Renewed Growth and Poverty Reduction in Zambia

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The Zambian economy has grown relatively fast over the last decade. This article discusses the challenge of using these growing resources effectively to improve the welfare of the population and reduce poverty. The poverty head count index is found to have declined between 1998 and 2004 by about 5.4 percentage points. This change can be decomposed into a 6.6 percentage point reduction due to growth and a 1.2 percentage point increase due to inequality change.

Since poverty is most severe in the rural areas, it is important to make agriculture more efficient by expanding access to electricity and improving roads, extension services and education. The paper further highlights the need to improve tax revenue collection and efficiency in realising budget expenditure plans. An important reform to undertake would be to change the budget cycle. The private sector development strategy should make the country a more attractive destination for private investors by creating a better business environment and infrastructure. The country needs a new trading arrangement with the European Union. Poverty relevant social services such as health and education remain vital. The health sector needs to be strengthened, both because it has an immediate effect on welfare and because it helps build and protect human capital that is essential for long-term growth. Social protection might have a role to play. It might be possible to use schools for channelling resources to the poor. Finally, improved governance helps all other measures to become more efficient.

1. Introduction[1]

The Zambian economy has been growing relatively fast over the last decade. Per capita incomes have been increasing after a long period of stagnation or decline. This positive trend is obviously going to be affected by the current global financial crisis, but our analysis is restricted to the period before the crisis. During that period, Zambia experienced strong improvements in terms of trade, but realistic observers always expected copper prices to decline over the medium term.[2] In any event, the country faces the challenge of using resources effectively to improve the welfare of the population and reduce poverty. We discuss public sector effectiveness (including tax revenue collection, financial management, transparency, accountability, education and health services), private sector development and agriculture. We analyse empirically the incidence of growth between 1998 and 2004 on both urban and rural households.

There is need to strengthen the analysis of the poverty implications of growth in Zambia. This is particularly pertinent since the experience from resource rich African countries is that incomes from natural resources tend to be distributed inequitably (Ndulu and O'Connell, 2008). It has also been hard to sustain growth accelerations in African economies. Between 1994 and 2005 Gross Domestic Product (GDP) per capita in Sub-Saharan Africa, excluding South Africa ("Africa" from here on), has grown by on average 2.1% per year,[3] that is slightly higher than during the last period of sustained African growth between 1964 and 1974. The policy challenge for Zambia is thus to use this opportunity to generate broad-based growth with effective poverty reduction.

Zambia is in the process of implementing its Fifth National Development Plan (FNDP) during the period 2006-2010, which is to guide policy formulation and implementation over the period. The theme of the plan is broad-based wealth creation through citizen participation and technological advancement. A major weakness in previous plans has been their poor implementation due to poor resource forecasts, weak institutional arrangements and weak monitoring. It is hoped that new public expenditure management[4] and accountability systems will improve implementation.

In the FNDP (2006:1) it is noted that "wealth creation through sustained economic growth constitutes the most important poverty reduction". It is thus acknowledged that sustained and significant poverty reduction cannot be achieved unless the economy grows. It is also pointed out that growth and equity objectives are not necessarily in conflict and that the government, therefore, should seek to pursue a broad-based growth approach.

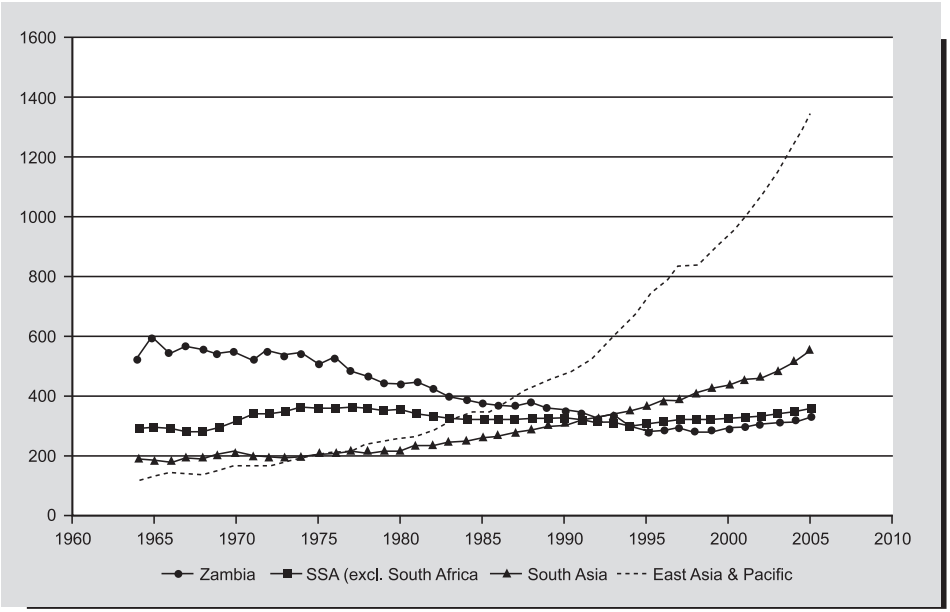
This article is structured as follows: Section 2 provides a short review of recent economic history. We consider some aspects of the growth-equity trade-off in Section 3. Section 4 provides a review of the recent economic performance and policies. Section 5 shows growth incidence curves for Zambia between 1998 and 2004, while Section 6 reviews agricultural policies. Section 7 discusses the role of donors in the policy processes and finally Section 8 summarises and concludes the article.

2. Context Setting

Zambia started out at independence as one of the richest of the newly independent developing countries, with a per capita income that was 75% above the African average and about four times that of East Asia. This is shown in figure 1.[5] Currently, the per capita income is below the African average and about a quarter of that in East Asia.

During the first decade of independence (1964-74), GDP per capita changed little while it increased by 24% in Africa. Still, Zambia saw progress in social outcomes during this period (life expectancy, child mortality, education and under-nourishment) that was similar to that of other developing countries (see figures A1, A2, A3 and A4 in the Appendix). However, from the oil crisis in 1973-1974 and up to the mid-1990s there were severe economic problems and declines in Africa with declining per capita incomes and tightening government budgets. This

Figure 1: GDP per capita (constant 2000 US$), 1960 - 2005



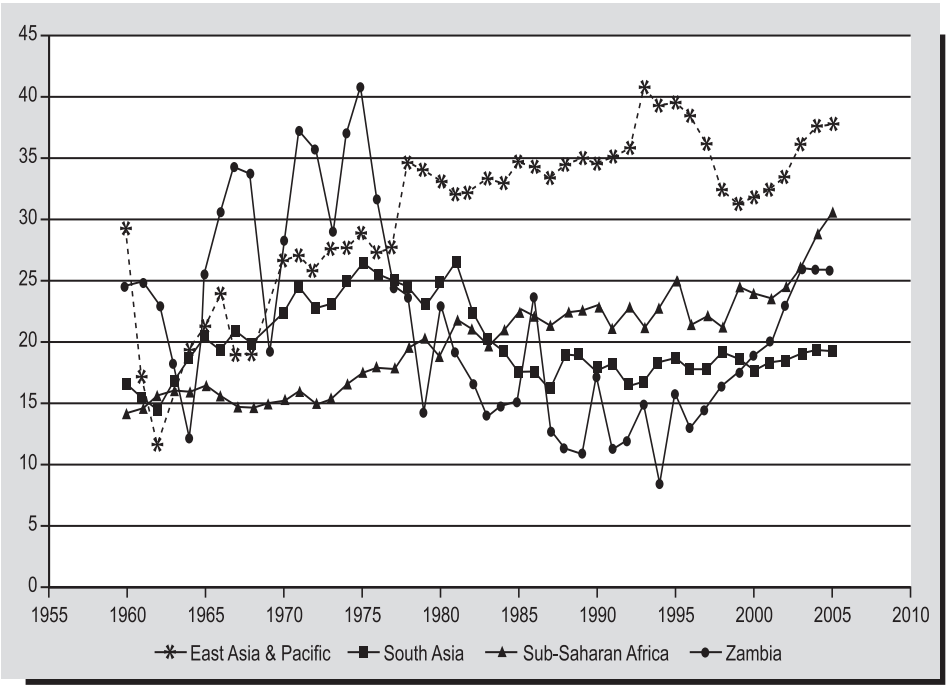
Source: World Bank (2007b), authors' own calculations

situation was compounded further by the debt crisis.[6] Life expectancy in Africa started to decline around 1985 (even before AIDS), and there were only small reductions in child mortality and undernourishment.

Except for education, Zambia's economic and social development during 1974-1994 was considerably worse than the African average (see figures A1, A2, A3 and A4 in the Appendix), and even more so compared to the developing world in general. The Zambian per capita incomes almost halved during the period. Life expectancy started to fall already in 1977 and has declined continuously ever since. Child mortality rose substantially during the 1980s. The magnitude of the decline becomes clear if one looks at the undernourishment rate, which increased from 29% to 48% between 1981 and 1992. However, it has stayed more or less the same since then. Something went terribly wrong in Zambia. Since the mid-1990s there has been some recovery, and Zambia presently seems to grow at about the same pace as the rest of Africa (and shows slightly improved social indicators).

Investment is the most classical growth determinant. Figure 2 shows that investment was high until 1975 with an average of 28% of GDP. This was higher than in East Asia at that time. But then it fell rapidly and between 1979 and 1997, the average investment rate was as low as 14.8%. The investment rate has gradually grown stronger since the mid-1990s and is now around 25% of GDP. Foreign Direct Investment (FDI) has started to increase from a low level and was projected to reach US$480 million in 2007. That can be compared to the average US$ 120 million per year in the early part of this decade.

Figure 2: Gross capital formation (% of GDP), 1955 – 2005



Source: World Bank (2007b)

Zambia has been used in the development literature as an example of how high aid is not in itself a guarantee for rapid growth. For example, Easterly (2002) computed what per capita incomes in Zambia would have been had all aid gone into investment with normal returns. He arrived at a value of US$ 20,000.[7] In reality, however, the country saw drastically falling per capita incomes, which shows that the available resources were not effectively allocated or used. During the last decade there have been some improvements though, which are to some extent due to the terms of trade gains, but there have also been some improvements in the policy environment.

Mwanawina and Mulungushi (2002) applied a growth accounting approach to analyse the period 1960-2000. They found that capital per worker started to decrease in 1975 and that total factor productivity (TFP) growth was slow throughout. Moreover, when decomposing the growth shortfall in Zambia relative to the rest of the world for the period 1960-2000, they found that capital per worker accounted for 1.96 percentage points, education for only 0.01 percentage points, and TFP for 0.86 percentage points.

What explains the low levels of investment and the poor TFP development? While the 1974 oil crisis and the general slowdown in the world economy are correlated with the negative development in Zambia, other countries were hit as

hard as Zambia, so there must be more fundamental explanations. A major political change had occurred in 1968 when Zambia started a transformation from a free market economy with multiparty democracy into a controlled economy with a parastatal sector created mainly through economic nationalisation. The reforms culminated in the one party state (second republic) in 1972. "The parastatal sector soon was confronted with political interference, inefficiency, capacity under utilisation, lack of accountability and dependency on government subsidies" (Mwanawina and Mulungushi, 2002: 2). It was also costly for Zambia to engage in helping neighbouring countries in their struggle for independence. Falling copper prices and capital flight contributed to a serious foreign exchange constraint, which led to capacity under-utilisation. The first stabilisation and structural adjustment programme began in 1985, but it was followed by a period of policy reversals. Zambia started to reinstate the market economy and multiparty democracy in 1991, although initially with mixed success. Poor sequencing of the reforms, poor institutions and poor governance meant that the environment remained hostile to investment.

Mwanawina and Mulungushi (2002) also undertook an econometric analysis trying to estimate the relative contributions of different factors to Zambia's growth failure in 1960-97.[8] Direct policies captured by the black market premium and the size of government spending explain 1.8 % of the growth shortfall. The age dependency ratio[9] and life expectancy explain another 2.4%. Finally, being landlocked explains 0.9%.[10] It is notable that the terms of trade effect does not have any significant effect. Finally, there was a positive residual of 0.6%. These are underlying variables that influence investment in physical capital as well as TFP.

Overall, Zambia's economic development during most of the Kaunda era (1964-1991) was very poor. There is certainly no basis for any yearning for a return to the policies of that era. The policy changes in recent years have not been perfect, but they have at least been in the right direction.

3. The Growth-Equity Trade-off

Bigsten and Shimeles (2007) analysed the growth-redistribution trade-off for various African countries. They found that Zambia would need to achieve an annual increase in per capita incomes of 4.0% between 2001 and 2015 to reduce poverty by half, assuming an unchanged income distribution (Gini-coefficient). Bigsten and Shimeles also calculated how much the Gini-coefficient in Zambia would have to change to halve poverty if there was no increase in per capita incomes. They found that it would require an annual reduction of the Gini-coefficient by 2.5% or a total reduction to 0.17 by 2015. This is of course impossible to achieve. But the calculation at least shows the shape of the trade-off. In the case of Zambia, with the current growth largely based on a natural resource boom, there is instead a high risk of increasing inequality unless policies are put in place to manage the distributional consequences of the boom. The challenge for poverty reduction is to achieve a good distributional outcome without jeopardising long-term growth.

The World Development Report 2006: Equity and Development (World Bank, 2006) deals with the role of income distribution policy in poverty reduction strategies. It implicitly takes the view that there is not mainly a trade-off between equity and growth, but that inequality instead in various ways is an obstacle to growth that needs to be removed. The focus of the report is not generally on the inequality of outcomes but rather on the inequality of opportunities. The key recommendation is that a level playing field should be created so that opportunities are equalised. Zambia has, for example, done this by investing in education. Although this is desirable for reasons of fairness and efficiency there may still be tradeoffs, and we need to understand how actual policies affect both growth and equity.

There is a risk of policy errors if the policy process focuses too much on policies that have short-term poverty-reducing effects. The optimal development path from a poverty reduction perspective would probably best be defined as one that minimises the discounted sum of future poverty. A policy package that achieves this would be different from one that minimises poverty in the short term. There are many policies that increase consumption today at the expense of consumption tomorrow. At the same time there are policies aimed at financing investment in infrastructure (e.g., taxation) that generate growth and poverty reduction in the longer term, while they may have negligible or even negative effects on the consumption of the poor today. Redistribution from the future to the present and from the currently non-poor to the poor can reduce poverty in the short term, but the question that needs to be addressed is how it affects future poverty.

4. Economic Performance, Structural Change, and the Budget

After twenty five years of mostly declining real incomes, Zambia has achieved positive per capita income growth rates in all years since the turn of the century. Starting in 2003, these have consistently been above 2.5%. This is shown in table 1.[11] This means that the Zambian economy has seen a gradual recovery. However, the per capita income level in 2007 will still only be back to where it was in the late 1980s. The recovery started a couple of years before the copper boom in 2004, which has accelerated growth further. The growth objective in the FNDP is to achieve a growth rate of at least 7% and to ensure that it is broad based and rapid in the sectors where the poor are mostly engaged (FNDP, 2006: 26). We also note that according to the estimates presented in the previous section, Zambia would have needed to grow by about 6.5% per year between 2001 and 2015 to be able to reach Millennium Development Goal (MDG) 1 (reduction of poverty by half). Since the growth rate has so far been below 6.5% since 2001, the rate of GDP growth from now until 2015 required to achieve MDG1 is about 7.7% per year (assuming an unchanged Gini-coefficient).

Table 1: Basic macro-economic variables, 2000 – 2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Real GDP (annual % change)	3.6	4.9	3.3	5.1	5.4	5.2	6.2	6.2	6.5
Real per capita GDP growth (%)[12]	1.4	2.5	0.9	2.7	2.9	2.7	3.5	3.5	3.5
Population growth (%)	2.2	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Inflation (%)	26.0	21.4	22.2	21.4	18.0	18.3	9.1	8.0	
Current account balance (% of GDP)									
* excl. official transfers	-19.2	-13.5	-20.8	-13.9	-17.3	-9.2	-15.9	-9.3	-10.7
* incl. official transfers	-5.5	-9.6	-3.8	-7.9	-3.8	-9.0	-5.1	-9.7	-5.9
Real effective exchange rate (2000=100)	100	112.0	110.9	101.7	107.8	134.7	176.4		
Terms of Trade (% Change)	-4.2	-1.7	-6.7	4.4	21.4	5.5	18.3	-9.7	-7.0
Copper export volume (000' tons)	234	297	330	353	393	423	476	555	610
Population, million	10.5	10.7	10.9	11.1	11.3	11.5			
GDP (Kwacha, trillions)	10.07	13.13	16.26	20.48	25.92	32.45	39.30	44.14	48.29
Gov. rev. (excl. grants), % of GDP	19.4	19.1	17.9	18.0	18.2	17.4	16.8	17.5	17.9
Gov. exp. (excl. interest) % of GDP	27.9	29.7	27.2	27.1	23.2	23.1	21.5	22.1	22.5
Gov. overall balance, cash basis	-7.0	-8.1	-6.3	-6.6	-1.7	-2.6	13.5	-2.1	-2.0

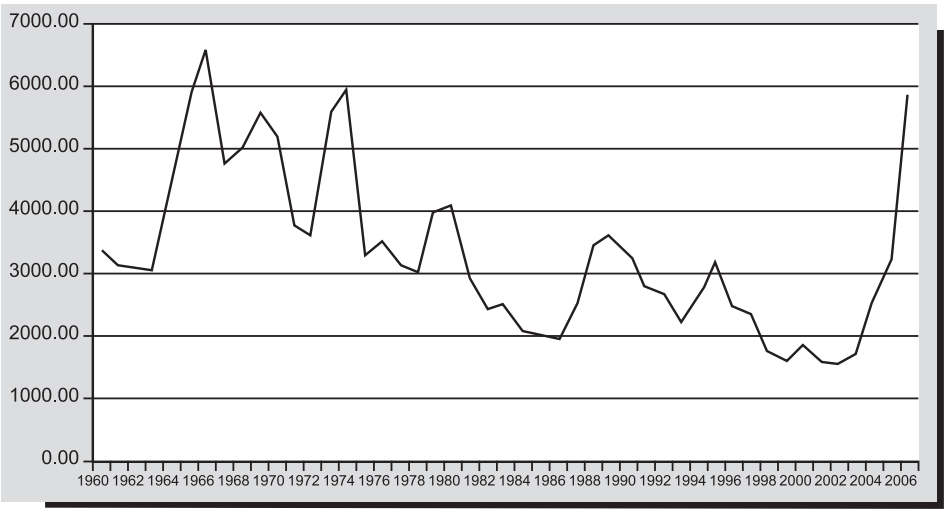
Note. 2005 is preliminary and 2006-2008 are projections

Source: IMF (2007b) Real effective exchange rate. World Bank (2007b) and IMF (2007b) consumer prices. IMF (2007b) and own calculations of real per capita GDP growth. IMF (2006a) population growth 2001-2008. IMF (2007b) population growth 2000. IMF (2007a) Average period exchange rate. None of these figures are prognoses, preliminaries or projections. Real GDP (annual % change) and population growth are projections for 2005-2008. The GDP deflator is preliminary for 2005 and projected for 2006-2008. Bank of Zambia (2007) Exchange rates for 2006 and 2007 Jan-March. World Bank (2007b) for population. IMF (2006a, 2006b)) for the rest.

The growth improvement involves most sectors with mining and quarrying, manufacturing, construction, wholesale and retail trade, and real estate and business services as driving sectors. Agricultural output has at least expanded reasonably well since the 1990s.[13] Historically the share of mining and quarrying has fallen dramatically, but during the last few years it has grown fast. Copper has historically dominated exports. Copper production exceeded 400,000 tonnes annually in the late 1950s. It reached a peak of 700,000 tonnes between 1969 and 1976 before beginning a progressive decline. In 2000, it was as low as

257,000 tonnes (Republic of Zambia, 2007, and DFID, 2006). The copper price fell in real terms until the early 2000s when it was one-third of the 1960-80 price. It has increased dramatically in the last few years and is now about the same as at the 1967 peak level. This is shown in figure 3.

Figure 3: Copper prices per tonne (constant 2000 US$), 1960 – 2006



Source: IMF (2007a)

The exported quantity of copper has doubled during the last five years, which in combination with dramatic price hikes means that export revenues from copper have increased rapidly. However, non-traditional exports have also increased substantially in recent years, with copper wire and electrical cables having the biggest volumes and sugar and tobacco doing well. While the current account balance, including grants is negative, the overall balance has been positive during the last few years due to substantial inflows of private net capital.

Total exports in dollar value have increased fourfold since 2000. They reached US$ 3.3 billion in 2006. This equals approximately US$ 250 (constant 2000) per capita which is back at the per capita level of the early 1980s but still just half of the average 1960-80 levels.

During 1995-2003 the Kwacha depreciated not only against the United States dollar but also against a basket of currencies, although the real exchange rate was quite stable. However, from January 2004 to January 2007 the Kwacha appreciated relative to the US dollar from K4,767 to K4,221 per US$ (it peaked in May 2006 at K3,185). The exchange rate peaked because of a combination of rocketing copper prices, restrictive money supply by the Bank of Zambia to get inflation down, radical debt reduction, and portfolio inflows.[14]

Generally, when faced with an appreciating exchange rate the government

needs to think of ways to pursue policies that benefit the survival of the tradables sector. An example of this could be to use the new revenue to reduce exporter costs, such as investment in transport and energy. The impact of the resource rents on the real exchange rate can also be contained by increasing imports, where the major tool is, of course, trade liberalisation. Policy changes like these, of course, have distributional consequences that need to be considered.

Although real GDP increased by 34% between 2000 and 2006, government revenue collection (excluding grants) went up by only 16%. This means that revenues as a percentage of GDP slipped from 19.4% in 2000 to 16.8% in 2006. This is to some extent explained by the Kwacha appreciation resulting in a lower Kwacha value of the Value Added Tax (VAT) on imports and customs duty (0.7% of GDP). But bringing especially the agricultural sector and the informal sector into the tax net is a problem. Furthermore, the whole fiscal regime for minerals is too generous to the existing mining houses. The planned increase in royalties will give the Treasury some extra funds, but what is required is a combination of measures such as increased royalties, increased corporate income tax and withholding tax on dividends. The new fiscal regime still does not include a form of windfall tax, which would allow Zambia to get a fair share of the current windfall revenues. We have also seen a piecemeal approach to tax policy in the past, and it is important to expedite a comprehensive review of the tax system (IMF, 2006b).

At the same time, government expenditure as a percentage of GDP has been falling. It is about the same in real terms now as at the beginning of the decade. The overall budget deficit has been kept around 2% of GDP since 2004. Budget discipline is, of course, a positive factor, but expenditures have mainly been kept low due to failures to carry out the budget plans. A key concern with regard to Zambian governance is budget implementation, and in particular its consequences for the poverty reduction strategy. There has been some progress with regard to domestic resource mobilisation through the Zambia Revenue Authority (ZRA), and at the same time Zambia receives increasing amounts of budget support. However, much work remains to be done to extend the tax coverage and even more so with regard to the implementation of the existing tax legislation.

It is important to achieve a budget allocation that is relevant for poverty reduction and that strikes a sensible balance between short-term and long-term effects on poverty. In the FNDP there is an increased emphasis on growth issues that are good for poverty reduction in the longer term, but it is also important that the programmes which can have a more immediate impact are functioning well. There seem to be high levels of inefficiency in the ways the government works, and considerable budget resources have not been spent in recent years. In 2006, K8,665 billion was spent out of the K9,942 billion in the approved budget. The K757 billion difference is explained by shortfalls in total revenues and grants relative to the targets. However, another K521 billion was unspent and only 5% of the approved budget for capital expenditures were used. In 2004 and 2005 the amounts not spent were even higher (Republic of Zambia, 2006b).

In this context one might note that the country has an absurdly misaligned budget cycle. The budget decision is taken in Parliament in March, while the budget year starts in January. This means that many activities are put on hold – something that surely makes it harder to meet expenditure and activity targets. However, addressing this problem requires a constitutional amendment which seems to be buried in the slow process to revise the full constitution[15].

Since we are here concerned with poverty reduction, we need to consider the implication of the fact that the economic expansion is driven by the copper sector. This means that there is relatively limited expansion of formal sector employment, which in turn means that the informal sector has to continue to absorb the bulk of the labour that keeps leaving agriculture. This implies that most of the new migrants will probably earn very low incomes. The Central Statistical Office (CSO) (2005) reports that there were approximately 6.7 million persons aged 12 and above in 2004. Fifty-nine percent of these were employed and 6% were unemployed. Hence 65% of this age group constitutes the labour force. Almost all of those outside the labour force are reported as full-time students or full-time homemakers. Eighty-one percent of the employed persons were engaged in the informal sector[16], up from 79% in 1998. In rural areas this proportion was unchanged at 91%, but the proportion in the urban areas increased from 48% to 57%. The increase in informal employment could partly be explained by the fact that 5% of the population aged 12 and above reported themselves as unpaid family workers in 2004, while less than 1% did so in 1998. Consequently, a new group has been added to the employed. However, the fact that the total number of persons employed in the formal sector has gone up from 740,000 to only 780,000 over the same period shows that the formal sector is not keeping up with population growth.

Another serious problem with regard to poverty reduction is that the government does not collect much tax revenue (directly) from the copper sector (obviously the government is not able to collect significant revenues from the informal sector either), because the firms that bought the copper companies at the bottom of the crisis at the turn of the century were given extremely favourable terms with extensive tax exemptions. The government is now trying to renegotiate the copper contracts, and hopefully something beneficial will come out of this.

Although the government certainly could do more with a larger budget, it is still very important to improve efficiency in terms of how the existing money is handled and spent. The process of reforming public financial management has been ongoing for a long time, but progress seems to be exceedingly slow. Zambia is introducing an integrated financial management information system (IFMIS) within the public expenditure management and financial accountability (PEMFA) programme to strengthen the financial management system. To get a modern system in place to track expenditures is a central dimension in the reform process. There is not yet a single treasury account, and the cash management still seems to be inefficient.

The government has difficulties both implementing performance assessment indicators and terminating inefficient programmes. Decentralisation efforts are

ongoing, although this seems to be a challenging task. The Auditor General supplies reports with critical information to the Public Accounts Committee of the National Assembly, but the actions are decided by the Executive. Still, this is done in camera and people are becoming more aware. Large-scale corruption is being tackled, but small scale corruption does not seem to be declining. The Corruption Perception Index (Transparency International, 2008) has not changed at all since the turn of the century.

5. Poverty and Inequality Outcomes

Zambia is unusually urbanised for an African country, with an urban population share of 39%. Yet, the country does not have an unusually large share of the labour force in formal sector employment (19% of the employed or 17% of the labour force). The bulk (66%) of the urban labour force is in the informal sector or unemployed (CSO, 2005). This needs to be taken into account when formulating poverty reduction policies. Still, there has certainly not been any overemphasis on the poor rural inhabitants and reaching those groups will remain the key challenge.

The country has conducted at least six countrywide surveys since 1991 to measure the living standards of its people (CSO, 2005). The 2002/03 Living Conditions Monitoring Survey III (LCMS III) was an Integrated Household Budget survey; a diary method was used and a 12-month period was covered. The other five were Indicator Monitoring Surveys; one-spot (single interview) surveys. It is therefore not completely appropriate to compare the results from LCMS III with the results from the other surveys. The poverty lines in the Indicator Monitoring Surveys (see table AI in the Appendix) were originally derived from a 1981 ILO/JASPA basic needs mission to Zambia. The Zambian poverty lines have been based on the Food-Energy Intake approach. In 1991 the cost of the food basket (the poverty line) was updated.[17] The poverty lines were then again updated in subsequent surveys by the change in the Consumer Price Index (CPI) (Situmbeko, n.d.) In all of them the calorie requirements per adult equivalent was set at 2,721; not at 2,450 as recommended by the World Health Organisation (WHO) (CSO, 2004): this, of course, means that the estimated level of poverty is higher than if the WHO recommendation had been used.

The surveys collected data on household consumption expenditures. Two poverty lines are used by the CSO: the extreme poverty line is the food poverty line, which was K78, 223 (1.02 PPP adjusted international 2000 US$/day) in 2004. The moderate poverty line also includes consumption of “some minimum basic non-food items such as health, shelter and education”. This part is assumed to make up 30% of the consumption bundle of the poor. Thus, the moderate poverty line can simply be constructed as 1/(1-0.3) times the food poverty line, or K111,747 (1.45 PPP adjusted international 2000US$/day). This can be compared with the World Bank poverty line of 1.22 PPP adjusted international 2000 $/day (World Bank, 2007b). The World Bank has 28% non-food items in the basket defining the poverty line.

The levels of poverty recorded for Zambia by the CSO are significantly higher than those of other African countries at a similar income level. The World Bank

(2007a) argues in their analysis of poverty in 2002/03 that the poverty line used by the CSO is too high. While CSO's moderate poverty line for 2002/03 was estimated to be K92,185, the World Bank estimated it to be K73, 394. Their respective estimates of the incidence of poverty were 67% and 56%.

The methodologies used by the World Bank and the CSO to estimate the level of poverty for 2002/03 are similar, but the assumptions underlying the estimations differ in several respects. The first difference between the two poverty line estimates is that CSO sets the calorie requirement per adult equivalent at 2,721, while the World Bank uses the WHO (1985) recommendation of 2,464 calories. Secondly, there is a difference in how the consumption basket of the poor is constructed. CSO uses Lusaka prices from the first of the ten cycles in the survey as reference prices, while the World Bank uses national median prices. To determine the food basket underlying the poverty line, CSO calculates quantities by dividing national average expenditure shares by Lusaka cycle one prices. This means that the CSO basket has less of foods that are expensive in Lusaka relative to the national representative food basket. Then both institutions compute district poverty lines using district prices relative to the baseline prices. There are, furthermore, some small differences between the two estimates in how the price index is constructed. The discussion of the CSO and the World Bank is of some importance with regard to the poverty discussion within Zambia, but it is mainly with regard to international comparisons that it is important to keep measurements consistent across countries. The CSO-estimated poverty line seems quite high. The World Bank estimate gives a more internationally comparable estimate of the level of poverty in Zambia. However, with regard to changes over time, the level of the poverty line matters less. Here, it is important that the procedures to compute the poverty line do not change over time. We will stick to the CSO line in our estimates below for 1998-2004, although we do find that the World Bank line is preferable for some uses.

The 1998 food poverty line was K32,861 per adult equivalent. The CPI adjusted poverty lines from 1993, 1996 and 1998 are updated versions of the 1991 line using CPI (CSO, 2005:112). However, it seems that the 2004 poverty line was not updated accordingly. It was instead updated with the CPI based on the 2002/03 line, which was calculated from scratch. The increase of the poverty line between 1998 and 2004 is smaller than the CPI increase, suggesting that the 2002/03 computations probably were done based on food prices (which makes sense given the way the poverty line is constructed).

The CSO-estimated poverty levels are shown in Table 2. According to these, national poverty was virtually the same in 2004 as in 1991. The rural level of poverty declined from 88% to 78%, while the urban poverty level increased from 49% to 53%. However, both urban and rural poverty declined from 1998 to 2004.[18]

Table 2: Historical development of moderate poverty levels, 1991 -2004

	1991	1993[19]	1996	1998	2004
Poverty level	70	74	69	73	68
Rural poverty level	88	92	82	83	78
Urban poverty level	49	45	46	56	53

Source: CSO (2005)

The poverty levels in 1998 and 2004 are estimated using the standard FGT index, which is given as:

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{(z - y_i)}{z}\right]^\alpha$$

Where *n* is the total number of households, q is the number of households below the poverty line, *z* is the poverty line and y_i is the consumption of household *i*. For α = 0, the FGT index reduces to the head-count ratio H; for α = 1, it is the poverty-gap or depth of poverty; and for α = 2 the FGT index has been interpreted as indicating the severity of poverty.

Table 3: FGT-indices of moderate poverty for total, rural and urban households

	Total		Rural		Urban	
	1998	2004	1998	2004	1998	2004
Head count	72.93	67.56	83.45	77.47	55.05	52.12
Depth	40.05	35.22	49.94	44.10	23.74	22.00
Severity	26.71	22.73	34.82	29.86	13.20	11.98

Source: Own calculations

We see in table 3 that poverty is much more widespread and severe in rural areas. The positive news is that the rural depth of poverty fell from 0.72 in 1991 to 0.50 in 1998, and then finally to 0.44 in 2004.

Next we take a closer look at how the poverty changes have been brought about, using the approach of Datt and Ravallion (1992). They devised a simple decomposition algorithm able to decompose the change in poverty between two points in time into one part due to per capita income change and one part due to inequality change plus a residual. We apply this approach on the change in poverty from 1998 to 2004. The basic formula is:

$$P_{04} - P_{98} = G(98,04) + D(98,04) + R(98,04)$$

The growth component G and the redistribution component D are given by

$$G(98,04) = P(z_{04}/\mu 04_{04},L_{98}) - P(z_{98}/\mu_{98},L_{98})$$

$$D(98,04) = P(z_{98}/\mu_{98},L_{04}) - P(z_{98}/\mu_{98},L_{98}),$$

Where, for example, $P(z_{04}/\mu 04_{04},L_{98})$ is the poverty level that Zambia would have had in 2004 with a 1998 income distribution and a 2004 per capita income level. Since the poverty measures used are not additively separable, we get a residual component R.

We have used this method to decompose the change in moderate poverty from 1998 to 2004. This decomposition is based on the official poverty lines, even though we have some concerns about them as discussed above. Our consumption expenditure per adult equivalent based Gini-coefficients are 0.533 for 1998 and 0.544 for 2004, indicating that there was a slight increase in the Gini-coefficient over this period.[20] Tables 4, 5 and 6 report our results.

Table 4: Decomposition of changes in total moderate poverty

Period	**Growth component**	**Redistribution Component**	**Residual In poverty**	**Total change**
Head count (P0)				
1998 to 2004	-6.62	1.24	0.01	-5.37
Depth (P1)				
1998 to 2004	-5.41	0.68	-0.10	-4.83
Severity P(2)				
1998 to 2004	-4.27	0.39	-0.10	-3.98

Source: Own calculations

The results for changes in moderate poverty show that growth contributed significantly to poverty reduction in the period 1998-2004, both in urban and rural areas. Although there was a modest poverty increasing effect from the inequality increase, overall poverty still declined substantially.

Since Zambia is a very unequal society with a Gini-coefficient almost as high as that of South Africa, there is an underutilised poverty reduction potential from policies aimed at decreasing inequality. We see that the negative effect of income distribution change on poverty is somewhat more pronounced in urban areas than in rural areas. We repeated the same calculations for extreme poverty for the period 1998-2004, and found the same pattern there.

Table 5: Decomposition of changes in rural moderate poverty

Period	Growth component	Redistribution Component	Residual	Total change In poverty
Head count (P0)				
1998 - 2004	-6.53	0.21	0.34	-5.98
Depth (P1)				
1998 - 2004	-7	1	0.16	-5.84
Severity P(2)				
1998 - 2004	-6.06	1.1	0	-4.96

Source: Own calculations

Table 6: Decomposition of changes in urban moderate poverty

Period	Growth component	Redistribution component	Residual	Total change In poverty
Head count (P0)				
1998 - 2004	-5.9	2.85	0.12	-2.93
Depth (P1)				
1998 - 2004	-3.45	1.84	-0.13	-1.74
Severity P(2)				
1998 - 2004	-2.28	1.2	-0.14	-1.22

Source: Own calculations

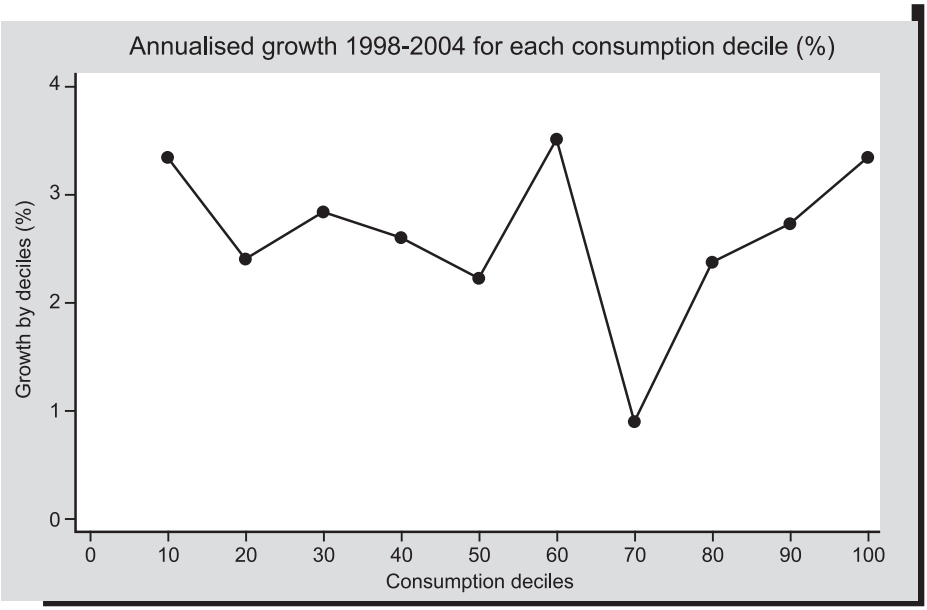
Poverty is clearly more severe in rural areas, but we also note that income growth has been somewhat better there than in urban areas. The incidence as measured by the head count is, of course, much higher, but the urban-rural differences are even larger when comparing the depth and the severity of poverty. The results are in line with indicators such as life expectancy, undernutrition and child mortality, where Zambia has been scoring worse than Africa in general since around 1990 (see figures A1, A2 and A4 in the Appendix). Hence, even if poverty is being urbanised in Africa, it is still overwhelmingly rural.

To characterise the growth pattern further we have constructed growth incidence curves for all of Zambia, rural and urban Zambia. These curves show how consumption growth varies across deciles of the population, and how average real household consumption increased from 1998 to 2004. The curves are deflated by the poverty line.

For all of Zambia, we can see that all deciles experienced positive growth during the period. This is shown in figure 4. There is no clear pattern of differences across income levels.

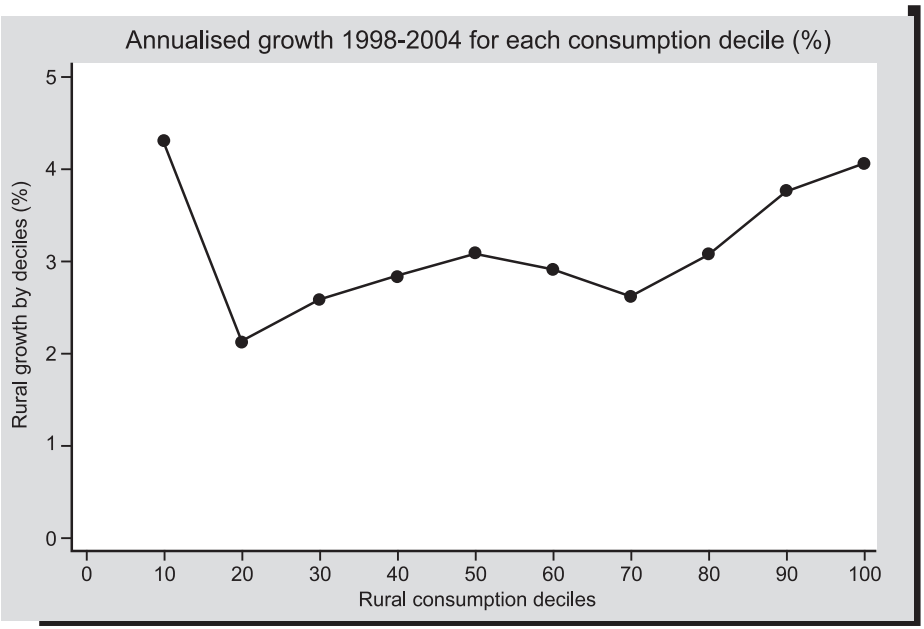
The results for rural Zambia shown in figure 5 indicate that the bottom decile has done really well, but one needs to be cautious not to read into this too much, since measuring there is problematic. These are households with very low

Figure 4: All of Zambia growth incidence curve



Source: Own calculations

Figure 5: Rural growth incidence curve

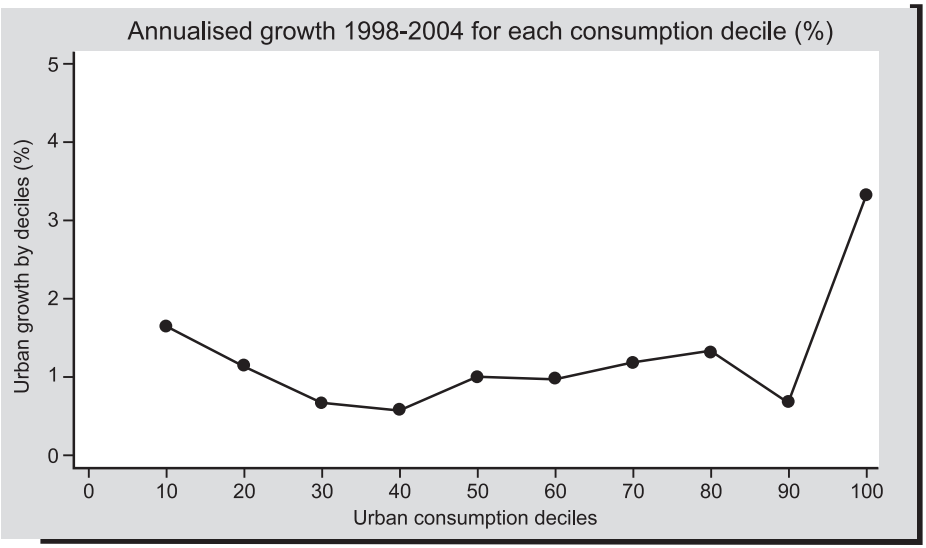


Source: Own calculations

incomes. Apart from the bottom decile, the curve slopes generally upward, indicating that the better-off farmers on the whole did somewhat better than their poorer colleagues.

When it comes to the urban growth incidence curve shown in figure 6, we see that the bottom of the distribution has done slightly better than the intermediate range, while the richest urban decile in particular was successful. It is perhaps not surprising that the better off in particular benefit when there is acceleration in the growth of the economy.

Figure 6: Urban growth incidence curve



Source: Own calculations

6. Agricultural policies

In the 1980s, up to 17% of the national budget was devoted to maize and fertiliser subsidies, but these were then scaled back. However, in recent years as much as 70% of the Ministry of Agriculture budget has gone to fertiliser subsidies and maize marketing and stockholding programmes. Only 20% of small farmers use fertilisers in Zambia. The farmers' effective demand for fertilisers must be built up by making it profitable to use, which includes developing output markets and regional trade patterns. Jayne et al. (2007) argue that "sustained investment in crop science, effective extension programmes, physical infrastructure and a stable and supportive policy environment" is where public sector resources can make the best use. Targeted assistance to vulnerable households is important but should not interfere with the long-term development of agricultural markets.

Since the bulk of the poor in Zambia are found in rural areas, it is of course

vitally important to develop agriculture and other rural economic activities. Development of agriculture is also important to bring about the structural change required for long-term growth. The introduction of a complex set of subsidy programmes via local governments and cooperatives does not seem to be the most efficient route to improve rural incomes. This has meant that the private network sellers of fertilisers are in trouble and many do not even hold fertiliser stocks any more since their market has been taken away. Local traders and network sellers need a predictable environment to get incentives for a long-term engagement in the sector. The recent huge government maize purchase is a signal pointing in the wrong direction. The private traders who had entered the business are squeezed.

The Food Reserve Agency (FRA) should be just that and not a last resort buyer. The policy in this area was rather straightforward until the last election when the purchases of the FRA shot up from 50,000 to 400,000 tonnes. The surplus was supposed to be exported but that has still not happened. Instead there seems to be a high risk that much of it will be wasted. The government seems to have had a roadmap for private sector growth in agriculture, but now there seems to be a move of policy thinking towards more state intervention and subsidy schemes. Subsidised fertilisers are sold through farmer unions and the like, and the well-connected people end up getting access. There are suggestions that there are very extensive rent-seeking activities going on, where the elite get the cheap fertiliser and then re-sell it.

Hence, the introduction of these subsidy schemes is problematic not only from an efficiency perspective but also from a distributional point of view. Since 75% of farmers do not sell maize at all and a small minority, 2%, sells half of it, the distributional impact of these subsidies is skewed. The subsidy scheme has also had other distortionary effects. Since the guaranteed prices are higher than in neighbouring countries, it seems obvious that maize is carried over the border and sold into the Zambian reserves. There are at least four places along the borders where the buying stations have bought much more than the local farmers sold (so-called ghost sales).

There is a high variation within districts in terms of land ownership and land ownership is a key income determining factor. The issue of land ownership has not yet been sorted out. In areas under traditional tenure (94% of the land), the chief decides on the allocation of land. Everyone is supposed to have land according to capability, but this is, of course, a flexible concept. Influence seems to matter a lot as well. Local allocation of land in fairer ways seems highly important. Insecurity of tenure may have significant effects on the willingness of farmers to invest and on their ability to use land as collateral for loans to finance investment.

Bigsten and Tengstam (2009) show that smallholders in Zambia are dependent on a whole range of off-farm incomes, and that it is, therefore, important not to look at rural policies as only those that concern agriculture. Paving the way for diversification is also key in a package of poverty-reduction policies. Infrastructure that facilitates activities other than agriculture includes many things

that are also beneficial for agriculture, e.g. a good transport infrastructure. The diversification route to higher incomes for rural households requires a well-functioning economic environment and general policies that make it possible for new activities to emerge.

7. Donors and Governance

We have argued in this article that the formulation of policies and probably even more the implementation of those policies is a key challenge for Zambian development. We conclude with a brief discussion of what this implies for donors.

Donors have developed a Joint Assistance Strategy for Zambia (JASZ), which is related to the FNDP. This is to provide an analysis and a basis for collaboration. JASZ has a lead donor concept, which is almost fully implemented. Also, the coordination of donors is a complicated process. The Zambian aid policy is now approved. The Aid Department at the Ministry of Finance and National Planning is working more or less as it did twenty years ago, but is currently revising its structure to allow for the donor coordination efforts. The FNDP is generally sensible in terms of overall policy direction, but the challenge is to implement the policies especially since governance in Zambia remains weak. This is or should be the key concern from a donor point of view with regard to development cooperation with Zambia.

Collier (2006) discusses aid collaboration in Africa and notes that the resource-rich countries often have had large and corrupt government sectors, since they have been able to earn sizeable resource rents which accrue to the government. Although the resource rents accruing to the Zambian government today are very much reduced compared to the initial decades after independence, the current system nevertheless emerged under those circumstances. Collier argues that the appropriate strategy towards countries in this category is to find ways to improve their efficiency in spending public money. This can be done through knowledge transfers and governance conditionality trying to make the government more accountable to its citizens. For rents (and aid money which also can be seen as a sort of rent) to be effectively used, it is probably necessary that power is more widely diffused. The development of good systems of public spending can be supported by appropriate technical assistance. There is a strong need for proper project evaluation techniques to be incorporated in the project evaluation and monitoring (PEM) systems in Zambia. Transparency and accountability mechanisms are certainly important, but one must not forget that bad policies will have poor impacts and results even if they are implemented transparently and with full accountability.

Policy conditionality was not very successful in dealing with the problems of elite capture. The alternative of governance conditionality aimed at weakening the dominance of the governing elite was proposed by Collier (2006) as a better alternative.[21] Unfortunately there is a knowledge gap about how to implement governance conditionality. A parallel constraint is the lack of administrative capacity in the civil service, which needs to be developed by various forms of technical assistance. Technical assistance needs to be aligned with the new paradigm of ownership and control.

Democracy has two dimensions: electoral competition and checks and balances. Resource rich countries in particular need democracy to avoid elite capture of rents. They also need checks and balances to prevent elections from being converted into corrupt patronage games financed by the resource rents. One needs system scrutiny to achieve honesty and other systems to achieve efficiency. Since scrutiny is a public good it is subject to collective action problems, and donors could possibly take a role to stimulate peer group evaluations. The donors could help improve the information to the principals (citizens) and build up their capacity to analyse it, and help promote incentives for government agents to act in accordance with the wishes of the principals. Audit systems and parliamentary scrutiny are key areas of intervention, and these are both part of the PEMFA programme.

A key aim of donors in Zambia should be to improve governance and implementation capacity. This may require governance conditionality combined with technical assistance to build up systems that can handle government resources in a transparent and accountable manner. Zambia has reformed economic policies extensively and the current FNDP seems reasonable. How well the government will succeed in achieving growth and poverty reduction will depend on the amount of resources it can mobilise, but it is also crucially important that the government is able to implement policies effectively.

8. Concluding Remarks

This article started with a discussion of Zambia's economic development up to the present phase which is characterised by a resource boom. We discussed current economic policies, and provided our own empirical estimates of changes in poverty, mainly from 1998 to 2004. Against this background we considered the appropriateness of economic policies for poverty reduction. The focus has not been on the macroeconomic issues which have been dealt with extensively by others, but instead on micro and structural issues.

We found that poverty as measured by the head count index declined by about 5.4 percentage points. We decomposed this change into a 6.6 percentage point reduction due to growth and a 1.2 percentage point increase due to a slight change in inequality. We also looked at the growth incidence across consumption deciles. According to our estimates all deciles experienced an increase in consumption between the two years. Overall the increase seems to have been somewhat larger in rural areas, with the exception of the top urban decile which experienced a rapid consumption increase. Poverty still remains much more severe in the rural areas than in the urban areas. We also note that poverty leads to undernutrition, that life expectancy in Zambia is among the lowest in the world, and that under-5 child mortality is very high.

We saw in our analysis of the pattern of smallholder income growth that diversification is a very important route out of poverty for the rural poor in Zambia. Policy makers should thus keep in mind that rural household incomes are not from agriculture alone. A major focus should be on measures that strive to facilitate the diversification process. Typically, these are policies that develop the overall economic

environment and help smallholders get better market access. Agriculture is a major part of the private sector in Zambia, and should receive higher priority in policy.

The government often has sensible private sector development policies, but according to several observers they are implemented poorly, slowly and reluctantly. This is the classical Zambian problem of a disjoint between sensible policy analyses and the capacity and willingness to implement the policies. Policy is often inconsistent as to what to do with the private sector. It seems as if the government likes interventions to be specific rather than general. The reluctance to move away from ad hoc government interventions may in part be due to the lingering Kaunda romanticism.

So what are our policy conclusions? First, we saw from the review that tax revenue collection has not kept pace with GDP growth, one reason being that the copper boom generates little direct tax revenue. Another reason is that most employment is within the informal sector, where hardly any tax is collected. Still, the poor tax buoyancy is a concern from a poverty reduction perspective, because collecting tax revenues and using them for poverty reducing expenditures would have been one of the main ways to channel resources from the boom to the poor.

Second, we noted that the government is very inefficient in realising its expenditure plans. This is a reflection of the generally low level of efficiency in the public sector, and it is absolutely essential that the financial management reforms are speeded up. Smooth and transparent reporting is key for domestic accountability and also for development cooperation. An important reform to undertake would be to change the budget cycle. It certainly seems absurd to decide on the budget in the Parliament in March when the budget year starts in January!

Third, we noted that improved public sector efficiency is crucial if reforms are to function properly. We discussed various issues relating to transparency and accountability, and the importance of monitoring by the electorate, the donors and by government institutions such as the Auditor General.

Fourth, it is clear that the focus of poverty oriented policies will largely have to be on the rural sector and agriculture, since rural poverty is much more extensive than urban poverty. Since Zambia is a very unequal society with a high Gini-coefficient, poverty levels could also be reduced via a lowering of inequality. But since the average income and consumption is extremely low, growth is crucial for poverty reduction. To make agriculture more efficient and to reduce rural poverty, resources should be used in line with the FNDP to improve infrastructure such as roads and electricity supply, extension services and education rather than for subsidy schemes. More than half of the Ministry of Agriculture budget has gone to fertiliser subsidies (mostly for maize) and maize programmes. However, there has been diversification and in recent years it is, for example, cassava, sweet potatoes and livestock production that have performed well. Secure property rights are of course also a crucial determinant of rural investment. While the FNDP emphasises the measures just mentioned, implementation in these areas seems to be slow.

Fifth, there are some good intentions in the private sector development strategy, but implementation again seems to be inefficient. The government still

seems to focus too much on the need to control and intervene in details, while it would be more efficient to do away with excessive interventions. If Zambia is to be able to reach an economic take-off, the country must be an attractive destination for both foreign and domestic private investors. Apart from a better business environment, the infrastructure must be improved (particularly since Zambia is landlocked), and the country needs a successful completion of a new trading arrangement with the European Union.

Sixth, even if there is a need for policies towards the productive sectors, the very important areas of poverty relevant social services such as health and education remain vital. The health sector needs to be strengthened both because it has an immediate effect on welfare and because it helps build and protect human capital that is essential for long-term growth.[22]

Seventh, social protection might have a role to play, but it is probably not possible to expand this fast. It might be possible to use schools for channelling resources to the poor. By having, for example, free school lunches and school uniforms, a certain amount of "child support" would be provided and school attendance would be encouraged at the same time. There are some interesting but small-scale experiments of social protection done with donor support. For example, the Ministry of Community Development is currently experimenting with a cash transfer scheme in the Southern Province that seems to hold some promise.[23] There is, of course, a concern as to the ability of the system to scale up this, and the cost implications of that have not yet been analysed.

Eighth, we have repeatedly noted that improved governance is the key to successful development, an idea that has been floated is that donors should shift to some form of governance conditionality. This would mean a concentration on achieving a transparent and accountable process rather than on achieving specific decisions.

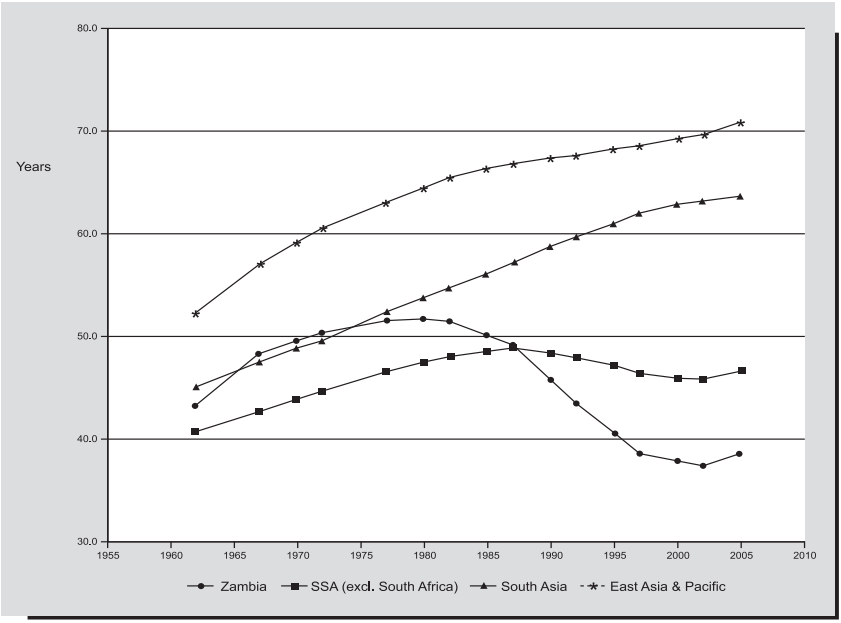
Appendix: Tables and Figures

Table A1: Poverty lines, 1981-2004.

Year of Survey (ending month)	Poverty lines	
	Food Poverty	**Moderately**
1981 ILO/JASP	K60	K105.94
1991 PSI (nov)	K961	K1,380
1993 PSII (june)	K5,910	K8,480
1996 LCMSI (sept)	K20,181	K28,979
1998 LCMSII (dec)	K32,861	K47,187
2002/3 LCMSIII (oct)	K64,530	K92,185
2004 LCMSIV (jan 05)	K78,223	K111,747

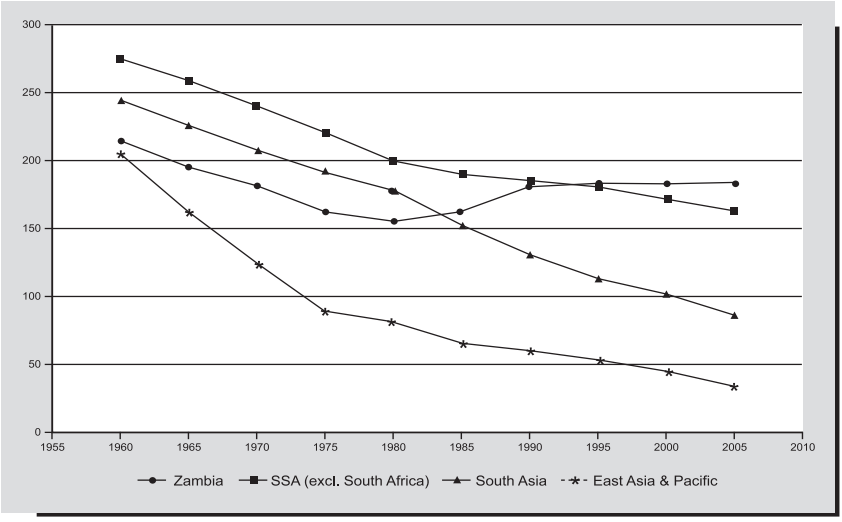
Source: CSO (2005)

Figure A1: Life expectancy at birth, total (years)



Source: World Bank (2007b), authors' own calculations.

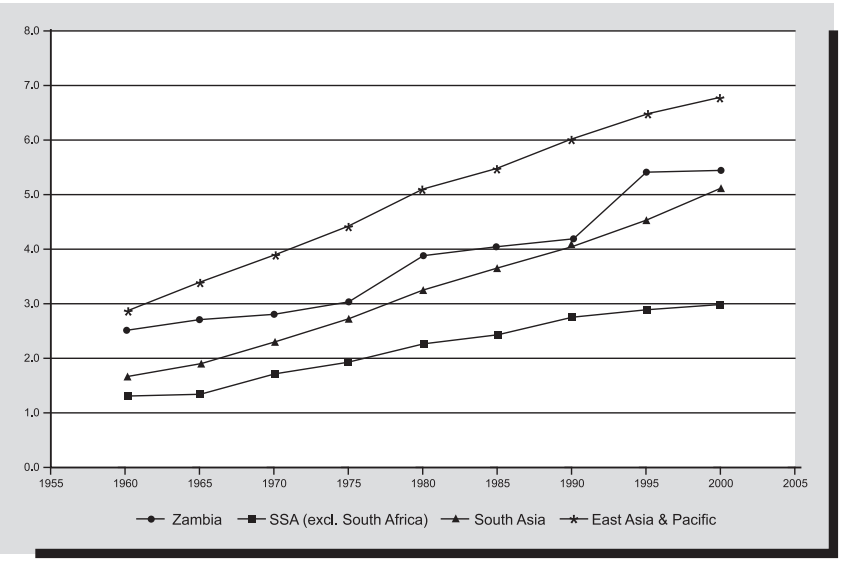
Figure A2: Mortality rate under-5 (per 1000)



Note: The 1965 and 1975 values for SSA and South Asia and Pacific are authors" estimations, due to lack of data. Sub Saharan Africa (incl. South Africa) is used due to lack of data.

Source: World Bank (2007b)

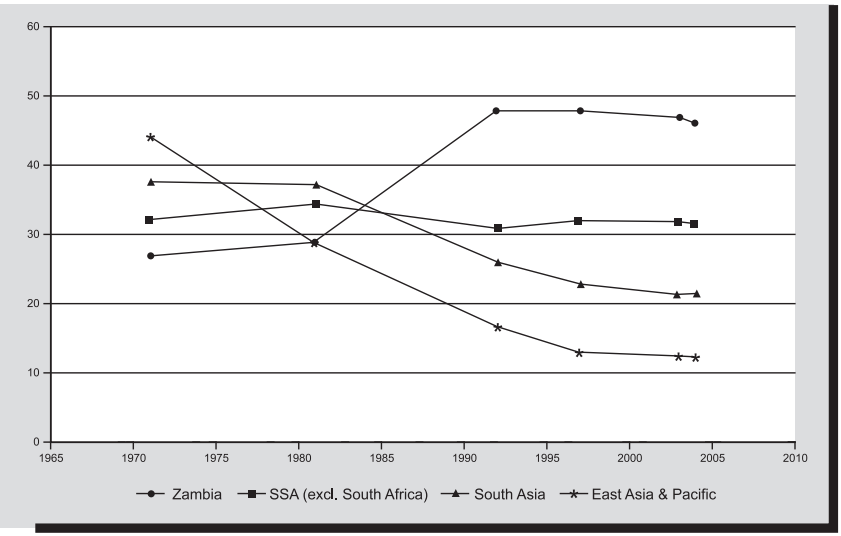
Figure A3: Average years of schooling



Note: *Since no data is available for SSA, South Asia or East Asia; average of Ghana, Kenya, Senegal, Sierra Leone, Sudan, Tanzania, Uganda and DRC is used for SSA, India is used for South Asia and Malaysia is used for East Asia. They are fairly representative for respectively country-group (please note that data for China is not available).*

Source: *Barro and Lee (2000).*

Figure A4: Prevalence of undernourishment (%)



Source: World Bank (2007b), authors' own calculations

Notes

1 We would like to thank officials of the Zambian government and other institutions for very helpful discussions. We are grateful to Jos Verbeek for useful comments and to Abebe Shimeles for help with the poverty analysis. We would also like to thank Michael Weber and Anthony Chapoto for sharing their data on Zambian agriculture with us. Finally, we are grateful for all the help received from Eva Lövgren and other staff at the Swedish Embassy.

2 Commodity prices are generally volatile and unpredictable. The typical pattern has been a rapid price increase when there is a stockout of the commodity (when stocks fall below some level that is considered acceptable) (Collier, 2007). This abrupt increase in the price of a commodity is then generally followed by a slow long-term decline. The pattern one observes is consequently one with short periods of very high prices with slowly falling prices in between. Zambia currently has extremely high copper prices, but experience from other such periods thus seems to suggest that it will be followed by a long period of declining prices. Countries have generally found it difficult to handle commodity booms (Collier and Gunning, 1999; O'Connell and Ndulu, 2006), and Zambia has previously had problems handling resource incomes in an effective manner (Bigsten, 2001).

3 1994-2005 World Bank (2007b), 2005-2007 IMF (2007b), 2006-2007 is an estimate.

4 For example, the Integrated Financial Management Information System and expenditure programme controls making sure that no investments that do not have a certain minimum internal rate of return are undertaken.

5 The initial differences are somewhat smaller in PPP adjusted constant 2000 international $: Zambia 1390, Africa 990, South Asia 1010 and East Asia and Pacific 530 (authors' own calculations and World Bank, 2007b).

6 In the early 1980s the international community throttled the inflow of loan money to less than debt service levels (net flows became negative). This contributed to cutbacks in government expenditures and lower investments both in the social sectors and in infrastructure.

7 "I start with a comparison of what Zambia's actual average income is to what it would have been, $2 billion of aid later, if filling the financing gap has worked as predicted ( ). Zambia today would be an industrialised country with a per capita income of $20,000, instead of its actual condition as one of the poorest countries in the world with a per capita income of $600 (which is one third lower than at independence). Zambia is one of the worst cases for the financing gap approach, because it already had a high investment rate before aid and it got a lot of aid. But Zambia's investment rate went down, not up, as the aid increased, and the investment in a case did not yield growth" (Easterly, 2002: 42).

8 The black market premium was around 100 %, which lowered the annual growth by 0.7 %. Had the size of the government sector been 20 % instead of around 30 % of GDP, growth would have been 1.1 % higher. Being landlocked lowered growth by 0.9 %. The age dependency ratio has been around 100 %, but if this had been 70 % as in e.g. India in the 1980s, growth would have been 1.5 % higher. Had life expectancy been 60 years instead of 50, then growth would have been 0.9 % higher.

9 Controlled for difference between growth of working age population and total population.

10 Geography is important (Sachs and Warner, 1997, and Bloom and Sachs, 1998) as it could either undermine the health of workers or impose high transactions costs.

11 IMF (2006b) estimates the annual population growth to 2.4 %, but World Bank (2007b) reports an average rate of 1.9 % for the period.

12 The total gross value of agricultural output rose by over 50% between the mid-90s and 2001-2004 (Jayne et. al., 2007), and grew annually by 3.8 % 2003-2006 (Republic of Zambia, 2006a and 2006b).

13 A debt management system is under way with the help of the IMF and the World Bank. Maybe large new loans will have to pass through Parliament. The country is more creditworthy again, but for the time being the government is not in any shape to start taking large new loans.

14 Informal sector employment is defined as employment where the employed persons are not entitled to paid leave, pension, gratuity and social security, and work in an establishment employing five persons or less.

15 The budget cycle was changed in the 2010 budget.

16 By the National Food and Nutrition Commission, and the Price and Incomes Commission.

17 Poverty levels generally change with the seasons. The 1993 survey was conducted April-June, which is a season when the poverty level is approximately three percentage points lower than the yearly average. The other four surveys (except 2002/03) were conducted when poverty levels were in general 3-5 percentage points higher than the yearly average (World Bank, 2007a:54).

18 The Gini-coefficient for income is estimated by CSO to be 0.57 (Zambia, 2006c: 16). Our estimate of the Gini-coefficient for the distribution of per adult equivalent consumption is slightly lower at 0.544. Consumption distributions tend to be more equal than income distributions.

19 Currently partners in Poverty Reduction Budget Support to Zambia monitor progress against agreed benchmarks drawn from the Zambian FNDP. Partners could consider withdrawing aid when the recipient moves away from commitments to poverty reduction, human rights and other international obligations, or sound financial management.

20 The per capita 2006 spending on health was US$ 16.7 (K51,500) or 1.5 % of GDP, so the consumption of (publicly provided) health is very low. The AIDS situation in Zambia is extremely serious; apart from the human suffering it causes shortages of essential labour. The missing staff must be replaced, which probably leads to higher wages. This is an area where the need for increased intervention is obvious, and here for example the Zambian Government, the Global Fund and PEPFAR provide resources covering ARVs for infected persons. Since the costs of drugs are covered by the donor this does not seriously crowd out other government projects, although there are administrative burdens in association with the administering of the project.

21 The largest social protection scheme in the country is the World Food Programme, which provides food for US$10-15 million every year reaching 300-400 thousand people/children.

22 This might be too low, since it is calculated from the population growth reported by IMF (2007b), which is high. Note that IMF and World Bank (2007b) in general have the same figures for Zambia 2000-2005 for real GDP growth, but IMF on average reports 0.6 percentage points higher population growth rates, and 0.6 percentage points lower GDP per capita growth rates.

23 The extra high poverty levels this year when taking the underestimation into account are probably explained to a large extent by drought.

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Determinants of Child Nutritional Status in Zambia: An Analysis of a National Survey

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Malnutrition affects many children and is a leading cause of childhood mortality and non-fatal health loss. Zambia has one of the highest rates of malnutrition in the world. About half of the Zambian children are stunted while one in five is underweight. Prevalence of wasting is much lower. This article examines the determinants of nutritional status among children aged below five years in Zambia using data from a national cross-sectional survey conducted in 2006. Multivariate analysis is used to quantify the effects of several household and child-specific socioeconomic and demographic factors on nutritional status, as well as a geographic context (community level) fixed effect. Our analysis indicates that household expenditure is a leading determinant of nutritional status of a child. Further, the positive effect of parental education was observed. Children become more malnourished as they get older than 18 months. Poor nutrition falls disproportionately on rural children, after all other included covariates were controlled for. The significance of the geographic context suggests an underlying ecological pattern to malnutrition besides the individual and households factors. Understanding the determinants of poor nutritional attainment can provide insights in designing interventions for reducing the high levels of child malnutrition in Zambia.

1. Introduction

There is heightened global policy attention to the problem of poor nutritional attainment among children in developing countries. The United Nations has included two nutrition-based indicators, defined as the prevalence of underweight children (under five years of age) and the proportion of population below minimum level of dietary energy consumption, to monitor progress towards its Millennium Development Goal (MDG) number one (eradication of extreme poverty and hunger). Thus, nutritional status is often used as a measure of social development. Furthermore, nutritional status is strongly connected to health outcomes (Braveman 1998; Muller and Krawinkel, 2005). The most recent estimates on deaths attributable to malnutrition indicate that about 20% of all deaths and 20% of health loss (measured in Disability-Adjusted Life Years (DALYs)) among children aged below five years living in low-income countries can be attributed to nutritional deficiency (Black et al., 2008). DALYs are used by the World Bank and the World Health Organisation (WHO) to represent a composite measure of mortality and non-fatal consequences of disease or ill-health. Furthermore, children afflicted by severe or chronic malnutrition also go

on to suffer diminished functional and intellectual capacity as adults (Muller and Krawinkel, 2005).

Malnutrition in children takes several different forms. Our focus is on what is commonly referred to as protein-energy malnutrition. Nutritional status in children is determined in surveys using measurements of a child's height, weight and age. Three indices of nutritional status are typically constructed from these measurements. These are, weight-for-age, height-for-age, and weight-for-height. These measurements are compared against an international reference population (the United States population) to determine whether or not a child is malnourished. An underweight child is one having a low weight when compared with the reference population of the same age and sex. A child is considered stunted if it has a low height compared with children of the same age and sex. Similarly, wasting implies that a child has a low weight for their height, compared to the reference population (WHO, 1986).

Studies have demonstrated that significant differences in nutritional attainment are observed among children of different population groups within countries. Often these differences are patterned along socio-economic strata. That is, the burden of malnutrition falls disproportionately on children from lower socioeconomic groups (Wagstaff et al., 2003; Gwatkin et al., 2003; Haddad et al, 2003; Zere and McIntyre, 2003; Anand and Ravallion, 1993; Van de Poel et al., 1998). However, a necessary condition for reducing health disparities is to ascertain the role of socioeconomic and demographic factors in shaping patterns of nutritional status among children in Zambia.

Zambia is located in a region in Sub-Saharan Africa where the prevalence of malnutrition is highest in the world (Black et al 2008). It is estimated that about half (54%) of all children aged below five years are stunted while one in five (19.7%) are underweight. The prevalence of the wasting form of malnutrition is 6%. We use the most recent representative national survey conducted in 2006 to investigate the determinants of child nutritional status in Zambia. The aim is to measure the quantitative significance of individual and household demographic, socio-economic and geographical factors in determining child nutritional status. We employ a multilevel statistical model that permits us to measure the effects of individual and household effects and geographical context factors separately. Information on determinants of child nutritional attainment could provide insights in designing interventions for dealing with child malnutrition in Zambia.

The article is organised as follows. In section 2, we provide a brief description of the country's socioeconomic context and the child nutrition profile. We discuss the study methods and estimation techniques in section 3. Section 4 presents and analyses the findings of the study. A discussion follows in section 5. Finally, we present the conclusions of the article in section 6.

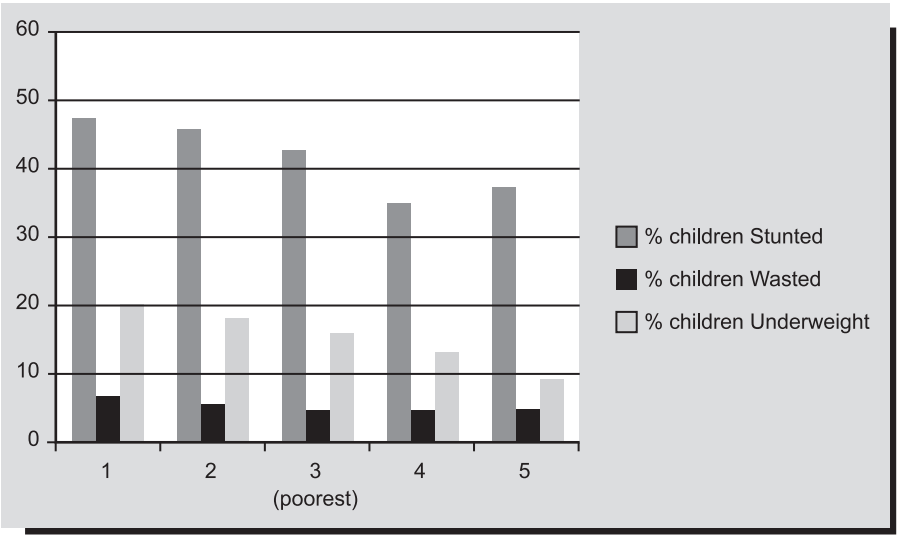
2. Country Context

Zambia is a low-income country of twelve million people in Southern Africa. It has a per capita Gross Domestic Product (GDP) of about United States $600 (WHO, 2009). The economy depends largely on mineral exports (mainly copper) and agricultural products. Subsistence agriculture and the informal sector employ a large

proportion of the labour force. The country depends on significant donor support to finance its national budget. The current global economic recession is having a devastating effect on the economy. There have already been many job losses in the mining sector. Public revenues are likely to be negatively affected, potentially constraining the capacity of the Government to support important public services.

In 1992, the new Zambian government introduced major economic reforms aimed at restructuring the economy. The Structural Adjustment Programme (SAP) was supported by the International Monetary Fund (IMF) and the World Bank. In the ten years or so that followed the implementation of the SAP, the country experienced reduced social spending to major sectors notably health, education, public water and sanitation. Access to health and other social services is a major problem especially among the poor and rural population. Consequently, general human conditions have continued to deteriorate. In 2006, it was estimated that 50% of the population were living below one United States dollar a day. This, however, is a substantial improvement from the much higher poverty levels recorded during the 1990s. Major human development indicators have worsened. Average life expectancy at birth is 43 years. Nearly one out of seven children born in the country dies before their fifth birthday. Maternal Mortality Ratio (MMR) is estimated at 449 per 100,000 live births (CSO, 2009). About 15% of adults aged 15-49 are HIV positive. Essentially, widespread malnutrition among children is an epitome of these dismal human conditions that obtain in the country. Figure 1 shows the prevalence of malnutrition by expenditure quintile in 2006.

Figure 1: Prevalence of malnutrition by expenditure quintile in 2006, Zambia



Source: CSO (2009), authors' own calculations

3. Data and Methods

Data sources

The data used in the study are based on a representative national survey conducted by the Central Statistical Office (CSO) with technical support from the World Bank. The survey is part of the World Bank's global data collection enterprise in developing countries called Living Standards Monitoring Surveys (LSMS). In Zambia these surveys are conducted by the CSO.

The 2006 Zambian Living Conditions Monitoring Survey (LCMS) covered about 20,000 households using a multi-stage sampling procedure. Sample weights are provided in the datasets. In our estimation, we applied those sample weights to the data in order to ensure the national representativeness of the results. Anthropometric measures of child nutritional status constitute only one module among several fields in these datasets. In addition, the LCMS also contains data on several other variables ranging from household socio-economic characteristics, demographic composition, and access to social services and amenities. We linked the child nutritional data file with other relevant files containing data on household conditions and parental characteristics.

The Model

A structural causal web of the determinants of nutritional status has been presented which includes proximal causes (socio-economic, physical, environmental, political, and social), underlying causes (income poverty, food insecurity, employment, inadequate care, and household conditions) and immediate causes (inadequate dietary intake and disease) (Muller and Krawinkel, 2005). The specific causal paths between these factors and child nutritional status are, of course, complex. However, abstracting from this framework, determinants of child nutritional status can be modelled in terms of a reduced-form health production function.

In this approach we posit that poor nutrition reflects an imbalance in dietary intake and/or a consequence of chronic exposure to disease. Dietary intake, in turn, is determined by access to resources and the ability to use those resources to produce good nutrition. Similarly, access to good quality health care can prevent or mitigate the adverse effects of chronic infection on nutritional wellbeing (although chronic under-nourishment can also increase proneness to infection) (Muller and Krawinkel, 2005; Gwatkin et al., 2003). In this context, child nutrition is assumed to be a function of a set of socio-economic factors such as household income, parental education, household hygiene and individual characteristics, in a regression framework (Wagstaff et al., 2003). As such, in this model, we estimate a production function of distal determinants of nutritional status.

We decided to keep our dependent variable as a continuous variable (i.e. the z-score for HAZ, WAZ and WHZ) rather than a dichotomous variable (e.g. stunted or not). The model to be estimated is specified as follows:

$$y_{ij} = \alpha_j + X_{ij}\,\beta + u_j + \varepsilon_{ij}$$

Where y_{ij}, is the dependent variable of the ith child living in j^{th} cluster while X_{ij} are the associated covariates; β are parameters to be estimated. The model specifies a separate intercept, α_j, for each cluster. In other words, this model assumes that the effect (slope) of different covariates on the dependent variable score is the same across different geographical units defined as clusters, but the intercepts across clusters (i.e. the level of relationship of different clusters with the dependent variable) could vary. The term $u_j \sim N(O,\sigma_u^2)$ represents the residual occurring at the jth (cluster) level while $\varepsilon_{ij} \sim N(O,\sigma_u^2)$ represents the residual at level-i and captures unaccounted for variations across children within a jth unit.

Measures of nutritional status

We used all the three anthropometric indicators mentioned earlier. In the LCMS, children aged 3-59 months in the sampled households are measured for age in months, height and weight. From these measurements, three anthropometric indicators are constructed on height-for-age, weight-for-age and weight-for-height in the form of z-scores. Each z-score depicts the deviation from the median height or weight of a child of the same age and sex in the reference population (the United States population). These scores called *HAZ, WAZ* and *WHZ* are already compiled in the LCMS, following international norms approved by the WHO (WHO, 1995).

For example, a child with a *HAZ* z-score of zero is considered to have the median height of a United States child of the same age and sex. A z-score less than zero indicates how much lower the child's height from the median height of the relevant population. Measurement of all three anthropometric indicators in surveys can be prone to error. As is recommended, we eliminate all observations with *HAZ* z-scores which were below -5 or above +3, less than -5 or greater than 5 for *WAZ*, and less than -4 or greater than 5 for *WHZ*. Such ranges are considered to be implausibly high or low respectively. About 4.8% of the observations were dropped.

Covariates of child nutritional status

In this article, we have included seven household-level and child-level covariates. Household per capita expenditure (which is used as a proxy for income) is expected to affect a child's nutritional status through its effect on the quantity and quality of food and other resources available within the household. A higher level of household expenditure implies that a household has greater financial capacity to buy good quality food. However, the wasting form of malnutrition or weight-for-age indicators of nutrition have been found to be insensitive to household income in some studies (Zere and McIntyre, 2003; Van de Poel et al., 1998).

Parental education is another factor that has been considered to affect the nutritional status of children. The basic hypothesis is that, everything else being equal, better-educated parents (especially the mother) have greater capacity to utilise effective sources of nutrients, and thereby alleviate risks of malnutrition in their children. In the survey education was defined as the number of schooling

years completed. However, the empirical evidence is mixed (Behrman and Wolfe, 1987). We included the education level of the head of the household and the biological mother of the child.

We included the area of residence, defined as rural or urban. Although area of residence often tends to be a confounder of other socio-economic factors such as income, in this case we are interested in its independent effect, after controlling for all the other factors. The question is whether living in a rural area influences a child's proneness to malnutrition, after income and other factors are controlled for.

In addition, we tested if the quality of domestic water source and sanitation has any effect on a child's nutritional status as suggested in some studies (Merchant et al., 2003). Water was constructed as a dummy defined as 1 for safe drinking water and 0 otherwise. The following sources of water were classified as good: tap water within the house, tap water outside the house and a protected communal borehole. Bad water included all other categories such as unprotected borehole or well, bottled water, rain water, water bought from vendors and 'other source'. Sanitation was defined using the quality of the toilet facility as a dummy: Good sanitation consisted of a flush toilet (inside or outside the house) while all other types of toilets were classified as poor toilet.

Finally, we included two child-specific variables. These are the sex and age of child. Based on the literature on malnutrition studies, boys are generally more prone to malnutrition than girls, all else being equal (Wagstaff et al., 2003). It is also reported that young children aged at least one year are more prone to malnutrition than infants, possibly due to the lost benefits of breast-feeding or reduced intensity of maternal care.

Econometric Estimation

A significant challenge in applied multivariate analysis is to find an estimation strategy that fits the data well and also possesses desirable statistical properties. This process involves dealing with several econometric estimation issues. First, based on the literature on the socio-economic determinants of child nutritional status, we address the potential endogeneity of household expenditure. Endogeneity, in this case, could arise from the possibility that a chronically and severely undernourished child, who is likely to be in poor health, could potentially reduce household expenditure by reducing the parents' time available for earning an income. In this case, malnutrition becomes a predictor of household expenditure rather than the reverse. Thus, reverse causation creates a form of endogeneity. Further, endogeneity could result from error in the measurement of per capita household expenditure. Specifically, error in the measurement of a regressor tends to cause correlation between the explanatory variable and error term (Wooldridge, 2002).

Another source of endogeneity results from correlation between included regressors and omitted variables. This means that the effect of omitted variables is captured in the error terms. Thus, the regressors are correlated with the error term. The consequence of endogeneity for Ordinary Least Squares (OLS)

estimation is to bias the true effect of household expenditure on child health, usually downwards (i.e. towards zero). OLS estimates are inconsistent while the standard errors are inefficient, potentially leading to misleading inferences (Wooldridge, 2002). In the literature it is recommended that the researcher should first run a formal test (e.g. Wu-Hausman test or the GMM C test) to ascertain whether expenditure should be considered endogenous. The danger is that running Instrumental Variables (IV) estimation in the absence of endogeneity can actually produce worse results than OLS (Baum et al., 2003; Staiger, 1997).

We carried out our endogeneity test of household expenditure under the framework of the IV-GMM estimator. The IV-GMM provides a robust fit under general circumstances (in particular in the presence of heteroscedasicity of unknown form). In this sense, this routine is superior to the traditional Hausman test if the assumption of homoscedasticity is violated. It also permits the inclusion of sample weights. Our Wu-Hausman test statistic indicates that we cannot reject the null hypothesis of exogenous expenditure. This would imply that the expenditure variable could in fact be treated as exogenous. In a recent cross-country empirical study on the effects of socio-economic status on child malnutrition, Haddad et al. (2003) found that household wealth was endogenous in some cases but exogenous in others. This demonstrates that an empirical test is necessary.

The second estimation issue we confront is the choice between a fixed-effects estimator and a random-effects estimator. The *hausman* test is the appropriate test for this. We performed an enhanced *hausman* test, which is robust to heteroskedastic or clustered errors, to evaluate the suitability of either the fixed-effects or random-effects specification (Baum et al., 2003). The choice is important because in the presence of correlation, the random effects estimator is inconsistent (Wooldridge, 2002). The null hypothesis in this test is that there is no correlation between explanatory variables and the cluster-level error term. Our test statistic leads us to reject decisively the null hypothesis, indicating the superiority of the fixed effects estimator. A third estimation issue has to do with the likely non-constant error variances at the household level (level-one unit of observation) by requesting robust standard errors.

A fourth concern emanates from the possibility that errors between households within the same cluster may not be independent, although errors across clusters might be. Within-cluster correlation produces inconsistent standard errors, leading to a potential for invalid inference (Wooldridge, 2002). Ideally, we should adjust our fixed effects estimator to control for clustered variances. However, potential dangers exist when estimating the cluster-robust standard errors of the error variance in a situation where the panels are as unbalanced (non-uniform number of units in each cluster) as ours (Nichols and Schaffer, 2007). While the mean number of units (households) per cluster was 7.5, 25% of clusters had three units while 20% of clusters have at least 10 units.

Fifth, we are also interested in measuring the independent effects of household factors and geographic area effects on child nutritional status. Our unit

of geographic area is the sampling cluster. These are sub-district localities which typically comprise a collection of a few community neighbourhoods. In such studies good reasons exist for including geographic area fixed or random effects. Regions in Zambia exhibit varying levels of economic development. The country also shows different patterns with regard to epidemiology, food security, access to health care, and cultural practices towards child-care. The fixed effect (or random effect) parameter will represent unmeasured area-level factors that may be affecting child-nutritional status. Related to this issue, we include an interaction term between location of residence (i.e. rural or urban) and household expenditure. It could be hypothesised that malnutrition in urban children may be more sensitive to changes in cash incomes than in rural children. This can come about because in urban areas households are tied to the monetary economy while the agricultural subsistence economy can enable rural households meet some of their nutritional requirements.

A final issue we encountered arose from missing observations on the variable representing the child's biological mother's education attainment. Mother's education is considered a strong predictor of child nutritional wellbeing. Of the 10,400 children in the sample, 1,470 (nearly 14%) had missing data on the variable mothers' education. There could be many reasons for this. Some of these children are orphans and were being looked after by others. In countries such as Zambia with very high adult mortality levels largely induced by HIV/AIDS, it is not uncommon that many children of such young age are orphans. Further, some biological mothers could have been absent from the household on account of schooling, divorce, visiting and for some other reasons. But it could also simply be the case that enumerators could not obtain education data on some of the mothers. However, we do not investigate the reasons why the child's biological mother was missing.

In the event that data on this covariate were missing in a non-random manner, this creates a special case of sample-selection bias (Lindsey and Lindsey, 2001). A consequence of this problem is the loss of consistency (Wooldridge, 2002). Furthermore, we cannot use the sub sample of children whose mother's education was recorded. The first step is to test whether missing mothers' education is linked to the outcome variable (nutritional status of the child). Thereafter, we use interactions to check whether income and other covariates have a different effect if the biological mother is absent from the household (Lindsey and Lindsey, 2001). Coefficients for interaction terms for missing mother and rural-urban resident were not significant, implying that the effect of covariates were essentially the same between children without mothers and also between rural and urban children.

4. Results

Descriptive Statistics of Sample

The descriptive statistics of the sample are presented in table 1. We show the prevalence of height-for-age, weight-for-age and weight-for-height malnutrition among

Zambian children aged five years or less, separately for rural and urban areas. Table 1 demonstrates that malnutrition among children is high in both urban and rural Zambia. Height-for-age malnutrition is highest followed by weight-for-age malnutrition.

Table 1 also shows the substantial rural-urban variation in malnutrition. The prevalences of stunting and underweight malnutrition are higher among rural children compared with urban counterparts. The prevalence of wasting is nearly the same in both rural and urban areas. But from a global perspective, all Zambian children suffer a great burden of stunting and underweight malnutrition. Rural children tend to have inferior nutritional status, compared with children who live in urban areas. It is also worth noting that even in the presence of widespread overall malnutrition the prevalence of wasting as a specific form of malnutrition is quite low. Further, table 1 also shows that rural poverty is very high while access to good sanitation and water is quite low.

Table 1: Descriptive statistics of sample, selected variables

Variable		**Rural**	**Urban**
Mean Age of sampled children, in months *		25.84	27.94
Age distribution (%)	0-11 months	15.9	16.8
	12-23 months	21.7	21.6
	24+ months	62.4	61.6
Mean years of schooling of household head*		9.73	13.04
Mean *HAZ* z-score*		-1.83	-1.42
Mean *WAZ* z-score *		-0.91	-0.63
Mean *WHZ* z-scores*		0.33	0.35
% children Underweight *(WAZ<-2)*		21.8	15.1
% children stunted *(HAZ<-2)*		51.0	40.2
% children wasted *(WHZ<-2)*		5.4	4.9
% of sample living in urban area		54.6	45.4
% of Male children in sample		48.9	50.0
% of households with safe drinking water		40.3	84.7
% of households with access to good sanitation		21.2	25.0
% of households living below the poverty line		83.0	40.8

* *at 95 % confidence level*

Determinants of child nutritional status

The main regression results are presented in table 2. We find that missing mother's education does not influence child's nutrition in the case of *HAZ* and *WAZ*, but is shown to have a positive effect for *WHZ* (significance at the 5% level). For *HAZ* and *WAZ*, this implies that the outcome variable does not depend on whether the child's biological mother's education is missing or not, which partially rules out significant sample selection bias.

Table 2: Determinants of child nutrition regression results

Dependent Variables: height-for-age, weight-for-age, and weight-for-height z-scores

	HAZ		*WAZ*		*WHZ*	
	Coef.	Robust SE	Coef.	Robust SE	Coef.	Robust SE
Log per capita expenditure	0.092***	0.030	0.067***	0.022	0.016	0.026
Residence (rural=1,urban=0)	-0.211*	0.115	-0.203**	0.080	-0.114	0.090
Sex (male=1,female=0)	-0.171***	0.043	-0.181***	0.033	-0.167***	0.038
Age in months (child)	-0.055***	0.006	-0.052***	0.005	-0.048***	0.006
Age_square(child)	0.001***	0.000	0.001***	0.000	0.001***	0.000
Edu household head	0.019**	0.008	0.016***	0.006	0.005	0.007
Safe water =1, bad water=0	0.019	0.062	0.075	0.048	0.057	0.061
Good sanitation=1, bad sanitation=0	-0.014	0.111	0.060	0.082	0.128	0.089
Constant (mean cluster effect)	-1.977***	0.330	-0.824***	0.245	0.913***	0.291
	Adj R-squared= 0.30		Adj R-squared= 0.46		Adj R-squared= 0.32	
	F(8, 9663) = 20.24		F(8, 9663) = 20.24		F(8, 9663) = 14.20	
	n= 10,388		n= 10,388		n= 10,388	

*Note: *** indicates significance at 99% ; ** is significance at 95% ; and * is significance at 10% level.*

Household per capita expenditure is shown to have a strong effect in the case of models for *HAZ* and *WAZ*. The coefficients suggest that a one percent increase in household per capita expenditure increases the z-score of a child's height-for-age index by about 9% (or 7% in the case of *WAZ*). Notably, the coefficient on expenditure was not significant for the weight-for-height nutrition indicator, *WHZ*. This result suggests that height-for-age nutritional indicator does not necessarily depend on household expenditure. We do not have a good understanding of why *WHZ* seems to portray a rather counter-intuitive phenomenon. Furthermore, we attempted to include the square of income to see if income influences could be non-linear, but all the coefficients did not prove to be significant (results not shown here).

The negative and strongly significant coefficient on age for all the three indicators suggests that younger children tend to have better nutritional status than older children. It is also demonstrated that the effect of age is not constant at all ages. The positive coefficient of the square of age suggests that the effect of age is concave, although this effect is rather small but significant. This is possibly linked to the effect of breast-feeding or more intense maternal care among younger children (most children stop breast-feeding around 15-18 months of age).

The education level of the head of the household was found to be a positive and significant determinant of *HAZ* and *WAZ* score, after all other covariates are controlled. Again, the size of the coefficient stays the same across all the different models estimated. This variable is not significant when we use *WHZ*. However,

when mother's education is included it is found to be insignificant. It appears that even the effect of the education of the household head is attenuated by the inclusion of mother's education.

Access to safe drinking water and sanitation are both shown to be insignificant predictors, for all of the three anthropometric indicators. Although some studies have reported a significant effect of sanitation and safe water (Wagstaff et al., 2003; Merchant et al., 2003), other studies have found no significant effect of safe water or sanitary toilet (Van de Poel, 2007).

In addition, being a resident of a rural area was a significant predictor of nutritional status in the case of *HAZ* and *WAZ*. The significant difference in prevalence of malnutrition between rural and urban areas is mediated through other socio-economic variables, particularly household expenditure. Our results also show that the hypothesis of no cluster fixed-effects is rejected (the fixed effect parameter is significant). The cluster effect is negative for *HAZ* and *WAZ* but negative for *WHZ*. The size of the cluster fixed effect for *HAZ* is nearly double its size for *WAZ*. This finding points to the existence of significant unmeasured cluster neighbourhood effects that impact on children's nutritional status.

5. Discussion

We have used a representative national survey to measure the effect of a range of factors that influence the nutritional status of Zambian children. The key findings are as follows: a strong wealth gradient is revealed, with children from poorer households having inferior nutritional status. This result indicates that children from poor households with less income to spend do exhibit a greater proneness to malnutrition, particularly stunting and underweight. However, just as has been reported elsewhere, household income was not a significant predictor of a child's weight-for-height nutritional status.

Sex and age are shown to be strong predictors of child nutritional status. The effect of age is probably mediated by breastfeeding or more intense parental attention in younger children. The effect of sex in favour of girls is probably more biological. The education level of the head of the household was found to be an important positive predictor of better nutritional status, although its effect was tempered by the inclusion of the education of the biological mother of the child. When included alone, the mother's education was significant in the case of *HAZ* and *WAZ*. We believe that apart from giving better knowledge about nutrition, education also usually implies empowerment of women. In this way, education can give a woman more domestic power in allocating household resources towards adequate diet for children.

Our examination of geographical effects revealed useful findings. First, we showed that being in a rural area produces an adverse effect on nutritional attainment of children. Second, we also found significant unmeasured effects that operate at the geographic (i.e. community) level. This result points to the significance of environmental context in influencing the nutritional status of children, after all individual and household factors were adjusted for. Finally, we

found no evidence that socioeconomic variables have a differential effect on a child's nutritional status between rural and urban areas.

One of the important issues of debate in the literature on determinants of nutrition is whether general socio-economic improvements alone are sufficient to bring about positive changes and reduce inequalities in nutritional status. Other approaches advocate more direct nutritional interventions targeted at vulnerable segments of the population. There is support for both approaches in this analysis: lack of income to spend impedes access to nutrition while children in households living in particular geographical and expenditure regions will need to be targeted for short-term nutritional programmes if they are to escape malnutrition. In the short term, targeted nutritional programmes are important, while general economic empowerment seems to be appropriate for dealing with deeper causes of nutritional deficiency among population groups.

Study limitations

A number of issues could be addressed in this article. First, we cannot draw any causal inferences because of the cross-sectional nature of this article. Second, the economic approach used in this study is an attempt at modelling what are clearly complex phenomena. The literature on causes of malnutrition is less clear. For example, the nutrition literature points out that while stunting is a long-term phenomenon, wasting and under-weight are considered to be consequences of short-term nutritional deficiency (Müller and Krawinkel, 2005; WHO, 1995). Although current income is usually a good proxy for recent past income, it is still an open question how *HAZ* versus *WAZ* and *WHZ* change with income. Nonetheless, our task in this study was modest in trying to measure the influence of the major known covariates.

Finally, the dataset we used did not include some variables which could be potentially linked to child nutrition such as child's health status and parents' height. In addition, although this article found evidence that geographical area (cluster fixed effect) was a significant predictor of child nutritional status further research is required to investigate the role of specific geographic level variables such as epidemiology, access to health care, and proneness to food insecurity.

6. Conclusion

Malnutrition is widespread among children in Zambia. It is a leading contributor to the high burden of disease. As our analysis has demonstrated, children from poorer households bear a disproportionate share of the burden of malnutrition. Hence it is not only useful to understand the factors that influence the nutritional status of children but also how those factors can be used to explain observed inequality in nutritional status.

The article identified and measured the effect of a range of socioeconomic and environmental factors that influence nutritional wellbeing of children. A socioeconomic gradient is confirmed in the case of height-for-age and weight-for-age nutritional status. We found no such gradient for weight-for-height nutritional status. Our results

also point to a significant role of geographical context effects. This implies that in addition to the well known characteristics of children and the households in which they live, we find that the environment in which children live does influence their nutritional attainment. This finding lends support to nutritional interventions that are targeted at disadvantaged groups and areas as a strategy to improve child nutrition. However, the observed differences in nutritional status among rural and urban children are moderated after individual and household factors are taken into account.

Note:
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