario due to the fact that no other MDG enters the production function for water and sanitation.

Table 14 MDG performance: targeting MDGs 4-5 only

		2004	2010	2015	Annual growth
Poverty headcount	(%)	64		57	-1.1
Primary completion rate	(%)	76	82	93	1.9
Under-5 mortality	(per 1,000)	41	29	24	-4.8
Maternal mortality	(per 100,000)	108	81	70	-3.9
Access to safe water	(%)	82	84	86	0.4
Access to sanitation	(%)	77	80	84	0.9
<i>Government current expenditure</i>					
Primary education	(% of GDP)	3.6	3.6	3.9	5.0
Secondary education	(% of GDP)	1.4	1.5	1.6	5.0
Tertiary education	(% of GDP)	1.1	1.1	1.2	5.0
Health	(% of GDP)	2.6	4.2	6.4	12.9
Water and sanitation	(% of GDP)	0.2	0.2	0.2	5.0
Public infrastructure	(% of GDP)	0.6	1.1	2.0	16.3
<i>Government investment</i>					
Primary education	(% of GDP)	0.1	0.1	0.1	5.0
Secondary education	(% of GDP)	0.0	0.0	0.0	5.0
Tertiary education	(% of GDP)	0.0	0.0	0.0	5.0
Health	(% of GDP)	0.1	0.3	0.5	19.8
Water and sanitation	(% of GDP)	0.3	0.3	0.3	5.0
Public infrastructure	(% of GDP)	1.0	4.6	8.3	25.7

Table 14 presents a second set of results, where we target only the health MDGs. Because the expenditures required to achieve the health targets exceed those needed for improved water and sanitation coverage (and consequently more foreign financing is obtained), the poverty results improve slightly from the MDG 7a-b simulation. Education performance is also improved over the previous simulation, due to the more direct impact of health on primary completion rates. However, both current and capital expenditure in the health sector have to more rapidly in this scenario than in the full MDG achievement, since the positive spillovers from reaching the water and sanitation goals are now forgone. In fact, current expenditure on health in 2015 increases by 0.1 percent of GDP (300 million Lempiras) above what would be required under the full MDG achievement scenario.

Table 15 MDG performance: targeting MDG 2 only

		2004	2010	2015	Annual growth
Poverty headcount	(%)	64		56	-1.2
Primary completion rate	(%)	76	91	99	2.5
Under-5 mortality	(per 1,000)	41	35	31	-2.5
Maternal mortality	(per 100,000)	108	95	86	-2.0
Access to safe water	(%)	82	84	86	0.4
Access to sanitation	(%)	77	80	84	0.9
<i>Government current expenditure</i>					
Primary education	(% of GDP)	3.6	6.6	5.3	8.0
Secondary education	(% of GDP)	1.4	1.5	1.6	5.0
Tertiary education	(% of GDP)	1.1	1.1	1.2	5.0
Health	(% of GDP)	2.6	2.7	2.9	5.0
Water and sanitation	(% of GDP)	0.2	0.2	0.2	5.0
Public infrastructure	(% of GDP)	0.6	1.1	2.0	16.3
<i>Government investment</i>					
Primary education	(% of GDP)	0.1	0.4	0.0	31.7
Secondary education	(% of GDP)	0.0	0.0	0.0	5.0
Tertiary education	(% of GDP)	0.0	0.0	0.0	5.0
Health	(% of GDP)	0.1	0.1	0.1	5.0
Water and sanitation	(% of GDP)	0.3	0.3	0.3	5.0
Public infrastructure	(% of GDP)	1.0	4.6	8.3	25.7

Table 15 presents the results of our final simulation, where only the education MDG is targeted. Even though the education goal does not have any explicit links to any of the other MDGs, the other indicators show slight improvement over the baseline due to the positive influence of expansion in infrastructure. Similar to the earlier simulations, government spending on education must grow faster than in the full MDG scenario. In addition to the loss of positive externalities from health and water-sanitation, this result is caused by the labor market impacts of pursuing MDG 2, which, as mentioned in the previous section, reduce the overall labor force and therefore lower income growth. The labor market “growth penalty” is sufficient to more than offset the positive spillover effects of faster public infrastructure spending, which results in a higher rate of growth in education spending between 2004 and 2010 than identified in the partial equilibrium studies.

5.4 Alternative financing scenarios

An important feature of the full MDG scenario is the assumption that foreign grants will provide all of the financing required to reach the MDGs. Given the very large expenditure increases needed to meet the goals, one might ask whether Honduras is likely

to secure the necessary amounts of foreign aid and if not, what effects this might have on the MDGs and the rest of the economy. To test the sensitivity of our results to alternative financing closures, we fix the amount of available foreign grants to one half of the amount provided in the full MDG scenario. We continue to impose MDG achievement for goals 2, 4, 5, 7a, and 7b, therefore forcing the government to raise additional funds from domestic resources. For this simulation, we allow the government to vary direct tax rates in order to obtain the necessary financing. The behavior of the government savings-investment account is shown in Table 16.

Table 16 Government financing: foreign grants at half the required level

		2004	2010	2015	Annual growth
<i>Outflows</i>	(% of GDP)				
Investment		5.4	10.3	14.4	13.9
<i>Inflows</i>	(% of GDP)				
Saving		2.4	2.0	4.7	
Income from bonds		0.4	0.5	0.4	3.5
Income from CB		0.4	0.5	0.4	3.5
Foreign borrowing		2.1	1.5	1.2	-0.5
Foreign grants		0.0	5.8	7.6	
<i>Memo: Foreign grants per capita</i>	(USD)	0.0	69.8	99.1	

The MDG results are summarized in Table 17. Since our only changes to the model specification involve the sources of financing, the required expenditures and MDG attainment of the targeted goals remain unchanged from the foreign grants MDG scenario. However, Table 17 highlights one critical difference between the two financing closures—the poverty headcount is significantly higher when half of the resources are raised by increasing taxes on domestic consumers, although it is still two percent below baseline poverty levels.

Table 17 MDG performance: foreign grants at half the required level

		2004	2010	2015	Annual growth
Poverty headcount	(%)	64		58	-0.9
Primary completion rate	(%)	76	91	99	2.5
Under-5 mortality	(per 1,000)	41	28	24	-4.8
Maternal mortality	(per 100,000)	108	81	70	-3.9
Access to safe water	(%)	82	88	95	1.3
Access to sanitation	(%)	77	86	96	2.1
<i>Government current expenditure</i>					
Primary education	(% of GDP)	3.6	6.5	5.2	7.8
Secondary education	(% of GDP)	1.4	1.5	1.6	5.0
Tertiary education	(% of GDP)	1.1	1.1	1.2	5.0
Health	(% of GDP)	2.6	4.2	6.3	12.7
Water and sanitation	(% of GDP)	0.2	0.3	0.5	13.0
Public infrastructure	(% of GDP)	0.6	1.1	2.0	16.3
<i>Government investment</i>					
Primary education	(% of GDP)	0.1	0.4	0.0	31.1
Secondary education	(% of GDP)	0.0	0.0	0.0	5.0
Tertiary education	(% of GDP)	0.0	0.0	0.0	5.0
Health	(% of GDP)	0.1	0.3	0.5	19.6
Water and sanitation	(% of GDP)	0.3	1.0	1.5	20.1
Public infrastructure	(% of GDP)	1.0	4.6	8.3	25.7

Table 18 allows us to examine this issue in more detail by documenting the evolution of main macro variables. As a result of higher taxes, private consumption grows 0.7 percent per year slower than in the full foreign grants scenario. On the other hand, the per capita GDP growth remains virtually unchanged. This is driven by the fact that factor endowments stay the same, and the shortfall in private domestic spending is made up through higher exports due to less pronounced Dutch disease effects (as the exchange rate appreciates more slowly, imports growth also falls). Therefore, the macroeconomic consequences of this alternative financing closure are moderate and imply that it is possible for Honduras to raise a large share of financing required for MDG attainment domestically. At the same time, crowding out of private consumption is an area of significant policy concern, particularly because the poor households appear to bear a large share of the burden of slower growth. In fact, if all of the MDG-related expenditures are financed through domestic taxation or domestic borrowing, poverty headcount in 2015 is more than two percentage points higher than under baseline conditions in the same year, despite significantly faster growth in GDP per capita.

Therefore, these results highlight the importance of complementary policies to offset the negative effects on the poor through better targeting of the existing social safety nets.

Table 18 Macro variables: foreign grants at half the required level

		2004	2010	2015	Annual growth
Nominal GDP	(bn lcu)	135.7	193.5	254.3	5.9
Real GDP at factor cost	(bn lcu)	120.5	165.2	212.5	5.3
Real GDP	(bn lcu)	135.7	185.2	238.1	5.2
Private consumption	(% of GDP)	85.5	80.7	77.8	4.4
Government consumption	(% of GDP)	12.3	16.9	17.6	8.7
Investment	(% of GDP)	26.2	32.3	35.8	8.3
Private	(% of GDP)	20.9	22.4	22.9	6.2
Public	(% of GDP)	5.4	9.9	12.8	13.9
Exports	(% of GDP)	42.3	37.5	36.9	3.9
Imports	(% of GDP)	66.3	67.3	68.1	5.5
Real GDP per capita	(lcu)	18,972	22,814	26,785	3.2
Exchange rate	lcu per USD	1.00	0.95	0.94	-0.5
Trade-to-GDP	(%)	108.5	104.8	104.9	-0.3
Investment-to-absorption	(%)	21.2	24.2	26.2	2.0
Prv. Investment-to-absorption	(%)	16.8	16.8	16.8	0.0
Gov. Investment-to-absorption	(%)	4.3	7.4	9.4	7.3
Gov. current spending-to-absorption	(%)	9.9	15.0	16.6	4.8
Gov. total spending-to-absorption	(%)	14.3	22.4	26.0	5.6

6 Conclusion

Despite significant progress on most MDG indicators, Honduras lags behind other countries in Latin America and, if current trends continue, will not reach its goals by 2015. The poverty MDG is particularly worrisome, since the growth in GDP per capita required to reach the poverty headcount target of 42 percent (at the national poverty line) in 2015 must significantly exceed the IMF and government projections of 2.1 percent per year and be a major improvement over the 1990-2004 average of just 0.5 percent per annum. If MDG targets are to be reached, Honduras needs to expand its social spending significantly, and complement greater public investment in HD sectors with policies aimed at accelerating economic growth; the recent DR-CAFTA initiative is in the right direction.

The preliminary results of sectoral studies commissioned by the government provide some estimates of the magnitude of the expansion of public service provision necessary to achieve the MDGs. According to these studies, investment and current

spending on public infrastructure must grow by approximately 16 percent per year through 2015, as must service provision in primary education. Government spending in health and water-sanitation sectors has to expand by about 14 percent per year to reach the respective targets. However, these growth rates are calculated *ceteris paribus* and do not take into account the various ways in which MDGs can interact or the impact of targeted MDG policies on the rest of the economy.

In contrast, our general equilibrium approach explicitly considers the mechanisms through which service delivery and other determinants of MDG achievements interact, capturing the roles of the demand and supply sides of MDG services. Using the MAMS model, we show the importance of cross-MDG synergies, which can result in substantial cost savings. Incorporating the feedback of water-sanitation into health, health into education, and public infrastructure into all MDGs, we show that the growth in health and education necessary to reach the MDGs is closer to 13 percent per year. In terms of final year expenditures, these translate into 0.9 percent of GDP savings in health and 0.3 percent of GDP savings in primary education.

An additional advantage of using the MAMS framework is the ability to analyze competition over scarce resources between MDG services and other sectors as well as the interactions between MDG service provision and the rest of the economy via the labor market. In all cases, the large sustained increases in government consumption and investment crowd out private spending, although the relative size of the effect depends on the source of MDG financing. The labor market channel is particularly important for Honduras, where almost 45 percent of the total population is 16 years old or younger. Even under baseline conditions where the education target remains unreachable, the share of unskilled labor in the total labor force remains roughly constant over time as children remain in the school system instead of entering the labor market. The hypothetical scenario where the MDGs are attained brings about even larger changes in the labor force structure, as the composition of the labor supply makes a significant shift towards more skilled labor. Without faster growth and more demand for skilled labor, the absorptive capacity of the labor market is severely strained. The overall effect of MDG achievement on the labor market is a 4 percent decline in total labor supply by 2015, which penalizes

growth, at least in the timeframe considered in our simulations, and requires additional government education expenditure to offset the lower growth in consumption per capita.

The MAMS model also allows assessing the role of alternative MDG financing scenarios on the macro aggregates and the government budget balance. Under the assumption that MDG financing is entirely covered by flexible foreign aid, foreign grants per capita in 2015 increase to US\$190 from zero in the baseline. As a consequence of these large inflows, the exchange rate appreciates much more rapidly than in the baseline. In turn, the real exchange rate appreciation leads to a loss of competitiveness among the domestic producers, boosting the growth of imports by 50 percent and reducing the growth of exports by 10 percent. On the other hand, if only a portion of required financing is obtained from abroad, the Dutch disease effects are much less pronounced. However, since the rest of the financing needs must be met through increases in direct taxes or domestic borrowing, private consumption grows 0.7 to 1.6 percent per year slower than in the full foreign grants scenario, depending on whether the domestic resource requirements amount to one-half or all of the resources needed to reach the MDGs. Raising the resources to fund MDGs' programs domestically highlights an important trade off: HD targets are reached but, compared to the foreign grants scenario, poverty reductions are much smaller—the headcount index in 2015 rises two percent above the baseline levels in the same year under full domestic financing.

Overall, our results show that a large, sustained increase in public HD spending can lead to the achievement of MDGs, although the financing requirements are large and would necessitate a remarkable increase in foreign aid (even if part of the expenditures is financed domestically). However, without a significant acceleration in real GDP growth, the poverty target will likely remain elusive.

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