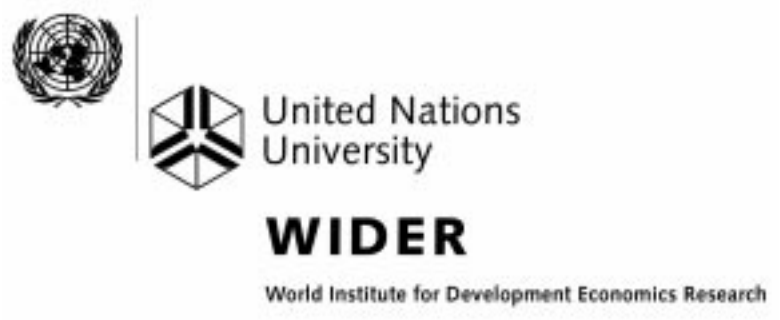

Discussion Paper No. 2001/104

Debt Relief and Growth

A Study of Zambia and Tanzania

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Abstract

This paper discusses some issues on how to evaluate the impact of HIPC debt relief in the cases of Tanzania and Zambia using two computable general equilibrium models. Within our relatively simple model framework, we found that the macroeconomic impact of debt relief is modest. One reason for this relatively modest impact is that the annual injection of additional resources relative to current actual debt service is small in both cases, which implies that the impact of debt relief per se would be expected to be modest. However, as illustrated in the case of Tanzania the impact could be considerably higher if additional public investment succeeds to improve private sector productivity.

Keywords: HIPC, Zambia, Tanzania, CGE-models, growth

JEL classification: F34, O11, O19

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1 Introduction

The issue of debt relief has been hotly debated during the last few years, and extensive debts have been considered to cripple growth prospects of particularly the poorest LDCs. The HIPC Initiative is an attempt to provide comprehensive debt relief to the poorest and most indebted countries. The World Bank and the IMF launched the first version of it in 1996. In 1999 it was enhanced following global consultations in Cologne, where it was considered necessary to provide more extensive and faster debt relief with clearer links to poverty reduction.[1]

The purpose of this paper is to contribute to the debate on the evaluation of the impact of debt relief on the least developed countries. We will sketch what ingredients need to be taken into account in the analysis and then use CGE-models to simulate some of those impacts for the cases of Tanzania and Zambia. The models used are neoclassical equilibrium models, which fail to take some potentially important disequilibria into account. Some of the parameters that are used in the analysis are hypothetical, which means that future analyses need to be refined to provide more reliable answers as to how large the effects could be. We still believe that our analysis will throw some light on the issues involved.

The paper is structured as follows: In Section 2 we outline the framework we use to analyse the impact of debt relief. In Section 3 we provide brief reviews of the economies of our two country cases, Tanzania and Zambia. Section 4 presents the two CGE-models that are used in the analysis, while Section 5 presents the results of the analysis. Finally, Section 6 summarizes the main results and suggests ways forward for the analysis of debt relief impacts.

2 Evaluating the impact of debt relief

To analyse the economic impact of debt relief one needs to take account of at least two issues. First we must ask how much resources are released under the HIPC Initiative.[2] When the overall size of the HIPC assistance is identified one must determine how the allocation of resources changes as a result of the new resources. A baseline is required to assess the changes in government spending. For example, a baseline medium-terms expenditure framework (MTEF) prepared before the receipt of HIPC assistance could be compared with one that includes HIPC assistance. The evaluation of the impact of HIPC assistance is complicated by the fact that is not possible to track only HIPC

1 IMF is the largest creditor followed by Japan and the World Bank. Multilaterals provide some 53 per cent, bilaterals 46 per cent and commercial sources 1 per cent of the money.

2 Some HIPC assistance may not immediately show up in the fiscal accounts. For example, IMF HIPC assistance would reduce the burden of debt service paid by the Central Bank. A special account is then needed to identify HIPC assistance and when the assistance is provided transfers would be made to the budget as grants (in the absence of a special account the transfer would show up as a profit transfer to the budget with a lag). In a similar way HIPC assistance in the form of write-downs of public enterprise debt guaranteed by the government will not be included in the budget unless arrangements are in place to ensure that the assistance is passed on to the budget.

funding. The link between aid and the recipient's budgetary allocation is not straightforward because much aid is fungible (Adam *et al.* 1994a and 1994b).[3]

When it comes to debt relief, there are in principle—as with budget support—two options: either it can be used to increase government spending or to reduce taxes. Public expenditures are clearly one of the main channels through which foreign aid influences development outcomes. During periods of debt relief the government faces a difficult intertemporal choice with regard to the setting the overall target for public expenditures. Should it spend all the money immediately or 'save' some of the resources for the future.

The most difficult question for the evaluation of the impact of debt relief concerns the effect of government expenditures on growth, productivity and overall economic welfare. All poverty reduction strategy papers (PRSP) aim to shift the composition of public spending towards poverty-reducing programmes. Most strategies aim to enhance the access of the poor to primary education and to primary and preventive health care services, and to develop the infrastructure. While increased access to education and health services would have a positive impact on the stock of human capital and productivity of individuals, investment in infrastructure would primarily lower transaction costs, which would have a positive impact on production activities and investment and hence income. Thus while expansion of both social and economic infrastructure should increase income in the longer term, the short-term benefits might be larger through investments in economic infrastructure. Furthermore, it might be the case that low incomes are a binding constraint determining household's choice of using public services such as education and health.

Another choice is whether the government really should spend all additional resources. An alternative would be to reduce taxes, which could stimulate economic growth and hence increase revenue and expenditures in the longer term. These tax measures could take several forms, but essentially this use of the extra resources puts more money into the private sector and shifts the spending decisions to private firms or individuals. The benefit of reducing taxes in terms of additional private investment could be higher than the benefit from increased spending on public services.[4]

Thus, the view of HIPC that is taken in this paper is that it releases extra government resources, which can either be used to increase government expenditures or to reduce taxation. Increased government expenditures can be in the form of increased public consumption or increased public investment, while lower taxes may lead to higher private investment or higher private consumption. It is these various choices and their impacts that are focused in this paper.

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3 While the empirical evidence about the extent of aid fungibility is mixed, the experiences of sub-Saharan Africa show that aid may have unintended effects on expenditure patterns (Devarajan and Hussain 1998).

4 Without going into details this opens up numerous possibilities. The tax system could be designed to provide incentives for private sector development. Tax holidays and various investment tax incentives are instruments now commonly used to attract foreign direct investments. However, promoting investments through such policy measures may have some disadvantages. They may lead to greater revenue loss than increases in investments.

3 Tanzania and Zambia: two heavily indebted poor countries

3.1 Macroeconomic developments in Tanzania

Tanzania is one of the poorest countries in the world with a large external debt. Tanzania's external is about US$ 7.3 billion, equivalent to 101 per cent of GDP in December 1999. The debt burden has grown rapidly despite generous treatment of Tanzania in Paris-Club negotiations. Since 1995 the Government of Tanzania has improved the management of the economy and the past years have witnessed major progress in stabilizing the economy. There has been progress toward a market-based economy and movement away from the previous reliance on direct control mechanisms and government ownership of the means of production. Recent achievements have included fiscal consolidation, streamlining of the civil service, and the privatization of about half of the parastatals.

There has also been a significant change in the efforts of the government to take control of its development programme, particularly in the sphere of macroeconomic management, where the government has led the preparation of the poverty reduction strategy paper. Since the mid-1990s the macroeconomic performance has improved. Compared to the early 1990s real GDP growth has increased and the average growth rate for the 1995-2000 period was about 4.1 per cent (Table 1). Because of a population growth rate of approximately 2.7 per cent this, however, implies only a modest per capita income growth rate of 1.4 per cent during the period.

Agriculture is still the most important sector and performance has improved compared to previous years. Other sectors such as mining, tourism, manufacturing, electricity and water also showed improved performance. Tourism and mining, in particular, have benefited a lot from various tax incentives such as tax holidays and investment incentives. The tourism industry has become the largest foreign exchange earner and the mining sector is booming.

Table 1
Growth rates of sector output and GDP, 1992-2000

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Agriculture	1.2	3.1	2.1	5.8	3.9	2.4	1.9	4.1	3.4
Mining	7.7	8.2	15.0	11.7	9.6	17.1	27.4	9.1	13.9
Manufacturing	-4.0	0.6	-0.2	1.6	4.8	5.0	8.0	3.6	4.8
Electricity and water	-1.3	0.9	2.0	6.1	11.1	2.2	5.5	3.9	5.0
Construction	5.8	-14.4	1.4	-14.7	7.6	8.2	9.9	8.7	8.4
Trade	-0.7	-0.4	1.1	3.5	3.5	5.0	4.7	6.0	6.5
Transport	14.2	0.1	0.9	5.9	1.1	4.9	6.2	5.8	6.1
Finance	-0.9	-7.1	-5.2	6.0	10.4	-15.8	-3.0	0.7	3.3
Public administration and other services	5.6	-3.9	-0.1	-2.7	1.6	3.2	2.7	3.5	3.6
GDP at factor cost	1.8	0.4	1.4	3.6	4.2	3.3	4.0	4.7	4.9

Source: IMF (2000).

Table 2
Use of resources and external account (% of GDP at market prices)

	1991	1992	1993	1994	1995	1996	1997	1998
Private consumption	74.6	75.1	85.0	78.9	82.0	82.7	78.1	85.4
Private investment	15.9	16.3	17.8	17.5	16.0	13.1	11.0	12.4
Government expenditures	25.5	26.3	27.3	21.7	18.3	15.0	10.9	10.8
Government consumption	17.3	17.8	19.7	16.1	15.0	11.5	8.1	7.5
Government investment	8.2	8.4	7.7	5.7	3.3	3.5	2.7	3.3
Exports of goods and services	9.0	11.1	18.2	19.5	23.5	20.3	14.4	18.2
Imports of goods and services	25.0	28.8	48.3	37.7	39.8	31.1	14.5	26.9
Resource balance	-16.0	-17.7	-30.1	-18.2	-16.4	-10.8	0.0	-8.7
Net factor income	-3.4	-4.7	-3.5	-2.8	-2.1	-1.0	-1.5	-1.8
Net transfers	15.2	18.7	17.1	15.5	6.3	5.2	3.8	4.8
Current account deficit	-4.2	-3.6	-16.5	-5.5	-12.1	-6.6	2.3	-5.7

Source: Bank of Tanzania.

The government has been quite successful in its attempt to stabilize the economy. One of the major issues has been to cut down on government activities and there has been a remarkable contraction. Since the peak in 1992 when government expenditure was about 27 per cent of GDP, it has now been reduced to a mere 11 per cent (Table 2). Public consumption in 1999 was only 7.5 per cent of GDP, and public investment has been reduced quite dramatically, reaching 3.3 per cent of GDP in 1999. However, the tight fiscal policy has not, so far, produced the intended boost in private investments. Indeed, since the peak in 1993, private investment as a share of GDP has seen a steady decline, reaching 12 per cent of GDP in 1998. This might suggest that an excessive shake out of some public investment categories, such as investment in infrastructure, could have the effect of lowering the productivity of private investment.[5] As transport costs and marketing margins are quite high in Tanzania, there is a case for the government to support improvements in infrastructure in order to reduce transport costs and marketing margins to support the rural areas (World Bank 2000).

Over the past few years Tanzania has made considerable progress in restoring fiscal discipline. Excluding foreign aid there has been a surplus during the last two years at a level of 0.9 and 0.7 per cent of GDP, respectively (Table 3). The drastic expenditure cuts have had a negative impact in most sectors, however. To some extent, priority sectors such as education, health, water, roads and agriculture have been protected through additional resources made available through the Multilateral Debt Fund (MDF) facility.[6] Still, expenditures remain low, which is a reflection of the low domestic revenue base in Tanzania. Despite a change in the tax structure, the revenue-GDP ratio has been fairly constant in the 1990s, hovering around 11-13 per cent of GDP.

5 For example, poor infrastructure and deficient public services in Uganda significantly reduced investments of private firms (Reinikka and Svensson 1999).

6 The funds are used for Tanzania's debt service to multilateral institutions, including the World Bank, IMF, African Development Bank and African Development Fund. By the end of December 1998 US$ 44.7 million, equivalent to TZS 23.6 billion, was disbursed into the MDF fund and TZS 18.2 billion was absorbed in the budget under the principle of protecting social sectors.

In conjunction with the tight fiscal policy the authorities has followed a strict monetary policy. Since 1993 the money supply-GDP ratio has been falling (Table 4). Looking at the two components of money supply, we note that the economic reform programme has had the anticipated effects; net foreign assets have increased and net domestic assets have been reduced. Credit to the private sector, as a percentage of GDP, has been falling quite significantly over the years. Instead of supporting long-term investment projects, the financial sector still prefers lending to less risky activities such as Treasury Bills and government securities (Table 4). This is partly a result of the lack of capacity to assess creditworthiness within the commercial banks and problems associated with handling commercial disputes. Another factor preventing a boost in private investment is the high real interest rates still prevailing.

In April 2000 the International Monetary Fund (IMF) and the World Bank Group's International Development Association (IDA) agreed to support a comprehensive debt reduction package for Tanzania under the enhanced Heavily Indebted Poor Countries (HIPC) Initiative. Total relief from all of Tanzania's creditors is worth more than US$ 2 billion, which is equivalent to more than half of the net present value of total debt outstanding after the full use of traditional debt relief mechanisms.

Table 3
Internal balance (% of GDP at market prices)

	1991	1992	1993	1994	1995	1996	1997	1998
Total revenue including grants	15.8	18.0	20.3	16.7	15.0	16.7	15.9	16.4
Total revenue excluding grants	12.3	11.2	11.9	11.7	12.6	13.5	11.8	11.5
Private savings	21.4	21.0	8.3	17.0	7.3	4.8	8.3	1.2
Net flow of private savings into the financial market	5.5	4.7	-9.5	-0.5	-8.8	-8.2	-2.7	-11.2
Government savings	-9.7	-8.3	-7.0	-5.0	-3.4	1.6	5.1	5.5
Current account deficit	-4.2	-3.6	-16.5	-5.5	-12.1	-6.6	2.3	-5.7

Notes: Government savings defined as government expenditures (Table 2) subtracted by total revenue including grants (Table 3).

Table 4
Monetary survey, 1992-2000 (% of GDP at market prices)

	1991	1992	1993	1994	1995	1996	1997	1998
Money supply (M3)	18.8	21.5	24.7	24.1	24.6	21.9	20.1	18.9
Net foreign assets	1.8	3.4	1.6	4.9	5.4	7.8	8.6	8.4
Net domestic assets	17	18.1	23.1	19.2	19.1	14.1	11.4	10.5
Credit to government	3.5	5.2	10.8	7.7	9.1	7.9	5.2	5.1
Credit to private sector	17.6	13.5	14.5	11.9	8.1	3.8	4	4.6
Other	-4.1	-0.6	-2.1	-0.3	2	2.4	2.3	0.8
Lending to deposit ratio (%)	137.9	94.2	89.7	70.3	50.6	25.4	27.7	33.8
Treasury bills and securities to total lending (%)	1.7	7.0	37.7	39.2	62.1	172.8	132.7	123.1

Source: Bank of Tanzania.

The debt reduction operation will translate into debt-service relief over time of US$ 3 billion, or about one-half of Tanzania's debt-service obligations during fiscal years 2001-03 and about one-third of Tanzania's debt-service obligations thereafter. The debt service-fiscal revenue ratio is expected to decline from 15 per cent to 9 per cent during 2000-09. Thus, even though HIPC makes some additional resources available the amount is not excessive.

But this will still create room for additional public expenditures on poverty reduction. Tanzania will receive the bulk of the assistance under the enhanced HIPC Initiative, when it satisfies a number of conditions including the adoption and implementation of a participatory poverty reduction strategy paper.[7] One of the key objectives of the poverty reduction strategy is to promote accelerated and equitable growth. Specifically over the three-year period 2000/01-2002/03 annual GDP growth is targeted to accelerate from about 5.2 per cent to 6 per cent.[8] Moreover if the targets are achieved, the government anticipates that poverty (rural) will be reduced from 48 (57) per cent in 2000 to 42 (49.5) per cent in 2003 and 24 (29) per cent in 2010.

2.2 Macroeconomic developments in Zambia

The Movement for Multiparty Democracy (MMD) won the elections in 1991 on a liberal platform. As soon as it was elected, it introduced its economic reform programme (ERP) with the goal of arresting the economic decline. The donors responded to the government's efforts by resuming their support to the Zambia. During the first two years there was rapid liberalization of the external trade and payments system, and a move towards a market-determined exchange rate. Over a period of five years, all licensing and quantitative restrictions on imports and exports were removed, and the tariff structure was rationalized, and by 1994 Zambia had one of the most liberal foreign exchange regimes in Sub-Saharan Africa.

The reform programme has implied a tighter fiscal and monetary policy. The most important part of the budget balancing process was expenditure reduction, which was virtually unmatched in Africa. A cash budget was introduced in 1993. Capital expenditures have been reduced, subsidies have been eliminated, military spending was reduced, and the civil service experienced severe real wage reductions. Still, budgetary discipline has remained a problem. In 1998 more than 10 per cent of expenditures were spent on expenditures that were made in violation of the budget regulations. There were substantial over-spending in general public services and massive cuts in economic services and also some cuts in social services. At times, the fiscal weakness of the country has not been fully appreciated when one looks at the central government budget only. But one also needs to consider local governments, state-owned enterprises, pension funds, special funds, and quasi-fiscal activities to get the full picture. There has been a very substantial other quasi-fiscal deficit. The financial liberalization implied that interest charges on domestic debt increased.

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7 For a review on the current strategy to tackle poverty see United Republic of Tanzania (2000).

8 Although this is a relatively good performance compared to the past much higher growth rates would be necessary to halve poverty by 2015.

Table 5
Revenue in per cent of GDP

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Total revenue (including grants)	24.6	32.9	33	26.3	30.2	29.0	26.8	24.8	24.9	25.5	26.7
Grants	4.3	14.2	14.7	10.5	10.1	9.2	6.1	5	6.5	7.9	8.4
Grants/total	17.5	43	44.5	40	33	31.7	22.3	20	26	31.8	31.5

Source: CSO (Quarterly Statistics from various years); IMF (2001).

Table 6
Monetary aggregates per cent, 1990-98

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Money supply growth, M2		139	65	122	46	48	62	18	21	32	63
Bank rate	34	42	54	122.5	24.8	51.5	69.8	23.3	43.6		
Inflation	107	97.7	165.7	183.8	54.6	34.9	43.1	24.4	24.5	27.1	25.9

Source: Bank of Zambia (2001).

Apart from the cash budget, the government has also attempted to balance the budget by increasing revenue. In 1993, a revenue board was introduced, with a value-added tax (VAT) put in place in July 1995, while user fees have been introduced for most social services. The Zambia Revenue Authority has increased resource mobilization in the form of taxes, while non-tax revenue collection still remains weak (Table 5).

During the first half of the 1990s, the government liberalized both maize and fertilizer marketing, eliminating the associated subsidies. Most of the labour market controls were also removed, but the most far-reaching liberalization efforts were in the financial sector. The government freed interest rates in September 1992 and liberalized the treasury bill market in January 1993. The immediate effect was a rise in interest rates and positive real rates were achieved in mid-1993 (Table 6). In February 1994, the government removed controls on the capital account for foreign payments. The monetary stance has been to restrict the growth of money supply.

The most important strategic error in Zambia was the mishandling of the earlier engine of growth, i. e., the copper mines, which were nationalized in the 1970s. Surpluses were not reinvested in the mines, but were diverted to politically more important uses outside the copper sector. There was inadequate supervision and management of the mines, where political considerations often outweighed economic considerations. This neglect meant that copper production fell from 825,000 tonnes in 1969 to 250,000 tonnes at the end of the millennium. It was this decline in output that caused the income decline and not so much the price changes. It was not until 1996 that the government acceded to the privatization of the copper parastatal ZCCM, but the process was not concluded until in March 2000. The drawn-out process for the privatization of the loss-making mines had serious negative consequences for the economy.

GDP growth has been uneven during the reform period (Table 7). There has been drought, which has affected agriculture, while manufacturing output has been affected by the removal of protection, the monetary squeeze, low internal demand and the parastatal reforms. Per capita incomes fell by more than a quarter between 1990 and 2000. The mining industry declined throughout due to the production problems of the ZCCM. Terms-of-trade developments have shown a declining trend, largely driven by negative changes in copper prices (Table 8).

Finally, we can also note that there has not been any significant recovery of investment in Zambia (Table 9). Since this was a major aim of the reform process, this is a major setback. The government has not been able to establish a credible reform environment, and the heavy burden of debt is certainly a part of the explanation to this.

Table 7
GDP and sector growth rates, 1990-2000 (change in %)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Total GDP	-3.4	-0.6	2.1	-0.2	-8.6	-2.3	6.6	3.3	-1.9	2.0	3.5
Non-agriculture	-2.5	-1.4	7.4	-6.6	-12.3	-7.8	8.2	5.1	-2.0	2.2	5.5
Non-mining GDP	-2.4	1.4	-0.1	1.8	-12.5	2.8	7.2	3.5	1.2	6.3	5.6
Real GDP per capita index	100	96.4	95.6	92.6	81.6	73.6	76.5	77.5	73.6	72.8	72.9

Source: CSO (Quarterly Statistics from various years) and Zambia (2001b).

Table 8
Terms of trade and copper prices, 1990-2000

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Terms of trade index (1990=100)	100	105.9	94.5	82.4	89.1	99.5	76.8	93.4	83.8	79.1	89.6
LME price index	90	80	78	65	79	100	78	78	56	54	61

Source: IMF (1999) for the price index series; IMF IFS, and Bank of Zambia (2001).

Table 9
Gross domestic product by type of expenditure, 1990-2000 (in of GDP at current prices)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Consumption:										
Public	14.8	16.2	17.9	13	13.1	15.5	18.3	17.5	15.8	13.4
Private	68.7	75.4	82.8	75.8	79.5	72.3	76.4	73.2	80.3	87.7
Investment including change in stock	17.3	11	11.9	15	8.2	15.9	12.8	14.6	14.8	17.5
Trade balance	-0.7	-2.6	-12.6	-3.8	-1.0	-3.8	-7.5	-5.2	-12.5	-18.6

Source: CSO (Quarterly Statistics from various years) and Zambia (2001b); new series from 1994.

Table 10
Zambia: Debt service paid and external flows, 1990-99

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Debt service paid, US$ million	290	655	354	326	409	1584	319	217	147	136
Debt service paid in % of exports of goods and non-factor services	21.6	56.0	29.6	31.2	34.8	120.4	28.7	17.6	18.0	16.2
Debt service paid in % of GDP	7.7	19.4	10.7	10.0	12.2	45.7	9.7	5.6	4.6	4.3
Debt service paid in % of government revenue	38.2	103.7	58.3	63.2	60.9	230.2	47.1	27.9	24.4	24.5
Gross external inflows (including rescheduling)	-	-	1,106	795	550	1,816	510	401	297	511
Net external flows (official)	-	-	752	469	141	232	191	184	150	375

Source: IDA and IMF (2000b: 19).

It is clear that the debt burden is a serious threat to the economy (see Table 10), but acceptance into the HIPC programme should go some distance towards solving this problem. The executive boards of the IMF and the World Bank decided in December 2000 that Zambia qualifies for debt relief under the HIPC Initiative. It was emphasized that the budgetary resources released by debt relief were to be used for poverty reduction and social sector development. Total debt service relief under the HIPC amounts to US$ 2.5 billion in net present value terms or 62.6 per cent of the total debt outstanding at the end of 1999 after the full use of the debt relief mechanisms. Zambia has also requested the Paris Club to reschedule debt on Cologne terms. It is expected that the Paris Club, at the completion point, will implement a stock-of-debt operation leading to a sustainable external debt position for Zambia.

Zambia reached the decision point in December 2000, and the first interim relief started flowing in January 2001. At the end of 1999 Zambia had a total foreign debt of US$ 6.5 billion. After the predicted Paris Club forgiveness and various other debt relief measures, it has a debt stock of about US$ 5.5 billion. It is estimated that 63 per cent or US$ 3.8 billion of the 5.5 billion debt is to be written off.

As of January 2001, Zambia has started to receive interim relief from the World Bank, IMF and eventually also from the African Development Bank and others. The end result of these relief measure will be that during 2001-05 Zambia will lower its contracted debt service costs by US$ 260 million per year and during the period 2006-15 by roughly US$ 130 million per year. Compared to the actual debt service paid during 2000, however, Zambia will save only US$ 30 million per year over the next 15 years. Between 2001 and 2003, when the completion point is expected to be reached, the Bank will provide US$ 61 million of the total write-off of US$ 885 million that it plans to provide on the total debt stock of US$ 1.7 billion.

For Zambia to reach the floating completion point, there are certain key objectives and reforms that have to be achieved. With regard to poverty reduction it has to put a PRSP in place through a participatory process, as well as a process of implementation and monitoring for at least one year. In the social sectors it must make progress in the fight

against AIDS, through the staffing of the AIDS Council, the integration of awareness and prevention programmes in at least ten ministries, progress in education reforms by increasing the share of education in the budget to at least 20.5 per cent, raising salaries to the teachers in the rural areas above the poverty line, and to put plans in place to increase retention of pupils in the poorer regions of the country. There has to be progress on the health front as indicated by the launching of a plan to combat malaria, the introduction of transparent procedures for the purchase of drugs, timely release of health expenditure data, and the actual cash releases to district health management boards shall be at least 80 per cent of the amounts budgeted.

4 Model frameworks

In Section 2 we discussed some of the ways in which debt relief may affect an economy. In this section we concretize this by setting up two computable general equilibrium models to analyse the impacts in Tanzania and Zambia, which are then used to simulate the impact of debt relief. Both the Tanzanian and the Zambian models are of a fairly standard neoclassical type, although they have somewhat different characteristics.

4.1 The Tanzania model[9]

There are three sectors in the model: agriculture, manufacturing and services. The trade and production structure in the model is specified as a multi-level nest of different functional forms. At the highest level of aggregation the Armington (1969) specification is used, which defines a composite commodity for each sector as a constant elasticity of substitution (CES) function of commodities produced domestically and imported from abroad. Output in each sector is either sold on the domestic market or exported. A constant elasticity of transformation (CET) framework allocates domestic output between exports and domestic sales. Sectoral gross output is a CES function of aggregate labour and composite capital, while demand for intermediate goods is given by a Leontief technology. Composite capital in the agricultural sector is defined as a CES function of capital, land and aggregate labour. Aggregate labour is a set of nested CES functions for five different labour categories; highly skilled, skilled, semi-skilled, unskilled and casual labour. CES functions allow for imperfect substitution at each level. In a nested production structure, producers will choose the optimal mix of primary factors at each stage in the production process. At any level, primary factors are demanded up to the point where factor prices, inclusive of sector-specific differentials, equal marginal value product of the specific factor.

The model is run with the assumptions of a mobile labour force and fixed sector-specific capital augmented by investment each period. In the labour market it is assumed that each sector initially has a specific combination of labour categories. Total supply of each category is assumed constant and demand varies with changes in each category's wage rate. Factor incomes of capital and land are distributed to two institutions: enterprises and proprietors of land. Enterprises keep a fixed proportion of

9 This model follows the approach popularized by Dervis, de Milo and Robinson (1982) and the Social Accounting Matrix used in this study is a modified version of the Tanzanian 1992 SAM developed by Wobst (1998).

capital income, net of taxes, as retained earnings while the remaining share is distributed to households. In the agricultural sector, factor income from land plus a government transfer, is directly transferred to households. Sectoral factor incomes of the various labour categories, as well as other sources of income such as remittances from abroad and government transfers, are distributed in fixed proportions to the various households. Households pay a direct tax to the government, while a fixed proportion of household disposable income is saved. Finally, consumer demand of the various households in the model is given by a Stone-Geary linear expenditure system (LES).

Besides direct taxes, government derives revenue from import tariffs on goods, transfers from abroad (aid) and indirect taxes levied on domestic output. Government savings equal revenue less current expenditures on goods and services, transfers and interest payments on foreign loans. Adding savings from households, enterprises, and foreign savings equals total savings in the economy. Government investment is exogenous in the model, while aggregate private investment is assumed to be endogenous. At the sectoral level, private investment is determined by fixed coefficients. Goods demanded for investment purposes from the private sector are derived with the help of a capital-coefficient matrix. Fixed expenditure shares determine also government demand of investment goods.

The model incorporates complementary productivity effects of both private ad public investments in sectoral production functions. Total factor productivity growth in each sector is a function private investment in the sector and to public investment, both of them normalized by the sectoral capital stock.[10] Thus, depending on the amount invested, both private and public, total factor productivity changes in the following period.

The final block in the model defines equilibrium in the markets for factors, commodities and foreign exchange. Given behavioural and institutional constraints (elaborated upon above), there is a set of prices in the model solution that represents market equilibrium. Domestic prices for imports and exports are products of world prices (exogenously given) multiplied by the 'nominal' exchange rate, adjusted for tariffs. The price of the composite good is the sum of total values of domestic sales out of total output and values of imports divided by total output of the composite good. In a similar way sectoral output price is defined as the value of domestic sales and exports divided by total output. Price of value added or the net producer price is equal to the output price, adjusted for indirect taxes, less the cost of intermediate inputs per unit of output. The price of a unit of capital is defined as a weighted average of the prices of capital goods by sector of origin. A weighed producer price index is defined as the numeraire in the model. Given the numeraire and assuming exogenous capital inflows, movements in the exchange rate equilibrate the external account. An increase in the exchange rate would increase tradable prices relative to nontradable prices leading to a real depreciation. This will increase exports and reduce imports.

10 See Fargeix (1990) for more details.

4.2 The Zambia model

This model is a Walrasian type of general equilibrium model with a dynamic specification.[11] The main purpose of the modelling strategy was to build a model that is suitable for the analyses of investment changes due to various policy changes. The model incorporates different ways of modelling endogenous investment and capital formation in a dynamic setting with several linked time periods. Since the capital stock and thus productive capacity depends on investment, we have chosen a neoclassical type of production function approach in order to have a direct two-way link between investment and other economic variables.

The economy is divided into seven sectors or commodities. The supply of each commodity is determined by domestic production and imports. Essentially, production is determined by the amount of capital available in each sector and the amount of skilled and unskilled labour that is occupied in the production process of each sector. With a relatively high price of a commodity, domestic production is larger than at a lower price. Furthermore, with a high domestic price of a good, imports also tend to be high. This is to say that supply increases with the price of the commodity.

Demand is determined by demand for intermediate goods in the production process, by private and public demand, investment demand and export. Demand decreases as prices increase. Prices in the model are determined in such a way that demand equals supply of each commodity. Furthermore, wages are found for which labour supply equals labour demand.

Investment depends on savings and the marginal efficiency of capital in each sector. An increase in the capital stock, i.e. investment, is undertaken as long as it yields profitable production. This induces changing capital stocks over time and determines the growth of production and GDP. Due to financial constraints of the economy, the model uses a balance of trade condition meaning that net borrowing from abroad is limited. Financial aid can thus be modelled as a lowering of the balance of trade constraint, yielding less export and an increase in imports. This has a tendency to increase domestic demand and to increase domestic prices and profits, which in turn will increase investment and growth. A decrease in savings, which may be the consequence of increased consumption, may have a tendency to lower investment.

Foreign aid can also be modelled as an increase in capital stocks interpreted as ‘gifts’ of productive capital. With an increase in the capital stock, there is also an increase in growth. Supply will increase and lower prices and profits, which will have a dampening effect on further investment. Reducing debt service makes it possible to increase public demand and public investment. In the model simulations it is assumed that an increase of the capital stock in the production of public services is composed of imported capital goods in excess of imports subject to the balance of trade constraint. Reduced debt service is thus partly replaced by an increase of imports.

11 The model used is presented in full in Andersson, Bigsten and Persson (2000).

5 Simulation result

To say something about the magnitude of the impact of debt relief, we use the two CGE-models presented in the previous section for simulations. The models are not exactly the same, which means that we have to be cautious about comparing the results across countries. We are more confident in comparing different scenarios within one country. However, by having two models with somewhat different designs applied on similar cases, we can get some indication about the extent to which the results depend on the model specification.

5.1 Results of simulations with the Zambian model

The simulations with this model are presented for two periods only, but this is sufficient to show how rates of growth and investment levels change. We have a base solution that assumes that nothing has happened with regard to debt service. We follow the approach outlined in Section 2, and assume that HIPC reduces interest and amortization payments of the government. In our simulation we assume that HIPC annually releases resources for the government corresponding to 1 per cent of GDP. This is based on an estimate of how much actual payments change relative to the preceding years. Relative to contractual obligations the debt reduction represents a reduction in debt service of about 10 per cent of GDP.

Next we assume that the resources are used to increase public spending and/or reduce taxes in the Zambian economy.[12] We introduce the changes in a step-wise fashion, to see how much of the effect of the full package derives from each ingredient:

1) In the first step we simply increase public consumption demand by 0.5 per cent of GDP, that is we use half the resources released to increase public consumption.

2) In the second step we add a secondary effect of increased public expenditures. We assume that the HIPC-related increase in expenditures is particularly focused on education, and we simulate the impact of this by increasing the number of labourer in the skilled labour category by 0.5 per cent per year and we reduce the number in unskilled labour to the same degree.[13] This productivity-enhancing effect of public expenditure would in the real economy take an extended period of time before it is realized, but we assume that it has an impact already in period one and two. We thus try to capture the more long-term effects within the framework of our limited model.

3) In this step we assume that 0.5 per cent of GDP in period 1 is used to increase public sector investment (but changes 1 and 2 are not included here).

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[12] Increased public investment is modelled by increasing productivity in the production of public services by 0.5 per cent in year 1. Increased public consumption is assumed to increase the supply of skilled labour. Skilled labour increases by 0.5 per cent above the population growth rate while unskilled labour reduces its share.

[13] Jung and Thorbecke (2001) endogenize the production of new human capital in a more sophisticated way, but also they assume that it has an impact already in the first after the base period period in their two-period model.

4) In this step we assume that public sector investment also has an effect on public sector productivity. We thus add to step 3 an increase in public sector productivity by 0.5 per cent in period one and this effect is maintained in period two.[14]

5) Then we combine experiments 2 and 4, that is increase in both public consumption and public investment with their assumed indirect effects.

6) We add an attempt to simulate the effect of a tax reduction. Since we do not have taxes explicitly in the model, we simulate a tax reduction by assuming higher savings in the economy.

7) Finally, we add the tax reduction effect to simulation 5 to get the effect of a complete package. The sums of our changes in public consumption and public investment are equal to 1 per cent of GDP, while the simulated tax cut comes on top of that. We do not have any easy way of measuring the size of the tax cut required to this increase in savings and investment, so this final step is even more hypothetical than the previous ones.

It should be noted that our numbers for the magnitude of some of these effects are hypothetical, and much research is needed to provide a solid underpinning of the estimates. The uncertainty of those effects also means that the effects of debt reduction that we estimate are also uncertain. The growth results from our simulations are shown in Table 11. The full results of experiment 5 are provided in Appendix 1.

The results show that the impact of a debt reduction of the type implemented in Zambia is going to have rather limited growth effects. We simulate the impact of a combined increase in public consumption and investment corresponding to 1 per cent of GDP. If we also assume certain indirect productivity effect, we do get an increase in the growth rate of around 0.2 per cent (experiment 5). This is not insignificant, but by itself it is not going to change the situation in Zambia in any dramatic way. In the simulation, the capital stock is expanding and with a capital-output ratio of say 1-2 the increase in GDP seems a bit low. One reason is that changes in the composition of demand affect investments in the various sectors and this will have an impact on GDP. Investments in sectors with 'low' productivity will dampen GDP growth. When we add in our attempt to simulate a tax cut, we do get a slightly larger effect in year 2 but this experiment is a bit hard to evaluate. We also refer to another experiment in footnote 12 where we assume that public sector infrastructure investments increase productivity throughout the economy. Then we do get a more dramatic increase in output, but since we do not have any empirical basis for our assumption in the experiment, we will not draw to far-reaching conclusions from that.

The restrictions of an analysis of this sort are rather obvious. Due to the nature of the model, there are some effects that cannot be taken into account. For example, if capacity utilization is restricted because of a shortage of imported inputs, debt reductions may

[14] As an alternative experiment we assumed that increased investments in the public sector infrastructure are increase the profitability of investments throughout the economy. The productivity in all sectors is therefore increased by 0.5 per year over and above what is implied in the base solution. If the impact of infrastructure investments were as large as that we would get a very substantial impact on the economy. The growth rate in period one increases by 0.52 per cent and in period 2 by 1.00 per cent. This is by far the largest effect we have got in any of our simulations, but since we are very uncertain about the realism of this simulation we relegate it to this footnote.

make it possible to increase capacity utilization. This is not dealt with in this model. There are also factors such as political will and ability that we do not take into account at all (see Bigsten and Kayizzi-Mugerwa [2000] and Bigsten [2001]).

Table 11
Growth impacts of HIPC-financed policy interventions in Zambia
(percentage changes relative to the baseline)

Experiment		Growth in year 1 relative to the base solution (%)	Growth in year 2 relative to the base solution (%)
1)	Increase of public consumption by 0.5 % of GDP	0.07	0.07
2)	1 plus accumulation of human capital	0.11	0.14
3)	Increase in public investment by 0.5 % of GDP	0.04	0.04
4)	3 plus increased productivity in the public sector	0.07	0.07
5)	2 plus 4	0.19	0.21
6)	Tax reduction	0.00	0.00
7)	5 plus 6	0.19	0.25

5.2 Results of simulations with the Tanzania model

As described above, the Tanzania model is slightly different from the Zambia model. The model runs over four periods, capturing the amount of resources expected to be released during 2000-05.[15] In the baseline scenario we have assumed that the economy grows on average by 4.5 per cent over the period. In the various experiments we look at the impact of a foreign interest payment reduction combined with four different policy scenarios. In the first scenario we assume, as in the Zambian case, that half of the resources released are used for public consumption. In the second experiment we add a 'human capital' effect of increased public current expenditures. The number of labourers in the skilled labour categories increases by 2.9 per cent per year while the growth rate of those regarded as unskilled is reduced to keep the overall growth rate at 2.5 per cent.[16] In the third scenario we assume, as in the Zambian case, that half of the resources released by HIPC are used to increase public sector investment. In the fourth experiment we assume that public sector investments also have an effect on private sector productivity. In the final experiment we add the second and the fourth experiment, assuming both human capital and productivity effects of increased public spending.

[15] The debt service/government revenue ratio is assumed to decline from 15 to 10 per cent. The amount of resources 'saved' from debt relief amounts to 4.4 per cent of GDP, which is distributed in pieces over the years (0.7, 1.0, 1.2 and 1.5 per cent of GDP, respectively).

[16] In the baseline scenario all labour categories are assumed to grow by 2.5 per annum. The 'education effects' of increasing the growth rate to 2.9 per cent among skilled categories are based on estimates from Jung and Thorbecke (2001).

Table 12 and 13 show the result of the various scenarios. Compared to the Zambian results, we note the impact is rather similar with one notable exception, the impact of productivity effects. The impact of increased public spending is rather modest regardless of whether it is public consumption or investment that is increased (simulation 1 and 3). In these two experiments the impact of public spending is limited to either increased demand for investment goods (if capital expenditures are increased) or a higher wage bill (if current government expenditures are increased). Thus, just looking at HIPC resources as additional resources to stimulate demand would not generate any substantial gains.

What would be the impact if public resources were used to accumulate human capital in the economy? As in the Zambian case, this is modelled in a rudimentary manner assuming that the number of skilled labourers increases relative to the unskilled. The GDP growth rate would increase by 0.1 percentage units in the first period and 0.15 percentage units in the last period, which is quite close to the Zambian results. However, the impact is still modest. What would be the impact of increased public investment combined with improved productivity? The impact in the first period is modest, as productivity gains materialize in the following periods, but thereafter growth rates are increasing and at the end of the period the GDP growth rate is 2.4 percentage units higher than the baseline.[17]

In the final experiment we combine, as in the Zambian case, simulation 2 and simulation 4 to get the combined effects of increased public spending, accumulation of human capital and changes in productivity. Compared to the baseline, GDP growth rates are increasing in all periods and particularly towards the end of the periods simulated. Thus, if resources were targeted to human capital accumulation and succeed in inducing productivity changes, the impact on real GDP could be quite substantial. In period 4, GDP growth rate would be approximately 2 percentage units higher compared to the baseline growth rate. However, as in the Zambian case our model specification is not based on any detailed assessment of the 'true' impact of human capital accumulation and changes in productivity. This is illustrated by comparing experiment 4 and 5. Adding human accumulation to public investment plus productivity effects actually lowers the growth rates, as increased public consumption crowds out private investments. Although there is a positive impact of accumulation of human capital and public investments, there is a net loss as private sector investments decline. Whether productivity changes as a result of lower private investments outweighing the positive impact of higher public spending is an important issue to consider. Thus, as highlighted earlier, it is important to undertake a more detailed analysis of the impact on public spending. Particularly important are complementarities between public investments and developments in the private sector. Moreover, the analysis would certainly benefit if public spending could be disaggregated into health, education and infrastructure spending, for example. Another potentially important aspect that is missing from the model is the monetary sector. Debt relief would certainly impact on financial markets, which would be an important channel to investment and future growth.

17 Note that productivity changes as a result of an increase in both public and private investment.

Table 12
Growth impacts of HIPC-financed policy interventions in Tanzania (real GDP growth rates)

		Period 1	Period 2	Period 3	Period 4
Baseline scenario		4.7	4.5	4.4	4.4
1)	Increase in public consumption	4.7	4.5	4.5	4.4
2)	Increase in public consumption + accumulation of human capital	4.8	4.6	4.6	4.5
3)	Increase in public investment	4.7	4.5	4.5	4.4
4)	Increase in public investment + productivity effects	4.7	4.6	5.7	6.8
5)	2 + 4	4.8	4.5	5.6	6.7

Table 13
Growth impacts of HIPC-financed policy interventions in Tanzania
(Percentage units difference from the baseline scenario)

		Period 1	Period 2	Period 3	Period 4
1)	Increase in public consumption	0.01	0.04	0.05	0.05
2)	Increase in public consumption + accumulation of human capital	0.10	0.14	0.15	0.16
3)	Increase in public investment	0.01	0.04	0.05	0.05
4)	Increase in public investment + productivity effects	0.01	0.10	1.30	2.42
5)	2 + 4	0.10	0.05	1.21	2.28

6 Conclusions

This paper discusses some issues on how to evaluate the impact of HIPC debt relief in the case of Tanzania and Zambia using two computable general equilibrium models. Both countries are among the poorest and most indebted countries in the world. Last year both Zambia and Tanzania qualified for debt relief under the HIPC Initiative. There is a strong emphasis that the budgetary resources released by debt relief should be used for poverty reduction and social sector development. In both countries the debt burden is a serious threat to the economy, but the acceptance into the HIPC programme should go some distance towards solving this problem.

Within our relatively simple model framework, the macroeconomic impact of debt relief seems modest. In the case of Zambia, where we combine debt relief with increased public spending and lower taxes, the GDP growth rate increases by about 0.2 per cent. In the case of Tanzania, a combination of debt relief, increased public spending and accumulation of human capital would increase real GDP by 0.2 percentage units. One reason for this relatively modest effect is that the annual injection of additional resources relative to current actual debt service is small in both cases, which implies that the impact of debt relief per se would be expected to be modest. However, as illustrated in the case of Tanzania, the impact could be considerably higher if additional public investment succeeds in improving private sector productivity.

Still, our approach fails to incorporate certain factors that relate increased public spending to growth, productivity and overall economic welfare. For example, increased access to education and health services would have a positive impact on the stock of human capital and productivity of individuals, and investments in infrastructure would lower transaction costs, which would have a positive impact on production activities and investment and hence income. We also fail to allow for the fact that the countries will now be meeting their contractual debt service obligations, which should make them more credible as investment destinations. In the future the analysis needs to take these aspects into account.

Appendix 1

Appendix Table
Results from the Zambia model – Experiment 5

	Agri-culture	Mining	Food	Manufac-turing	Construc-tion	Private service	Public service
			Period 1				
Production	-0.40	0.10	-0.38	0.14	1.37	0.05	2.35
Consumption	-0.30		-0.40	-0.44	0.00	-0.64	0.00
Public demand							2.80
Investment demand	0.00			0.26	0.00		
Export	0.00	0.11	0.00	0.00		0.00	
Import	0.00	0.00	-1.89	0.23		0.00	
Sector GDP	-0.48	-0.24	-0.62	0.00	3.13	-0.10	1.61
Investment by sector	0.00	0.00	-1.85	0.00	2.50	0.00	-2.17
Market price	-0.10	-0.11	-0.10	-0.10	0.21	-0.10	-0.21
Producer price	-0.10	-0.11	-0.10	0.00	0.21	0.00	-0.21
Capital stock	0.26	0.09	0.14	0.12	0.53	0.10	2.43
MP of capital	-0.78	-0.23	0.00	0.00	2.47	-0.47	0.00
Real GDP	0.19	Consumption value		-0.54			
Trade balance	0.00	Government income		0.00			
Skilled wage	-0.10	Unskilled wages		-0.20			
Skilled employment	0.59	Unskilled employment		-0.14			
Wage incomes	0.08	Disposable profits		0.00	Disposable income		0.00
Savings	0.30	Investment		0.21			
			Period 2				
Production	-0.25	0.10	-0.35	0.26	1.34	0.10	2.54
Consumption	-0.56		-0.38	-0.42	0.00	-0.30	0.00
Public demand							2.80
Investment demand	0.00			0.51	1.49		
Export	0.00	0.11	0.00	0.00		0.00	
Import	0.00	0.00	0.00	0.22		0.00	
Sector GDP	-0.23	-0.26	-0.59	0.25	0.00	0.00	1.69
Investment by sector	-3.03	0.00	0.00	1.14	0.00	0.60	0.00
Market price	-0.10	-0.11	-0.10	-0.10	0.00	-0.10	-0.42
Producer price	-0.10	-0.24	-0.10	-0.10	0.00	-0.20	-0.42
Capital stock	0.00	0.09	0.00	0.12	0.50	0.06	2.32
MP of capital	-0.78	-0.27	-4.35	0.00	1.45	0.00	-3.03
Real GDP	0.21	Consumption value		-0.46			
Trade balance	0.00	Government income		0.00			
Skilled wage	-0.41	Unskilled wages		0.20			
Skilled employment	0.95	Unskilled employment		-0.42			
Wage incomes	0.00	Disposable profits		0.00			
Savings	0.44	Investment		0.21	D ISP INC		0.00

Appendix 2: Application of the Zambian model

The model has been applied to Zambian data together with some assumed parameter values. The applied model has the following seven sectors: agriculture, mining, food, manufacturing, construction, private services and public services.

In our numerical examples we have used a fairly moderate growth rate of the labour force. We have assumed that both skilled and unskilled labour grow by 2.5 per cent per year. We have assumed that average annual depreciation of the capital stock is 5 per cent. In our base case, this implies that capital grows by about 1 per cent per year. Furthermore, productivity grows by 2.5 per cent per year.

In this case, real GDP grows by an annual 4.2 per cent. With a balance of trade constraint, domestic production prices decline in comparison with world market prices by 2 per cent per year. Growth in GDP means growth in import demand, which must be paid for by exports, which, can only be accomplished by improved terms of trade. There is an increase in total real private consumption of about 4.2 per cent per year. Investment increases by 4.4 per cent.

Nominal wages decline by about 1 per cent per year and there is also a slight decline in (nominal) marginal productivity of capital. The corresponding decrease in real wages is due to the larger growth rate of the labour force in comparison with the growth rate of capital. Net savings out of GDP is 14 per cent.

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