Public Policies for Human Development

Achieving the Millennium Development Goals in Latin America

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Marco V. Sánchez and Rob Vos

Introduction

For several decades, Nicaragua lagged far behind most of the countries of Latin America and the Caribbean (LAC) in terms of economic and social development. It suffered significant setbacks in the 1980s as a consequence of the armed conflict and the suspension of commercial and financial relations with the United States and the main international financial institutions (IFIs). From 1985 to 1989, per capita income dropped 7.4 per cent annually in a context of hyperinflation. This situation turned around markedly in the early 1990s once the peacemaking process was underway and commercial and financial relations resumed.

A massive influx of external aid backed an economic stabilization programme characterized by restrictive monetary policy and strong fiscal discipline. Once the economy showed signs of stability, a series of fiscal reforms and reforms of the state apparatus were undertaken, along with a far-reaching liberalization of the country's trade, foreign-exchange and financial regimes. Controls on foreign direct investment (FDI) were also removed. As a result, during the 1990s, public finances were put in order, inflation was brought down, and international trade recovered. Nonetheless, the economic recovery was neither swift nor sustained. Rather, growth slowed in the second half of the 1990s, discouraged by unfavourable internal and external factors. In the first half of the 2000s, volatile terms of trade were a source of unstable economic growth, reflecting the economy's continued external vulnerability.

In addition, the level of external public indebtedness still averaged near 150 per cent of GDP between 2000 and 2005. Because of its low income and debt problems, Nicaragua was able to benefit from the relief offered by the Heavily Indebted Poor Countries (HIPC) initiative and the Multilateral Debt Reduction Initiative (MDRI). The economy is excessively dependent on external financing and grants, including the mentioned debt-relief programmes, to pay

for the cost of its social programmes. Mounting trade deficits following import liberalization and the heavy debt-service burden have led to chronic current account deficits and continued demand for vast amounts of external financing.

In the late 1990s and during the first half of the 2000s, several programmes and strategies were formulated with support of the IFIs and aimed at reducing the high level of poverty. In 2000, Nicaragua undertook to achieve the Millennium Development Goals (MDGs) with specific targets to be met by 2015, including reducing extreme poverty. The MDGs were incorporated into the Strengthened Growth and Poverty Reduction Strategy (ERCERP: *Estrategia Reforzada de Crecimiento Económico y Reducción de la Pobreza*). This is equivalent to Nicaragua's Poverty Reduction Strategy Paper (PRSP), drawn up initially in the context of the HIPC initiative. In 2003, the goals were made part of the National Development Plan (PND) which succeeded the ERCERP.[1]

While Nicaragua's population has seen major social gains since 1990, considerable challenges remain in order to achieve the MDGs. Extreme poverty has fallen, but far from enough. Much remains to be done for all children who enter primary education to complete it on time by 2015. Increases in the access to health services have helped reduce under-five child mortality, yet similar results have not been seen in maternal mortality. The coverage of drinking water and sanitation services has expanded, yet shortcomings persist in infrastructure and water quality, and there has been too little progress towards attaining the MDG for sanitation. Consequently, public policy efforts will need to be stepped up in order to increase the likelihood of achieving the MDGs in Nicaragua.

This chapter has three purposes: first, to quantify the additional public spending that would be needed to meet the MDGs in primary education, health, and water and sanitation in Nicaragua; second, to identify viable financing strategies to cover the cost of increased public spending; and third, to assess the macroeconomic trade-offs and social impact of the additional public spending for the MDGs. The core methodology is a dynamic computable general equilibrium model, called MAMS (see Chapter 3), in which the MDGs respond to a series of determinants. The feasibility of meeting the target for reducing extreme poverty is assessed through a complementary method of microsimulations (see Chapter 2).

The rest of the chapter includes six sections. The next section highlights the main reforms implemented since 1990 and the subsequent economic performance in Nicaragua. The subsequent section addresses aspects of social policy and the progress made towards the MDGs. An analysis of the main determinants of the MDGs is presented in the fourth section. The steps taken to adapt the modelling methodology to Nicaragua's context are summarized in the following section, while the results of the simulated policy scenarios are analyzed in section six. Finally, the last section provides some final considerations and policy recommendations.

Main reforms and economic performance in Nicaragua

The 1990s represented a turning point in Nicaragua's economic and social development, as illustrated by the data in Table 11.1. The peacemaking process ushered in renewed lending from the IFIs and the resumption of commercial ties with the United States. Official assistance (grants and non-concessional loans from abroad) came to represent more than 35 per cent of GDP per year from 1990 to 1994 and, even though it fell significantly and suffered important fluctuations during 1995-2005, aid remained high on average at approximately 14 per cent of GDP per year. The external assistance supported the effective implementation of a macroeconomic stabilization programme based on tight monetary policy and strong fiscal discipline. It also supported economic performance while subsequent fiscal and other public-sector reforms and economic liberalization policies were undertaken. Nonetheless, the foreign resources did relatively little to enhance the government's space for discretionary spending, as more than 85 per cent of the official assistance is project-specific. According to preliminary estimates by Guimarães and Avendaño (2007), however, the share of aid granted in the form of budget support increased after 2006, consistent with agreements with donors in the context of the poverty reduction strategy and the Paris Declaration on Aid Effectiveness by the Development Assistance Committee (DAC).

The reform of the state apparatus included the privatization of some public enterprises. With the 1997 fiscal reform, the tax system was simplified, a land-tenure tax was introduced, and the tax base was expanded. The tax base expanded further after 2002 with the implementation of the Law on Fiscal Equity. In May 2003 all the laws related to Nicaragua's tax administration were consolidated into a single law, some tax rates were changed, mainly for luxury goods, and the income-tax rate was increased and made more progressive.

The stabilization programme and economic reforms helped consolidate public finances and substantially lower inflation. Tax revenues mounted and the non-financial public sector generated savings of over 3.6 per cent of GDP per year on average between 1995 and 2005. Nonetheless, the tax burden continued to be relatively low at around 15 per cent of GDP, while the deficit of the non-financial public sector increased to 6.5 per cent of GDP on average between 2000 and 2005, up from 5.4 per cent of GDP per year during 1995-99. Grants from abroad helped reduce the deficit, bringing it to 1 per cent of GDP in 2005; without this assistance, the deficit would have reached 4.5 per cent of GDP. Revenues from privatizations and the access to external financing reduced dependence on domestic financing. Reducing the domestic public debt was a priority during the 1990s, but the banking crises of 2000 and 2001 drove it up considerably, with maturities concentrated in the 2002 to 2004 period. The external debt, which in 1990 peaked at 1,062 per cent of GDP, was slashed drastically falling to 110 per cent of GDP in 2005.

Table 11.1 Nicaragua: Macroeconomic indicators, 1990-2005 (annual averages)

Indicator	1990-1994	1995-1999	2000-2005
External sector and foreign investment			
Exports of goods and services (% of GDP)	20.0	21.4	24.8
Imports of goods and services (% of GDP)	46.4	44.6	51.8
Trade balance (% of GDP)	-26.4	-23.2	-27.0
Current account balance (% of GDP)	-31.2	-23.3	-17.6
Remittances of emigrant workers (% of GDP)[a]	1.2	4.7	10.0
Foreign direct investment (% of GDP)	1.5	5.5	5.1
Public finances, public debt, and external assistance			
Tax burden (% of GDP)[b]	n.a.	14.1	15.4
Government savings (% of GDP)[b]	n.a.	4.4	3.6
Actual fiscal deficit before grants from abroad (% of GDP)[b,c]	n.a.	-5.4	-6.5
Actual fiscal deficit after grants from abroad (% of GDP)[b,c]	n.a.	-1.2	-2.9
Domestic public debt (% of GDP)[b]	n.a.	17.8	31.3
External public debt (% of GDP)[b]	674.9	206.6	145.7
Official external assistance (% of GDP)[d]	36.1	15.8	12.5
Concessional loans (% of GDP)	18.3	8.9	6.2
Grants (% of GDP)	17.8	6.9	6.3
Prices			
Annual inflation (%)	2.096.3	11.2	7.7
Index of real effective exchange rate (2000 = 100)	69.5	98.8	94.2
Terms of trade (2000 = 100)[e]	120.4	114.2	91.7
Production, employment and wages			
Real GDP (rate of growth)	0.6	5.4	3.2
Real per capita GDP (rate of growth)	-1.8	3.3	2.2
Employment (rate of growth)	2.1	5.6	3.7
Real wage per employed worker (rate of growth)[f]	-19.2	2.3	3.1

Source: World Bank (World Development Indicators), except for the data on public finances, public debt, and external debt, which are from the Central Bank of Nicaragua.

[a] The data for the first period exclude 1990 and 1991.

[b] Non-financial public sector.

[c] Grants from abroad include part of the project-specific external cash grants as well as interim relief in the context of the HIPC initiative.

[d] Budget support and project aid.

[e] Data for the last period exclude 2005.

[f] Data for the first period exclude 1990.

n.a.: no data available.

From 1991 to 1993, the United States Agency for International Development (USAID) and the governments of France, the Netherlands, and Finland cancelled debts owed by Nicaragua which together came to US$ 366 million (Vos and Johansson, 1998). In 1996, the former Soviet Union and other bilateral donors that are not members of the Donor Assistance Committee (DAC) (including Mexico and the other Central American countries) cancelled most of their outstanding loans to Nicaragua. The debt cancellation totalled US$ 4 million, accounting for nearly 40 per cent of Nicaragua's external debt (Dijkstra and Evans, 2003). In the context of the HIPC initiative, which came about in October 1996, before reaching the completion point in the 1997-2003 period, the country benefited from additional debt cancellation to the tune of US$ 1.3 billion. In 2004, when reaching the completion point of HIPC-II, further debt reduction was granted for US$ 4.5 billion covering the period up until 2023. In addition, US$ 896 million of Nicaragua's debt with the IFIs will be cancelled in the framework of the MDRI. The debt relief thus obtained should allow Nicaragua to allocate more budgetary resources to programmes aimed at attaining the MDGs.

The trade regime was radically reformed as of the early 1990s. The State's monopoly over trade was eliminated, and quantitative restrictions on international trade were lifted. Export taxes were eliminated in 1993, and taxes on imports dropped precipitously as a result of unilateral measures as Nicaragua joined the World Trade Organization in 1995 and subsequently entered into various free trade agreements. Special mention should be made of the treaty signed by Central American countries and the Dominican Republic with the United States (DR-CAFTA).

The trade opening was accompanied by liberalization of the exchange and financial markets, and restrictions on the FDI regime were eliminated. There was no move to a flexible exchange-rate regime, however. In February 1991, the Córdoba Oro was introduced with a fixed exchange rate tied to the U.S. dollar, and in 1993 a system of pre-announced mini-devaluations was adopted. This exchange-rate policy resulted in a marked depreciation of the real exchange rate in the early 1990s. The real exchange rate appreciated during 1993 and 1997, as the economy stabilized. From 1997 to 2001, however, the system of mini-devaluations succeeded in improving the competitiveness of the real exchange rate, which depreciated during that period. From 2001 to 2005, there was a clear and renewed trend towards exchange-rate appreciation as the pace of the mini-devaluations was slowed.

The importance of international trade for the economy increased significantly. Liberalization cheapened imports, while export promotion policies, including the system of mini-devaluations, made sales abroad more competitive. Exports have not diversified much, however. Imports grew much more than exports from 1995 to 2005. The resulting wider trade deficit was covered by rising inflows of

worker remittances from Nicaraguans abroad and high levels of foreign grants. The current account deficit of the balance of payments has declined steadily as a result since the mid 1990s. Even so, external deficits have remained relatively large, especially on account of the persistent heavy external debt-service burden. Next to concessional loans, rising FDI helped cover the wide current account deficits. FDI recovered notably in the second half of the 1990s, stabilizing at just over 5 per cent of GDP in the period from 1995 to 2005.

The economic gains from controlling inflation and the reforms were felt in the 1990s, but did not translate into a swift and sustained economic recovery. The rate of growth of real per- capita GDP fluctuated in the 1990s (see Figure 11.1) and, in general, fell, on average, from 3.3 per cent per year in the second half of the 1990s to 2.2 per cent per year in the period 2000-05. By and large, the economy showed major volatility as a result of its high degree of external vulnerability.

Based on a decomposition of GDP growth, Sánchez and Vos (2006) determined that the contraction in spending and tax reform limited growth in the 1990-2003 period. They also determined that trade liberalization stimulated the propensity to import and that exports became the engine of the economy's modest growth. During part of the second half of the 1990s, output growth was also supported by expanding investment, especially for the reconstruction of infrastructure following Hurricane Mitch in the late 1990s. The abrupt slowdown in 1999, which endured until 2002, is explained by the end of the reconstruction process, the slowdown in the world economy, falling world prices of main export products (coffee and sugar), and rising oil prices.[2] Later,

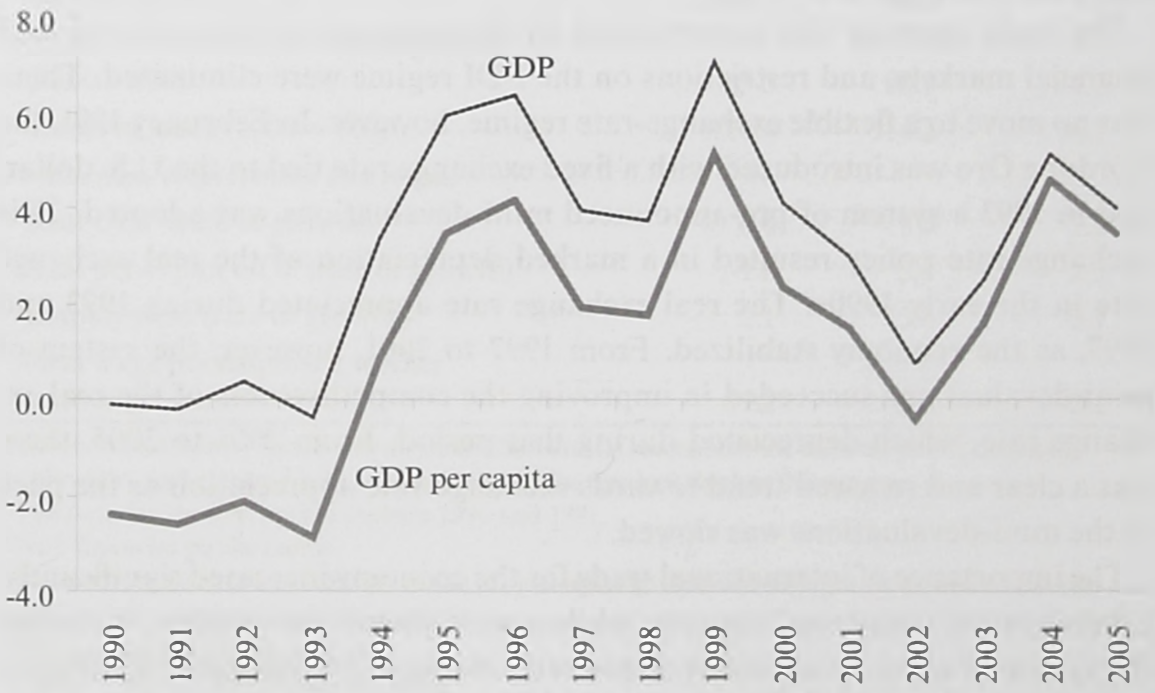

Figure 11.1 Nicaragua: Growth of real GDP and per capita GDP, 1990-2005
Source: World Bank. World Development Indicators.

the recovery of the world economy and export prices helped spur economic growth again during much of 2003-08, but given the country's external vulnerability growth remained volatile.

Employment has fluctuated with the swings in output. During 1990 and 1994, employment increased, but with much of the growth reflecting higher levels of underemployment and increased informal sector activity. As a result and with inflation still very high, real wages fell almost 20 per cent per year on average during that period. Output recovery and falling inflation allowed for a rise in real wages from the mid-1990s. Output volatility led to inadequate employment growth, however, resulting in sustained high levels of unemployment. Consequently, rising average real wages did not translate into systematic reductions in poverty.

Social policies and progress towards the MDGs in Nicaragua

Amidst slowing economic growth, a beginning was made with the process of defining the poverty reduction strategy in the framework of the HIPC initiative at the turn of the new century. The strategy puts priority on maximizing growth as well as achievement of the MDGs. The initiative made Nicaragua eligible for substantial debt relief and for obtaining resources from the Poverty Reduction and Growth Facility (PRGF) granted by the IMF in January 2004 when the country reached the completion point in complying with the HIPC conditions. The resources freed up by the debt relief and the additional donor resources granted through the HIPC initiative should be allocated for the poverty reduction strategy as laid down initially in the ERCERP and subsequently in the PND.

In this context, public social spending could be increased, though apparently not enough to make further progress towards the MDG targets. According to ECLAC (2006), public social spending as a percentage of GDP increased from 6.6 per cent in 1990-91 to 7.6 per cent in 1998-99 and further to 8.8 per cent in 2002-03. At these levels, social spending was among the lowest in Latin America. After introduction of the poverty reduction strategy, the share rose to 9.1 per cent of GDP in 2002, 12.1 per cent in 2006 and, based on the approved budget, to 13.2 per cent in 2007 (see Table 11.2).[3] This upward trend has little to do, however, with increases in spending on MDG-related services, which experienced little change between 2002 and 2006, remaining around 6 per cent of GDP and increasing slightly to 7 per cent of GDP in 2007. Given the enormous social challenges which Nicaragua faces and given the vast amounts of external aid the country has absorbed, the modest increase in public social spending is of concern. Although per capita expenditure for poverty reduction increased from US$68.3 to US$110.2 between 2002 and 2006, it remains among the lowest in the region.

During 2003-05, only one third of the spending associated with the poverty reduction strategy was financed from domestic resources, mainly taxes, while the rest was financed through foreign aid and debt relief (see Table 11.2). Only part of the debt relief has been earmarked to poverty reduction programmes. In 2005, only 53 per cent was earmarked as such. The remaining 47 per cent was allocated to repayment of domestic central government debt (Guimarães and Avendaño, 2007). In 2006 and 2007, there was a sharp increase in subsidies on the consumption of drinking water, electricity, and public transport in response to rising food and energy prices. Education and health spending has continued to rely heavily on external financing and to the donor conditionality associated with it.

Insufficient poverty reduction

Nicaragua has committed to meeting the international targets for MDG 1 of halving both the percentage of persons living on less than one dollar a day and the percentage of persons suffering hunger between 1993 and 2015.[4] The government aims to achieve a similar reduction in the percentage of the population with per-capita consumption below the national thresholds for moderate and

Table 11.2 Nicaragua: Public spending earmarked to the poverty reduction strategy (PRS) and its financing, 2002-2007[a]

	2002	2003	2004	2005	2006	2007
Public spending on MDG services (% of GDP)	9.1	11.1	11.9	13.0	12.1	13.2
Education	2.6	2.9	2.8	3.2	3.0	3.4
Health	2.9	3.3	2.9	3.1	3.2	3.5
Water and maintenance	0.1	0.0	0.1	0.0	0.1	0.0
Others	3.5	4.9	6.1	6.7	5.8	6.2
Per-capita public spending on MDG services (US$)	68.3	82.7	94.9	105.1	110.2	131.6
Total public spending on MDG services (millions of US$)	364.6	453.5	533.9	606.9	651.3	796.7
Financing of public spending on MDGs (percentage shares)						
Fiscal resources[b]	54.8	33.2	28.3	38.7	52.0	59.8
External development cooperation[c]	36.5	45.5	48.5	42.3	33.4	24.4
External debt relief[d]	8.67	21.3	23.2	19.0	14.6	15.9

Source: Ministry of Finance (spending data) and BCN (average exchange rate).

[a] Public spending accrued in 2002-2006 and public spending budgeted for 2007. For 2002-2006, the public spending accrued represents on average approximately 90 per cent of public spending budgeted.

[b] Includes mainly tax revenues, as well as earmarked revenues. The latter account on average for 2.3 per cent of budget financing during 2002-2007.

[c] Includes grants and loans.

[d] Includes debt relief under the HIPC initiative and cancellation of Paris Club debt.

extreme poverty.[5] Poverty fell between 1993 and 2005, mainly in the rural areas. This reduction was the result of the economic recovery, the increase in real wages and social programmes (see Table 11.3). Also, relative prices for the main products of the basic consumption basket (rice and beans) fell in the late 1990s (World Bank, 2003).[6] Increasing remittances from emigrant workers helped reduce poverty further, as in other Central American countries (see, for example, Sánchez, 2005). Nonetheless, the rate of poverty reduction has been insufficient to be on track towards the 2015 target (see Table 11.3).

The volatility of economic growth has attenuated poverty reduction. In fact, the population living on less than one dollar a day increased slightly during the economic slowdown between 1998 and 2001. In addition, in this period an important part of social spending was used to address demands for emergency relief brought on by natural disasters. Poverty, as measured by the national poverty lines, also increased during other recent episodes of economic slowdown (2001-02 and 2004-05), especially in rural areas. Extreme poverty as measured by the one-dollar-a-day threshold did not fall, however, as a result of targeted social programmes.

The government redefined some priorities in the PND for 2006-10 in order to reach sustained economic growth with the expectation that this would trickle

Table 11.3 Nicaragua: Poverty indicators, 1993-2005 and target for 2015

	Percentage of the population					Reduction observed	Reduction needed
Indicator	**1993**	**1998**	**2001**	**2005**	**Target for 2015**	**1993-2005[c]**	**2005-2015[c]**
Percentage of the population living on less than 1 dollar a day (MDG 1)	44.0	42.2	43.0	39.4	22.0	-4.6	-17.4
Urban	26.0	24.9	27.5	22.3	13.0	-3.7	-9.3
Rural	69.2	62.8	64.7	60.7	34.6	-8.5	-26.1
National moderate poverty[a]	50.3	47.9	45.8	48.3	25.2	-2.0	-23.2
Urban	31.9	30.5	30.1	30.9	16.0	-1.0	-15.0
Rural	76.1	68.5	67.8	70.3	38.1	-5.8	-32.3
National extreme poverty[b]	19.4	17.3	15.1	17.2	9.7	-2.2	-7.5
Urban	7.3	7.6	6.2	6.7	3.7	-0.6	-3.1
Rural	36.3	28.9	27.4	30.5	18.2	-5.8	-12.4

Source: Living Standards Measurement Study (LSMS) survey, National Institute of Statistics and Census (INEC).

[a] Percentage of the population with per-capita consumption below the official poverty line.

[b] Percentage of the population with per-capita consumption below the official extreme poverty line.

[c] In percentage points.

down and help reduce poverty. Increased social spending is less dominant in the new plan.

Nicaragua not only needs higher economic growth, but also less inequality. According to INEC's household survey data, the Gini coefficient of per-capita consumption fell from 0.49 in 1993 to 0.43 in 2001. Various food subsidies and poverty reduction programmes may have influenced this outcome. Income inequality, however, does not seem to have decreased. According to ECLAC (2006), the Gini coefficient of per-capita income increased slightly between 1993 (0.582) and 1998 (0.584) and fell only marginally thereafter (to 0.579 in 2001). According to ECLAC-IPEA-UNDP (2003), Nicaragua would have to increase per-capita GDP by 2.7 per cent per year if it aspires to reach the MDG for reducing extreme poverty, assuming that it is able to reduce inequality (measured by the Gini coefficient) by 3.6 per cent. Using this redistributive scenario as a benchmark, both the rate of growth of per-capita GDP observed from 2000 to 2005 and the degree of income redistribution were insufficient for the country to be on track in attaining the poverty reduction target.

Universal primary education: A feasible but costly target

Primary education indicators have improved significantly (see Table 11.4). Gender inequalities in primary education have been eliminated (MDG 3). Net enrolment rates and the proportion of students who begin first grade and reach fifth have increased as a result of lower drop-out and higher retention rates, permitting progress towards the MDG 2 target of making it possible for all children able to complete primary education by 2015. The proportion of students who begin primary school and complete it increased almost 29 points in 13 years, from 1991 to 2003. At a continued linear trend, the target can be met by 2015. This would require substantial further increases in public spending considering the remaining educational gaps. Improved performance in education was helped by increased spending on school infrastructure and school meal programmes and by improvements in the quality of education following the modernizing of the sector. In addition, it is likely that lower child mortality and growing average incomes of the population have had a positive impact on primary school outcomes.

The public resources required to attain the primary education target would have to be allocated efficiently to priority areas. The schooling infrastructure capacity (schools and teaching materials) and the number of teachers are still insufficient.[7] In rural areas, for example, many schools do not offer the complete primary cycle. In addition, new resources will need to be earmarked to improve the quality of teaching, relevance of curriculums, and administration of education, including through hiring better-trained and better-paid teachers.[8] As explained below, the quality of education is an important determinant for primary school enrolment. In addition, income constraints, migratory flows,

Table 11.4 Nicaragua: MDG indicators, 1990-2004 and target for 2015

Indicator	1990	2000	2004	Target for 2015
Percentage of students who begin and complete primary (MDG 2)	44.3[a]	66.0	73.1[b]	100.0
Percentage of students who begin first grade and reach fifth grade	44.1[a]	54.2	73.5	
Net enrolment rate (%)	72.6[a]	80.5	87.9	
Net enrolment rate for girls with respect to boys (%) (MDG 3)	1.1[a]	1.0	1.0	1.0
Under-five child mortality, per 1,000 live births (MDG 4)	68.0	43.0	38.0	22.7
Infant mortality, per 1,000 live births	52.0	34.0	31.0	
Maternal mortality, per 100,000 live births (MDG 5)	160.0	230.0	n.a.	40.0
Percentage of the population with access to an improved water supply (MDG 7a)[c]	70.0	n.a.	79.0	85.0
Urban area	91.0	n.a.	90.0	95.5
Rural area	46.0	n.a.	63.0	73.0
Percentage of the population with access to improved sanitation (MDG 7b)[d]	45.0	n.a.	47.0	72.5
Urban area	91.0	n.a.	90.0	95.5
Rural area	46.0	n.a.	63.0	73.0

Source: United Nations Statistics Division (http://mdgs.un.org/unsd/mdg/Default.aspx).

[a] Data from 1991.

[b] Data from 2003.

[c] Includes access to: connection to a water supply system, public pipe, natural or protected well, protected spring, and the supply of collected rainwater.

[d] Includes the connection to a public sewage system or a septic system, or access to a latrine with a particular technology (for example, dry compost latrines, pit latrines, or improved ventilated pit latrines).

n.a.: no data available.

and the cost of education affect demand for schooling among low-income groups. These factors also influence drop-out rates, especially in rural areas where opportunity costs are also high as reflected in widespread child labour.[9] The area of residence also influences the probability of primary school attendance. Because of easier access to schools and higher mean incomes of parents, this likelihood is much higher in urban than rural areas. Accordingly, a large part of the new resources should be earmarked to subsidizing households that cannot cover the private cost and opportunity cost of education, mainly in rural areas.

Opposite trends in child mortality and maternal mortality

Comprehensive care for children under 6 years with nutritional and educational vulnerability has been a social policy priority. As a result, under-five child

mortality was reduced by 30 deaths per 1,000 live births from 1990 to 2004 (see Table 11.4). Child mortality is due almost entirely to deaths during the first year of life (infant mortality). According to the United Nations (Sistema de las Naciones Unidas, 2003), the drop in infant mortality in Nicaragua is associated with the expansion of the coverage (now more than 80 per cent) of the Expanded Programme on Immunization, as well as the promotion of breast-feeding, a greater use of oral rehydration therapy and control of infections, increased public investment in basic services in the rural areas, and comprehensive social protection programmes geared at serving children under six years of age in extreme poverty. Greater access to an improved water source in rural areas may also have helped reduce child mortality, as explained below.

Public spending on health care in Nicaragua is relatively low by Latin American standards. Even so, and despite the fact it has not increased as a share of GDP, health spending has been effective in reducing child mortality. At continued trends, it would be possible to meet the MDG target of reducing child mortality by two-thirds between 1990 and 2015. If this is accomplished, 15 more child deaths per 1,000 live births would have been prevented each year by 2015, as compared with the situation in 2004. This may well be feasible, given that during 1990-2004, twice as many deaths were prevented in a shorter period of time. While feasible, it would require a larger share of public spending on health being earmarked to further reduce the prevalence of diarrheal diseases and acute respiratory infections, premature births, and the problems of low birth-weight, asphyxia, and sepsis.

The outlook is less encouraging for maternal mortality, which increased from 160 per 100,000 live births in 1990 to 230 in 2000 (see Table 11.4).[10] Complications during childbirth were the main cause of the deaths of women of reproductive age in the period from 1990 to 2000. Reducing maternal mortality would contribute to reducing infant mortality since, according to the official statistics, two-thirds of maternal deaths are caused by direct obstetric complications, such as haemorrhage, hypertension during pregnancy, sepsis and unsafe induced abortion (MINSA, 2000). The programmes of integrated child care for those at risk of nutritional and educational vulnerability may have helped to offset the negative impact of rising maternal deaths on infant mortality.

Achieving the target of reducing maternal mortality by three fourths between 1990 and 2015 will require higher and more sustained growth of public health spending. The priority areas are to improve the quality and coverage of prenatal care, childbirth, puerperium and care for preventing complications in pregnancy. According to the United Nations (Sistema de las Naciones Unidas, 2003), the efficiency of health services must improve. This will require greater coverage and improvements in health infrastructure, especially at the primary and secondary levels of care, as well as better preventive care and health promotion for households and communities, especially in rural areas.

Increasing coverage of drinking water, but lags in sanitation

Nicaragua also intends to reduce by half the number of persons without access to drinking water and improved sanitation services from 1990 to 2015. The coverage of both services has expanded, albeit to a limited extent, given existing infrastructure deficiencies and very slight increases in public spending on water and sanitation (see Tables 11.2 and 11.4). The proportion of the population with access to an improved water source increased to 79 per cent in 2004, up by 9 percentage points from 1990. This progress is largely due to enhanced supply in rural areas and in the neighbourhoods of Managua through the investment programme of the water and sewage company, *Empresa Nicaragüense de Acueductos y Alcantarillados Sanitarios* (ENACAL).[11] To attain this target, there should be a 6 per cent increase in the population with access to an improved water source by 2015. This is less than the progress made in 15 years during 1990-2004. Achieving the target would thus require additional public spending efforts, including the effective implementation of the investment programmes agreed upon in the PND.

Increased household incomes will further help improve access to water and sanitation, as suggested by the econometric estimates analyzed in the next section. With respect to sanitation, the sewerage programmes of ENACAL and the rural latrine promotion projects of the Emergency Social Investment Fund (FISE) have benefited thousands of households in recent years. Nonetheless, the percentage of the population with access to improved sanitation increased by a meagre 2 per cent between 1990 and 2004, reaching coverage of only half of the total population (see Table 11.4). Coverage improved in rural areas, but fell in urban areas. It will be hard for the country to meet the sanitation target of increasing coverage by 25 percent by 2015, unless there is a more sustained increase in public spending to expand and improve the sewerage and rural latrines infrastructure.

Determinants of primary school completion, maternal and child mortality, and access to water and sanitation

The CGE model (MAMS), discussed below, includes a module defining the determinants of the MDGs presented in Table 11.4. Hammill (2006) has estimated the related functional relationships and the corresponding elasticities for Nicaragua. These estimates have been used for the application of MAMS for Nicaragua.

The probability of students completing the full cycle of primary schooling is hypothesized to increase with improved public infrastructure (excluding water and sanitation), better health status of children (as measure through lower child mortality), higher quality of education, a larger wage premium on education, and a higher level of per-capita household consumption. To

determine the statistical significance of these determinants, Hammill (2006) applies a standard logit model, as well as a proportions model, merging data on schooling from the 2001 LSMS with data on the quality and availability of school infrastructure by level of education and municipality from the Ministry of Education.[12] He finds that the last three of the mentioned determinants are statistically significant in the case of Nicaragua. The coefficient for public infrastructure has the expected sign, but is not significant, possibly because its influence is estimated with variations at the municipal level only.[13] In addition, due to data constraints, the impact of lower child mortality had to be measured on the basis of averages at the municipal level. Possibly as a result of this limitation, the health status variable was not found to be statistically significant either.

Hammill's estimates have two salient results (2006). First, primary schooling outcomes are most responsive to changes in the wage premium. Consequently, improved labour market conditions would significantly increase the likelihood of children attending primary school, offsetting the opportunity cost involved. Second, other determinants not taken into account in MAMS, but found to be statistically significant in explaining primary schooling performance include geographic area (urban and rural) and the proportion of students who benefit from the school meals programme. These findings confirm the recommendation suggested above: that more public spending should be allocated to programmes aimed at reducing the large number of children who are now outside the school system and who have dropped out, especially in rural areas, and at targeting the integrated early childhood and school meal programmes at those in extreme poverty.

Other studies show findings consistent with Hammill's. For example, to evaluate the impact of the "Education for All" programme, Arcia (2003) projects the levels of schooling and spending on education from 2001 to 2015, using transition matrices for education and employment of children, as well as population projections. The author concludes that due to the shortcomings in the quality of education, it will be extremely difficult to increase the proportion of students who complete primary schooling to more than 80 per cent by 2015. In addition, he estimates that by providing an annual cash transfer of US$145 per student in the first four grades of primary education, school attendance of children aged 7 to 13 years could increase by 21.7 per cent, the net enrolment rate by 30.1 per cent, and the number of students who continue attending school beyond the fourth grade by 8 per cent. According to these findings, the enrolment rates and the number of students who complete primary school would depend mainly on the cost of education. In addition, the opportunity cost of attending school for children aged 10 to 15 is approximately US$108 per year per family. The cash transfer would compensate for this opportunity cost. Other social assistance programmes for schoolchildren will also help reduce child labour and school

dropout and improve economic conditions for poor households. Hammill's estimates confirm these findings by showing the significant and positive effect of household consumption on primary school outcomes and of the wage premium on education.

Differences in the importance of these determinants by specific population groups were found by Ponce (2005). Using a probit model, Ponce found that the likelihood that a child (mainly poor) will attend primary school in rural areas is statistically correlated to public social spending, travel time to school (infrastructure variable), and the number of students per class and of children with only one teacher (quality-of-education variables). Other determinants of schooling in primary education – though relatively less elastic – are school meal programmes and provision of a school bag, but only for the group of poor children from rural areas, in the first case, and poor children in urban areas in the second. In addition, the author finds that to reduce the number of students per classroom or of children with just one teacher to international standards (that is, from 34 to 30 and from 40 to 36, respectively), education spending should be increased by 1.4 per cent of GDP from 2003 to 2015, after adjusting for population growth and inflation. Even so, the author finds that the primary education target would not be met, since this would also require an improvement in quality of education, especially in rural areas. Increasing public spending by a similar amount to expand the cash transfer programme, reduce the number of students per classroom, and expand the school bag programme, however, would also be insufficient to attain the goal, since in that scenario the primary school attendance rate would increase to 89 per cent by 2015.

Less empirical evidence is available in the area of health, lacking especially for determinants of maternal mortality. In MAMS, under-five child mortality and maternal mortality are assumed to depend on changes in per-capita health spending, per-capita household consumption, public infrastructure (excluding water and sanitation), and access to improved water sources and sanitation. Hammill (2006) tests these relationships econometrically. Using data from the 2001 LSMS, his study finds that higher per-capita household consumption and greater access to adequate water and sanitation services indeed reduce the likelihood of child death, but only the first determinant is statistically significant at the highest confidence level. Data limitations impede testing the impact of improved public infrastructure on child mortality.[14]

In its 2001 study on poverty in Nicaragua, the World Bank estimated a probabilistic model of survival at five years, using data from the 1993-98 demographic and health surveys (World Bank, 2001). The Bank finds that the maternal and child health care services are the most significant determinant, whereas other important factors are maternal education and access to a safe water source (both with a positive sign), as well as the number of pregnancies at young ages (with a negative sign).

Using population projections based on a model that projects cohorts and multiple socio-demographic conditions, Andersen (2004) estimates that public spending on health should increase steadily until almost doubling the level observed in 2000 if one wishes to meet the MDGs.

MAMS considers a relatively smaller number of determinants of access to improved water sources and sanitation. These encompass: per-capita spending on both services, per-capita consumption of households, and availability of general public infrastructure (excluding water and sanitation). Using a pooled logit model based on panel data from the LSMS for 1998 and 2001, Hammill (2006) estimates that these determinants correlate positively with improved coverage of water and sanitation services. Nonetheless, only the first two determinants listed are found statistically significant. Once again, as was the case for the microeconometric analysis of the health and education determinants, the lack of information makes it hard to measure the effect of infrastructure with greater precision. According to the estimates cited, the likelihood that a household will have access to improved water and sanitation services is also greater in urban areas, which is to be expected to the extent that there are marked lags in rural areas. The study by Andersen (2004) also highlights the importance of public spending on water and sanitation systems. In order to achieve the MDGs for water and sanitation, the study concludes that spending would need to increase to levels that are, respectively, 1.2 and 3.4 times greater in 2015 as compared with those of 2000.

Modelling methodology

Definition of scenarios and main assumptions

The main conclusions of this study stem from an analysis of scenarios simulated using the CGE model that is described in Chapter 3 (that is, MAMS). The model captures the dynamic impact on the economy of attaining the MDGs (for example, through changes in the composition of labour supply), and the repercussions that the public social spending needed to achieve them and its financing could have on productive activities.

First, a baseline scenario was defined for the period 2000-15, which by and large reproduces the observed trajectory of the economy during the first years of the period. The baseline also projects growth of spending for final government consumption at the pace of the first years of the 2000s. This growth of public spending is not sufficient to meet the MDGs. The baseline is subsequently used as the reference for policy scenarios that simulate achievement of the MDGs for education, health, and water and sanitation by scaling up the corresponding public expenditures sufficiently to meet the established targets. These policy scenarios are run for each MDG separately, as well as for the case where all these MDGs would be achieved simultaneously. The model

simulations yield outcomes under four alternative sources of financing of the increased public spending: foreign grants, external borrowing, taxation, or domestic borrowing.

The following macroeconomic closure rules are assumed for the baseline scenario. First, income taxes are adjusted to balance the government budget. Levels of public borrowing are assumed to be fixed. As explained above, fiscal reforms over the past decade allowed for a broadening of the tax base and significant increases in government revenue in Nicaragua. Second, adjustments in the real exchange rate are assumed to balance the external account as the level of capital inflows is kept fixed in the baseline. This external closure rule is not an entirely adequate representation of exchange-rate adjustments through the system of mini-devaluations, with implications for the interpretation of the model results as discussed below. Third, having determined government investment spending, realized private investment is assumed to adjust to the level of total investment that matches total savings in the economy. The first closure rule is changed in accordance with the alternative financing scenarios for achieving the MDGs, in the cases where increased public spending is not met by raising tax rates, but by, respectively, domestic borrowing, foreign grants or external borrowing. In these three cases, one of the mechanisms of financing becomes a flexible variable, while the income tax rates are kept fixed.

Three types of workers compete in the labour market: unskilled workers (those who have not completed secondary education), semi-skilled workers (with completed secondary education or incomplete tertiary education) and skilled workers (with completed tertiary education). Depending on the state of the economy, equilibrium in each segment of the labour market is reached either through adjustments in the level of unemployment or real wages. If the unemployment rate by type of worker is higher than a pre-established minimum rate, the real wage remains fixed at a so-called "reserve wage" level and supply and demand for labour balances through adjustments in the level of employment (and hence the degree of unemployment). Alternatively, if the rate of unemployment drops to the minimum, the labour market reaches equilibrium through adjustments in the real wage. The capital market, in turn, reaches equilibrium through adjustments in the return to capital under the assumption of full utilization of the production factor capital.

Calibrating MAMS for Nicaragua

To calibrate MAMS empirically to the conditions of the Nicaraguan economy, first a Social Accounting Matrix (SAM) was constructed for the year 2000 based on the SAM elaborated by Sánchez and Vos (2006). The steps taken to adapt this SAM for MAMS are described in Annex 1 of Sánchez and Vos (2007). Next, the elasticities associated with the MDG determinants

were estimated as discussed above. Those used in MAMS for Nicaragua are presented in Table A11.1. Original estimates were in some cases adjusted to achieve model consistency. Those adjustments were made after conducting a sensitivity analysis testing for a feasible range (upper and lower bounds) within which the values of those elasticities should fall for the model to find a consistent solution. Most of the elasticities estimated by Hammill (2006) fell within feasible ranges, except the elasticities for achievements in primary education which were too low for the model to converge to a solution. These elasticities were adjusted upwards to reach the lower bound of the range of feasibility. Other exceptions are for some of the elasticities for which Hammill (2006) did not obtain statistically significant results or did not obtain any result at all for lack of data, as in the case of maternal mortality. To overcome these limitations, ad-hoc values, falling within the range of feasibility, were assumed in these cases. In the case of the determinants of maternal mortality, the same elasticities were assumed as those for child mortality, on grounds that several of the causes of maternal mortality are closely related to those of infant mortality and that in MAMS both types of mortality are assumed to depend on the same determinants.

Other key elasticities of the model define the degree of substitution in production and consumption in response to changes in relative prices and the responsiveness of household spending to changes in income. These elasticities were taken from the study by Sánchez and Vos (2006) who estimated these econometrically for Nicaragua. In the cases where the sector disaggregation of MAMS differed from the CGE model developed by Sánchez and Vos (2006), the elasticities were adjusted by reweighting these in function of sector size (see Sánchez and Vos, 2007, for this procedure). Values of most elasticities are low, reflecting relatively low degrees of substitutability in production and consumption in the Nicaraguan economy.

The MDG indicators used in MAMS are those presented in Table 11.4. The population data come from ECLAC/CELADE (2002) and employment data are derived from INEC's Labour Force Survey for November 2000. Student performance in education (entering school, passing a grade, graduating from a cycle, repeating a grade, and dropping out) was measured using data from the 2001 LSMS and the Ministry of Education and the National Council of Universities (CNU). Andersen's projections for public spending (Andersen 2004) were valuable to calibrate the parameters associated with the logistic functions through which MAMS determines the degree of effectiveness over time of the MDG determinants in reaching the given targets. Generally, the functions show diminishing marginal returns to interventions working on the determinants the closer one gets to the targets.

Sánchez and Vos (2007, Annex 2) give a full account of all other relevant data and data sources used to calibrate MAMS.

Microsimulation methodology to estimate impact on poverty

As is the case with any typical general equilibrium model, MAMS lacks sufficient income distribution detail in order to make robust estimates of the impact on poverty of simulated scenarios. To overcome this limitation, the microsimulations methodology explained in Appendix A2 of Chapter 2 is applied. Each of the scenarios simulated with MAMS generates a new structure of the labour market for each year of the simulation period. These new labour market structures were imputed to the full household income distribution as derived from the 2001 LSMS. To obtain initial poverty estimates comparable with official estimates, two adjustments had to be made. First, per-capita incomes of non-poor households were adjusted to the level of their per-capita consumption if by the original estimates the former was higher than the latter. A similar adjustment was made to the incomes of a number of poor households whose per-capita income was greater than their per-capita consumption according to the original survey estimates.[15] Second, the original survey recorded some families as having higher labour income than their total income. In these cases, total household income was adjusted to the sum of labour incomes of household members. With these adjustments, the official estimates of poverty as calculated by INEC could be reproduced using income data, even though INEC measures poverty on the basis of per-capita household consumption.

Analysis of the simulated scenarios

Baseline scenario

The main results of the baseline or 'business-as-usual' scenario are presented in Table A11.2 in the Appendix. Real GDP grows on average by 3.2 per cent per year, close to the rate observed for the 2000-05 period. The actual observed rate of growth was slightly higher, however, since MAMS for Nicaragua underestimates export growth given that the external closure rule does not properly capture the positive influence of the system of mini-devaluations on competitiveness. The baseline, in contrast, shows a steady appreciation of the real exchange rate.[16] As a result, imports increase gradually, while exports fall as a share of output. The rising imports and expanding supply of non-tradable goods resulting from the currency appreciation are mirrored in increasing domestic demand.

Employment moves hand-in-hand with production, though at a more modest pace (2.7 per cent per year), though somewhat lower than that observed (see Table 11.1). This is so for two reasons. First, in the baseline scenario it is assumed that an increasing number of children in primary-school age enter the education system, while fewer enter the labour market. As a consequence, the supply of unskilled workers in MAMS is less than observed. In parallel,

education outcomes improve, leading to lower growth in both the supply and employment of unskilled workers (1.9 per cent per year) compared with that of semi-skilled and skilled workers (5.5 per cent per year). Second, the appreciation in the exchange rate leads to a contraction of employment in export sectors. Owing to these changes in employment, semi-skilled and skilled workers see their average real wage decline by 1.2 per cent and 0.4 per cent per year, respectively. By contrast, unskilled workers see their average real wage grow at 2 per cent per year. As unskilled workers are predominant in the labour force, the average real wage in the economy increases by 1.4 per cent per year.

These changes in the labour market translate into lower poverty and less income inequality in the baseline scenario (see Table A11.3). As shown in Figure 11.2, poverty falls considerably, but the target of halving extreme poverty between 1990 and 2015 is not met in the business-as-usual scenario.

In the baseline scenario, government spending on final consumption grows at 6.8 per cent per year, following the observed trend for 2000-04. Public investment falls 3.6 per cent per year in the first five years, then returns to growth at a pace of 0.1 per cent per year. It is important to note that in practice, public investment showed marked fluctuations in Nicaragua in the 1990s and into the new millennium, but it dropped at an average rate of 3.7 per cent per year during 2002-06. The growth in overall public spending facilitates important progress towards attaining the MDGs for education, health, and drinking water and sanitation. Yet, none of the targets for these MDGs is attained, as shown in Figure 11.3. In other words, current growth in public spending is insufficient to reach the MDGs in Nicaragua.

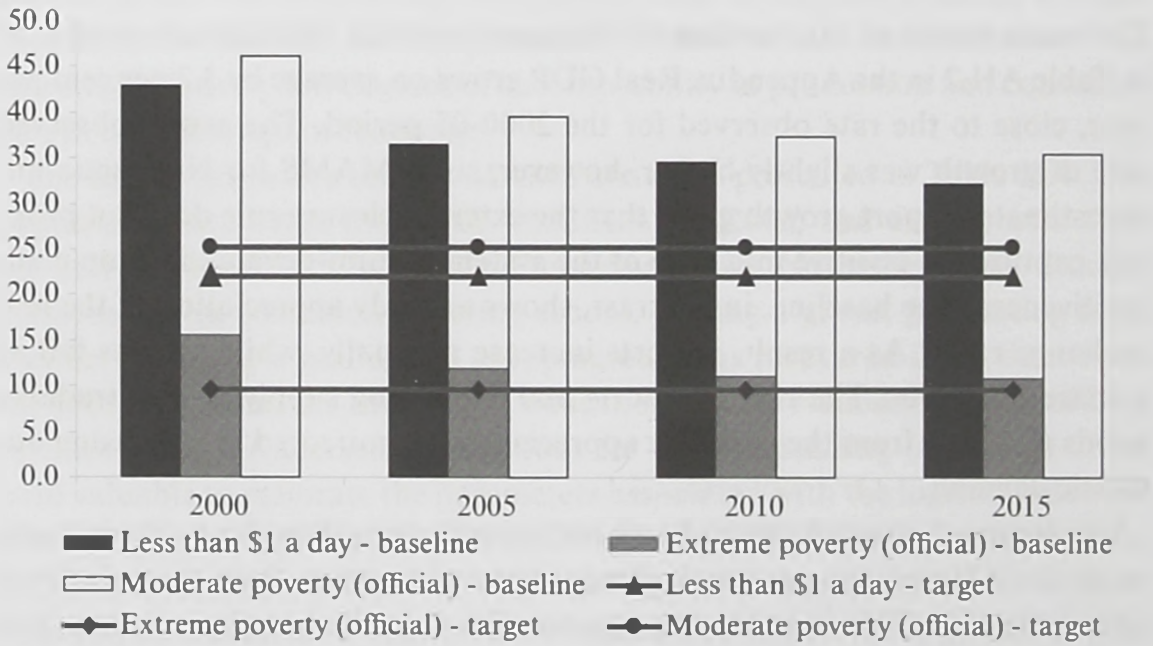

Figure 11.2 Nicaragua: Poverty indicators in the baseline scenario, 2000-2015 (Percentages)

Source: MAMS for Nicaragua and microsimulation results based on the 2001 LSMS.

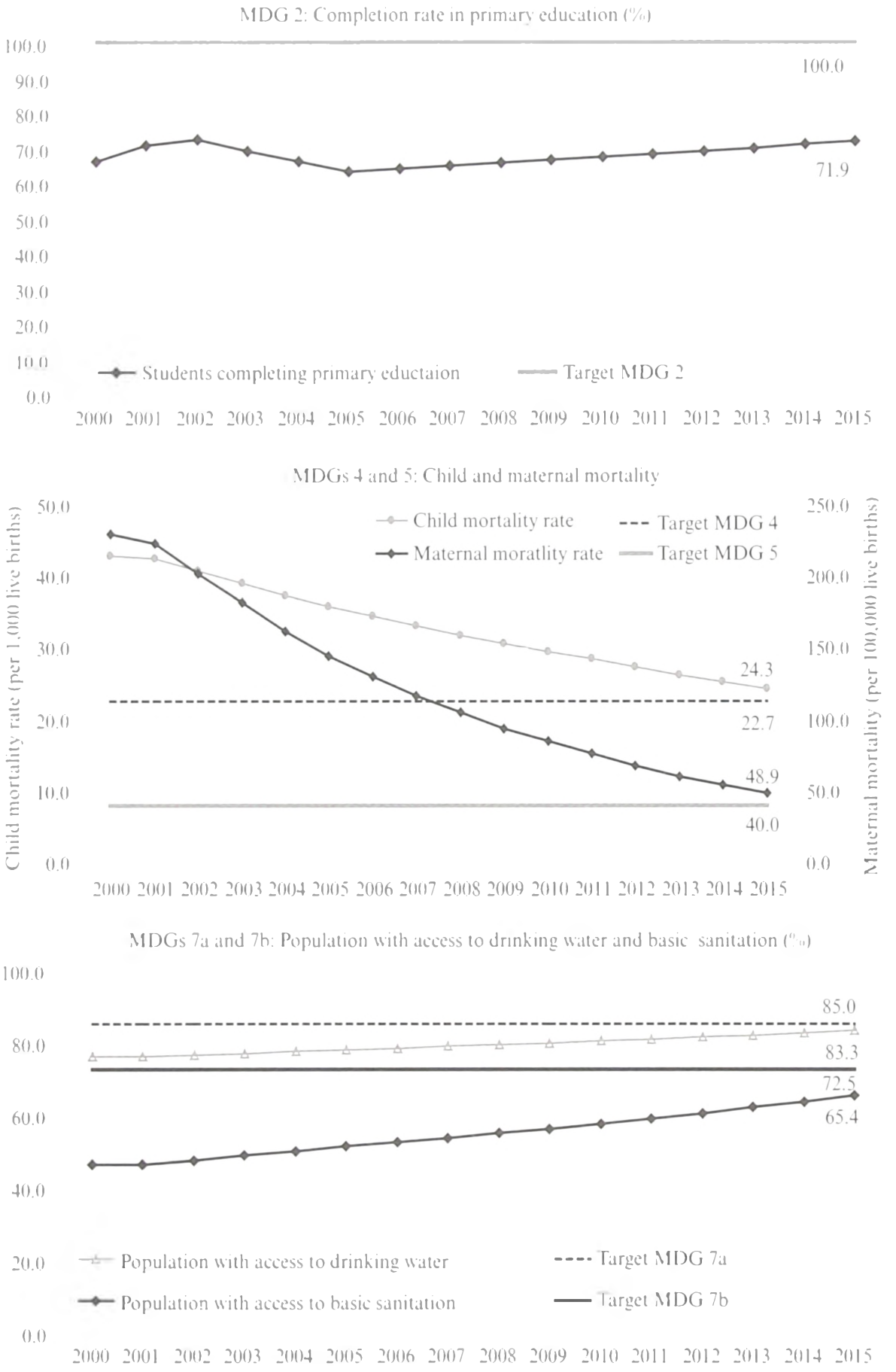

Figure 11.3 MDG indicators in the baseline scenario, 2000-2015

Source: MAMS for Nicaragua.

The fiscal deficit as a percentage of GDP increases with the strong increase in final government consumption. At the same time, the falling wages of semi-skilled and skilled workers affects the collection of income taxes. Income tax revenue falls as a percentage of GDP from the base year (2000) level, only to recover in the last five years of the simulation period. With no new domestic public borrowing, internal domestic debt falls with respect to GDP. External debt, in contrast, increases by almost 8 percentage points of GDP between 2000 and 2015 in the baseline scenario, as external borrowing continues to grow at (fixed) historical rates and the baseline only consider the cancellation of Nicaragua's external debt that took place during 2000-2006.

Scenarios for attaining the MDGs

Detailed results of the scenarios in which the MDGs are attained simultaneously under alternative strategies to finance the scaled-up public spending are presented in Tables A11.2-A11.3.[17] The results show that public spending on MDG related services would need to increase substantially to meet the targets (see Table 11.5). Average annual public spending would need to increase by 3.6 per cent of GDP as compared with the baseline in the scenarios where the additional expenditures are financed from abroad, by 4.4 per cent of GDP if financed through domestic borrowing and by 4.7 per cent of GDP if the costs of the MDG strategy are covered by increasing income taxes. Attaining universal primary education would be most expensive, requiring additional public spending of 2 per cent of GDP per year.[18] Reaching the targets for reducing child and maternal mortality would also be significant, costing an additional 1.1-1.7 per cent of GDP in public spending per year.

Financing the MDG strategy through domestic resource mobilization is more costly as shown in Table 11.5. Increased domestic public borrowing reduces savings available for financing of private investment. Higher income taxes limit disposable household income reducing private consumption compared with the baseline. Tax financing also crowds out private investment to some extent, but this effect is less significant than the compression of private consumption. In both cases, private spending on MDG-related services declines compared with the baseline, such that government spending has to increase by more in order to meet the MDG targets. In the case of Nicaragua, tax financing turns out to be the costliest option owing to the impact on private consumption.

It is less onerous for the treasury to finance all the goals simultaneously, due to the synergies among them (see Table 11.5). The sum of additional public spending in the scenarios in which only one or two MDGs are reached at the same time exceeds that required for attaining them simultaneously. The synergy effects amount to 0.8 per cent, 0.5 per cent, and 0.3 per cent of GDP per year, respectively, when using external financing, domestic borrowing, or higher income taxes.

Table 11.5 Nicaragua: Additional public spending per year required to attain the MDGs simultaneously or individually under alternative financing strategies, 2000-2015 (Percentage of GDP)

	Average spending in baseline scenario	Foreign grants	Taxes	Public borrowing		Foreign grants	Taxes	Public borrowing	
				External	Internal			External	Internal
		All MDGs simultaneously				*Only the primary education MDG*			
Primary education	2.0	1.9	2.0	1.9	2.1	2.1	2.2	2.1	2.2
Final consumption	1.7	1.5	1.5	1.5	1.6	1.6	1.7	1.6	1.7
Investment	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5
Health	3.4	1.1	1.7	1.1	1.6	0.0	0.0	0.0	0.0
Final consumption	2.9	0.7	1.1	0.7	1.1	0.0	0.0	0.0	0.0
Investment	0.5	0.4	0.6	0.4	0.5	0.0	0.0	0.0	0.0
Water and sanitation	0.3	0.6	1.0	0.6	0.8	0.0	0.0	0.0	0.0
Final consumption	0.2	0.6	1.0	0.6	0.8	0.0	0.0	0.0	0.0
Investment	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	5.7	3.6	4.7	3.6	4.4	2.0	2.1	2.0	2.2
Final consumption	4.8	2.8	3.7	2.8	3.5	1.6	1.7	1.6	1.8
Investment	0.9	0.8	1.0	0.8	0.9	0.4	0.5	0.4	0.5
		Only the health MDGs				*Only the MDGs for water and sanitation*			
Primary education	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final consumption	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Investment	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health	3.4	1.6	2.1	1.6	1.9	0.0	0.0	0.0	0.0
Final consumption	2.9	1.1	1.4	1.1	1.3	0.0	0.0	0.0	0.0
Investment	0.5	0.5	0.7	0.5	0.6	0.0	0.0	0.0	0.0
Water and sanitation	0.3	0.0	0.0	0.0	0.0	0.8	0.9	0.8	0.8
Final consumption	0.2	0.0	0.0	0.0	0.0	0.8	0.9	0.8	0.8
Investment	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	5.7	1.6	2.1	1.6	1.9	0.8	0.8	0.8	0.8
Final consumption	4.8	1.1	1.4	1.1	1.3	0.8	0.8	0.8	0.8
Investment	0.9	0.5	0.7	0.5	0.6	0.0	0.0	0.0	0.0

Source: MAMS for Nicaragua.

New public spending makes it possible to expand public services associated with the MDGs. As a result, the demand for inputs in health, education, and other services increases as does the demand for, mostly, skilled workers (doctors, nurses, teachers, and so on). The costs of these inputs and workers increase as these are not unlimited in supply. The rising costs of producing public services translate into a higher relative price of non-tradable goods and services with respect to the price of tradable goods. This is consistent with the appreciation of the real exchange rate by 1 point or more per year with respect to the baseline scenario, except in the case of tax-financing of the strategy (see Table A11.2).

The exchange-rate appreciation discourages exports and stimulates imports. Private investment contracts slightly with respect to the baseline to the extent that export sectors are affected. The impact is stronger in the scenarios with domestic resource mobilization. Nonetheless, average output growth does not fall with respect to the baseline scenario since increased government spending compensates for this fall in aggregate demand (see Table A11.2). In the domestic borrowing scenario, however, output does fall below the baseline level after 2010 as a result of the "crowding out effect" on private investment. This is not the case in the scenario when income taxes are raised, since the drop in private consumption has a stronger effect on reducing the import leakage, and rising public consumption otherwise offsets the drop in private spending on aggregate demand. Because of the drop in the demand for imported consumer goods in the tax-financing scenario, the trade gap narrows reducing the pressure on the exchange rate to appreciate.

The MDG scenarios do not produce any great impact on average labour market indicators (see Table A11.2). In the scenario with domestic borrowing, employment falls slightly with respect to the baseline scenario (0.1 per cent per year), owing to the crowding out of private investment. Average real wages remain practically unchanged when the additional spending is covered by taxation but increase by 0.2 per cent per year when the strategy is financed by external funds and drop by 0.2 per cent per year when relying on domestic borrowing. There are a number of reasons for this limited impact. First, the changes in total output with respect to the baseline scenario are equally modest. Second, the small changes in employment and remuneration are also a result of the fact that a larger number of children enrol in primary education and finish it on time in the MDG scenario, thereby generating a relative scarcity of unskilled workers with respect to the baseline scenario. As a result, employment for these workers tends to fall, while their remuneration rises. In the aggregate, these changes are partially offset by a decline in the average real wage of semi-skilled and skilled workers and the demand for these workers increases. Third, some of the children that are now encouraged to enter the primary school system were in the labour market thus further limiting the positive employment effects of

the strategy. Finally, the children entering for the first time in the educational system take at least 12 to 16 years to complete secondary and tertiary studies and thus would remain in the schooling system, rather than entering the labour market for most if not all of the simulation period to 2015.

Because of the small impact of the MDG scenarios on the labour market, inequality in per-capita household income also changes only marginally with respect to the baseline scenario (see Table A11.3). In the baseline, income inequality falls slightly over the simulation period. This decline is less pronounced in the MDG scenarios, explained mainly by the stronger increase in the demand for skilled workers. The impact on poverty is equally small. The MDG strategy generates slightly more poverty reduction, as compared with the baseline, when financed through foreign grants or external borrowing. When financed through domestic resource mobilization, the degree of poverty reduction is slightly less. These differences are mainly due to the differences in the outcomes for employment and real wages. In the MDG scenarios with external financing, aggregate employment falls slightly but its impact on poverty is more than offset by rising real wages. In the domestic borrowing scenario, both employment and real wages fall with respect to the baseline. In the case of the tax-financing scenario, the impact on poverty of the decline in employment for unskilled workers and the drop in real wages for unskilled workers with respect to the baseline is not made up by the slight increase in the real wage for unskilled workers. For all MDG scenarios it holds that poverty reduction remains insufficient, as in the baseline, to meet the target for MDG 1.

The macroeconomic viability of increasing public spending to meet the goals depends on the source of financing. External borrowing would not seem very viable given the high initial level of external indebtedness, even after considering the debt relief received under the HIPC initiative until 2006. According to the simulations with MAMS, the MDG strategy would lift external public debt to 158.3 per cent of GDP in 2015 (see Table A11.2). Financing through domestic borrowing would yield an even more explosive debt situation: domestic public debt would increase by 57.3 percentage points between 2000 and 2015, reaching 192.7 per cent of GDP at the end of the period. In this scenario, the fiscal deficit practically doubles with respect to the baseline scenario, while financing through domestic borrowing has added costs in terms of lower growth and less poverty reduction as compared with the baseline. This scenario is also less viable, as the capacity of the government to borrow on the domestic capital market is rather limited in practice given the lack of a developed domestic bond market in Nicaragua.

Increasing taxes could be a better alternative, requiring that revenue from income taxes increase by 4.2 per cent of GDP between 2000 and 2015, in order to reach 6.5 per cent of GDP at the end of the period (see Table A11.2). This is a substantial increase, but may be feasible to achieve considering the already seen

increase in tax collection as a result of the fiscal reform of the 1990s. Total tax income increased by 4.7 per cent of GDP between 1995 and 2005. In addition, even with this increase the current tax burden remains relatively low at around 15 per cent of GDP (see Table 11.1). Further increasing the tax base would also help lower the public debt overhang. On the downside, however, tax financing makes the MDG strategy more costly in terms of the required additional public spending, as indicated.

These macroeconomic trade-offs can be avoided by and large if the strategy is financed through increasing foreign grants. Nicaragua would need approximately 3.5 per cent of GDP per year in additional resources from foreign donors. While substantial, such an increase is not out of reach considering historical levels of official development assistance for Nicaragua (see Table 11.1). A different matter is how much and for how long Nicaragua wishes to remain aid dependent, but the macroeconomic trade-offs associated with this form of financing are of lesser concern than those of the alternative financing options.

Conclusions and policy recommendations

Nicaragua faces enormous challenges to reach the MDGs by 2015. Poverty is widespread and income distribution is highly skewed. Domestic economic constraints and external vulnerability have made the economy highly dependent on foreign aid and other sources of external financing. This dependence has led to high levels of external indebtedness, making the debt relief obtained through the HIPC initiative essential to enable the country to free up more resources for poverty reduction and expansion of social programmes. Progress made towards the MDGs has been insufficient, especially with regard to poverty reduction, increasing access to basic sanitation, and reducing maternal mortality. Progress towards the MDG targets for universalizing primary education, reducing child mortality, and enhancing access to drinking water has been more satisfactory, such that Nicaragua should be able to meet these targets without major difficulty by 2015.

The model-based analysis shows that with continued trends in public spending, Nicaragua would make further, yet insufficient, progress towards timely achievement of the MDGs for primary education, health, and water and sanitation. The analysis indicates further that trying to achieve all MDGs simultaneously would be less costly given the synergy effects among the MDGs. Even so, public social spending would need to be scaled up substantially to achieve the targets. The precise increase that is required depends on the financing strategy. When financed through foreign grants or external borrowing, government spending would have to increase by 3.6 per cent of GDP per year compared with the simulated baseline scenario. When financed through domestic borrowing, the required increase would be 4.4 per cent of GDP per annum, and the

increase would have to be 4.7 per cent in the case of tax financing. About half of the additional resources would be needed to achieve 100 per cent primary completion rates.

Increasing public spending to such an extent would adversely affect investment in export sectors as it causes an appreciation of the real exchange rate. Nonetheless, overall economic growth would not be affected as aggregate demand is kept up by the increase in public social spending. Since the aggregate output effects are modest at best, labour market outcomes of the MDG strategy do not differ greatly from the baseline scenario. Consequently, the impact on poverty and inequality are minor and the target for reducing extreme poverty is not met even as the other MDGs are being met.

Financing the strategy through external borrowing would be undesirable. It would lead to an unsustainable level of public debt with the external debt-to-GDP ratio increasing to 158.3 per cent of GDP in 2015. It should be noted that this rise in indebtedness does not account for the debt relief the country received after 2007. Debt relief in the framework of the HIPC initiative would thus be critical for keeping the degree of external debt overhang below 100 per cent of GDP, but even then the debt burden would be too high for comfort.

Financing the MDG strategy through domestic borrowing appears to be even more prohibitive. Not only would public debt inflate to almost 200 per cent of GDP by 2015, but it would entail losses in terms of economic growth and poverty reduction. Given this, the recommended alternative would seem to be to finance the increased public spending by raising income taxes. In the model simulations the tax increase is applied uniformly to all households and direct tax revenue would need to be increased by 4.2 per cent of GDP, reaching 6.5 per cent of GDP in 2015. Such an increase, while substantial, may be feasible. During 1995 and 2005, the government managed to increase tax revenue by a wider margin and the existing total tax burden is still relatively low by international standards. Moreover, increasing the tax base would help improve public finances and reduce indebtedness. It would make the MDG strategy more costly, however, since the government would need to step in with more resources to compensate for lower private spending on the MDGs as disposable incomes would be affected by the tax increase. The scenarios considered here do not include a possible fiscal reform which would put most of the additional tax burden on high-income households. Such a progressive tax reform could avoid affecting the consumption of low-income households, thereby avoiding one of the downsides to this financing option.

For the short to medium run, Nicaragua will need to continue relying on foreign development assistance to complement domestic resources in financing spending towards the achievement of the MDGs. With additional aid several of the trade offs of the alternative financing options could be avoided. When fully financed through grants, Nicaragua would need an additional 3.5 per cent

of GDP in development assistance per year to finance the MDG strategy. This would entail an increase by about 50 per cent from the level of aid received during 2000-05. This may be a preferable option in the short run, but in order to reduce aid dependence, the country should consider further fiscal reforms such that it can gradually replace aid financing with tax revenue. A progressive fiscal reform could also help reduce inequality and, in this way, enhance the impact of economic growth on poverty reduction.

The target for MDG 1 is not met under any of the scenarios simulated, including also when public spending is increased to meet the other MDGs. Apart from what might be achieved through redistributive taxation, perhaps more important for meeting the poverty reduction target will be for the government to engage in more active production sector and labour market policies in order to raise productivity growth and create more jobs in the economy. In this regard, successive governments have placed high hopes on free trade agreements, including the DR-CAFTA agreement with the United States and the agreement being negotiated with the European Union. Nonetheless, as Sánchez and Vos (2006) concluded, free trade agreements such as DR-CAFTA are anything but a panacea for Nicaraguan economic development and will not yield sufficient poverty reduction without complementary policies aimed at improving production capacity and encouraging the creation of employment.

Table A11.1 Nicaragua: Elasticities of the MDGs module of the MAMS model

	Determinants in the MAMS model					
(a) MDGs 4, 5 and 7	**Per-capita spending on water and sanitation**	**Infrastructure (except water and sanitation)**	**Access to drinking water (MDG 7a)**	**Access to sanitation (MDG 7b)**	**Per-capita household consumption**	**Per-capita health consumption**
MDG 4: child mortality		-0.2000[c]	-0.3268[a]	-0.1315[a]	-0.6133[a]	-0.5000[c]
MDG 5: maternal mortality		-0.2000[c]	-0.3268[a]	-0.1315[a]	-0.6133[a]	-0.5000[c]
MDG 7a: access to water	0.0360[a]	0.0020[a]			0.1120[a]	
MDG 7b: access to sanitation	0.1600[a]	0.0840[a]			0.2650[a]	
(b) MDG 2 (education)	**Child mortality rate (MDG 4)**	**Infrastructure (except water and sanitation)**	**Wage premium: complete vs incomplete secondary**	**Wage premium tertiary vs complete secondary**	**Per-capita household consumption**	**Quality of education**
Percentage of students at the age for entering primary school who enrol in the cycle	-0.6300[b]	0.3815[b]	1.3650[a]		0.3063[b]	1.0000[c]
Percentage of students who passed their grade in primary school.	-0.6300[b]	0.1715[b]	0.5167[a]		0.1187[b]	1.0000[c]
Percentage of students who passed their grade in secondary school	-0.0046[a]	0.1059[a]	1.5874[a]		0.4269[a]	0.2881
Percentage of students who passed their grade in tertiary education.	-0.0046[a]	0.1059[a]		2.3849[a]	1.9724[a]	0.2881
Percentage of primary school graduates who go on to secondary education.	-0.0046[a]	0.1059[a]	1.5874[a]		0.4269[a]	0.2881
Percentage of secondary school graduates who go on to tertiary education.	-0.0046[a]	0.1059[a]		2.3849[a]	1.9724[a]	0.2881

Source: Econometric estimates taken from Hammill (2006) and own imputations.

[a] Econometric estimates from Hammill (2006).

[b] Econometric estimates adjusted proportionally to make them fall within the range of feasibility of the MAMS model for the elasticity in question.

[c] Value assumed ad-hoc, but falling in the range of feasibility to obtain a consistent model solution for MAMS.

Table A11.2 Nicaragua: Main results of the scenarios simulated using the MAMS model, 2000-2015

	Values of the baseline scenario			Deviation with respect to baseline values for MDG scenarios financed with:							
				foreign grants		external borrowing		domestic borrowing		income taxes	
	2000	2015	2000-2015	2015	2000-2015	2015	2000-2015	2015	2000-2015	2015	2000-2015
Exchange rate (index 2000 = 100)	100.0	76.0	91.2	-1.4	-1.8	-1.4	-1.8	-3.5	-1.6	-0.2	-0.1
Real GDP growth (%)		2.7	3.2	0.1	0.2	0.1	0.2	-0.6	-0.3	0.0	0.2
Composition of GDP (% of GDP)											
Private final consumption	76.8	105.0	85.3	-1.0	-0.4	-1.0	-0.4	4.5	1.3	-4.8	-4.2
Government final consumption	17.3	29.6	24.0	4.1	2.8	4.1	2.8	5.7	3.5	5.0	3.7
Private gross fixed capital formation	25.2	36.3	28.8	-0.3	-0.2	-0.3	-0.2	-8.7	-6.0	-1.6	-1.4
Public gross fixed capital formation	7.6	4.7	5.2	0.2	0.8	0.2	0.8	0.4	0.9	0.2	1.0
Exports of goods and services	27.2	12.4	20.4	-0.8	-1.2	-0.8	-1.2	-1.9	-1.4	-0.5	-0.5
Imports of goods and services	54.0	88.0	63.7	1.3	1.5	1.2	1.5	1.4	-0.8	-2.5	-1.5
Public finances (% of GDP)											
Income taxes	2.3	2.6	1.5	-0.1	0.0	-0.1	0.0	0.0	0.0	3.9	4.5
Government savings	-2.6	-9.8	-7.5	-2.3	-2.1	-3.0	-2.4	-7.7	-4.7	0.5	1.3
Foreign savings	23.4	24.8	21.4	3.2	3.3	4.1	3.7	0.6	0.1	-0.6	-0.5
Foreign grants	4.5	4.5	4.5	3.1	3.5	0.0	0.0	0.0	0.0	0.0	0.0
Domestic government debt	17.9	7.3	12.3	-0.3	-0.4	-0.3	-0.4	67.9	27.5	-0.2	-0.3
External government debt	112.6	120.5	97.6	-7.1	-5.1	30.8	12.6	-3.0	-1.4	-3.1	-2.2

Table A11.2 (cont'd)

	Values of the baseline scenario			Deviation with respect to baseline values for MDG scenarios financed with:							
				foreign grant		external borrowing		domestic borrowing		income taxes	
	2000	2015	2000-2015	2015	2000-2015	2015	2000-2015	2015	2000-2015	2015	2000-2015
Labour market											
Employment (thousands of persons employed)	1,808	2,712	2,215	-17	-8	-17	-8	-43	-31	-8	-11
Unskilled workers	1,466	1,953	1,694	-46	-20	-46	-20	-47	-31	-27	-17
Semi-skilled workers	241	537	370	23	9	23	9	5	904	17	5
Skilled workers	101	222	152	6	3	6	3	-1	-467	2	340
Real wage per worker (*córdobas* per year)	1,477.3	1,826.8	1,621.0	55.6	36.0	55.6	36.0	-50.6	-16.3	1.2	4.9
Unskilled workers	1,157.7	1,553.4	1,316.3	78.4	39.7	78.4	39.7	-55.0	-20.2	18.3	10.5
Semi-skilled workers	2,007.4	1,682.3	1,815.4	-32.3	-0.8	-32.3	-0.8	-59.0	-22.9	-54.5	-19.8
Skilled workers	4,845.0	4,551.7	4,702.8	-32.9	18.9	-32.9	18.9	-37.0	-11.8	-56.7	-19.2

Source: MAMS for Nicaragua.

Table A11.3 Nicaragua: Results of the microsimulations in simulated scenarios, 2000-2015[a]

	Moderate poverty[b]				Extreme poverty[b]				Population living on less than one dollar a day (%)				Gini coefficient for per-capita household income			
	2000	2005	2010	2015	2000	2005	2010	2015	2000	2005	2010	2015	2000	2005	2010	2015
Baseline scenario																
(1) U	46.2	43.3	42.5	43.6	15.8	13.3	13.4	14.4	43.0	39.5	39.0	40.0	0.540	0.520	0.510	0.470
(2) U + S	46.2	43.3	41.9	43.5	15.8	13.4	13.1	14.2	43.0	39.9	38.7	39.9	0.540	0.520	0.510	0.470
(3) U + S + W1	46.1	43.5	43.1	44.2	15.7	14.6	15.6	16.6	43.0	40.7	40.5	41.1	0.540	0.530	0.530	0.480
(4) U + S + W1 + W2	46.1	39.9	37.8	36.1	15.7	12.0	11.2	11.0	43.0	37.1	35.2	33.1	0.540	0.530	0.530	0.480
(5) U + S + W1 + W2 + M	46.1	39.6	37.4	35.4	15.7	12.0	11.2	10.8	43.0	36.6	34.6	32.3	0.540	0.530	0.530	0.480
MDG scenarios financed with:																
Foreign grants or external borrowing																
(1) U	46.1	44.0	42.5	43.8	15.9	13.5	13.1	13.7	43.0	40.7	39.0	40.5	0.540	0.530	0.510	0.490
(2) U + S	46.1	43.7	42.6	43.6	15.9	13.6	13.3	14.0	43.1	40.2	39.0	40.1	0.540	0.520	0.520	0.490
(3) U + S + W1	45.0	44.2	43.4	44.8	15.1	15.2	17.1	17.1	42.1	41.3	40.5	41.8	0.530	0.540	0.530	0.510
(4) U + S + W1 + W2	45.0	40.2	35.8	34.6	15.1	12.2	11.0	9.8	42.1	37.2	33.2	31.6	0.530	0.540	0.530	0.510
(5) U + S + W1 + W2 + M	45.0	39.7	35.2	34.2	15.1	12.4	10.7	9.9	42.1	36.8	32.5	30.7	0.530	0.540	0.540	0.520
Incomes taxes																
(1) U	46.4	43.0	42.9	43.7	15.9	13.2	13.5	14.2	43.2	39.7	39.2	40.5	0.540	0.510	0.490	0.500
(2) U + S	46.4	43.3	42.4	43.3	15.9	13.3	13.2	14.2	43.2	39.7	39.3	39.9	0.540	0.520	0.490	0.500
(3) U + S + W1	46.3	43.0	43.2	45.0	15.8	14.2	16.8	18.2	43.2	40.2	40.5	42.5	0.540	0.520	0.500	0.520
(4) U + S + W1 + W2	46.3	38.2	37.9	37.6	15.8	11.3	11.8	12.4	43.2	35.1	34.7	34.9	0.540	0.520	0.500	0.520
(5) U + S + W1 + W2 + M	46.3	37.8	37.3	36.5	15.7	11.3	12.0	12.2	43.1	34.9	34.4	33.8	0.540	0.520	0.510	0.530

Table A11.3 (cont'd)

	Moderate poverty[b]				Extreme poverty[b]				Population living on less than one dollar a day (%)				Gini coefficient for per-capita household income			
	2000	2005	2010	2015	2000	2005	2010	2015	2000	2005	2010	2015	2000	2005	2010	2015
Domestic borrowing																
(1) U	46.5	44.1	47.2	48.7	15.8	13.9	16.1	17.2	43.4	40.8	44.0	45.6	0.540	0.530	0.510	0.510
(2) U + S	46.5	43.8	47.1	48.7	15.8	14.2	16.2	17.2	43.4	40.4	43.9	45.5	0.540	0.530	0.510	0.510
(3) U + S + W1	46.2	44.0	47.4	49.8	15.7	16.1	19.0	21.0	43.3	41.5	45.0	46.9	0.540	0.540	0.520	0.540
(4) U + S + W1 + W2	46.2	40.5	40.7	41.2	15.7	13.2	13.3	13.6	43.3	37.7	37.9	38.5	0.540	0.540	0.520	0.530
(5) U + S + W1 + W2 + M	46.2	39.8	39.4	40.7	15.7	13.2	13.1	13.8	43.3	37.2	36.7	37.9	0.540	0.540	0.520	0.540

Source: MAMS for Nicaragua and microsimulations based on the 2001 LSMS.

[a] Showing the cumulative effects of: U, changes in the structure of unemployment by level of skill of the worker; S, changes in the structure of employment by sector of activity, according to the level of skill of the worker in the different segments of the labour market; W1, changes in the structure of labour incomes by sector of activity, according to the level of skill of the worker in the different segments of the labour market; W2, changes in average labour income; M, changes in the skills structure of the employed labour force. The final result on poverty and inequality is given by the cumulative effect of the sequence of all the changes simulated in the labour market in the fifth step.

[b] Percentage of the population with incomes less than the corresponding official poverty line for 2001.

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Notes

1 The National Development Plan (PND) is also known as the second document that defines Nicaragua's Poverty Reduction Strategy Paper (or PRSP-II).
2 Nicaragua's production could have been greater had oil prices not increased from 2002 to 2006 (United Nations, 2007, Box I.4).
3 Uses the definition of public social spending introduced in 2005, according to which it is specified in relation to its association with poverty reduction.
4 Due to the lack of comparative surveys for 1990, the baseline year established internationally for evaluating the MDGs, 1993 is taken as the baseline year for establishing the MDG for extreme poverty in Nicaragua.
5 National extreme poverty indirectly quantifies the scourge of hunger, as the extreme poverty line considers only the cost of basic food items.
6 Reducing the cost of these basic foods is due to the *pound-for-pound* programme for rice as well as to the incentives for bean production as part of the reconstruction programmes after Hurricane Mitch.
7 According to the Ministry of Education, investment in school infrastructure diminished steadily from 2000 to 2003, falling from US$ 35.3 million to US$ 8.7 million, 67 per cent lower than in 1997.
8 Data from the Ministry of Education indicate that the salary of teachers in the basic and middle education system remained far below the cost of the basic market basket from 1998 to 2003.
9 The Survey of Child and Adolescent Labour in Nicaragua (ENTIA: *Encuesta de Trabajo Infantil y de Adolescentes de Nicaragua*) for 2000 indicates that there were 314,000 child and adolescent workers aged 5 to 17, just over 54 per cent of whom did not go to school; 18 per cent of those who attended school said that working had a negative impact on their regular school attendance. Of these, 22.3 per cent were illiterate and only 20.5 per cent had reached the last grade of primary school (United Nations System, 2003: 26).
10 Data on maternal mortality in Nicaragua vary, depending on the source. According to the PND, maternal mortality per 100,000 live births rose from 106 in 1998 to 201 in 2001, and dropped to 96 in 2004 (Gobierno de Nicaragua, 2005). The first report monitoring the MDGs in Nicaragua indicates that the rate first decreased after 1993, but subsequently increased between 1998 and 2001, as reported by the previous source (Sistema de las Naciones Unidas, 2003). The data compiled by the Ministry of Health based on reported death cases by health centres differ from those mentioned above.

According to this source, maternal mortality increased from 98 to 125 per 100,000 live births between 1993 and 1996, falling thereafter to 89.6 in 2005. Those data also show two major spikes in maternal mortality: one from 1998 to 1999 when the rate jumps from 106 to 118 and one from 2000 to 2001 when it is up from 87 to 115 deaths per 100,000 live births. The causes of the volatility in these estimates are not clear, but are likely to be a result of weaknesses in the administrative records of health centres. For this reason, Ministry of Health data are not used in this study.

11 The percentage of the population with access to drinking water also increased notably, from 45.8 per cent in 1990 to 70.5 per cent in 2001, though with significant lags in rural areas (United Nations System, 2003).

12 The model of proportions is estimated by means of the "quasi-maximum likelihood method" suggested in Papke and Wooldridge (1996).

13 In Hammill (2006), the quality of education is also measured indirectly by the average number of teachers per school, in some cases, and the average number of students per teacher, in others.

14 Greater density and quality of the road system, for example, would improve access to health centers, and better communications and energy infrastructure would facilitate the operation of such centers.

15 Deficiencies in reporting of income sources explain most of these cases where consumption levels exceed household income.

16 It should be noted, however, that in reality the real exchange rate appreciated during 2001-05, as the pace of devaluation was diminished. Yet, MAMS for Nicaragua shows a somewhat stronger exchange-rate appreciation than that observed.

17 The results of the scenarios in which only one or two MDGs are attained at the same time are reported in Sánchez and Vos (2007).

18 It should be noted that these cost estimates consider economy-wide effects, including endogenous effects on changing teacher salaries as well as the impact of changes in household incomes, in wage premiums, and in children's health status on education performance. Considering these feedback effects leads to lower estimates of the additional public spending required to achieve the MDG for primary education than likely would have been obtained when using sector analysis or a partial equilibrium approach. For example, ECLAC and UNESCO (2005) estimate that the cost of universalizing primary education and of ensuring that all students complete at least five grades of primary schooling by 2015 would be more than 3 per cent of GDP per year in Nicaragua.

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